

## Appendix 13.6: Water Framework Directive and River Basin Management Planning

### 1 Introduction

- 1.1 This appendix screens the impact of the operational phase of the proposed scheme on main stem water bodies classified by the Scottish Environmental Protection Agency (SEPA) as part of the River Basin Management Plans (RBMP), in accordance with Annex V of the EU Water Framework Directive 2000/60/EC (WFD) to determine the acceptability of the proposed works under the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) (CAR).
- 1.2 The WFD (Directive 2000/60/EC) is a significant piece of EU water legislation that came into force in 2000, with the overarching objective of all water bodies in Europe attaining good or high ecological status/potential over a period of time (before 2027).
- 1.3 The WFD was transposed into Scottish law under the Water Environment and Water Services (Scotland) Act 2003, known as the WEWS Act. Under the WFD, new activities within or near to the water environment must not cause deterioration (of overall ecology or overall chemistry status of surface and groundwater bodies) or prevent the achievement of 'Good Status' or 'Good Ecological Potential' (for artificial or heavily modified water bodies).
- 1.4 The WEWS Act is delivered through the production of RBMPs, which detail the current condition of water bodies in the plan area and set objectives for improvement. SEPA is the competent authority in Scotland responsible for the delivery of the WFD and associated RBMPs and regulates any activities that could have an impact on the water environment. The RBMP of relevance to water bodies in the proposed scheme area is 'The river basin management plan for the Scotland river basin district: 2015 to 2027' (SEPA 2015). The objectives were published in the second RBMP cycle in December 2014. These objectives outline how SEPA intends on achieving 'Good' status for all water bodies to meet the objectives of WFD.
- 1.5 Controlled activities in or near watercourses are regulated under the CAR and The Water Environment (Miscellaneous) (Scotland) Regulations 2017. This legislation controls engineering works within inland surface waters, as well as point source discharges, abstractions and impoundments.
- 1.6 The proposed scheme would result in the modification of Cairnlaw Burn (referenced as SWF08 in Chapter 13: Road Drainage and the Water Environment) and its tributaries through the introduction of culverts, outfalls and realignments. Cairnlaw Burn is the only baseline water body monitored by SEPA under WFD in the study area and is therefore the only watercourse considered in this appendix.
- 1.7 Consultation with SEPA undertaken in March 2018 noted that there is currently an error with the SEPA water body line for Cairnlaw Burn (as used in this assessment, see Figure 13.1). This means that the reach currently shown on SEPA's Water Environment Hub (SEPA 2016) and Water Classification Hub (SEPA 2018) within the study area and crossed by the proposed scheme may be subject to change. Therefore, in subsequent stages (such as CAR) the proposed works on Cairnlaw Burn may be assessed as being on a tributary, as opposed to on a baseline water body. However, at the time of writing, the water body line remains the same, therefore the assessment has been completed on this basis.

### 2 Methodology

- 2.1 The screening process is based on a combination of desk studies reviewing existing information for the proposed scheme and Cairnlaw Burn site visits and specialist assessment. Qualified specialists have undertaken individual assessments for the biological, hydrological, physico-chemical and hydromorphological elements.
- 2.2 Baseline information on the water body has been collated and reviewed, including:

- current online WFD data available on SEPAs Water Classification Hub (SEPA 2018);
- water body objective data from SEPAs Water Environment Hub (SEPA 2016);
- site surveys conducted by geomorphologists, hydrologists, ecologists and water quality specialists; and
- detailed information from SEPAs Morphological Impact Assessment System (MImAS) obtained through consultation.

**Site surveys**

- 2.3 Walkover surveys were undertaken in January and June 2018 to assess the baseline condition of Cairnlaw Burn and other watercourses within the vicinity of the proposed scheme. The walkover provided an understanding of the existing condition of the watercourses and the condition of the channels both upstream and downstream of the proposed scheme. A photographic record of each watercourse was collected.
- 2.4 Geomorphological walkover surveys were conducted in January 2018, in order to assess the baseline conditions of all watercourses within the vicinity of the proposed scheme. The walkover provided an understanding of the condition and of the processes responsible for shaping the channel forms and features of the watercourses both upstream and downstream of the proposed scheme.
- 2.5 Aquatic macroinvertebrate surveys were conducted in October 2017 and April 2018. Inshes Burn (SWF02) and Scretan Burn (SWF04) were sampled in both seasons; however Cairnlaw Burn could not be accessed in April due to safety concerns over large equipment operating in the vicinity of the sampling point.

**3 Baseline Conditions – Cairnlaw Burn**

**Catchment Overview**

- 3.1 Cairnlaw Burn has a catchment area of 5.19km<sup>2</sup>. The source of the burn lies to the south of Upper Muckovie (outside of the study area) at approximately 190m Above Ordnance Datum (AOD). This watercourse flows in a north-westerly direction before flowing under the Highland Main Line Railway. The watercourse then flows in a north-easterly direction through the study area, under the A96 Aberdeen – Inverness Trunk Road, beneath the Aberdeen to Inverness Railway and into the Inner Moray Firth. Cairnlaw Burn has three direct tributaries which are within the vicinity of the proposed scheme.

