8 Water Resources

8.1 Introduction

8.1.1 Purpose & Scope of the Assessment

This Chapter addresses the potential effects on water resources as a result of the proposed Scheme. Water resources include surface waters (e.g. rivers, burns, static water bodies, tidal waters, etc.) and groundwater (e.g. shallow and deep aquifers). The assessment process comprised of characterisation of the existing water resources, identification and prediction of potential effects, and recommendations for any secondary mitigation measures (i.e. those not already included in the Scheme outline design or thought of as standard practice) required to offset any significant residual effects.

8.1.2 Planning Framework

Apart from general statutory and planning requirements for a scheme of this nature, the water resources aspects are regulated by a number of EU, Scottish and Local instruments, including:

- EU Directive 2000/60/EC (Water Framework Directive (WFD)), transposed into the Water Environment and Water Services Act (Scotland) 2003 (the "WEWS" Act);
- The Water Environment (Controlled Activities) (Scotland) Regulations 2005 in respect of discharges to surface or groundwater;
- SPP 7 (Planning and Flooding), policy for flood prevention and planning controls;
- Scottish Environment Protection Agency (SEPA) Policy No.22 (Flood Risk Assessment Strategy);
- SEPA Policy No. 41 (A SEPA – Planning Authority Protocol, Development at Risk of Flooding: Advice and Consultation);
- SEPA Policy No. 19 (Groundwater Protection Policy for Scotland);
- The Local Authority's Structure Plan and Local Plan.

The resultant influence of this statutory and planning regime is discussed in Section 8.3.5 in deriving a set of key issues and constraints for the water resource aspects of this Scheme.

8.1.3 Study Area

The section of the A96 under consideration is situated approximately 6km to the east of Elgin in relatively flat countryside on the coastal plain of the Moray Firth. The general topography is such that the surrounding land falls gradually towards the sea. All surrounding surface water features tend to drain at 90 degrees to the A96 towards the sea.

In the context of these proposals, there are four water resources features that have been identified as part of this assessment. Within a 500m boundary either side of the proposed Scheme there is one loch, one surface watercourse, one small reservoir, and the groundwater beneath the proposed scheme. All of these features are shown on Figure 1.3.

8.1.4 Water Resources Related Proposals

A full description of the scheme is included in Chapter 2 of this ES, but details that have an effect on this assessment are highlighted or expanded upon under the following headings.

General Scheme Overview

The proposed scheme involves the rationalisation of the existing side road junctions coming onto the A96 in the vicinity of Threapland (Figure 1.2). The scope of work includes the following:

- Rationalising two side road junctions into one on the southern side of the A96,
- Improvements to the format of the side road junction on the northern side of the A96,
- Cutting back side slopes either side of the A96 in the vicinity of these junctions to improve visibility,
- Alteration to the vertical alignment of the A96 to improve visibility,
- Installation of formal road drainage along approximately 1.5km along with sustainable urban drainage systems for treatment before discharge.

The primary objective of the proposed scheme is to reduce the number of accidents on the A96.

Existing Road Drainage & Outfalls

To put the new proposals into context, it is necessary to understand the existing road drainage in the vicinity of the proposed junction. No formal drainage plans exist for this section of the A96, and the following information has been collected from site visits and discussions with the design team. The only formal road drainage (i.e. gullies, kerb drains, etc.) on this section of the A96 is understood to be on the southern side of the road in the section between the Loch Oire Junction and the Threapland Junction. The road drainage is in the form of a number of gullies at 30 – 40m intervals covering the low point in the A96. No records or site evidence could be found to confirm where these gullies drain to, but given that the only watercourse nearby is the outfall drain from Loch Oire it is suspected that there is some form of connection to this feature.

Proposed Road Drainage & Outfalls

As is standard for all new roads schemes, SEPA has requested that Sustainable Urban Drainage System principles are applied. The format of the drainage scheme should be in accordance with the technical guidance set out in CIRIA Report C697 “The SUDS manual”. In response to this the road drainage design incorporates two levels of treatment, the first being via filter drains running along the revised section of the A96 and the second being the provision of a retention pond which all new road drainage will pass through. It is noted that both of these features will also offer attenuation of the surface water run off, allowing the rate of discharge from the new sections of road to be controlled. After passing through the retention pond the treated road run off will drain into the Loch Oire Outfall Drain on the northern side of the A96 i.e. approximately 100m downstream of the Loch. Figure 2.1 shows these drainage proposals.

Watercourse Crossings

There will only be one watercourse crossing as part of the proposed scheme, and this will involve replacing and extending the length of existing culvert that carries the Loch Oire Outfall Drain under the A96. This is necessary because the vertical profile of the A96 is being raised at this point and this will mean that an embankment is required to carry the road over the lower lying ground in this vicinity. It is estimated that the extension required to this existing culvert will be approximately 8m in total, when this is replaced. The format of the culvert will be the same as the existing one i.e. circular concrete pipe.

8.2 Approach & Methodology

The assessment methodology used in this Chapter is based on the generic methodology presented within Chapter 1 of this ES. Into this methodology, the guidance and techniques presented within the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 10 "Road Drainage and the Water Environment" have been incorporated. The following section gives further detail in regard to how the potential effects on the water resources, which may arise from the construction and operation of the Scheme, were assessed.

8.2.1 Baseline Conditions

Water resources features around the Scheme were identified initially from Ordnance Survey maps, a desktop review of previous reports, and survey data collected for the study area during the preparation of the ES. This initial desktop review was supplemented by consultations with statutory organisations and further consideration of available data. The study area assessed extends 500m either side of the Scheme (and further downstream where required) for surface water features, whilst groundwater features were considered over an area extending 1km either side of the Scheme.

Surface Waters

Geomorphological and Hydrological Data

Geomorphological conditions of each water resources feature were evaluated from Ordnance Survey mapping, data collected during the field surveys for this ES, data collected from a review of the Ecology Chapter of this ES, and information from the ground investigations completed for the engineering design.

No hydrological data was available for either the Outfall Drain or the Loch itself, and therefore an assessment of the potential flow in the Outfall Drain was made using standard hydrologic techniques. It is noted that this flow has been derived for the purposes of this assessment only, and the designers will be responsible for assessing the flows and providing adequate attenuation within the road drainage system.

Flooding information was gained from the SEPA Indicative River and Coastal Flood Map (Scotland) for the surrounding watercourses, to enable an assessment of whether the proposals may affect any identified floodplains.

Water Quality Data

SEPA have developed a River Water Quality Classification system, which is applied to all significant watercourses in Scotland. This system is based on an assessment of chemical and biological indicators. The Water Quality Classification system categorizes rivers into A1 – excellent, A2 – Good, B – Fair, C – Poor, and D – Seriously Polluted, and a full description of this system is available on the SEPA website.

