A14.1 Baseline Description and Evaluation

1.1 Features of the Existing Water Environment

SWF 01: Mill Burn

Brief Description of Watercourse

1.1.1 The source of Mill Burn appears to be a number of drains that flow northwards from Drummosie Muir, to the south of Milton of Leys (outside of the study area, to the south). Mill Burn enters the study area to the north-west of Milton of Leys. The watercourse flows in a north-westerly direction through the south-western corner of the study area. It then flows in a northerly direction through Inverness (outside of the study area, to the west) before re-entering the study area between Inverness Golf Club and Milburn Academy. The watercourse then passes beneath two minor roads, a railway and the A96 Aberdeen – Inverness Trunk Road before flowing into the Moray Firth (within the study area).

Hydrology and Flood Risk

1.1.2 Mill Burn features on the Scottish Environment Protection Agency (SEPA) Flood Map as having areas at medium likelihood of flooding (areas likely to flood during a 0.5% Annual Exceedance Probability event or 1 in 200 year return period event). The SEPA Flood Map shows Mill Burn poses a flood risk to a number of properties and fields within 1Km of the route options and also a number of areas (residential, recreational, commercial) downstream of the route options. Mill Burn is further shown by the SEPA Flood Risk Maps as being within PVA (Potential Vulnerable Area) 01/21 which indicates that the watercourse is within an area identified as particularly susceptible to flooding.

Fluvial Geomorphology

1.1.3 Mill Burn has a predominantly straight planform for the majority of its course from Fountainhead Woodland to its confluence with the Moray Firth, particularly through Inverness where the channel appears to be culverted under several roads and channelized between residential areas. The channel has a slightly sinuous course through the study area north of Milton of Leys where the river flows through a woodland area.

1.1.4 The majority of the course of Mill Burn upstream of Inverness (at Sir Walter Scott Drive) has a vegetated riparian buffer of 5m of more on both banks. Analysis of aerial photography shows that some sections of eroding banks are present on the burn, particularly on the outside of meander bends within the study area.

1.1.5 Mill Burn forms part of two Water Framework Directive (WFD) water bodies. These include the 'Mill Burn – Hilton to source' which is currently classified as achieving 'Good' physical condition and the 'Mill Burn – sea to Hilton' which is currently classified as achieving 'Moderate' physical condition.

1.1.6 This water feature has been assessed as having a high sensitivity to disturbance due to its WFD classification.

Water Quality

1.1.7 Mill Burn receives flow from at least three direct tributaries. It has a medium sized catchment (in comparison to the other watercourses that flow through the study area) comprising woodland, a small number of agricultural fields and part of Inverness (including residential, commercial and industrial areas). This watercourse may also receive runoff from the major and minor road network and from the Highland Main Line and Aberdeen to Inverness Railway Line.

1.1.8 This watercourse comprises two WFD water bodies, both of which flow through the study area. The section of watercourse between its source and its confluence with a tributary to the east of Hilton forms the 'Mill Burn - Hilton to source' water body. This water body is currently classified as achieving Good Ecological Status and Good Water Quality Status. The section to the north of this confluence, extending all the way to Moray Firth, forms the 'Mill Burn – sea to Hilton' water body. This water body is currently classified as achieving Moderate Ecological Potential and Good Water Quality Status.

SWF 02: Inshes Burn

Brief Description of Watercourse

1.1.9 The source of Inshes Burn appears to lie to the south of Balvonie Wood (within the study area). It flows in a north-easterly direction through the study area before flowing into Scretan Burn (SWF04) to the north east of Inverness Retail and Business Park. Scretan Burn then flows under the A96 Aberdeen – Inverness Trunk Road, beneath the Aberdeen to Inverness Railway Line and downstream into the Moray Firth (within the study area, to the north of Inverness Retail and Business Park).

Hydrology and Flood Risk

1.1.10 Inshes Burn does not feature on the SEPA Flood Map for the medium likelihood event due to its catchment area being less than 3km^2 and therefore smaller than the significance threshold for inclusion in the SEPA data. Inshes Burn, however, does flow in very close proximity to residential areas, commercial areas, Raigmore Hospital and the local road network. The watercourse is therefore likely to pose a flood risk during higher return period flood events.

1.1.11 Consultation with The Highland Council has identified that Inshes Burn (SWF 02) upstream of and in the vicinity of the Inshes Retail Park has potential to pose flood risk to local receptors including local residences.

Fluvial Geomorphology

1.1.12 Inshes Burn has a predominantly sinuous planform within its upstream section from Balvonie Wood to Dell of Inshes and a straightened planform as it flows through the industrial estate to the east of Inverness. With the exception of a 350m section of the channel north of Inshes, which has a scattered tree lining, the channel has a complex vegetated riparian zone consisting of trees and shrubs within the upstream section. The channel appears to have no substantial riparian buffer in the downstream section.

1.1.13 Inshes Burn is considered to have a low sensitivity to disturbance.

Water Quality

1.1.14 Inshes Burn receives flow from at least two direct tributaries. It has a relatively small catchment (in comparison to the other watercourses that flow through the study area) comprising agricultural fields and part of Inverness (including residential, commercial and industrial areas). This watercourse may also receive runoff from the major and minor road network and from the Highland Main Line and Aberdeen to Inverness Railway Line.

1.1.15 This SWF receives a licenced sewage discharge (combined sewer overflow) from Stoneyfield House.

SWF 03: Tributary of Scretan Burn (1)

Brief Description of Watercourse

1.1.16 Tributary of Scretan Burn (1) (SWF 03) appears to have its source to the north of Inshes, between Culloden Road and Caulfield Road North (within the study area). This watercourse flows first in a north-westerly direction, and then in a north-easterly direction, before joining with Scretan Burn (SWF 04), to the east of Inverness Retail and Business Park (within the study area).

Hydrology and Flood Risk

1.1.17 SWF 03 does not feature on the SEPA Flood Map due to its small catchment (less than 3km^2). There are a number of properties that are located in very close proximity to the watercourse, as well as buildings for Inverness College University of Highlands and Islands (UHI) and Inverness Retail and Business Park which may be at flood risk during higher return period events. SWF 03 passes the Inshes Smallholdings, and consultation with The Highland Council has identified SWF 03 in this vicinity as a potential source of flood risk in connection with the proposed Scheme.

