10. Surface Water

10.1. Introduction

10.1.1. Scope of Assessment

This section of the ES describes the baseline surface water resource of the GARL corridor. It identifies construction and operational impacts on the quality and hydrology of surface waters. Mitigation measures forming part of the GARL scheme are described and the residual environmental impacts assessed. The magnitude and significance of impacts on the surface water environment during the construction and operational period are evaluated. The impacts predicted during the operational period of the GARL are referred to as long term or 'permanent' for the purposes of this ES. The aims of this chapter are to:

- Identify the baseline surface water resource along the GARL corridor;
- Consider the potential for adverse and/or positive impacts on the surface water environment arising from the proposed development;
- Describe options for mitigating adverse impacts on the surface water environment; and
- Determine the likely residual environmental impacts of the scheme.

Construction and operational stages of the scheme can impact on both water quality and drainage in numerous ways. Impacts may include, among others, alterations to drainage patterns, increased runoff, damage during construction and operation, flooding, watercourse severance, and changes to river quality and flows. Any resultant increases in traffic volumes may also increase water pollution and accidental spillages.

Potential impacts on groundwater and hydrogeology are addressed in the Geology and Soils chapter and impacts on aquatic and terrestrial ecology are considered in the Ecology and Nature Conservation chapter. Reference has been made to these sections where necessary. The terms "Impact" and "Effect" are used interchangeably.

10.2. Methods

10.2.1. Information Sources

A baseline desk study of the surface water resource along the route was undertaken and included:

- Review of river classifications from SEPA for water bodies within 250m of the proposed route; and
- Collation of information on flooding and land drainage within the area of the proposed route;
- Review of the Renfrewshire Council Local Plan (Adopted and Finalised);
- Review of the Glasgow City Plan; and
- Review of details of the White Cart Water Project (Flood Prevention Scheme).

No monitoring was undertaken as part of this assessment. However, a walkover survey of the route corridor was undertaken during March 2005 to visually inspect sites of potential interest along the route. This included non-intrusive visual surveys of the existing rail corridor, the proposed branch line extension through St James' Park and the Airport, including the area around Paisley Moss LNR. For the purposes of the assessment it has been assumed that stretches of the watercourses are currently used as receiving watercourses for discharges from activities on land.

10.2.2. Consultations

The following organisations were consulted for their views and comments on the preferred route within the context of the water environment and as a source of baseline information:

- The Scottish Environment Protection Agency (SEPA);
- Scottish Natural Heritage (SNH);
- Glasgow City Council (GCC);
- The Scottish Executive;
- Renfrewshire Council; and
- Scottish Water.

Consultees were consulted at an early stage in the project, mainly to gather baseline information. Subsequently, consultees were asked to comment on the GARL Environmental Scoping Report issued in February 2005. The draft ES was issued on 10 June 2005 for comment by the same consultees. Responses from consultees at all stages have been taken into account in the preparation of this chapter. Copies of consultation replies are included in the Appendix to Chapter 3 in Volume 4 of the ES.

10.2.3. Assessment Methods

Impacts on surface water were evaluated by reference to statutory and non-statutory requirements and guidelines. The assessment drew on the guidance set out in the following documents:

- DMRB Volume 11: Environmental Assessment - Part 10 Water Quality and Drainage;
- DMRB Volume 10: Environmental Design and Management;
- Scottish Planning Policy 7 (SPP7): Planning and Flooding;
- CIRIA Report 142: Control of Pollution from Highway Drainage Discharges;
- Planning Advice Note (PAN 69): Planning and Building Standards Advice on Flooding;
- The Glasgow City Plan (Parts 1&2) and related policies;
- The Renfrewshire Council Local Plan (Adopted and Finalised Plans);
- Scottish Transport Appraisal Guidance (STAG) Part 2 – Appraisal.
- The Environment Impact Assessment (Scotland) Regulations 1999; and
- The Water Framework Directive (2000/60/EC) enacted in Scotland by the Water Environment and Water Services (Scotland) Act 2003 (WEWS Act 2003).

Chapter 4 (Policy Context) of the ES provides detailed information on the regulatory context and policy considerations of the scheme.

The assessment also considered the potential impacts of an unplanned incident, such as a hazardous substance spillage, on a number of factors such as the sensitivity of surface waters and associated receptors. The significance of impacts on surface watercourses was assessed using the impact definitions as discussed in the following section and the methodology used to assign impact scores was largely based upon a qualitative assessment approach.