The Loch Oire Outfall Drain does not possess a formal SEPA classification. Therefore, the evaluation of baseline water quality in this Chapter for the Outfall Drain has been estimated based on the estimated water quality classification of the Loch and a visual / qualitative assessment using the River Classification Scheme criteria. The visual / qualitative element of the assessment is based on the presence of List A (faeces, toilet paper, oils, non natural foam, sewage or oily smells) and List B (builders waste, gross litter (furniture, motor vehicles, road cones, etc.) contaminants (see Table 1 Aesthetic Contaminants – River Classification Scheme). The evaluation also takes into account the setting of this watercourse e.g. the presence of surrounding infrastructure that may influence water quality.

SEPA have also developed a Standing Waters Classification Scheme, which is applied to all lochs over 1km^2 together with a number of smaller lochs considered to be of particular local interest. This system is based on "the extent to which the quality of the standing water has changed from its pristine condition" (SEPA – Technical Guidance Manual for Licensing Discharges to Water (2002). The Classification system categorizes lochs into: -

- Excellent / good – lochs whose water quality and aquatic ecology are not significantly altered by anthropogenic activity,
- Fair – lochs whose water quality and / or ecology are significantly altered by anthropogenic activity,
- Poor – lochs whose water quality and ecology are seriously downgraded by anthropogenic activity,
- Seriously Polluted – severely polluted lochs incapable of supporting fisheries due to gross anthropogenic enrichment, acidification, presence or toxins or de-oxygenation.

It is understood that there is currently no water quality classification assigned to this loch under the Standing Waters Classification Scheme. Therefore, the evaluation of baseline water quality in this Chapter for the Loch has been estimated based on its ecological status and from information gathered during site visits.

For the purposes of this assessment, the present water quality objectives for all of the surface water features in this area are assumed to be the preservation of the current water quality classifications. It is noted that the creation of River Basin Management Plans for the purposes of the WEWS Act will influence future water quality objectives, however it is understood that the water quality objectives for individual water resources features have not yet been developed.

Groundwater

Groundwater data was sourced from:

- Consultations with SEPA in regard to any areas of known groundwater pollution within the study area,
- Consultations with the Moray Council Environmental Health Officer in regard to any known private water supplies from groundwater within the study area,
- Geology and Soils Chapter of the DMRB Stage 2 Report,
- Details from the Ground Investigations undertaken for the engineering design of the scheme (including borehole and trial pit logs, groundwater level measurements, etc.)
- The following mapping derived by SEPA for the characterisation of groundwater for the WFD – "Groundwater Vulnerability Map", "Superficial Aquifer Map", and the "Bedrock Aquifer Map"; and
- The original, and now partially superseded, "Groundwater Vulnerability Map of Scotland" (1995) and "Hydrogeological Map of Scotland" (1988) published by the British Geological Survey.

8.2.2 Impact Identification

Identification of the possible range and location of potential impacts was based on:

- The guidance within DMRB Volume 11, Section 3, Part 10 "Road Drainage and the Water Environment";
- The professional experience of the assessment team;
- Consultation with relevant statutory and non-statutory organisations;
- Desk and site based research;
- An EIA scoping report and a DMRB Stage 2 report previously prepared; and
- Liaison with other chapter authors, and in particular the authors of the Ecology and Nature Conservation Chapter.

From this work a distilled list of impacts considered to have potential to cause adverse effects on the water resource features was derived (see Section 8.4). It is noted that environmental effects on the water resource features may also lead to other impacts (such as changes to the aquatic ecology), which are addressed separately in the ES.

8.2.3 Impact Assessment

Impact assessment was based on the generic assessment methodology presented in Chapter 1 of the ES and the guidance within DMRB Volume 11, Section 3, Part 10 "Road Drainage and the Water Environment".

Impact Magnitude

The **magnitude** of a potential effect on the water resources features was evaluated using the criteria provided in Table 5.4 "Estimating the Magnitude of an Impact on an Attribute" (DMRB), with the addition of the following criteria to cover areas not specifically dealt with in the DMRB criteria. It is noted that impact magnitudes described below are all phrased assuming adverse impacts, but these general classifications have also been used, where appropriate, to describe beneficial impacts from the Scheme:

Severe – (equivalent to "Major Adverse" in DMRB) – results in loss of attribute and / or quality and integrity of attribute. Additional criteria:

- Degrading of the existing water quality classification;
- Significantly increased flooding of residential or commercial properties (this is in lieu of the DMRB increase in flood level >100mm);
- Loss of or serious effect on the integrity of an internationally or nationally designated aquatic ecological resource;
- Gross changes to geomorphological or hydraulic characteristics e.g. loss of natural bank and bed over a length of 50m or more, reduction in flow capacity of an existing river channel by 20% or more; and
- Widespread effect on groundwater movement with a gross change to overall groundwater transfer from up gradient to down gradient resources. Widespread and gross effects on groundwater quality.

Moderate – (equivalent to "Moderate Adverse" in DMRB) – results in effect on integrity of attribute or loss of part of attribute. Additional criteria:

- Degrading of either the combined water quality or biological quality indicators (in the case of watercourses) one or more classifications, but no change in overall classification;
- Slight increased flooding of residential or commercial properties (this is in lieu of the DMRB increase in flood level >50mm);
- Slight impact on an internationally or nationally designated aquatic ecological resource, or a loss or serious effect on the integrity of a nationally or locally important aquatic ecological resource that is not designated;
- Significant, but not gross, changes to geomorphological or hydraulic characteristics e.g. loss of natural bed and bank over a length of 20m or more, reduction in the area of an existing watercourse channel by less than 20%; and
- Widespread effects on groundwater movement with a measurable, but not gross, effect on overall groundwater transfer from up gradient to down gradient resources. Widespread, but not gross, effects on groundwater quality.

Slight – (equivalent to "Minor Adverse" in DMRB) – results in some measurable changes in attributes quality or vulnerability. Additional criteria:

- Degrading of two or more water quality or biological quality indicators (in the case of watercourses), but with no change in either overall or the individual water or biological quality classifications;
- Some increased flooding in rural areas immediately adjacent to proposed Scheme, but not affecting property, infrastructure, or ecological resources (this is in lieu of the DMRB increase in flood level >10mm);
- Slight impact on a nationally or locally important aquatic ecological resource, or the loss of a moderate area of an abundant aquatic ecological resource;
- Minor changes to some geomorphological or hydraulic characteristics e.g. loss of natural bed and bank over a length of less than 20m, reduction in the area of an existing watercourse channel by less than 5%; and
- Localised effect on groundwater movement but no measurable effect on overall groundwater transfer from up gradient to down gradient resources. Localised, measurable but not gross, effects on groundwater quality.

Negligible – (equivalent to "Negligible" in DMRB) – results in effect on attribute, but of insufficient magnitude to affect the use or integrity. Additional criteria:

- Degrading of one individual chemical or biological quality indicators (in the case of watercourses), but with no change in either the overall or the chemical or biological quality classifications;
- Minor / no increased flooding in rural areas (this is in lieu of the DMRB increase in flood level <10mm);
- Slight impact on a small area of an abundant aquatic ecological resource;
- Highly localised but not measurable changes in some geomorphological or hydraulic characteristics; and
- Highly localised effect on groundwater movement but no effect on overall groundwater transfer from up gradient to down gradient resources. Localised, but not measurable, effects on groundwater quality.