1.1.18 The Highland Main Line also crosses over SWF 03 and its crossing may pose flood risk within the study area.

Fluvial Geomorphology

1.1.19 Tributary of Scretan Burn (1) is a small channel which has a predominantly straight planform from source to confluence with the Scretan Burn (SWF 04). Upstream of the Highland Main Line, the burn has a channel width approximately 2-3m wide which appears to be narrowing (by creating berms) and laterally adjusting within its banks to create a low flow channel approximately 0.4m wide (Plate 1). Downstream of the Highland Main Line, the channel exhibits a more uniform cross section measuring approximately 1.5-2m wide with no low flow channel. The burn has some variability in flow types, including sections of rippled flow and smooth flow. Some woody material was also observed the upstream section of the burn which creates areas of pooled water. The channel is embanked on both sides for a large section immediately upstream of the Highland Main Line and appeared to be overdeep with little connectivity with the flood plain for the majority of its course.

1.1.20 The channel has a simple riparian buffer zone consisting predominantly of reeds and grasses, with some sections of shrubs and gorse, particularly upstream of the Highland Main Line (Plate 2). The channel substrate consists predominantly of silt with some gravels and cobbles within the faster flowing sections of the burn. Downstream of the Highland Main Line the channel is slightly wider (approximately 2m wide) for a short section where silt substrate is dominant.

1.1.21 SWF03 (Tributary of Scretan Burn) is assessed as having a low sensitivity to disturbance.

Plate 1: Channel narrowing and laterally adjusting upstream of Highland Main Line

Plate 2: Riparian buffer consisting of gorse and grasses within the upstream section

Water Quality

1.1.22 Tributary of Scretan Burn (1) does not receive flow from any tributaries. It has a relatively small catchment (in comparison to the other watercourses that flow through the study area) comprising agricultural fields and Inverness College UHI. This watercourse may also receive runoff from the major and minor road network, Highland Main Line and Inverness Retail and Business Park.

1.1.23 This SWF receives a licenced discharge from Inverness College UHI.

SWF 04: Scretan Burn

Brief Description of Watercourse

1.1.24 The source of Scretan Burn (SWF 04) appears to be to the east of Milton of Leys (a suburb of Inverness) and the A9 (outside of the study area, to the south). This watercourse enters the study area shortly after its source, to the east of Drumossie Hotel. It flows in a northerly direction through the study area, before joining Inshes Burn (SWF 02) to the north west of Inverness Retail and Business Park, and then flowing under the A96 Aberdeen – Inverness Trunk Road, beneath the Aberdeen to Inverness Railway Line and into the Moray Firth (to the west of Smithton Junction, within the study area).

Hydrology and Flood Risk

1.1.25 Scretan Burn (SWF04) features on the SEPA Flood Map for the medium likelihood event over nearly the entire reach downstream of the railway crossing to the Moray Firth. The flood extents typically lie within farm land, although it is possible that some land within the curtilage of the Inverness Retail and Business Park at Smithton is affected. Flows in Scretan Burn may contribute to flooding indicated by SEPA to the south (i.e. upstream) of the Aberdeen to Inverness Railway Line between Scretan Burn and Cairnlaw Burn (SWF 08) crossings. Pluvial flood risk is also indicated by the SEPA Flood Map south of the Scretan Burn crossing of the railway line. Pluvial flood risk is indicated to occur over a dispersed area at this location between the railway line and a point to the north east of Inshes. It should also be noted that the Stratton New Town Development is proposed to be located in the very lower reaches of the SWF 04 catchment; therefore, the development could be at potential flood risk over small areas depending on the proposed layout of the development.

Fluvial Geomorphology

1.1.26 The majority of Scretan Burn (SWF 04) within the study area flows through grazed agricultural land with a small section flowing through deciduous woodland downstream of the A96 Aberdeen – Inverness Trunk Road. A complex vegetated riparian zone is present along the majority of both banks to the east of Inverness Retail and Business Park, comprising grasses, shrubs and trees and measuring over 1.5m wide. A simple vegetated buffer comprising grasses was present upstream of this section.

1.1.27 The burn flows through a predominantly straight planform with a large uniform cross-section measuring up to 4m wide and 1m deep immediately downstream of the Highland Main Line. Within its banks the burn is narrowing and latterly adjusting, creating a sinuous low flow channel within the confines of the banks (Plate 3). The channel is embanked along the majority of the upstream section (Plate 4).

1.1.28 Large areas of erosion are present downstream of the A96 Aberdeen – Inverness Trunk Road due to a natural increase in gradient. This could also be exacerbated as a result of reduced channel roughness caused by the significant reinforcement associated with the culvert under the A96. Bank material within this section predominantly consisted of earth with steep, vertical or undercut bank profiles.

1.1.29 The dominant flow types are smooth and rippled flow throughout the course of the channel, with some pools also present in the downstream section. Some sections were choked with vegetation, where stagnant flow is also present.

1.1.30 The channel is culverted under several roads and two railways, including one under the A96 Aberdeen – Inverness Trunk Road which included a 4m high wing wall. Artificial concrete beds are present immediately downstream of the culvert under the A96. Several weirs are also present within the study area.

1.1.31 This SWF is assessed to have a medium sensitivity to disturbance.

Plate 3: channel laterally adjusting within its banks downstream of the railway

Plate 4: Embanked channel downstream of railway

Water Quality

1.1.32 This SWF receives flow from at least six direct tributaries. It has a medium sized catchment (in comparison to the other watercourses that flow through the study area) comprising agricultural fields and part of Inverness (including residential and commercial areas). This SWF may also

receive runoff from the major and minor road network and from the Highland Main Line and Aberdeen to Inverness Railway Line.

1.1.33 In its upper reaches, this watercourse forms part of the wider Cairnlaw Burn (WFD 08) waterbody (between its source, near Milton of Leys, and Caulfield Road North, in Inshes). The Cairnlaw Burn WFD water body is currently classified as achieving Moderate Ecological Status and Good Water Quality Status.