**Water Framework Directive (WFD)**

- 3.2 The current overall classification of the Cairnlaw Burn (ID: 20241) is 'Moderate'. The key pressure on the burn preventing improvement to 'Good' overall status is physical condition, which has been caused by morphological pressures including modifications to the bed and banks due to urban and rural land uses. The RBMP objectives for Cairnlaw Burn are shown in Table 1 (SEPA 2016).

**Table 1: RBMP Objectives for Cairnlaw Burn**

Condition in 2014 and Future Objectives	2014	2021	2027	Long Term
Overall	Moderate	Moderate	Good	Good
Access for fish migration	High	High	High	High
Water flows and levels	High	High	High	High
Physical condition	Moderate	Moderate	Good	Good
Freedom from invasive species	High	High	High	High
Water quality	Good	Good	Good	Good

- 3.3 A full breakdown of the most recent 2017 classification data for Cairnlaw Burn is provided in Table 2 below (SEPA 2018). It is noted that improvement to 'Good' status for hydromorphology had not been achieved between the start of the first RBMP cycle in 2007 and the latest classification results in 2017. This is likely due to large sections of straightened watercourse and barriers to migratory fish.

**Table 2 Water Classification Data for Cairnlaw Burn (2007 and 2017)**

Parameter Code	Parameter Name	2007	2017
1	Overall Status	Moderate	Moderate
1-1	Pre-Heavily Modified Water Body (HMWB) Status	-	Moderate
1-3	Overall Ecology	Moderate	Moderate
<b>Chemical and Physicochemical Classification Data</b>			
1-3-1	Physico-Chem	High	High
1-3-1-1	Temperature	High	High
1-3-1-2	Soluble reactive phosphorus	High	High
1-3-1-4	Dissolved Oxygen	High	High
1-3-1-9	Acidity	-	High
1-3-1-9-2	pH	High	High
<b>Biological Classification Data</b>			
1-3-2	Biological Elements	Moderate	Moderate
1-3-2-3	Invertebrate animals	-	Good
1-3-2-3-3	Macroinvertebrates (RICT/WHPT)	Moderate	Good
1-3-2-3-3-1	Macroinvertebrates (ASPT)	-	Good
1-3-2-3-3-2	Macroinvertebrates (NTAXA)	-	High
1-3-2-5	Fish	-	Moderate
1-3-2-5-2	Fish Barrier	-	Moderate
<b>Hydromorphological Classification Data</b>			
1-3-4	Hydromorphology	Moderate	Bad*
1-3-4-1	Morphology	Moderate	Bad*
1-3-4-2	Overall hydrology	High	High
1-3-4-2-1	Modelled hydrology	-	High
1-3-4-2-1-1	Hydrology (medium/high flows)	-	High
1-3-4-2-1-2	Hydrology (low flows)	-	High

\*Classification for hydromorphology and morphology have been amended to 'Bad' by SEPA. Data provided during consultation (June 2018).

#### Chemistry and Physico-chemistry Environmental Standards

- 3.4 From the results shown in Table 2, there are not anticipated to be any existing issues with water quality within the Cairnlaw Burn catchment, as the latest 2017 classification presents a Physico-Chemical status of 'High' (SEPA 2018). However, it is noted that SEPA do not currently perform monitoring for 'Specific Pollutants' in the catchment.
- 3.5 The land-use within the study area and site surveys provide an indication of potential pollutants within the catchment. Inclusive of the catchments of its tributaries in the study area (SWF09 and SWF10), agricultural land comprises the greatest proportion of land use, predominantly in the lower reaches of

the watercourse, which equates to approximately 42%. The watercourse flows through the settlements of Cradlehall and Westhill, encompassing approximately 31% of the total urban development. Potential pollutants from urban and agricultural land use could include suspended solids and contaminants bound to them (such as heavy metals and phosphorus); diffuse sources with high levels of (agricultural) nutrients (nitrogen and phosphorus); de-icing salt (chloride); and oil and related compounds. Plantation woodland and forestry in the upper reaches of the watercourse (near Drummosie Muir) encompass approximately 27% of the catchment and have the potential to input pollutants including sediment, dissolved organic carbon and nutrients into the watercourse.

- 3.6 No CAR licenced abstractions have been identified from Cairnlaw Burn within 50m of the watercourse or outwith the study area of the proposed scheme. However, a Scottish Water Surface Water Sewer discharge at Cradlehall Primary School (from Cradlehall Park residential properties) at approximate NGR NH 70608 44551 is present.

#### Biological Environmental Standards

- 3.7 Table 2 shows that the 'Biological Elements' for Cairnlaw Burn have been assigned 'Moderate' status. Cairnlaw Burn currently supports aquatic species, including trout and European eel, and there is the potential to provide suitable habitat for lamprey species and potentially for spawning Atlantic salmon in the lower reaches. The Cairnlaw Burn discharges into Longman Bay and the Inner Moray Firth which has multiple designations including; Wetland of International Importance (Ramsar); Site of Special Scientific Interest (SSSI); and Special Protected Area (SPA). The designations are primarily for protected ornithological interests.