Sensitivity of Receptor

The **sensitivity** of a water resources feature is a synthesis of its environmental importance, socio-economic value, recreational value, and also its resilience to cope with change. The sensitivity of a water resources feature was evaluated using the guidance provided in Tables 5.1 "Water Features: Attributes and Indicators of Quality" & 5.3 "Estimating the Importance of Water Environment Attributes" (DMRB). From this guidance the following objective tests have been used in this Chapter to assess sensitivity:

- The environmental importance of the water resources feature; e.g. if it has a designation at an international or national level (e.g. Special Area of Conservation (SAC), Site of Special Scientific Interest (SSSI) etc.) or if the water body has an excellent or good water quality and is therefore a valuable pristine habitat, then this would tend to increase the sensitivity value of the receptor;

- The socio-economic value of the water body e.g. if the water body has notable aquatic ecological resources (e.g. an important local or national fishery) or if the groundwater is in a drinking water protected area as defined in the SEPA WFD Protected Areas Register, then this would tend to increase the sensitivity value of the receptor;
- The recreational value of the water body e.g. if an area is a SEPA designated bathing area or if a watercourse is an important local fishery this would tend to increase the sensitivity value of the receptor; and
- The size of the water body and its ability to buffer flow and water quality changes e.g. if a water body has high dilution characteristics compared to a small proposed discharge then its sensitivity value would tend to be lower.

In accordance with the generic methodology, sensitivity has been scaled from Negligible to Low to Medium to High to Very High. In this Chapter a Negligible or Low sensitivity attribute are both considered to be equivalent to the Low Importance stated in Table 5.3 (DMRB). To ensure the transparency of this assessment, a description of how the sensitivity of each water body was derived is included in the "Baseline" Section of this Chapter.

Impact Significance

Overall Significance is considered to be a product of both the sensitivity of the receptor and the magnitude of the effect. Significance is scaled from Negligible to Minor, and Moderate, to Substantial. In assessing the product of sensitivity and magnitude the Matrix of Significance presented in Chapter 1 of the original ES has been adopted. Therefore, only impacts that are Moderate or Substantial are considered to be Significant. The significance of a potential effect on the water resources features has been evaluated using the guidance provided in Table 5.6 "Definitions of Overall Assessment Scores" (DMRB).

It is noted that primary mitigation (see section below for details) is deemed to have been included when making the initial assessment of impact significance.

It is also valuable to attribute a level of confidence to the predicted impact assessment. Unless otherwise stated the impacts described in this Chapter are given at a high confidence level. Where impacts are given at a low confidence level, a reason shall be stated for this e.g. lack of detailed design data.

Mitigation

Mitigation measures considered appropriate for the avoidance and minimisation of effects on water resource features will be proposed in accordance with the generic guidance provided in Chapter 1 of the original ES.

Primary mitigation has been included in the "Environmental Effects" section of this Chapter, and these measures represent what are considered to be standard mitigation measures that would be applied to the construction and operation of such a scheme. These include standard conditions that would be applied by SEPA, or measures that a designer or contractor would be expected to take based on current best practice.

Mitigation measures noted subsequently in the "Mitigation" section, are those that are considered necessary for this Scheme in particular in order to offset any significant potential environmental effects, but that would not necessarily have been included as a matter of course in the design of such a Scheme.

8.2.4 Assessment Years

The baseline established for this assessment has been assumed to remain constant up to the time when the Scheme is put in place (2009), and this is because the full implementation of the Water Framework Directive will not have been completed (i.e. the publishing of the first round of River Basin Management Plans and setting of specific environmental objectives). For the purposes of this assessment the baseline has also been assumed to remain constant till the point when the Scheme has completed its first 20year period of operation (2028). The reason for this is that it is difficult at this stage to identify what specific objectives will be set under the River Basin Management Plans. However, it is recognised that there is the potential for the baseline water quality of the water resources features to improve over the next 20 years based on the overall aim of the Water Framework Directive to protect and enhance the water environment.

8.3 Baseline Information

8.3.1 Loch Oire

The principal surface water resources feature within the study area is Loch Oire, which is a small man-made loch with a surface area of approximately 0.06km^2. The catchment area is difficult to define as the loch is surrounded by a number of linear features i.e. the railway to the southwest, the minor road to the northeast, and the A96 to the north. Loch Oire is a designated SSSI and this aspect is discussed more fully in the Ecology and Nature Conservation Chapter. It is noted that the Management Statement confirms that little is known about the hydrology of the site, but that it was created in around 1910 through excavation and damming works (Scottish Natural Heritage (SNH) SSSI Management Statement, 2002). SNH have noted that the principal feature of interest is the relatively undisturbed aquatic plant community and it is also important for some species of breeding waterfowl. Historically the loch was used for sports fishing, but this activity is no longer permitted at the loch.

It is understood that there is currently no water quality classification assigned to this loch under the standing water classification scheme. However, given its ecological status the water quality is expected to be Good to Excellent. The Ecology and Nature Conservation Chapter of this ES, which has assessed the Loch as "of National Importance", confirms this to an extent.

Receptor	Environmental Importance	Socio-Economic Value	Recreational Value	Size of Water Body	Overall Sensitivity
Loch Oire	Water Quality assessed as Good / Excellent – designated SSSI	Not a fishery	Use as a local bird watching site	Little ability to buffer discharges	**High**

8.3.2 Loch Oire Outfall Drain

This is the only watercourse within the study area, its catchment is that of the Loch and it flows out from the northern end of Loch Oire and passes under both the B road running alongside the Loch and then the A96 in culverts. The catchment area has been estimated from OS mapping to be approximately 0.75km^2 with the Loch area being approximately 0.06km^2. This gives an estimate of average daily flow in the region of 820m^3/d, and an estimate of Q95 in the region of 40+m^3/d (depending on the Base Flow Index and catchment area assumed - refer to calculations in the Technical Appendix, Appendix 5, supporting this Chapter). The catchment is predominately woodland. Downstream of the Loch the watercourse turns in a westerly direction and flows around the edge of Lhanbryde, from which point the watercourse is not shown on 1:50,000 OS mapping. However, it is likely that the watercourse flows into the Lhanbryde Burn. Adjacent to the A96 the watercourse was observed as being around 1m wide and is relatively shallow and slow flowing with earthen banks. From site inspections the watercourse is substantially blocked at both the upstream and downstream ends of the culvert under the A96, with only a small flow visible.

In terms of water quality, the Outfall Drain is not monitored by SEPA and therefore a classification has had to be derived for the purposes of this assessment based on the following:

- Water quality is regarded as good to excellent in order to support the existing resident aquatic ecology,
- There is no real evidence of significant “List A or List B” aesthetic contaminants,
- There may be an existing road drainage discharge downstream of the A96,
- The nearby Lhanbryde Burn, which is monitored by SEPA, possesses a water quality classification of “B – Fair” (2006 SEPA data) but its water chemistry and aesthetics are noted to be A2 & A1 respectively.