1.1.34 This SWF receives three licensed sewage discharges, as follows: emergency overflow from commercial premises at Inverness Retail and Business Park; septic tank effluent from Killerearnan Cottage, Woodside, Inshes; and sewage treatment works final effluent from a dwelling north-east of Milton Croft.

SWF 05: Tributary of Scretan Burn (2)

Brief Description of Watercourse

1.1.35 The tributary of Scretan Burn (2) appears to have its source in a field corner, to the north of the residential properties located along Cradlehall Meadow (within the study area). This watercourse flows first in a north-easterly direction across two field boundaries and through a culvert under the Highland Main Line. It then continues in a north-westerly direction across three fields before flowing into Scretan Burn to the east of Inverness Retail and Business Park (within the study area).

Hydrology and Flood Risk

1.1.36 SWF 05 does not feature on the SEPA Flood Map due to its small catchment (less than 3km^2). The watercourse/drainage ditch does, however, flow in close proximity to several houses before crosses under the Highland Main Line where flood risk is indicated for the medium likelihood event (0.5% AEP event) to the east and west of SWF 05 on the south side of the railway. Further flood risk is indicated for the medium likelihood event at this watercourse's confluence with SWF 04 (Scretan Burn) in the vicinity of the Inverness Retail and Business Park.

Fluvial Geomorphology

1.1.37 Tributary of Scretan Burn (2) is a small drainage channel forming the boundary of an agricultural field. The channel has a straight planform and a trapezoidal channel measuring approximately 1.5m wide. The channel is embanked on both sides and has a vegetated riparian buffer comprising grasses and gorse on the right bank only (Plate 5).

1.1.38 The predominant flow type is rippled flow and the substrate consists of silt.

1.1.39 SWF 05 is assessed as having a low sensitivity to disturbance.

Plate 5: Riparian vegetation on the right bank providing a buffer from agricultural land use.

Water Quality

1.1.40 This watercourse receives flow from one direct tributary. It has a relatively small catchment (in comparison to the other watercourses that flow through the study area) comprising agricultural fields. This SWF may also receive runoff from a small number of residential properties and from the Highland Main Line.

SWF 06: Indirect tributary of Scretan Burn

Brief Description of Watercourse

1.1.41 The indirect tributary of Scretan Burn (SWF 06) is a very short field drain that flows in a westerly direction from its source to the south of Ashton Farm, along one field boundary, before flowing into tributary of Scretan Burn (2).

Hydrology and Flood Risk

1.1.42 SWF 06 does not feature on the SEPA Flood Map due to its small catchment (less than 3km^2). The watercourse / drainage ditch has been assessed as having low flood risk due to the lack of sensitive receptors in close proximity to the surface water feature.

Fluvial Geomorphology

1.1.43 Indirect tributary of Scretan Burn has a continuous tree lining on both banks (Plate 6). The channel is fenced and has a small embankment (approximately 0.2m high) and a continuous vegetated riparian buffer, comprising grasses and shrubs present on both banks. Channel substrate is predominantly silt; however, several sections of the channel are dominated by terrestrial grass. The dominant flow type is smooth or pooled throughout the course of the channel.

1.1.44 SWF 06 is assessed as having a low sensitivity to disturbance.

Plate 6: Continuous tree lining on both banks of SWF 06.

Water Quality

1.1.45 This watercourse does not receive flow from any tributaries. It has a very small catchment (in comparison to the other watercourses that flow through the study area) comprising agricultural land.

SWF 07: Un-named drain

Brief Description of Watercourse

1.1.46 This drain flows along the boundaries of three agricultural fields, to the north of Ashton Farm, before joining Cairnlaw Burn (SWF 08) (all within the study area). The source of this drain appears to lie immediately to the north of Ashton Farm.

Hydrology and Flood Risk

1.1.47 SWF 07 (Un-named drain) does not feature on the SEPA Flood Map due to its very small catchment. The drainage ditch flows along the side of a local road before flowing across a field and into SWF 08 (Cairnlaw Burn). The drainage ditch is shown by the SEPA Flood Map to have associated flood risk near its confluence with SWF 08. Slight flooding is shown for a medium likelihood event in the proximity of its confluence with SWF 08. The SEPA Flood Map also shows this drainage ditch is within PVA 01/20. This indicates that the area has been identified by SEPA as being particularly susceptible to flooding. However, the drainage ditch is located on the outskirts of the PVA and the flood risk identified is more likely to be attributed to SWF 08. It should be noted that the Stratton New Town Development is proposed to be located within the SWF 07 catchment and therefore could be at potential flood risk depending on the proposed layout of the development.

Fluvial Geomorphology

1.1.48 Unnamed drain consists of a road drain along an access track to Ashton Farm and a small field drain. The road drain was dry at the time of survey and overgrown with brambles (Plate 7). The channel consists of earth and has a continuous tree lining on the left bank. The field drain is a small straightened channel with a continuous tree lining on the right bank and an intermittent fence on the left banks. At the time of survey water within the channel was stagnant and substrate consisted of silt (Plate 8).

1.1.49 Unnamed drain is assessed as having a low sensitivity to disturbance.

Plate 7: Dry road drain forming part of SWF 07

Plate 8: Field drain with stagnant water forming part of SWF 07

Water Quality

1.1.50 This drain does not receive flow from any other watercourses. It has a very small catchment (in comparison to the other watercourses that flow through the study area) comprising agricultural land and Ashton Farm access road.

SWF 08: Cairnlaw Burn

Brief Description of Watercourse

1.1.51 The source of Cairnlaw Burn (SWF 08) appears to lie to the north-west of Muckovie Quarry (disused), south of Easter Muckovie (outside of the study area, to the east). This watercourse enters the study area immediately to the west of Easter Muckovie. The watercourse then flows in a north-easterly direction through the study area, under the A96, beneath the Aberdeen to Inverness Railway Line and into the Moray Firth, north of Cairnlaw (also within the study area).