#### *Fish*

- 3.8 Cairnlaw Burn allows the upstream passage of migratory fish and contains suitable habitat to support fish species of conservation interest. The lower part of the Cairnlaw Burn (downstream of approx. ch850 of Link 1 - Culloden Road to Cradlehall Roundabout) is more natural, with wooded banks and some undercutting. The upper reach is heavily modified, having been straightened and over-deepened. Multiple habitat types and heterogeneous flows (a mix of run, glide and pool sections) were observed. Supporting habitat for macroinvertebrates and juvenile lamprey was noted. Cairnlaw Burn has been assigned a WFD classification of 'Moderate' for fish and fish passage indicating that barriers to fish passage at periods of low flow and sub-optimal habitat are present in the catchment.
- 3.9 Fish surveys undertaken to inform the DMRB Stage 3 A96 Dualling Inverness to Nairn (including Nairn Bypass) Environmental Statement (Jacobs 2016) recorded brown trout, European eel and three-spined stickleback in lower reaches of Cairnlaw Burn. Atlantic salmon, which is of considerable international and regional conservation interest, has a similar habitat and access requirements to brown trout, but a detailed desk study found no published records of Atlantic salmon in the watercourse.

#### *Fish Barrier*

- 3.10 During the 2015 walkovers for DMRB Stage 3 of the A96 Dualling Inverness to Nairn (including Nairn Bypass) scheme, surveyors made note of an in-stream barrier close to the mouth of the Cairnlaw Burn that rendered it inaccessible for migratory fish (Photograph 1 and 2). In 2017 surveyors noted a reduction in in-stream rubble (Photograph 3 and 4) and sediment deposits at the barrier when compared to conditions in 2015. Cairnlaw Burn is now thought to be accessible to migrating salmonids and eels but only during periods of high flow in combination with high tide. Although some of the larger boulders and sediment deposits have been removed from this feature since the 2015 surveys were undertaken, it would still be difficult for fish to navigate during average flow conditions in its current state. Removal of the remaining rubble and large boulders in this area would allow migratory fish access to Cairnlaw Burn under most flow conditions.



Photograph 1: State of Barrier in 2015, Viewed from Left Bank (Location: NH 70811 47148).



Photograph 2: View Downstream Towards Barrier in 2015 (Location: NH 70811 47148).



Photograph 3: State of Barrier in 2017, Viewed from Downstream (Location: NH 70811 47148).



Photograph 4: State of Barrier on 2017, Viewed from Left Bank Downstream (Location: NH 70811 47148).

### *Macroinvertebrates*

- 3.11 Autumn macroinvertebrate surveys were undertaken in October 2017; Cairnlaw Burn could not be accessed in April for a Spring 2018 survey due to safety concerns over large equipment operating in the vicinity of the sampling point. Further details of the assessment methods for macroinvertebrate surveys are detailed in Appendix A11.2 (Baseline Data and Detailed Survey Methods), which accompanies Chapter 11 (Ecology and Nature Conservation).
- 3.12 The results of the River invertebrate Classification Tool (RiCT) analysis indicated that Cairnlaw Burn supported macroinvertebrate communities yielding a WFD classification of 'Good', which is directly comparable to SEPA's WFD classification, which was also determined to be of 'Good' status for macroinvertebrates during the 2016 and 2017 rounds of sampling. Cairnlaw Burn had the lowest overall Whalley Hawkes Paisley Trigg (WHPT) scores, WHPT Average Score Per Taxon (ASPT) and WHPT Number of Taxa (NTAXA) values compared to other sampled watercourses in the study area, suggesting that the burn is subject to higher levels of pollution and is supporting a lower overall biodiversity of the macroinvertebrate community than the other locations surveyed. Species-level Lotic-invertebrate Index for Flow Evaluation (LIFE) scores calculated from the macroinvertebrate communities recovered from Cairnlaw Burn samples were indicative of a moderately flowing watercourse, however it is likely exposed to periods of low flow and was assessed as moderately sedimented based on calculated Proportion of Sediment-sensitive Invertebrates (PSI) Scores. Increased sedimentation is likely to occur in slow-flowing watercourses, particularly if there are localised areas of erosion. Field notes

taken during the October 2017 site visit to Cairnlaw Burn indicated eroding banks in close proximity to the survey site. The macroinvertebrate community of Cairnlaw Burn was of low conservation value when surveyed in October 2017 as shown in Table 3 below.