The Outfall Drain has been assigned a classification of A2 “Good” for the purposes of this assessment.

From the Ecology Chapter it is noted that the Outfall Drain does not possess any specific nature conservation designations. The Outfall Drain is not considered to be a fishery interest. The Indicative River and Coastal Flood Map produced by SEPA does not show any 1:200year flooding within the study area. However, it is noted that there is some flooding shown downstream on the Outfall Drain in the vicinity of Lhanbryde, and this is shown as being of limited extent immediately adjacent to the watercourse channel. It is possible that this flooding could affect residential or industrial properties immediately adjacent to this watercourse.

Receptor	Environmental Importance	Socio-Economic Value	Recreational Value	Size of Water Body	Overall Sensitivity
Loch Oire Outfall Drain	Water Quality A2 "Good" - No formal designations	Not a fishery	None	Low ability to buffer discharges - May flood to a limited extent d/s of study area	**Medium**

8.3.3 Water Supply Reservoir

There is a small water supply reservoir adjacent to the A96 just to the east of the existing junction. It is a Scottish Water drinking water distribution reservoir and is in the form of a sealed below ground concrete tank. Given that it has no connection to the surface or groundwater features identified within the study area, there is not considered to be any likelihood of environmental impacts to this feature. Therefore, it has not been considered further within this assessment. The infrastructure around this reservoir should be recorded as part of the engineering design to ensure that there are not any affects on connecting pipelines.

8.3.4 Groundwater

The following groundwater data has been gathered: -

- From the Groundwater Vulnerability Map of Scotland (BGS 1995) – the geological classification of the area is highly permeable strata. In addition, the soil classification is given as high leaching potential. The Hydro-geological Map of Scotland (BGS 1988) shows the area is likely to be underlain by aquifers in which inter-granular flow is significant. They can be further classified as locally important aquifers of quaternary sands and gravels,
- From the Geology and Soils Section of the Stage 2 Report it is noted that the drift deposits are likely to be sands and gravels with high overall permeability. The underlying solid deposits are likely to be sandstone with moderate to high permeability. It is also noted that a glacial drainage channel is shown by geological mapping to exist within the study area. This channel runs north crossing the Aberdeen to Inverness railway line before running beneath Loch Oire to just south of the A96,
- The SEPA "Bedrock Aquifers" map classifies the bedrock as "Inter granular fracture flow with high productivity". The SEPA "Superficial Aquifers" map classifies the drift deposits as "Intergranular flow high productivity". The SEPA "Vulnerability of Groundwater in the Uppermost Aquifer" map records the area as a highly variable in terms of vulnerability with results from "Category 3 – 4c" i.e. moderately vulnerable where categories range from 1 (least vulnerable) to 5 (most vulnerable),
- The recently completed geotechnical investigation only recorded standing groundwater in the trial pits and boreholes immediately to the north of the Loch. Across the remainder of the proposed scheme the trial pits and boreholes did not detect any standing groundwater within 5m of the surface. The approximate groundwater surface recorded at the north end of the Loch, to both the north and south of the A96 carriageway, was 33mAOD. This compares with the lowest point on the existing carriageway of 37.5mAOD. The GI results

appear to show the groundwater level lowering, as one moves away from the Loch, and therefore it is possible the groundwater being encountered is a localised feature due to the Loch and its outflow drain. The drift deposits were confirmed as sands and gravels down to 15m in places and no bedrock was encountered in any of the boreholes,

- The area is not a Drinking Water Protected Area although it is identified as a "Drinking Water (Groundwater)" area, as defined in the SEPA WFD Protected Areas Register. Information from the local Environmental Health Officer has confirmed that there are no known private water supplies within the study area.

Receptor	Environmental Importance	Socio-Economic Value	Recreational Value	Size of Water Body	Overall Sensitivity
Ground water	Not specifically protected, but classed as a drinking water (groundwater) area. Vulnerability is moderate to moderate / high	No recorded private water supplies relying on groundwater	Not applicable	Extensive along the coastal plain	**Medium** (Ref. Table 5.3 HA216/06)

8.3.5 Planning

Overarching Legislation

The WFD, enacted in Scotland by the Water Environment & Water Services Act (2003) aims to: protect and enhance the status of aquatic ecosystems; prevent further deterioration to such ecosystems; promote sustainable use of available water resources; and contribute to the mitigation of floods and droughts. A review of the SEPA WFD Interactive Map identified the area as being a designated groundwater body and a drinking water (groundwater) area

In terms of groundwater, Scotland currently has no system for reporting the overall condition of groundwater. The Directive requires the reporting and recording of groundwater status, and SEPA have targeted the introduction of such a scheme by 2009. As with surface water bodies, good quality groundwater bodies will be protected and poorer quality groundwater bodies will be targeted for restoration.

SPP7

SPP7 provides the current context for planning controls on flood risk. SPP7 states as general principles that new developments should not: materially increase the risk of flooding elsewhere; add to the area of land which requires protection by flood prevention measures; affect the ability of the functional flood plain to attenuate the effects of flooding by storing flood water; interfere detrimentally with the flow of water in the flood plain; or compromise future options for future shoreline or river management.

Structure & Local Plans

These documents were reviewed in terms of policies affecting water resources features and the following policies are highlighted.

Moray Structure Plan

The Natural Environment – "Aim: to protect the natural environment of nature conservation areas, landscape, and special areas of the countryside".

Surface Water Disposal – "In order to better manage the effect of development on the aquatic environment, the Council is keen to encourage the use of sustainable urban drainage systems (SUDS) at appropriate developments….".

8.3.6 Consultations

The table below provides a summary of the water environment related issues highlighted during the consultation exercise completed for this ES.

Consultee	*Consultee Response Summary*
SEPA	Main concerns would be the protection of nearby water bodies e.g. Loch Oire. Suitable protection should be taken to ensure no discharges from the construction works.
SNH	In respect of Loch Oire SSSI, SNH noted the following: - "Maintaining the water quality within the loch is an important consideration when designing the new road drainage. Road drainage should avoid discharging directly into the loch or watercourses." "During construction, when there will be bare earth excavation, there is the risk of run-off of sediment into the loch and watercourses. A construction method statement will need to be developed that will ensure that all precautions are taken to avoid pollution either by pollutants or sediments."
Moray Council (Planning & Development Department)	Noted that Loch Oire also formed part of the "Lhanbryde Lochs Site of Interest to Natural Science".
Lossie District Salmon Fisheries Board	Appropriate method statements to be agreed for the works, and culverts not to impede the passage of fish species.

8.4 Predicted Impacts

As a result of the consultations, site visits and desktop studies, the issues requiring consideration in this assessment were distilled down to those in the table below.