Hydrology and Flood Risk

1.1.52 Cairnlaw Burn is identified on the SEPA Flood Map as at risk of flooding during a medium likelihood event (0.5% AEP event). For the reach from Caulfield Road North in Cradlehall downstream to the Moray Firth there are a number of reaches of Cairnlaw Burn identified at flood risk during a medium likelihood event. Upstream of the Highland Main Line, flooding is also shown to potential impact the grounds of approximately five properties adjacent to Cairnlaw Burn. Downstream of the Highland Main Line crossing, floodwater is also indicated by the SEPA Flood Maps to spill widely over the adjacent fields before entering the catchment of SWF 09 which is itself an indirect tributary of Cairnlaw Burn.

1.1.53 Flows in Cairnlaw Burn are also likely to contribute to flooding indicated by the SEPA Flood Maps to the South (i.e. upstream) of the Aberdeen to Inverness Railway Line between the Scretan Burn (SWF 04) and Cairnlaw Burn crossings.

1.1.54 The SEPA Flood Map also shows this watercourse is within PVA 01/20. This indicates that the area has been identified by SEPA as being particularly susceptible to flooding.

1.1.55 It should also be noted that the Stratton New Town Development is proposed to be located in the lower reaches of the SWF 08 catchment and therefore could be at potential flood risk over small areas depending on the proposed layout of the development.

Fluvial Geomorphology

1.1.56 Cairnlaw Burn is a small field drain with a predominantly straightened planform along the majority of its course within the study area (Plate 9). The channel within the upstream section (adjacent to Ashton Farm) is embanked on both sides and appears to have very limited connectivity with the flood plain. The channel cross section at this location is trapezoidal and overdeep, with bank height measuring up to 1-1.5m high in some sections and up to 2m wide. Channel substrate consists predominantly of silt with some fine gravels and no deposits were observed during the site visit.

1.1.57 The majority of the channel has no substantial riparian buffer; however, some sections are lined with gorse and grasses providing some buffer from the surrounding agricultural land. The dominant flow type observed was rippled, with some sections of smooth flow also observed within wider sections.

1.1.58 Cairnlaw Burn is designated as a WFD water body and is currently achieving 'Moderate' physical condition.

1.1.59 Cairnlaw Burn is assessed as having a medium sensitivity to disturbance due to its WFD classification.

Plate 9: Straight planform and trapezoidal cross-section of SWF 08

Water Quality

1.1.60 This watercourse receives flow from at least eight direct tributaries. It has a medium-sized catchment (in comparison to the other watercourses that flow through the study area) comprising agricultural fields as well as residential areas. This SWF may also receive runoff from the major and minor road network, from the Highland Main Line and Aberdeen to Inverness Railway Line and from a small number of farmsteads.

1.1.61 This watercourse forms part of the Cairnlaw Burn WFD water body, which is currently classified as achieving Moderate Ecological Status and Good Water Quality Status.

SWF 09: Indirect tributary of Cairnlaw Burn

Brief Description of Watercourse

1.1.62 The indirect tributary of Cairnlaw Burn (SWF 09) appears to have its source to the south of the residential area of Reasurie, immediately south of the Highland Main Line (within the study area). This watercourse flows in a northerly direction along a small number of field boundaries, and through a small area of woodland, to flow into the tributary of Cairnlaw Burn (SWF 10) (within the study area).

Hydrology and Flood Risk

1.1.63 SWF 09 does not feature on the SEPA Flood Map in its own right due to it having a very small catchment. The SEPA Flood Map does, however, show associated flood risk in the vicinity of SWF 09 for a medium likelihood event (0.5% AEP event). The SEPA Flood Map suggests SWF 09 receives flood water from SWF 08 (Cairnlaw Burn) which cross the low watershed at times of flood. Downstream of the broad flood extents attributed to SWF 08 and immediately downstream of the Highland Main Line crossing, SWF 09 flood extent is typically contained close to the channel as it passes through farmland and woodland to its confluence with SWF 10 at Stratton. The SEPA Flood Map also shows this watercourse is within PVA 01/20. This indicates that the general area has been identified by SEPA as being particularly susceptible to flooding.

1.1.64 The watercourse is also shown by mapping data to flow in close proximity to a few residential properties and to cross the Highland Main Line in its upper reaches.

1.1.65 SWF 09 is on the very edge of the proposed Stratton New Town Development area.

Fluvial Geomorphology

1.1.66 Indirect tributary of Cairnlaw Burn is a small straightened drainage ditch, which forms the boundary between several agricultural field drains. The channel has no substantial riparian buffer and appears to have a small laterally adjusting low flow channel within the confines of its banks.

1.1.67 SWF 09 is assessed to have a low sensitivity to disturbance.

Water Quality

1.1.68 This watercourse receives flow from one direct tributary. It has a relatively small catchment (in comparison to the other watercourses that flow through the study area) comprising a small number of residential properties in Resaurie, agricultural fields and a small area of woodland. This watercourse may also receive runoff from a local road and from the railway.

SWF 10: Tributary of Cairnlaw Burn (1)

Brief Description of Watercourse

1.1.69 The source of this watercourse lies in the vicinity of Easter Bogbain, south-east of Upper Muckovie (outside of the study area, to the east). Tributary of Cairnlaw Burn (1) (SWF 10) enters the study area alongside Tower Brae North (road), close to the Highland Main Line between Smithton and Westhill. It flows in a northerly direction through the study area, before flowing into with Cairnlaw Burn (SWF 03) (described previously) to the north-west of Stratton (also within the study area).

Hydrology and Flood Risk

1.1.70 SEPA Flood Map data for the medium likelihood (0.5% AEP) event identifies SWF 10 as at risk from flood from its confluence with SWF 09 at Stratton to its confluence with SWF 08 at Cairnlaw.

The SEPA Flood Map also shows this watercourse is within PVA 01/20. This indicates that the general area has been identified by SEPA as being particularly susceptible to flooding.

1.1.71 The watercourse is also shown by mapping data to flow in close proximity to approximately 50 residential properties and the local road network as well as to cross the Highland Main Line.

1.1.72 The Stratton New Town Development is proposed to be located within the SWF 10 catchment and therefore may be at potential flood risk over small sections of the development depending on the proposed layout of the development.

Fluvial Geomorphology

1.1.73 Tributary of Cairnlaw Burn (1) has undergone high impact realignment in its upper catchment, upstream of Culloden Road where the planform is very straight, presumably to accommodate drainage for the agricultural and forestry land.