**Table 3: Metrics Calculated for Macroinvertebrate Surveys on Cairnlaw Burn**

Site	Month	Overall WFD Classification	WHPT Score	WHPT ASPT	WHPT NTAXASPT	LIFE (O/E)	LIFE Score	PSI Score	CCI* Score	CCI* Species of Conservation Interest
Cairnlaw Burn	Oct	Moderate	78.4	4.90	16	0.86	8.00	60	4.2	-

\*Community Conservation Index

### Hydromorphology

#### *Typology*

- 3.13 Upstream of its confluence with Tower Burn (SWF10), Cairnlaw Burn currently displays the characteristics of a Plane Bed Sensitivity B River Type and Plane-Riffle Sensitivity C River Type (SEPA 2012, WAT-SG-21). Through the majority of the study area, Cairnlaw Burn displays an artificially straightened planform with predominantly uniform tranquil and uniform rapid flow types; riffles are developing in some areas. The bed is homogenous and comprises poorly sorted clasts. In the 250m upstream of the confluence with Tower Burn (SWF10), there is some evidence of recovery within the confines of the straightened channel, with small lateral bars developing in places. Downstream of the confluence with Tower Burn (SWF10), based on existing conditions, Cairnlaw Burn currently displays the characteristics of an Active Meandering Sensitivity D River Type and Plane-riffle Sensitivity C River Type (SEPA 2012, WAT-SG-21). A full geomorphological baseline for Cairnlaw Burn is provided in Appendix A13.4 (Fluvial Geomorphology).

#### *Environmental Standard Test*

- 3.14 For Hydromorphology, the 'Environmental Standards Test' determines whether a proposed activity (or activities) will result in deterioration in morphological quality and WFD status.
- 3.15 The first stage of the test is to determine the impact at a local (500m reach) scale (scale may be extended depending on the extent of the proposed activities). The outcomes of the first stage determine the subsequent stages as follows:
- No downgrade in status - environmental standards test is passed, no further assessment necessary provided the water body is at 'Good' status or higher. If the water body is below 'Good' status, is within 2.5% of a morphological condition limit, and/or is <5 km long then the second stage of assessment is applied.
  - Downgrade in status - first stage of the environmental standards test is failed and a local standard is breached, second stage of assessment is applied. For proposals on smaller (not main stem) water bodies that breach a local standard they must undergo a 'Good Practice Test' (as described below).
- 3.16 Stage two of the 'Environmental Standards Test' determines whether the proposals would result in a downgrade in the status of the water body or breach a single activity limit (as described below). The outcomes of the second stage are as follows:
- No downgrade in status and do not exceed a single activity limit – environmental standards test is passed. However, as a local standard was breached in the first stage, it is currently below 'Good' status, is within 2.5% of a morphological condition limit and/or the water body is <5km long, a 'Good Practice Test' is required.

- Downgrade in status or exceedance of single activity limit - stage two of the assessment is failed and the water body status is at risk. These must undergo a 'Good Practice Test' and a 'Derogation Test'.
- 3.17 To aid the Environmental Standards Test, a SEPA tool, MImAS (Morphological Impact Assessment System), is used to determine the likely morphological impact resulting from a single activity, or combination of activities within a given length of river channel. The tool measures the existing 'system capacity' within the channel and banks as a percentage and then calculates the additional capacity used by a proposed engineering activity. It then predicts WFD status. The amount of capacity used by an activity or combination of activities varies depending on the watercourse sensitivity or type. The WFD status classes are also expressed as percentages of total system capacity, therefore works that result beyond these limits would cause a deterioration in status, as shown in Table 4 below:

**Table 4: Morphological Condition Limits for Rivers.**

Element of watercourse	WFD Status Class				
	High	Good	Moderate	Poor	Bad
River Channel	<5%	<25%	<50%	<75%	>75%
River Bank	<5%	<25%	<50%	<75%	>75%

- 3.18 If the proposed engineering activities causes a deterioration of WFD status within the local area (radius of 500m), then the 'Environmental Standards Test' requires an assessment to be undertaken of the cumulative pressures within a 1km radius along with an assessment against 'Single Activities Limits'.

*Good Practice Test*

- 3.19 As noted above a 'Good Practice Test' will be undertaken if any works cause failure of any standard, works are on a water body currently below 'Good' status, works are on a water body within 2.5% of a morphological capacity limit or are on a watercourse <5 km long.
- 3.20 To comply with the 'Good Practice Test' all engineering activities must meet three criteria:
- demonstrate the need for the activity;
  - consider a range of options; and
  - implement good practice where practical or justify the reason why it cannot be met.
- 3.21 Consultation with SEPA undertaken for the A96 Dualling Inverness to Nairn (including Nairn Bypass) scheme in June 2018 highlighted that the current official Cairnlaw Burn classification is based on remotely sensed data, which may have under-represented morphological pressures. This has subsequently been updated with field survey information. This may be the cause of the downgrade in status for 'Fish Barriers' from High in 2014 (Table 1, 'Access for Fish Migration') to Moderate in 2017 (Table 2, '1-3-2-5-2 Fish Barrier'). Hydromorphology and morphology status has subsequently been revised down from 'Moderate' to 'Bad', however this status change has not yet been reflected on the SEPA's Water Classification Hub (2018).
- 3.22 Transport Scotland have made a commitment to dual the A96 between Inverness and Nairn (including Nairn Bypass). This proposed scheme consists of new watercourse crossings, channel realignment and outfall construction on Cairnlaw Burn. Therefore, while assessing the baseline there is a requirement to consider the cumulative hydromorphological impacts and the available system capacity within the Cairnlaw Burn.
- 3.23 The system capacity of Cairnlaw Burn accounting for the A96 Inverness to Nairn scheme has been estimated by SEPA for two different scenarios comprising:
- an unnatural, engineered planform and cross section for the channel realignments (Scenario 1: High Impact Realignment); and