General Issue	***Specific Issues***	***Receptor/s***
Surface Water Quality	Sediment mobilisation and spillage or discharge of other pollutants in watercourses (Construction Phase)	Loch Oire & Loch Oire Outfall Drain
	Discharge of road run off to watercourses (Operational Phase)	Loch Oire Outfall Drain
	Other road and infrastructure maintenance (Operational Phase)	Loch Oire & Loch Oire Outfall Drain
Flooding	Flood risk to surrounding land from development (Construction Phase)	Surrounding land & infrastructure
	Flood Risk to surrounding land from development (Operational Phase)	Surrounding land & infrastructure
Geomorphology and Hydrology	Alteration of watercourse crossing (Construction Phase)	Loch Oire Outfall Drain
	Alteration of watercourse crossing (Operation Phase)	Loch Oire Outfall Drain
	Alteration to land drainage patterns (Construction and Operation Phase)	Loch Oire & Loch Oire Outfall Drain
	Run off from the Scheme into watercourses (Operation Phase)	Loch Oire Outfall Drain
Ground Water	Disturbance of groundwater movement (Construction Phase)	Groundwater
	Contamination of groundwater (Construction Phase)	Groundwater
	Disturbance of groundwater movement from the new road construction (Operational Phase)	Groundwater
	Contamination of groundwater (Operational Phase)	Groundwater

8.4.1 Effects of Construction

It is noted that some water related effects are also briefly discussed in Chapter 4 “Disruption Due to Construction”, but the assessment of effects and mitigation within this Chapter will take precedence with regard to water resources features.

Surface Water Quality

The following assessment considers the potential for sediment release and spillage / discharge of pollutants (e.g. oils, fuels, chemicals) to surrounding waters during the construction phase, and the potential impacts that such a release may have on surface water quality.

Receptor(s)	Loch Oire & Loch Oire Outfall Drain
Relevant Scheme Information	Given the nature of the project there will be significant earth / rock moving activities during construction. This presents a significant risk of surface water run off eroding bare slopes or material stockpiles, which can lead to increased suspended solids in watercourses. The construction phase also presents the potential for fuels, oils, and other chemicals to be spilled via an accident, improper usage, or poor storage. These could reach the receptors directly via discharge of polluted run off or via seepage into the shallow groundwater. Construction workforce sewage and washing effluent would be contained and taken offsite. The risk of spillage to watercourses is considered to be negligible and this potential impact is therefore not considered further.
Sensitivity of Receptor(s)	**High** (Loch Oire) **& Medium** (Loch Oire Outfall Drain)(see "Baseline" section)
Magnitude (and Type) of Effect	**Slight Adverse** (localised, temporary) – the proposals do not include works within Loch Oire itself, and the only works next to the Loch are minor alterations to the existing access road. The works to the Outfall Drain involve replacement and an extension of around 4m on either side of the existing culvert under the A96. Therefore the main potential source of polluting substances is likely to be through uncontrolled run off from areas of earthworks and spillage of pollutants directly or indirectly (e.g. via the existing road drains) into the surface water resources features. Based on the adoption of the primary mitigation measures noted below, the risk of a significant discharge of polluting substances into the Loch or its Outfall Drain should be able to be reduced to a low level. The effects of any residual construction stage pollution should be temporary in nature, and therefore no long-term impact on the water quality classification should be experienced.
Primary Mitigation Included	The Contractor should implement best practice guidance as detailed in PPG's published by SEPA and CIRIA Report C532, as a minimum. The Contractor should produce a site management plan covering the areas noted above, which should be discussed and agreed with SEPA, and all staff on site should be trained in the relevant best practice techniques. In particular, construction materials should be stored away from the surface water features, plant should be stored and maintained away from surface water features, silt fences or similar should be considered around exposed ground and stockpiles and checked regularly, and early re-vegetation of the completed elements of the Scheme should be undertaken to reduce silt laden run off. Part of the site management plan should identify a monitoring routine to check that the mitigation measures are in place and working. The drainage outfall/s for the existing A96 road drains should be located prior to commencing construction work. It is recommended that the control of surface water run off to these road drains be given consideration in the site management plan, so as to prevent a shortcut

	for potential construction pollutants to reach the Outfall Drain. Consideration should be given to creating the retention pond infrastructure at the outset of construction work, and this could then be used to treat construction stage site run off prior to discharge.
Overall Significance	**Minor Adverse** (for both Loch Oire & the Loch Oire Outfall Drain)

Flooding

This part of the assessment considers whether or not the construction activities could affect the level of flood risk to surrounding land and infrastructure.

Receptor(s)	Surrounding land and infrastructure located adjacent to the identified surface water resources features, including areas upstream and downstream
Relevant Scheme Information	During construction there will be works required within the channel of the Loch Oire Outfall Drain to replace the existing culvert under the A96. None of the land within the study area has been identified on the SEPA Indicative River & Coastal Flood Maps as being at risk from flooding in the 1:200yr return period event. There are no properties (residential or non-residential) in the vicinity of the Outfall Drain.
Sensitivity of Receptor(s)	Rural land is considered as having a **Low** sensitivity to increased flood risk, but property (both residential and non-residential) is considered as having a **High** sensitivity to increased flood risk.
Magnitude (and Type) of Effect	**Negligible Adverse** (localised and temporary) – with the primary mitigation measures included, the Contractor should be able to complete the works without increasing the risk of flooding to rural areas or property.
Primary Mitigation Included	The Contractor should ensure that provisions are made to keep a flow passing from the Loch to the downstream portions of the Outfall Drain during the works to the existing culvert. This could perhaps most practically be achieved via temporary damming of the Outfall Drain just upstream of the proposed culvert replacement and extension and providing pumps on a duty and stand by arrangement with sufficient capacity to pass the current flows experienced in the Outfall Drain. The timescale of such an operation would need to be limited to prevent significant effects on the free passage of aquatic ecology, and this work should form part of a method statement to be discussed and agreed with SEPA / SNH. In addition, the level of the Loch and that of the burn immediately downstream of the site would need to be monitored to ensure no flooding is being caused.
Overall Sig.	**Negligible Adverse** (for both rural land and property)

Geomorphology & Hydrology

This assessment considers the potential effects of the construction works on the structure of the bed and bank of the watercourse and the flow conveyance of the watercourse.