1.1.74 Downstream of Culloden Road, as the river flows through urban settlements of Westhill and Smithton, the planform of the channel is more natural and sinuous. There is also a substantial riparian zone throughout the urban settlements, consisting of a continuous broadleaf treeline. The river also flows through a number of culverts in the urban area. There are likely to be outfalls which contribute to sediment input. As the river leaves the urban areas, the channel planform becomes artificially straight as it flows over agricultural land once again into Cairnlaw Burn at Stratton. The downstream section of the channel, immediately upstream of its confluence with Cairnlaw Burn, has a wide cross section (approximately 3m) and cobble and pebble substrate.

1.1.75 SWF 10 is assessed to have a medium sensitivity to disturbance.

Water Quality

1.1.76 Tributary of Cairnlaw Burn (1) receives flow from at least four direct tributaries. It has a medium sized catchment (in comparison to the other watercourses that flow through the study area) comprising residential properties in Smithton, agricultural fields and a small area of woodland. This SWF may also receive runoff from the minor road network and from the railway.

SWF 11: Tributary of Cairnlaw Burn (2)

Brief Description of SWF

1.1.77 This is a short SWF that flows in its entirety within the study area (in a north-westerly direction). The source of this tributary appears to lie to the north of Caulfield Road, Smithton, to the south of a former hotel. The tributary flows into Cairnlaw Burn to the south of Cairnlaw and the A96 Aberdeen – Inverness Trunk Road.

Hydrology and Flood Risk

1.1.78 SWF 11 does not feature on the SEPA Flood Map in its own right due to it having a very small catchment (less than 3km^2). The SEPA Flood Map does, however, show associated surface water (pluvial) flood risk along the length of the watercourse. The watercourse therefore has the potential to flood adjacent land in close proximity to the watercourse which consists of predominantly woodland, farmland and the grounds of a former hotel. The Stratton New Town Development is also proposed to be located within the SWF11 catchment and therefore may be at potential flood risk over small sections of the development depending on the proposed layout of the development.

Fluvial Geomorphology

1.1.79 Tributary of Cairnlaw Burn (2) is a small sinuous channel measuring approximately 0.8 – 1m wide and located within an area of woodland. Flow type is predominantly smooth with some sections of

rippled flow. Channel substrate consists of gravels; however, at the time of survey, leaf litter obscured sight of the channel bed in several locations. Water in the channel appears to sink before its confluence with SWF 08 and no distinct channel is visible within the downstream section (approximately 15m from SWF 08).

1.1.80 Tributary of Cairnlaw Burn (2) is assessed to have a low sensitivity to disturbance.

Water Quality

1.1.81 This SWF does not appear to receive flow from any tributaries. It has a very small catchment (in comparison to the River Nairn) comprising agricultural fields and the hotel.

SWF 12: Kenneth's Black Well

Brief Description of SWF

1.1.82 Kenneth's Black Well (SWF 12) appears to have its source to the south of Culloden Wood, north of the B9006 (road). Kenneth's Black Well flows in a north-westerly direction through the study area before forming a tributary of Cairnlaw Burn (described previously) close to its mouth, between the Aberdeen to Inverness Railway Line (to the south) and Milton (to the north).

Hydrology and Flood Risk

1.1.83 The SEPA Flood Map indicates flood risk to agricultural land and a number of residential properties. The SWF also runs in close proximity to a school grounds, residential areas and is crossed by the Highland Main Line, the Aberdeen to Inverness Railway Line and a number of roads, potentially resulting in flood risk.

1.1.84 The SEPA Flood Map also shows this watercourse is within PVA 01/20. This indicates that the area has been identified by SEPA as being particularly susceptible to flooding. The Smithton and Culloden Flood Alleviation Scheme is proposed to be constructed in the upper reaches of this catchment.

Fluvial Geomorphology

1.1.85 Kenneth's Black Well forms a road drain for the majority of its course within the study area. A semi-continuous vegetated riparian zone is present on both banks, approximately 1m wide.

1.1.86 The majority of the SWF has a straightened planform with a uniform cross-section. Banks mainly consist of earth and have a resectioned profile. The dominant channel substrate is imbricated cobbles, gravel and silt. Multiple depositional features are present including gravel side bars and riffles. Various flow types were observed on-site including a pool-riffle sequence, smooth flow and rippled flow.

1.1.87 Four culverts are present along the course of this watercourse within the study area and reinforced concrete banks are present along the majority of the river along Caulfield Road and immediately upstream and downstream of the A96 culvert. A large concrete lined weir with a steep gradient (approx. 45°) is also present immediately upstream of the A96 culvert. This impact reduced the lateral and longitudinal connectivity of the channel throughout the study area.

1.1.88 Kenneth's Black Well is assessed to have a low sensitivity to disturbance.

Water Quality

1.1.89 Kenneth's Black Well receives flow from at least three direct tributaries. It has a relatively small catchment (in comparison to the River Nairn) that comprises agricultural fields, an area of

woodland (Culloden Wood) and residential areas in Culloden. This SWF may also receive runoff from the minor road network and Highland Main Line and Aberdeen to Inverness Railway Line.

1.1.90 This SWF receives a licenced sewage treatment works final effluent discharge.

1.2 Nitrate Vulnerable Zones

1.2.1 Nitrate Vulnerable Zones (NVZs) are areas designated as being at risk from agricultural nitrate pollution. The route options do not pass through a NVZ.

1.3 Water Quality Status

1.3.1 Under the WFD, SEPA classifies water bodies according to their ecological and water quality status. These are useful indicators of biodiversity/water quality, respectively. Both ecological and water quality status are classified on a five-point scale (bad/poor/moderate/good/high). The objectives of the WFD are for all water bodies to achieve or maintain an overall status of 'good' by 2021 or over agreed timescales, up to or beyond 2027. Artificial or heavily modified water bodies (HMWB) have less stringent targets to meet, however, these water bodies need to achieve at least 'good ecological potential' over the same timescales.

1.3.2 Within the study area, SEPA has classified three water bodies. The classifications, which are from 2014, are provided in Table 1, from west to east.

Table 1: Importance/sensitivity of each attribute of a water feature.