- a more natural planform and cross section for the channel realignments (Scenario 2: Low Impact Realignment).
- 3.24 The current status of the Cairnlaw Burn is 'Bad' for hydromorphology and morphology, therefore it is not possible for the A96 Inverness to Nairn scheme to further downgrade this status classification. However, for the local reach around the A96 dualling proposals, Scenario 1 would likely result in an increase in capacity usage, whereas Scenario 2 would result in decreased capacity usage. Although Scenario 2 would reduce capacity usage, is not likely to be sufficient to improve the overall water body status of Cairnlaw Burn.

*Cairnlaw Burn - Single Activity Limits (SAL)*

- 3.25 Single Activity Limits (SAL) are defined by SEPA as:

*'The limits are regarded as the maximum extent of an individual pressure which, in its own right, would cause a significant and long-term impact on the water environment'.*

- 3.26 SAL are assessed against six different river typologies. The maximum extent given for each individual activity will depend on the sensitivity of that river type to additional pressures. If a SAL is breached it would be necessary to demonstrate that the *'environmental harm is outweighed by the benefit to sustainable human development'*.
- 3.27 Proposed works on Cairnlaw Burn will be designed to ensure that they do not exceed the single activity limit.
- 3.28 Upstream of the confluence with Tower Burn (SWF10), based on existing conditions, Cairnlaw Burn displays the characteristics of a Plane-bed Sensitivity B River Type and a Plane-riffle Sensitivity C River Type. Downstream of the confluence with Tower Burn (SWF10), based on existing conditions, Cairnlaw Burn displays the characteristics of an Active Meandering Sensitivity D River Type and Plane-riffle Sensitivity C River Type (SEPA 2012, WAT-SG-21).
- 3.29 The engineering activities proposed are upstream of the confluence with Tower Burn (SWF10), therefore for the engineering activities which could possibly require authorisation under the proposed scheme, the SAL for both Type B and Type C typologies are provided in Table 5 below.

**Table 5: SALs (m) for Relevant Activities on Cairnlaw Burn in the Proposed Scheme Area (from SEPA 2012, WAT-SG-21).**

Activity	Type B	Type C
Riparian Vegetation	2500	1410
Embankments and Floodwalls (excludes	670	270
Set Back Embankments and Floodwalls	11250	3460
Grey (Hard) Bank Protection	1180	600
Green (Soft) Bank Protection	2370	1450
Bank Reprofilling	2370	1450
High Impact Realignment (e.g. straightening)	390	140
Low Impact Realignment (e.g.re-meandering)	1020	730
Flood Bypass Channel	660	240
Open Culverts	230	100
Culvert with Natural Bed (e.g. arch culvert)	340	140
Culvert with Artificial Bed (e.g. pipe or box culverts)	280	120
Croys, Groynes or Flow Deflectors	590	300

Activity	Type B	Type C
Bed Reinforcement	390	140

## 4 Proposed works on Cairnlaw Burn

### Culverts

- 4.1 As per SEPA Good Practice guidelines (SEPA 2010), a clear span bridge option is generally a preferable option to that of a closed culvert. However, whilst lessening the environmental impact with regards to the river corridor environment, a clear span bridge can represent a disproportionate cost to environmental benefit when compared with the culvert option. As the existing habitat and morphology of Cairnlaw Burn is sub-optimal, the preferred solution for the crossings of the burn are closed culverts due to the disproportional cost of bridge crossings. However, in-line with best practice, a range of mitigation measures will be considered.
- 4.2 A single span bridge with abutments set back from the Cairnlaw Burn would offer the potential to retain the existing riverbanks and maintain the processes of morphological recovery observed in the existing watercourse, particularly in the vicinity of culvert C07 (refer to Figure 13.1 of Chapter 12: Road Drainage and the Water Environment). However, it is likely that the riverbank vegetation will be lost or changed by both the construction process and the reduction of light penetration under the bridge. The loss of riverbank vegetation may result in the riverbanks becoming more readily susceptible to fluvial erosion and/or collapse. To protect the structure, this risk is likely to require bank reinforcement in the form of grey bank protection. Therefore, the benefit of a retaining a natural riverbank will be lost.
- 4.3 In the vicinity of culverts C06 and C07 (refer to Figure 13.1 of Chapter 13: Road Drainage and the Water Environment), the alternative of a single span bridge sized to fully span the flood envelope associated with the design flood event, would have a capital cost estimated to be in the region of £1.6 million and £2.2 million respectively. The capital cost associated with a closed culvert would be in the region of £222,000 and £288,000, respectively. The adoption of a single span bridge option would represent an approximate 721% and 764% increase in capital cost, respectively. This is considered disproportionate to the environmental benefits once the mitigation measures discussed above for the closed culvert are taken into consideration.
- 4.4 Further details on the culvert proposals and mitigation measures are provided in Appendix A13.5 (Watercourse Crossings).