Receptor(s)	Loch Oire Outfall Drain
Relevant Scheme Information	Geomorphology - During construction there will be works required within the channel of the Outfall Drain to replace and extend the existing culvert for approximately 4m on either side of the A96. Accounting for new headwall structures and the space required for construction, it is estimated that the works will disturb a total length of around 16m of the existing channel. There will also be localised works downstream of the culvert to create an outfall point from the retention pond. This type of structure is estimated to involve disturbance to the bed and bank for approximately 2-4m to allow for a headwall and localised scour protection to the channel. Hydrology – During construction surface water run off can be expected to be slightly increased as vegetation is cleared to cut back the ground at the side of the carriageway and a formalised drainage system gradually becomes operational.
Sensitivity of Receptor(s)	**Medium** (see "Baseline" section)
Magnitude (and Type) of Effect	Geomorphology - **Slight Adverse** (localised and temporary) for the Outfall Drain as there would be direct disturbance of the bed and channel for a length of around 20m. Suggested primary mitigation measures have been noted below, and these have been taken account of in deriving the magnitude of impact. Hydrology – **Slight Adverse** (localised and temporary) for the Outfall Drain it is likely to experience a slight increase in flow albeit on an occasional basis after rainfall. Suggested primary mitigation measures have been noted below, and these have been taken into account in deriving the magnitude of impact.
Primary Mitigation Included	Geomorphology – working areas around the Outfall Drain should be clearly set out prior to commencement of construction, and these should be the minimum areas required to safely complete the works. No allowance should be made for material storage and plant movements should be kept to a minimum around the banks of the Outfall Drain. A survey should be completed along the Outfall Drain covering the area predicted to be disturbed during the works. This information should provide sufficient detail to allow the alignment, levels, and form of the channel and its banks to be reinstated after the works. Reinstatement should include re-vegetation with local plant species to stabilise the structure of the completed banks. The contractor should make provision for these mitigation measures to be monitored during their implementation. The Contractor is also likely to need a CAR Licence for working within the watercourse.

	Hydrology – it is recommended that as the new formalised surface water drainage system is installed the retention pond should be available to enable the flows into the Outfall Drain to be controlled. The Contractor may require a temporary discharge licence under the Controlled Activity Regulations, and discussions should be held between the Designers and SEPA regarding an acceptable discharge rate for the watercourse.
Overall Significance	Geomorphology - **Minor Adverse** Hydrology – **Minor Adverse**

Groundwater

This assessment considers the potential effects of the construction works on the **movement** of the groundwater.

Receptor(s)	Ground Water
Relevant Scheme Information	The only significant excavation works involved in the scheme are the cutting back of the side slopes along this section of the A96. In general the A96 is either being left at its current level or locally raised to improve the longitudinal profile and improve visibility. The ground investigations have not recorded any groundwater above 33mAOD across the study area, and it is noted that the lowest point of the existing road profile is approximately 38mAOD, which will in turn be raised under the proposals.
Sensitivity of Receptor(s)	**Medium** (see "Baseline" section)
Magnitude (and Type) of Effect	**No Effect** – as it is not anticipated that construction work will involve work within the recorded groundwater zone.
Primary Mitigation Included	None required at this stage
Overall Significance	**Neutral**

This assessment considers the potential effects of the construction works on the **quality** of the groundwater.

Receptor(s)	Ground Water
Relevant Scheme Information	The construction works will involve earth moving plant and other machinery, and this presents a risk of spillage of fuels, oils, and other chemicals, which can seep into the shallow groundwater. The project will also require at least one major construction compound, providing welfare facilities for the Contractor, and these are likely to retain a store of fuels, oils, and other chemicals.

Sensitivity of Receptor(s)	**Medium** (see "Baseline" section)
Magnitude (and Type) of Effect	**Negligible** (localised, temporary) – with the primary mitigation measures in place (see below) and continually monitored, the likelihood of significant quantities of contaminants being released should be low. Therefore, it is considered that, although there may be a residual risk of some small spills of oil or fuel from plant, the effects of these will be highly localised and may not reach the groundwater surface, which is estimated to be between at least 5m below the ground level at the closest point.
Primary Mitigation Included	The Contractor should manage the works in accordance with the best practice guidance provided in the SEPA Pollution Prevention Guidelines, CIRIA Report C532 "Control of water pollution from construction sites", and CIRIA Report C638 "Control of water pollution from linear construction projects". In particular the Contractor should provide bunds around all fuel, oil, and other chemical stores; centralise and minimise the number of these stores; complete all servicing, fuelling, and storage of vehicles at construction compounds; provide dedicated wash down areas for concrete and other delivery vehicles. The Contractor should implement drainage control measures at the site to prevent areas of standing surface water that could become contaminated and leach into the shallow groundwater. Where collection of water at the site is unavoidable (e.g. excavations), provision should be made for this water to be collected and passed through some form of treatment before discharge. The Contractor should liase with SEPA regarding any proposed discharge from excavations in respect to the new Controlled Activities Regulations (2005). In both of the above cases the Contractor should make provision for the implementation of the recommended mitigation measures to be monitored as part of the method statement for the works. In practice this may mean a daily inspection of the site.
Overall Significance	**Negligible Adverse**

8.4.2 Effects of Operation

Surface Water Quality

Discharge of Road Run Off

General

The main contaminants that can be carried into the watercourses from road run-off include suspended solids (including grit, mud, metal particles), copper and zinc (from deterioration of vehicles), organic materials and hydrocarbons (such as rubber, bitumen, grease, oil and fuel) and salt.

DMRB Volume 11, Section 3, Part 10, HA 216/06 provides a number of assessment methods to gauge the potential impact of run-off from roads on the water environment. This Advice Note also provides guidance on suitable mitigation measures that can be applied when the above assessments indicate a risk of pollution to the water environment.

Assessment of Potential Impacts of Routine Run Off

With regard to the potential contamination from discharge of routine road run off into a watercourse, the Advice Note requires that a "Simple Assessment" be made initially to determine whether the watercourse is at high or low risk of pollution. This assessment involves examining the relationship between the predicted volume of run off from the proposals, the assessed low flow within the watercourse, and the daily flow of vehicles (full details of the methodology are within HA 216/06). If this "Simple Assessment" puts a watercourse in the "low risk" category then no further assessment is required, and the guidance states that the simple assessment method "…produces conservative estimates, so that if it indicates low risk, there is a high level of confidence that there will be minimal impact". Should the "Simple Assessment" indicate that the watercourse is at "high risk", then the "Detailed Assessment" method needs to be used. This method compares the pre and post Scheme levels of Copper and Zinc within the watercourse against the relevant Environmental Quality Standard.

Based on the road layout and drainage design provided the "Method A" Simple Assessment calculations have been undertaken. The road areas and drainage proposals are included in the Figure 2.1 accompanying Chapter 2 of this ES. The daily volume of flow (at low flow conditions (Q_{95})) in the Outfall Drain, which will receive discharge under the proposals, has been estimated using standard low flow hydrology techniques to be between 40+m^3/d. The 24hour Two Way AADT at present on the A96 is approximately 15,000, and with the application of national traffic growth factors the estimated 24hour Two Way AADT is approximately 19,400.

Using "Method A" calculations showed a "High Risk" of pollution from routine run off for the Outfall Drain (see Appendix 5 for copies of the calculations). It is noted that these calculations assumed a Q95 for the watercourse of 40m^3/d (i.e. conservative end of the range). Therefore, a detailed assessment using "Method B" was required.