SWF	Ecological Status/ Potential	Water Quality Status
SWF 01: Mill Burn - sea to Hilton	Moderate Potential	Good Status
SWF 01: Mill Burn - Hilton to source	Good Status	Good Status
SWF 03: Cairnlaw Burn	Moderate Status	Good Status

1.3.3 The ecological and water quality statuses of the rest of the surface water features that flow within the study area have not been classified by SEPA. Therefore, an assumption about the ecological statuses of these water features has been made, based on the following:

- Moderate ecological status has been assumed for those surface water features that have artificial or realigned channels; little or no riparian zone and/or are choked with vegetation; and
- Good ecological status has been assumed for those surface water features that have a natural planform and/or a good riparian zone.

1.4 River Flows

1.4.1 The annual 95 percentile river flow of a SWF (Q_{95}) is the flow exceeded for 95% of the time (i.e. it is a measure of the flow of water in the river when it is very low). This is important because it is an indication of the capacity of the SWF to dilute and disperse any contaminants discharged into it without significant harm to water quality or ecosystems.

1.4.2 There is no record of a gauging station on any of the watercourses that flow within the study area. Therefore, a Q_{95} value has been calculated for all SWFs that would receive runoff from the route options using area scaled Low Flows Enterprise Q_{95} flow estimates from a selected representative catchment.

1.4.3 The calculated Q_{95} values, by option, are as follows:

Option 1A

- SWF 02 (for Outfall 1): 0.001m^3/sec;

- SWF 04 (for Outfall 2): 0.005m^3/sec;
- SWF 08 (for Outfall 4): 0.002m^3/sec; and
- SWF 03 (for Outfall 5): 0.002m^3/sec.

1.4.4 The Q_{95} calculated for outfall 4 (into SWF 07) was a very low value of 0.00037m^3/sec. This is below the threshold of values than can be input into the HAWRAT tool. Therefore, a value of 0.001m^3/sec was used because this is the lowest value that can be input into HAWRAT. The use of such a value under these circumstances is endorsed by the DMRB method.

Option 1B

- SWF 02 (for Outfall 1): 0.001m^3/sec;
- SWF 04 (for Outfall 2): 0.005m^3/sec;
- SWF 08 (for Outfall 3): 0.002m^3/sec;
- SWF 08 (for Outfall 4): 0.002m^3/sec; and
- SWF 03 (for Outfall 5): 0.002m^3/sec.

Option 2A

- SWF 02 (for Outfall 1): 0.001m^3/sec;
- SWF 04 (for Outfall 3): 0.005m^3/sec;
- SWF 08 (for Outfall 5): 0.002m^3/sec; and
- SWF 03 (for Outfall 6): 0.002m^3/sec.

1.4.5 The calculation produced a very low value of 0.00037m^3/sec for outfall 4 (into SWF 07). This is below the threshold of values than can be input into the HAWRAT tool. Therefore, a value of 0.001 was used because this is the lowest value that can be input into HAWRAT. The use of such a value under these circumstances is endorsed by the DMRB method.

Option 2B

- SWF 02 (for Outfall 1): 0.001m^3/sec;
- SWF 04 (for Outfall 3): 0.005m^3/sec;
- SWF 08 (for Outfall 4): 0.002m^3/sec;
- SWF 08 (for Outfall 5): 0.002m^3/sec; and
- SWF 03 (for Outfall 6): 0.002m^3/sec.

Option 3A

- SWF 04 (for Outfall 2): 0.005m^3/sec;
- SWF 08 (for Outfall 4): 0.002m^3/sec; and
- SWF 03 (for Outfall 5): 0.002m^3/sec.

1.4.6 The calculation produced a very low value of 0.00037m^3/sec for outfall 3 (into SWF 07). This is below the threshold of values than can be input into the HAWRAT tool. Therefore, a value of 0.001m^3/sec was used because this is the lowest value that can be input into HAWRAT. The use of such a value under these circumstances is endorsed by the DMRB method.

Option 3B

- SWF 04 (for Outfall 2): 0.005m^3/sec;

- SWF 08 (for Outfall 3): 0.002m^3/sec;
- SWF 08 (for Outfall 4): 0.002m^3/sec; and
- SWF 03 (for Outfall 5): 0.002m^3/sec.

1.5 Designated Sites

1.5.1 None of the watercourses that flow through the study area are protected areas under the WFD. In addition, none of the watercourses flow upstream of a protected area.

1.5.2 All of the watercourses that flow through the study area flow into the Moray Firth, which has the following ecological designations:

- Inner Moray Firth Wetland of International Importance (Ramsar);
- Inner Moray Firth Special Protection Area;
- Longman and Castle Stuart Bays Site of Special Scientific Interest; and
- Moray Firth Special Area of Conservation.

1.6 Discharge Consents

1.6.1 A number of discharges to surface water have been identified within the study area from information provided by SEPA. These are listed below, with their CAR licence numbers:

- CAR/L/1026128: Miller Street; combined sewer overflow to an un-named tributary of Mill Burn;
- CAR/L/1026128: Stoneyfield House; combined sewer overflow to Inshes Burn (SWF 02);
- CAR/S/1098390: Beechwood UHI Campus, southern system SUDS; outfall to tributary of Scretan Burn (1) (SWF 03);
- CAR/R/1115486: Seafield Farmhouse and Cottage; septic tank effluent to Moray Firth;
- CAR/R/1049467: Killerearnan Cottage, Woodside, Inshes; septic tank effluent to Scretan Burn (SWF 04); and
- CAR/R/1029415: New dwelling NE of Milton Croft, Drumossie, Inverness; sewage treatment works final effluent to Scretan Burn (SWF 04).