### SuDS and Outfalls

- 4.5 Following SEPA Good Practice guidelines (SEPA 2008) and as agreed with SEPA, two levels of (conventional) SuDS treatment (Swale and Wetland / Retention Pond) will be provided within the road drainage catchments discharging to Cairnlaw Burn. The treatment levels, as agreed with SEPA, have also been designed to attenuate water levels associated with the 0.5% AEP (1 in 200-year) plus a 20% allowance for climate change (plus CC) flood event. The proposed scheme must not cause deterioration of the physico-chemical status of Cairnlaw Burn, which is currently 'High'.
- 4.6 Water quality assessments have been undertaken in line with SEPA's Regulatory Guidance (WAT-RM-08) Sustainable Urban Drainage Systems (SuDS or SUD Systems) (SEPA 2019). DMRB HD45/09 (Highways Agency, Transport Scotland, Welsh Government and The Department for Regional Development Northern Ireland 2009) Method A using the Highways Agency Water Risk Assessment Tool (HAWRAT) (which assesses the impacts on receiving watercourses from routine runoff) and Method D, (which assesses the risk from the accidental spillage of pollutants) have been used to assess outfalls draining roads with predicted Average Annual Daily Traffic (AADT) volumes of >10,000 vehicles per day (vpd). Side roads with predicted AADT volumes of <10,000, the suitability of SuDS have been assessed using the Simple Index Approach, as detailed within CIRIA (2015). These assessments have been undertaken to demonstrate the suitability of the proposed SuDS.

- 4.7 Further details on SuDS and Outfalls, including the assessment results demonstrating the suitability of proposed treatment is provided in Appendix A13.3 (SuDS and Water Quality).

**Morphological Improvement**

- 4.8 Where watercourse crossings are proposed, opportunities exist to provide morphological improvements upstream and downstream of crossing structures, which will also offset the morphological impacts of the proposed scheme and any cumulative impacts with the A96 Dualling Inverness to Nairn (including Nairn Bypass) scheme. This may be through re-creation of a sinuous channel where the existing channel currently follows an artificial alignment or by making smaller in-channel improvements to encourage the channel to adopt a more natural planform.
- 4.9 Cairnlaw Burn is currently at ‘Bad’ status for morphology. To mitigate the impact of the proposed scheme, morphological improvements are proposed to Cairnlaw Burn at an approximate 40m reach upstream and 60m downstream of culvert C06 and an approximate 200m reach upstream and 50m downstream of culvert C07, to encourage the existing artificially straightened channel to recover sinuosity in a two-stage channel (as above). The aim is to improve the existing morphological capacity and offset any capacity lost through the introduction of new crossing structures. Further details are provided in Table 13.15, **Mitigation Item WO3** of Chapter 13 (Road Drainage and the Water Environment) and in Appendix A13.4 (Fluvial Geomorphology).

**5 Impacts on WFD Status and RBMP Objectives**

- 5.1 Table 6 details the potential operational impacts of the proposed scheme on the WFD Status and RBMP Objectives for Cairnlaw Burn (based on the current water body line), incorporating best practice and morphological improvements.

**Table 6: Likely Operational Effects on Environmental Standards for Cairnlaw Burn**

Parameter Code	Parameter Name	2017	Anticipated Operational Impact of the Proposed Scheme
<b>Chemical and Physico-chemical Classification Data</b>			
1-3-1	Physico-Chem	High	<b>Culverts</b> All culverts on Cairnlaw Burn will be designed in line with good practice guidance where practical, therefore no operational impacts are anticipated. No risk to the ‘High’ WFD status for chemical and physico-chemical parameters is anticipated from operational culverts.
1-3-1-1	Temperature	High	
1-3-1-2	Soluble reactive phosphorus	High	
1-3-1-4	Dissolved Oxygen	High	
1-3-1-9	Acidity	High	
1-3-1-9-2	pH	High	<b>Outfalls</b> SuDS will be designed to convey runoff and provide attenuation and treatment. Two levels of SuDS treatment will be provided for Cairnlaw Burn (swale and wetland / or retention pond).  As per the methodology for determining impact significance, the HAWRAT assessment results in an impact of negligible magnitude and Neutral significance on Cairnlaw Burn (i.e. not significant) (see Appendix A13.3: SuDS and Water Quality for detailed results and Chapter 13 (Road Drainage and the Water Environment for impact assessment). In addition, research shows that the most significant pollutants from road runoff are dissolved copper (Cu) and dissolved zinc (Zn) and the assessments undertaken have shown that concentrations do not breach EQS for these two pollutants. Therefore, the discharge of routine runoff is not anticipated to prevent the watercourse from achieving ‘Good’ WFD status for dissolved Cu and dissolved Zn. In addition, no risk to the ‘High’ WFD