The "Method B" calculations were completed based on water quality sampling data from the Outfall Drain upstream of the A96. In terms of Copper the water sampling confirmed that the existing Copper level was 4∝g/l, and on completing the calculations for the proposed situation the predicted Copper level was 52∝g/l. This compares with the Environmental Quality Standard for a high quality watercourse of 40∝g/l for the hardness value measured (i.e. 100mg/l). In terms of Zinc the water sampling confirmed that the existing Zinc level was 23∝g/l, and on completing the calculations for the proposed situation the predicted Zinc level was 263∝g/l. This compares with the Environmental Quality Standard for a high quality watercourse of 300∝g/l for the hardness value measures (i.e. 100mg/l) (see Appendix 5).

De-icing salts will commonly be used on roads between the months of November and March. It is noted that the concurrent flows in watercourses are relatively high during these months, and therefore the salts would be subject to reasonable dilution and dispersion on entering a watercourse. From PPG 10 it is noted that the "…use of salt on highways is unlikely to lead to levels in the water environment that could affect aquatic life or drinking water supplies". There

is no specific assessment within the Advice Note for the potential impacts of de-icing salts on watercourses.

Assessment of Potential Impacts from Spillages

With regard to the potential contamination of the Outfall Drain from an accidental spillage on the revised section of the A96, the Advice Note requires an "Assessment of Pollution Impacts from Accidental Spillages" to be undertaken. This involves consideration of the probability of a spillage accident with an associated risk of serious pollution occurring. It is stated in the Advice Note that watercourses should be protected such that the risk of a serious pollution incident has an annual probability less than 1%.

The assessment method was followed based on the proposed surface water drainage arrangements (refer to design drawings supporting Chapter 2 of this ES for details). The annual probability of a spillage incident was calculated to be 0.07%, which is significantly less than 1% and therefore no additional protection measures are required (see Appendix 5 for copies of the calculations). It should be noted that the proposed road improvements are predicted to have a slight positive impact, in that they reduce the risk of an accidental spillage incident occurring. This concurs with the overall aim of the scheme, which is to reduce accidents by rationalising the number of side roads coming onto the A96.

Based on the above assessments the following summary of the effects on surface water quality has been derived.

Receptor(s)	Loch Oire Outfall Drain
Relevant Scheme Information	Refer to Section 8.1.4 and the design drawings supporting Chapter 2 of this ES for details of the proposed surface water drainage infrastructure.
Sensitivity of Receptor(s)	**Medium** (see "Baseline" section)
Magnitude (and Type) of Effect	**Moderate Adverse** (permanent) see Table 5.4 of HA 216/06 - in this case predicted Copper levels exceed the EQS limit, Zinc levels are predicted to be within the EQS limit, and spillage risk is <<1%. With the primary mitigation measures included within the scheme design (see below) a portion of this Copper and Zinc will be removed via the filter drains and the retention pond (refer to Table 2.2 DMRB Vol.11 Section 3 Part 10 i.e. superseded water quality & drainage assessment techniques). The actual % removal achieved could vary widely (10 – 80%), but as can be seen the Copper only slightly exceeds the allowable EQS and therefore only a small degree of removal would be required to keep it within EQS values.
Primary Mitigation Included	The new sections of road are to incorporate SUDS principles, by providing filter drains and an attenuation pond for the road run off. The proposed road alignment and profile has been designed to improve safety and hence reduce the risk of serious accidents and attendant spillages.

Overall Significance	**Minor Adverse**

Other road and infrastructure maintenance

This assessment considers whether the maintenance of the road, drainage infrastructure, and soft landscaping is likely to have any effect on the water quality of the surrounding watercourses. There is no specific guidance within DMRB HA 216/06 on assessing the potential impacts from this source of pollution.

Receptor(s)	Loch Oire & Loch Oire Outfall Drain
Relevant Scheme Information	During the operation of the Scheme the principal maintenance activities are likely to be road pavement maintenance (anticipated to be minimal during first 10years), cleaning debris from the culvert (possibly annual), maintenance of roadside verges (e.g. clearing debris, removing invasive species, etc), etc. There will be a slight increase in the area of road embankments due to cutting back the existing land to improve visibility.
Sensitivity of Receptor(s)	**High** (Loch Oire) & **Medium** (Loch Oire Outfall Drain)(see "Baseline" section)
Magnitude (and Type) of Effect	**Negligible Adverse** (localised, temporary) – cleaning of debris from the culvert is likely to cause only minor disturbance at the entrance and exit of the culvert and the vehicles / plant are assumed to work from the road with the appropriate traffic control measures in place. In terms of the Controlled Activities Regulations such work falls under the General Binding Rules or Registration categories, which are for activities considered to have a low risk to the water environment (i.e. do not require a licence). Repair of road infrastructure may involve repainting of parapets or use of other chemicals, and this presents a risk of materials entering watercourses. However, with the primary mitigation noted below, the risk of a major spillage should be reduced to a low level. It is understood that the landscape design for the road verges is to replant with native grass and therefore there is not expected to be any significant ongoing requirement for the use of herbicides to maintain these areas.
Primary Mitigation Included	Works to road infrastructure should be completed under an approved method statement and should include best practice measures (including the SEPA Pollution Prevention Guidelines) to reduce the risk of significant of major spillages to the surrounding water resources features.
Overall Significance	**Negligible Adverse** for both Loch Oire & the Loch Oire Outfall Drain

Flooding

This part of the assessment considers whether or not the proposed works would affect the flood risk within any identified floodplains.

Receptor(s)	Surrounding land and infrastructure located adjacent to the identified surface water resources features, including areas upstream and downstream
Relevant Scheme Information	The works will have served to replace and clear the existing culvert and lengthen it by around 8m. None of the land within the study area has been identified on the SEPA Indicative River & Coastal Flood Maps as being at risk from flooding in the 1:200yr return period event. In addition, there are no properties in the vicinity of the Outfall Drain at the A96. However, there is some flooding shown downstream on the Outfall Drain in the vicinity of Lhanbryde, and this is shown as being of limited extent immediately adjacent to the watercourse channel. It is possible that this flooding could affect properties immediately adjacent to this watercourse. The scheme will discharge surface water run off from this section of A96, after treatment and attenuation, into the Outfall Drain downstream of the A96 in a more formal manner than previously was the case. Note – the effects of road drainage on the hydrology of the Outfall Drain is also separately considered in the assessment of Geomorphology and Hydrology below.
Sensitivity of Receptor(s)	Rural land is considered as having a **Low** sensitivity to increased flood risk, but individual property is considered as having a **High** sensitivity to increased flood risk.
Magnitude (and Type) of Effect	**Negligible Adverse** (temporal i.e. during storm events only) – it is anticipated that with good design the replacement and extension of the culvert should be able to be completed without causing significant effects on the passage of flow down the Outfall Drain. With regard to the discharge of road run off, the designers should ensure that discharges from the retention pond are in accordance with the guidance provided in CIRIA Report C697 for rates of run off (see further discussion on primary mitigation measures below). Given that there will be attenuation from both the filter drains and the retention pond and some infiltration into the ground there is not anticipated to be a problem with designing the surface water drainage system to control run off rates to an acceptable level.
Primary Mitigation Included	The new culvert should be sized to accept a defined return period storm, which in turn should be set by the scheme designers in accordance with current best practice. The storm flows should be calculated for the Outfall Drain using FEH or similar accepted methods. The new culvert should be no smaller in diameter than the existing culvert. The designers should ensure that the rates of release of the surface water run off from the retention pond is in accordance with the guidance provided in CIRIA Report C697 for acceptable rates of run off.
Overall Significance	**Minor Adverse** for property & **Negligible Adverse** for rural land

Geomorphology & Hydrology

This assessment considers the potential effects of the proposed works on the structure of the bed and bank of each watercourse and the flow conveyance of each watercourse.