Effects were assessed by predicting the changes that would be caused by the construction and operation of the scheme in relation to the baseline situation.

10.2.4. Significance Criteria

The evaluation of residual impacts was achieved by using significance criteria. The criteria were derived from the extent to which an environmental attribute deviates from the baseline situation. Impacts were considered in terms of whether they were:

- Short or long term;
- Adverse or beneficial;
- Direct or indirect; or
- Permanent or temporary.

Mitigation measures were considered as part of the impact assessment. Residual impacts (i.e. those that remain after mitigation measures have been taken and/or which cannot be avoided or mitigated against) were ranked as major, moderate, minor or negligible in order to give a clear indication of the significance of the scheme's potential effects on the surface water resource. Criteria for determining the significance of an impact are shown in Table 10.1 below.

Table 10.1 Criteria for Determining the Significance of Adverse Impacts

Criteria	Rating Definition [1]		
	Major	Moderate	Minor
Water Quality included WFD	Change in water quality to render it unsuitable for its current use, resulting in a reduction of one or more classification	Change in water quality which would limit its current use and which may bring it close to failing the classification	Change in water quality which is insufficient to jeopardise current use or classification
Aquatic Ecology Macro invertebrate Habitats	Loss or damage to macro-invertebrate habitats resulting in a reduction of one or more biological quality class	Loss or damage to macro-invertebrate habitats which may bring it close to falling one biological quality class·	Change in macro-invertebrate habitats which is insufficient to jeopardise the biological quality class
Watercourse characteristics (Hydrology & Geomorphology)	Major change to existing river flow and/or major change in channel or bank form and/or flooding	Moderate change to existing river flow and/or moderate change in channel or bank form and/or flooding	Minor change to existing river flow and/or Minor change in channel or bank form and/or flooding

Notes: 1 "Negligible" is omitted, as this definition is self-explanatory

The above definitions are for adverse residual impacts. Any area where there is potential for an improvement in the quality of the surface water environment has been identified within the ES as a beneficial effect.

10.3. Baseline Conditions

10.3.1. Surface Water Resources within the Study Area

The following watercourses are described west to east in relation to the GARL corridor.

10.3.1.1 The Black Cart Water

The Black Cart Water lies approximately 1km to the west of the airport where it flows northwards, before converging with the River Gryfe and flowing to the east where it lies 1.5km to the north of the airport. The Black Cart joins the River Clyde approximately 3km northeast of the airport station location.

The Black Cart is monitored by SEPA at various points including at Middleton Farm, which is a new location and the closest monitoring point to the scheme. Although a river classification at this location has not been published, monitoring further upstream at Linwood Bridge indicates that the Black Cart is class "B" (fair) and SEPA anticipate that the Black Cart will also be class "B" at Middleton Farm in 2006.

Water quality data for the Black Cart Water at Blackstoun Farm Bridge (located to the southwest of the GARL corridor) for the period Jan 1974 – Dec 2003 was collated from SEPA sources. The parameters included in this dataset relate to flow, pH, conductivity, suspended solids and dissolved oxygen. The monitoring data is included in the Appendix to Chapter 10 in Volume 4 of the ES and forms the baseline water quality for the Black Cart Water.

10.3.1.2 The White Cart Water

The White Cart Water flows northwards towards the Clyde and crosses the beneath the GARL alignment at the existing viaduct located to the east of Paisley Gilmour Street Station.

Water quality data for the White Cart Water at Hawkshead (to the south east of the GARL corridor) for the period Jan 1974 – Dec 2003 was collated from SEPA sources. Monitoring data is presented in graphical format in the Appendix to Chapter 10. SEPA has classified the river as "C", primarily due to elevated ammoniacal nitrogen levels in the river.

10.3.1.3 The River Clyde

The River Clyde dominates the surface water environment in the area around Central Station. The GARL route crosses the River Clyde on the existing railway bridge immediately to the south of Central Station.

Water quality data for the River Clyde at Glasgow Green (upstream of Central Station) for the period Jan 1974 – Dec 2003 was collated from SEPA sources (http://www.sepa.org.uk/). Monitoring data is presented in graphical format in the Appendix to Chapter 10. SEPA has classified the river as "D" or "poor" at this point, primarily due to dissolved oxygen levels and the aesthetic quality.

10.3.1.4 Other Watercourses

Historical Ordnance Survey maps record two watercourses, the Abbot's Burn and the March Burn located within the area of the airport and the M8 motorway. Both of these appear to now be culverted watercourses flowing eastwards towards the White Cart Water (see copies of historical plans in the Appendix to Chapter 11 in Volume 4), possibly serving as surface water drains for the area.