Parameter Code	Parameter Name	2017	Anticipated Operational Impact of the Proposed Scheme
			<p>status for the monitored chemical and physico-chemical parameters is anticipated. The levels of SuDS treatment proposed are considered adequate to protect the water environment and chemical and physico-chemical parameters.</p> <p><b>Realignments for Morphological Improvement</b></p> <p>Realignments will be designed and undertaken in accordance with good practice. No risk to the 'High' WFD status for chemical and physico-chemical parameters is anticipated from operational realignments.</p>
<b>Biological Classification Data</b>			
1-3-2	Biological Elements	Moderate	<p><b>Culverts</b></p> <p>All culverts on Cairnlaw Burn will be designed in line with good practice where practical and will provide measures to ensure fish passage. Culverts and other watercourse crossing structures will seek to keep a consistent hydrological regime such that they do not form a barrier to fish passage. Culverts will maintain the existing channel width and gradient of the surrounding reach of watercourse where practical.</p> <p>Although no macroinvertebrate species of conservation interest were recorded during kick-sampling surveys undertaken for Cairnlaw Burn in 2017, suitable habitat for macroinvertebrate is present throughout the watercourse. A small amount of habitat may be lost due to shading from potential culverts, but this is considered negligible in the context of the river catchment. Morphological activities to promote re-meandering of the watercourse could also increase available habitat, compensating for any habitat lost due to the addition of culverts. It is therefore considered that the macroinvertebrate biological quality elements considered under the WFD will remain unimpacted by the proposed scheme, and the current WFD status of the watercourse is not anticipated to be affected.</p> <p>If the above good practice guidance is adhered to, no impacts on the WFD Biological Environmental Standards parameters are anticipated.</p> <p><b>Outfalls</b></p> <p>SuDS will be designed and installed in line with good practice guidance to convey runoff and sufficient attenuation and treatment. Therefore, no impacts on the WFD Biological Environmental Standards parameters are anticipated.</p> <p>The implementation of appropriate mitigation to ensure the maintenance of watercourse connectivity and habitat heterogeneity should ensure no degradation of the biological quality elements considered under the WFD.</p> <p><b>Morphological Improvement</b></p> <p>Morphological activities to increase morphological capacity have the potential to improve available habitat suitability, compensating for any habitat lost due to the addition of culverts. It is therefore considered that the biological quality elements considered under the WFD will remain unimpacted by the proposed scheme, and the current WFD status of the watercourse is not anticipated to be affected.</p>
1-3-2-3	Invertebrate animals	Good	
1-3-2-3-3	Macroinvertebrates (RiCT/WHPT)	Good	
1-3-2-3-3-1	Macroinvertebrates (ASPT)	Good	
1-3-2-3-3-2	Macroinvertebrates (NTAXA)	High	
1-3-2-5	Fish	Moderate	
1-3-2-5-2	Fish Barrier	Moderate	

Parameter Code	Parameter Name	2017	Anticipated Operational Impact of the Proposed Scheme
			<p>As there is currently a partial barrier to fish passage located at the confluence with the Inner Moray Firth (approx. 1.2km downstream of the proposed scheme) the proposals themselves will not facilitate improvement of Biological Environmental Standards from 'Moderate' to 'Good'. However, should the barrier to fish passage be removed in the future, the proposals may have an overall positive impact by potentially increasing the extent of accessible watercourse and suitable habitat conditions.</p> <p>The application of best practice guidance will ensure fish passage is maintained at its current level. It is therefore considered that the fish biological quality elements considered under the WFD will remain unimpacted by the proposed scheme, and the current WFD status of the watercourse is not anticipated to be affected.</p>
<b>Hydromorphological Classification Data</b>			
1-3-4	Hydromorphology	Bad*	<p><b>Culverts</b></p> <p>All culverts on Cairnlaw Burn will be designed in accordance with good practice guidance where practical. Whilst the installation of culverts may decrease morphological capacity, the proposed morphological improvements would offset any decrease, however this may not result in a WFD classification change. As a result, the proposed scheme has the potential to further the betterment made by the A96 Dualling Inverness to Nairn scheme.</p> <p>Culverts and flood mitigation have been designed in line with good practice to ensure a neutral impact on flood risk outwith the proposed scheme extents. Subsequently, no impact on flow regime is anticipated.</p> <p>No negative operational impacts on Hydromorphological Environmental Standards for the Cairnlaw Burn are anticipated.</p> <p><b>Outfalls and Drainage</b></p> <p>SuDS will be designed and installed in line with good practice to convey runoff and provide attenuation and treatment. The drainage strategy for surface water (quantity) is to ensure that the post development flows within receiving watercourses do not increase with respect to the pre-development conditions for all return period events up to the 1 in 200 year plus CC event. This is achieved by limiting all discharges of the rate of QMED (50% AEP (2-year) event). No negative operational impacts on Hydromorphological Environmental Standards for Cairnlaw Burn are anticipated. Discharge rates from the outfalls are currently set at 5l/s, therefore, no negative impacts regarding outfall locations are anticipated on the hydrology of the watercourse.</p> <p>Pre-earthwork drainage has been designed to capture runoff upslope of the proposed scheme and return these flows to their natural watercourse catchment. No direct river abstractions are associated with the proposed scheme. Therefore, no impact on flows is anticipated as a result of disruption to catchment hydrology.</p>
1-3-4-1	Morphology	Bad*	
1-3-4-2	Overall hydrology	High	
1-3-4-2-1	Modelled hydrology	High	
1-3-4-2-1-1	Hydrology (medium/high flows)	High	
1-3-4-2-1-2	Hydrology (low flows)	High	