Receptor(s)	Loch Oire Outfall Drain
Relevant Scheme Information	Geomorphology – around 8–12m of the natural channel will be lost to the new and extended culvert and headwall structures. There will also be a loss of around 2–4m of the natural channel due to the localised works downstream of the culvert to create an outfall point from the retention pond.
Sensitivity of Receptor(s)	**Medium** (see "Baseline" section)
Magnitude (and Type) of Effect	**Slight Adverse** (localised and permanent) – as the works will impact upon a length of bed and bank of less than 20m. The primary mitigation noted below is assumed to have been included in this assessment.
Primary Mitigation Included	The design of the new culvert shall be such as to avoid changing the alignment of the channel. Bank protection works upstream and downstream should be kept to the minimum length required. The advice within CIRIA Report C551 Manual on Scour at Bridges and other Hydraulic Structures should be taken into account in the design. Design of the culvert works for the scheme should be in accordance with the Scottish Executive's "River Crossings and Migratory Fish: Design Guidance (April 2002)".
Overall Significance	**Minor Adverse**

This assessment considers the potential effects of the presence of the proposed junctions and side roads on the natural surface drainage patterns of the surrounding land. Given the similarities in effects between construction and operational phases, namely potential severance of overland flow between upslope and down slope, both phases have been considered in this assessment.

Receptor(s)	Loch Oire and the Loch Oire Outfall Drain
Relevant Scheme Information	The existing A96 and the side roads within the study area already influence the natural drainage patterns. The A96 is being raised slightly along a short section, but this section is already on an embankment above the existing ground level. The only section of new hard standing created will be the revised access road from the north across a small area of relatively flat agricultural land near to Evanton. This will create a linear feature across a short length (approx. 150m) of open ground. This new access road will be at grade or in a shallow cutting.
Sensitivity of Receptor(s)	**High** (Loch Oire) & **Medium** (Loch Oire Outfall Drain)(see "Baseline" section)

Magnitude (and Type) of Effect	**Negligible Adverse** (localised, permanent) – the presence of the new access road may reduce overland flow over a small area within the Loch Oire catchment. However, given the highly permeable nature of the deposits and the presence of the existing access road along the side of the Loch, this new section of road is not anticipated to have a measurable effect on the movement of overland flow within the catchment.
Primary Mitigation Included	None included at this stage.
Overall Significance	**Negligible Adverse**

This assessment considers the potential effects of the surface water run off from the scheme on the hydrology of the Outfall Drain.

Receptor(s)	Loch Oire Outfall Drain
Relevant Scheme Information	The proposed Scheme is likely to increase the volume of surface water captured as it represents a more formal arrangement compared to the limited surface water drainage infrastructure currently present. However, the surface water drainage proposals for the scheme include roadside filter drains and a retention pond. Both of these features will provide attenuation of the run off before discharge to a new outfall downstream of the A96 into the Outfall Drain.
Sensitivity of Receptor(s)	**Medium** (see "Baseline" section)
Magnitude (and Type) of Effect	**Negligible Adverse** (localised, temporal) - on the basis that the primary mitigation measures already included (i.e. the filter drains and the retention pond) are adopted, as it should be possible to control the rate of the surface water drainage discharge to an acceptable percentage of the concurrent flow in the Outfall Drain using such attenuation provisions.
Primary Mitigation Included	The designers should ensure that the rates of release of the surface water run off from the retention pond is in accordance with the guidance provided in CIRIA Report C697 for allowable rates of run off.
Overall Significance	**Negligible Adverse** (temporal i.e. during and immediately after rainfall)

Groundwater

This assessment considers the potential effects on groundwater **movement** from the presence of the scheme.

Receptor(s)	Ground Water
Relevant Scheme Information	The proposals do not include any permanent works below the recorded groundwater levels.

Sensitivity of Receptor(s)	**Medium** (see "Baseline" section)
Magnitude (and Type) of Effect	**No Effect** – as it is not anticipated that any permanent works will intrude into the recorded groundwater zone
Primary Mitigation Included	No primary mitigation is considered to be necessary at this stage.
Overall Significance	**Neutral**

This assessment considers the potential effects on groundwater **quality** from the operation of the road.

Receptor(s)	Ground Water
Relevant Scheme Information	The main operational element of the Scheme that has the potential to affect the groundwater quality will be the surface water run off from the road, which is being drained via roadside filter drains and then into a retention pond. The other potential source for pollution is from vegetation maintenance alongside the road, where herbicides are used to control weeds along linear infrastructure features.
Sensitivity of Receptor(s)	**Medium** (see "Baseline" section)
Magnitude (and Type) of Effect	**Slight / Moderate Adverse** (local to study area, permanent) – following Method C within HA216/06 puts the groundwater below the proposed scheme at Medium risk of impact (Table 5.4 of HA216/06) (see Appendix 5 for copies of the calculations). The calculated risk of pollution from accidental spillages is <<0.5%, which places the groundwater at a negligible risk of impact (Table 5.4 of HA216/06). Overall magnitude assigned based on the combination of these two assessments.
Primary Mitigation Included	The scheme already includes for filter drains and an attenuation pond to provide treatment and storage of the road run off, and therefore primary mitigation is already built into the proposed Scheme. No further mitigation has been considered at this stage.
Overall Significance	**Minor Adverse**

8.5 Mitigation

Primary mitigation, as defined in the assessment methodology (Section 8.2.3), has been included in each of the above assessments, and no specific requirement for secondary mitigation measures has been identified at this stage.

8.6 Residual Impacts

Residual impacts (including primary mitigation measures) have been determined in the tables in Section 8.4. It is noted that no significant residual impacts have been predicted at this stage.

8.7 Summary

This chapter addresses the potential effects on water resources as a result of the proposed Scheme. In the context of these proposals the significant water resources are Loch Oire, the Loch Oire Outfall Drain, and the groundwater. The assessment of effects was divided into four main areas, and these were: Surface Water Quality; Flooding; Geomorphology and Hydrology; and Groundwater. The predicted residual impacts ranged from **Negligible to Minor Adverse**. Therefore, based on the assessment tools provided in DMRB HA216/06 and the additional assessments undertaken as part of this Chapter, it is considered unlikely that the proposed development would lead to any significant residual impacts on water resources features.