1.7 Water Abstractions

1.7.1 No surface water abstractions have been identified within the study area.

1.8 Importance/Sensitivity

Table 2: Importance/Sensitivity of Each Attribute of a Surface Water Feature

Surface Water Feature (SWF)	Attribute	Indicator of Quality	Sensitivity
SWF 01: Mill Burn	Hydrology and Flood Risk	Drains a relatively small sized catchment. Receives water from at least two direct tributaries. The watercourse is within PVA 01/21. Receptors: • >100 residential properties; • Commercial areas; • Local road network; • Farm land; and • Golf course.	Very High

Surface Water Feature (SWF)	Attribute	Indicator of Quality	Sensitivity
	Fluvial geomorphology	'Mill Burn – Hilton to source' achieving 'Good' physical condition 'Mill Burn – sea to Hilton' achieving 'Moderate' physical condition Slightly sinuous channel through study area with substantial vegetated riparian area on both banks. Some sections of erosion on the outside of meander bends evident on aerial photography.	High
	Water quality/supply	WFD water quality status: Good. Surrounding land-use: urban and residential; agriculture and forestry upstream. No licensed water abstractions identified in SEPA data.	High
	Dilution and removal of waste products	No licensed discharges identified in SEPA data. Potential additional pollutant sources: road and railway drainage and diffuse urban/rural sources.	Medium
	Biodiversity	WFD overall ecological status (Mill Burn - Hilton to source): Good WFD overall ecological potential (Mill Burn – sea to Hilton): Moderate Fisheries status: not designated.	High
SWF 02: Inshes Burn	Hydrology and Flood Risk	Drains a small catchment. Receives water from at least two direct tributaries. Receptors: • Approx 100 residential properties including some near Inshes Retail Park identified as particularly flood-sensitive by consultation responses; • Raigmore Hospital; • A9; • Inverness Retail and Business Park; • Local road network; and • Farm land.	Very High
	Fluvial geomorphology	Straightened channel choked with vegetation, extensively realigned with a trapezoidal cross section and reinforced banks. The channel was culverted under several roads.	Low
	Water quality/supply	Not classified under WFD. 'Good' water quality assumed. Surrounding land-use: urban, residential and agriculture; forestry upstream. No licensed water abstractions identified in SEPA data.	High
	Dilution and removal of waste products	CAR licence for combined sewer overflow from residential property. Potential additional pollutant sources: road and railway drainage and diffuse urban/rural sources.	High
	Biodiversity	WFD overall ecological status: not classified. 'Moderate' equivalent assumed. Fisheries status: not designated.	Medium
SWF 03: Tributary of Scretan Burn (1)	Hydrology and Flood Risk	Drains a small catchment. Receptors: • More than 10 residential properties, including some at Inshes Smallholdings identified as particularly flood-sensitive by consultation responses; • A9;	High

Surface Water Feature (SWF)	Attribute	Indicator of Quality	Sensitivity
		• Local road network; • Highland Main Line; • Inverness Retail and Business Park; • Inverness College University of Highlands and Islands; and • Farm land.	
	Fluvial geomorphology	Small channel with predominantly straight planform. Uniform cross-section with some variability in flow types. Some woody material present. Channel is embanked on both banks and appears to be overdeep for the majority of its course.	Low
	Water quality/supply	Not classified under WFD. 'Good' water quality assumed. Surrounding land-use: urban, residential and agriculture. No licensed water abstractions identified in SEPA data.	High
	Dilution and removal of waste products	CAR licence for a discharge from Beechwood UHI campus. Potential additional pollutant sources: road and railway drainage and diffuse urban/rural sources.	High
	Biodiversity	Not classified under WFD. 'Moderate status' ecological quality equivalent assumed.	Medium
SWF 04: Scretan Burn	Hydrology and Flood Risk	Drains a relatively small catchment. Receives water from at least six direct tributaries. Receptors: • 50-100 (approx.) residential properties; • Inverness Retail and Business Park; • A96 Aberdeen – Inverness Trunk Road; • Local road network; • Highland Main Line; and • Farm land. The Stratton Development is proposed to be located in the lower reaches of this watercourse, in the vicinity of the A96 Aberdeen – Inverness Trunk Road.	Very High
	Fluvial geomorphology	WFD hydromorphology parameter status: not classified. Channel choked with vegetation and extensively realigned. Bed substrate consisting of fine/coarse gravels, some variability in flow types. Areas of erosion and deposition creating a varied bank structure.	Medium
	Water quality/supply	WFD water quality status: Good. Surrounding land-use: urban, residential, agriculture and forestry. No licensed water abstractions identified in SEPA data.	High
	Dilution and removal of waste products	Three CAR licences identified: emergency overflow; septic tank effluent; and sewage treatment works final effluent. Potential additional pollutant sources: road and railway drainage and diffuse urban/rural sources.	High
	Biodiversity	WFD overall ecological status (Cairnlaw Burn): Moderate. Fisheries status: not designated.	Medium
SWF 05: Tributary of Scretan Burn (2)	Hydrology and Flood Risk	Drains a small catchment. Receptors: • Approximately 7 residential properties; • Local road network; • Highland Main Line; and	High

Surface Water Feature (SWF)	Attribute	Indicator of Quality	Sensitivity
		• Farm land.	
	Fluvial geomorphology	Small drainage channel with straight planform and trapezoidal cross-section. Channel is embanked on both banks.	Low
	Water quality/supply	Not classified under WFD. 'Good' water quality assumed. Surrounding land-use: residential and agriculture. No licensed water abstractions identified in SEPA data.	High
	Dilution and removal of waste products	No licensed discharges identified in SEPA data. Potential additional pollutant sources: railway drainage.	Low
	Biodiversity	WFD overall ecological status: not classified. 'Moderate' equivalent assumed. Fisheries status: not designated.	Medium
SWF 06: Indirect tributary of Scretan Burn	Hydrology and Flood Risk	Drains a very small catchment. Receptors: • Farm land.	Low
	Fluvial geomorphology	Small field drain with a straight planform and silt substrate. Channel is dominated by terrestrial grass in several sections.	Low
	Water quality/supply	Not classified under WFD. 'Good' water quality assumed. Surrounding land-use: agriculture. No licensed water abstractions identified in SEPA data.	High
	Dilution and removal of waste products	No licensed discharge consents identified in SEPA data.	Low
	Biodiversity	WFD overall ecological status: not classified. 'Moderate' equivalent assumed. Fisheries status: not designated.	Medium
SWF 07: Un-named drain	Hydrology and Flood Risk	Drains a very small catchment. On the edge of PVA 01/20. Receptors: • Farm land; and • Local road. The Stratton Development is proposed to be located in the SWF 07 catchment in the vicinity of the A96 Aberdeen – Inverness Trunk Road and the route options.	High
	Fluvial geomorphology	Consists of one road drain and a small field drain. Channel planform was straight and overgrown with brambles.	Low
	Water quality/supply	Not classified under WFD. 'Good' water quality assumed. Surrounding land-use: agriculture. No licensed water abstractions identified in SEPA data.	High
	Dilution and removal of waste products	No licensed discharge consents identified in SEPA data.	Low
	Biodiversity	WFD overall ecological status: not classified. 'Moderate' equivalent assumed. Fisheries status: not designated.	Medium
SWF 08: Cairnlaw Burn	Hydrology and Flood Risk	Drains a medium catchment. Receives water from at least four direct tributaries. Within PVA 01/20.	Very High