Parameter Code	Parameter Name	2017	Anticipated Operational Impact of the Proposed Scheme
			<p><b>Realignments for Morphological Improvement</b></p> <p>Cairnlaw Burn is currently at 'Bad' status for morphology. Through the majority of the study area, the burn displays an artificially straightened planform; this would generally be considered a 'high impact realignment', however, there is some evidence of natural recovery within the confines of the straightened channel through the development of small lateral bars.</p> <p>To mitigate the impact of the proposed scheme, morphological improvements are proposed upstream and downstream of culverts C06 and C07. The installation of alternate berms to act as flow deflectors and will encourage the existing artificially straightened channel to recover sinuosity in a two-stage channel.</p> <p>The proposed scheme has the potential to improve an approximate 350m reach of Cairnlaw Burn from a 'high impact realignment' to a 'low impact realignment'. It is therefore anticipated that the proposed scheme will increase the morphological capacity of the watercourse, moving the watercourse closer to the next highest WFD status class for hydromorphology.</p>
<b>Overall WFD Classification</b>			
1	Overall Status	Moderate	<p>Currently, the overall status and ecology status of Cairnlaw Burn are both at 'Moderate'.</p> <p>Cairnlaw Burn contains suitable supporting habitat for macroinvertebrates and a range of fish species, including fish species of conservation interest. The implementation of appropriate mitigation to ensure the maintenance of watercourse connectivity and habitat heterogeneity should ensure no degradation of the overall ecological quality elements considered under the WFD.</p>
1-3	Overall Ecology	Moderate	

\*Classification for hydromorphology and morphology have been amended to 'Bad' by SEPA. Data provided during consultation.

## 6 Summary

- 6.1 The assessment of the likely operational effects on the classification of Cairnlaw Burn demonstrates that if good practice guidance is adhered to, and appropriate mitigation measures are implemented, the proposed scheme design will pose no risk to the degradation of the current quality elements for Cairnlaw Burn considered under the WFD.

### Chemical and Physico-Chemical Quality Elements

- 6.2 For Chemical and Physico-chemical classification, all outfalls, culverts or realignments on Cairnlaw Burn will be designed in line with good practice where practical and therefore the proposed scheme is not anticipated to impact the WFD parameters for the watercourse. The levels of SuDS treatment proposed for Cairnlaw Burn are considered adequate to protect the water environment and chemical and physico-chemical parameters, therefore no risk to the 'High' WFD status for chemical and physico-chemical parameters is anticipated from operational outfalls, culverts or realignments.
- 6.3 In conclusion, chemical and physico-chemical elements considered under the WFD are not anticipated to be impacted by the proposed scheme, and the current WFD status of the watercourse is not anticipated to be affected.

### Biological Quality Elements

- 6.4 For Biological classification, culverts and other watercourse crossing structures will seek to provide measures to ensure fish passage and replicate the flow characteristics of the existing channel, such that they do not impact on biological parameters or form a barrier to fish passage.
- 6.5 A small area of habitat may be lost due to shading from potential culverts, however this is considered negligible in the context of the river catchment. Morphological activities to promote the restoration of sinuosity of the watercourse is likely to increase the available habitat and should off-set any loss of habitat due to the addition of culverts.
- 6.6 As there is currently a partial barrier to fish passage located at the confluence with Inner Moray Firth, the proposed designs themselves will not facilitate improvement from 'Moderate' to 'Good' status. However, should the barrier to fish passage be removed in the future, the proposals may have an overall positive impact by potentially increasing the extent of accessible watercourse and suitable habitat conditions.
- 6.7 In conclusion, biological quality elements considered under the WFD are not anticipated to be impacted by the proposed scheme, and the current WFD status of the watercourse is not anticipated to be affected.

### Hydromorphological Quality Elements

- 6.8 For Hydromorphological classification, no negative operational impacts on Cairnlaw Burn are anticipated. Whilst the installation of culverts may decrease morphological capacity, the proposed realignments for morphological improvement are likely to offset any decrease.
- 6.9 There is the potential to improve an approximate 350m reach of Cairnlaw Burn from a 'high impact realignment' to a 'low impact realignment'.
- 6.10 The proposed scheme has the potential to further the betterment made by the A96 Inverness to Nairn scheme and increase the morphological capacity of the watercourse, moving the watercourse closer to the next highest WFD status class for hydromorphology.
- 6.11 The drainage strategy for surface water (quantity) is to ensure that the post development flows within receiving watercourses do not increase with respect to the pre-development conditions for all return period events up to the 0.5% AEP (200-year) plus CC event; this will be the case for Cairnlaw Burn. This is achieved by limiting all discharges of the rate of QMED (50% AEP (2-year) event).
- 6.12 In conclusion, hydromorphological quality elements considered under WFD are not anticipated to be impacted by the proposed scheme, and the current WFD status of the watercourse is not anticipated to be affected.

## 7 References

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