Surface Water Feature (SWF)	Attribute	Indicator of Quality	Sensitivity
		Receptors: • 50-100 (approx.) residential properties; • School; • A96 Aberdeen – Inverness Trunk Road; • Local road network; • Highland Main Line; • Aberdeen to Inverness Railway Line; and • Farm and farm land. The Stratton Development is proposed to be located in the lower reaches of this watercourse, in the vicinity of the A96 Aberdeen – Inverness Trunk Road and the route options. Potential upstream impacts in Culloden.	
	Fluvial geomorphology	WFD 'Physical Condition' parameter status: Moderate. Predominantly cobble bed with depositional features. Diversity of flow types. Predominantly straight planform.	Medium
	Water quality/supply	WFD water quality status: Good. Surrounding land-use: urban, residential and agriculture. No licensed water abstractions identified in SEPA data.	High
	Dilution and removal of waste products	No licensed discharge consents identified in SEPA data. Potential additional pollutant sources: road and railway drainage and diffuse urban/rural sources.	Medium
	Biodiversity	WFD overall ecological status (Cairnlaw Burn): Moderate Fisheries status: not designated.	Medium
SWF 09: Indirect tributary of Cairnlaw Burn	Hydrology and Flood Risk	Drains a very small catchment. Receives water from at least one direct tributary. Within PVA 01/20. Receptors: • 1-10 (approx.) residential properties (in upper reaches); • Farm land; and • Highland Main Line. This watercourse is just outside the boundary of the proposed Stratton Development.	Medium
	Fluvial geomorphology	Small straightened drainage ditch with no substantial riparian buffer. Some small lateral adjustment within the low flow channel.	Low
	Water quality/supply	Not classified under WFD. 'Good' water quality assumed. Surrounding land-use: residential, agriculture and forestry. No licensed water abstractions identified in SEPA data.	High
	Dilution and removal of waste products	No licensed discharge consents identified in SEPA data. Potential additional pollutant sources: road and railway drainage and diffuse urban/rural sources.	Medium
	Biodiversity	WFD overall ecological status: not classified. 'Moderate' equivalent assumed. Fisheries status: not designated.	Medium
SWF 10: Tributary of Cairnlaw Burn	Hydrology and Flood Risk	Drains a relatively small catchment. Receives water from at least four direct tributaries. Within PVA 01/20.	High

Surface Water Feature (SWF)	Attribute	Indicator of Quality	Sensitivity
(1)		Receptors: • Approx. 50 residential properties; • Local road network; • Farm land; and • Highland Main Line. The proposed Stratton Development is located within the lower reaches of the SWF 10 catchment.	
	Fluvial geomorphology	WFD hydromorphology parameter status: not classified. Cobble substrate and depositional features including side bars. Rippled flow and vegetated riparian buffer.	Medium
	Water quality/supply	Not classified under WFD. 'Good' water quality assumed. Surrounding land-use: residential, agriculture and forestry. No licensed water abstractions identified in SEPA data.	High
	Dilution and removal of waste products	No licensed discharge consents identified in SEPA data. Potential additional pollutant sources: road and railway drainage and diffuse urban/rural sources.	Medium
	Biodiversity	WFD overall ecological status: not classified. 'Good' equivalent assumed. Fisheries status: not designated.	High
SWF 11: Tributary of Cairnlaw Burn (2)	Hydrology and Flood Risk	Drains a very small catchment. Does not receive flow from any tributaries. Within PVA 01/20. Receptors: • Grounds of former hotel; • Farm land and • Woodland. SWF 11 is on the boundary of the Stratton Development.	Low
	Fluvial geomorphology	WFD hydromorphology parameter status: not classified. Small sinuous channel (0.8-1 wide) located within area of woodland. Gravel substrate. No distinct channel evident within the downstream section (i.e. channel 'spreads' towards confluence with SWF 08).	Low
	Water quality/supply	Not classified under WFD. 'Good' water quality assumed. Surrounding land-use: woodland/forestry and agriculture.	High
	Dilution and removal of waste products	Relatively small catchment. Potential additional pollutant sources: diffuse rural sources and former hotel.	Low
	Biodiversity	WFD overall ecological status: not classified. 'Good' equivalent assumed. Fisheries status: not designated.	High
SWF 12: Kenneth's Black Well	Hydrology and Flood Risk	Drains a relatively small catchment. Receives water from at least three direct tributaries. Within PVA 01/20. The Smithton and Culloden Flood Alleviation Scheme is proposed within the upper reaches of this catchment. Receptors: • Residential properties (approx. 50);	High

Surface Water Feature (SWF)	Attribute	Indicator of Quality	Sensitivity
		• Local road network; • Grounds of a school • Farm land; and • Highland Main Line.	
	Fluvial geomorphology	WFD hydromorphology parameter status: not classified. Extensive channel realignment and culverted under several roads and access tracks. Fragmented riparian zone.	Low
	Water quality/supply	Not classified under WFD. 'Good' water quality assumed. Surrounding land-use: agriculture; urban/residential and forestry upstream.	Medium
	Dilution and removal of waste products	No discharge consents identified by Envirocheck. CAR licence identified in SEPA data for sewage treatment works final effluent discharge. Potential additional pollutant sources: diffuse rural/urban sources and road and railway drainage.	High
	Biodiversity	WFD overall ecological status: not classified. 'Moderate' equivalent assumed. Fisheries status: not designated.	Medium