10.3.1.5 Paisley Moss Local Nature Reserve

The Paisley Moss LNR lies adjacent to the southern western perimeter of Glasgow Airport and is within 250 metres of the GARL corridor (see Figure 4.1). The site extends to approximately 4 hectares and was designated in 1993 for its marshes, reeds, sedge beds and associated flora and fauna.

The area of land to the east of the LNR boundary, that forms the site of the new fuel farm, comprises a mixture of open habitat, including grassland, dense and scattered scrub, wet heath, marsh and swamp. Information provided by SNH (Watson, K. Paisley Moss Vegetation Survey August 2003 – Figure 1: Habitat Map, included in the Appendix to Chapter 9) indicates swamp ground extending to the north and eastern areas of the proposed fuel farm site.

Although unconfirmed, it is likely that the areas of swamp are hydrologically connected to the surface water and marshland of Paisley Moss LNR. As ground conditions in this area are generally marshy, dominated by peat, the water environment in this area would be particularly sensitive to groundwater and surface water pollution.

Note that the impacts of GARL on the ecological integrity and conservation value of Paisley Moss LNR are considered in more detail in the Ecology and Nature Conservation chapter of this ES (Chapter 9).

10.3.2. Flooding

In response to the scheme consultation, no statutory or non-statutory consultees noted the need for a flood risk assessment to be undertaken. In Scotland, the lead authority with regard to flood risk assessment is the local Council, who may be advised by SEPA. Consultation responses from Glasgow City Council have not indicated the requirement for a flood risk assessment to be undertaken for the scheme. In addition, Renfrewshire Council specifically stated that a flood risk assessment was not required (see consultation letters in Appendix to Chapter 3).

However, as the GARL alignment follows existing rail corridors and as the branch line to the airport would be mainly on an elevated supported on columns, all with appropriately designed drainage systems, it is concluded that the GARL scheme would not cause or increase flood risk to other receptors. However, as noted, this conclusion is based on a desk top study and is not the outcome of a formal flood risk assessment.

10.3.3. Water Framework Directive

In May 2005, the Scottish Executive published a document - *The Water Environment (Controlled Activities) (Scotland) Regulations 2005: Policy Statement and Regulatory Impact Assessment* – which relates to the Water Environment (Controlled Activities) (Scotland) Regulations 2005 ("the Regulations") laid before the Scottish Parliament in April 2005. The statement explains the purpose of the Regulations which implement the obligations of section 20 of the WEWS Act 2003. Under Section 20, Scottish Ministers have powers to introduce controls over a range of activities which can have an adverse impact upon the water environment.

The Regulations will control activities liable to cause pollution that affect identified River Basin Districts, i.e. river catchment areas, that includes the related surface water and groundwater. As such, the implications of the surfaced water impacts of GARL, discussed in this chapter, and their relation to the new Regulations and SEPA's obligations under the River Basin Management Plans, in terms of construction works and operation activities liable to cause pollution of surface waters, will be developed with SEPA.

10.4. Construction Impacts

10.4.1. Potential Impacts

Potential impacts on the surface water environment associated with the construction of the GARL scheme are summarised below.

Known or unidentified areas of contaminated land, such as the existing fuel farm that will have to be decommissioned, have the potential to impact upon the water environment through mobilisation of contaminated materials. Earthworks associated with construction activities may mobilise pollutants in the soil and allow them to contaminate nearby watercourses through surface water run-off, infiltration to groundwater or via drains. In addition, sediment deposited in the sewer system can cause reductions in flow capacity, resulting in blockages and the potential for effluent discharge and related pollution incidents.

Remedial works to existing culverts or bridges, such as over the Clyde or the White Cart Water, may mobilise sediment or construction related materials to pollute watercourses. For example, strengthening or painting works may cause materials to enter watercourses and impacting on water quality. In addition, damage to the banks and/or beds of watercourses may affect flow characteristics with potential consequential impacts on fragile riparian and aquatic ecosystems.

The construction of the GARL would require the use of construction compounds to store materials, equipment, vehicles and office accommodation for contractors. During operation of the compounds, there is potential for accidental release of construction materials (such as cement, concrete, diesel, hydraulic fluid or paint) which may enter watercourses or drainage systems.

Soil compaction can occur as a result of construction vehicles and plant passing over previously undeveloped land. This can cause a reduction in the volume of water permeating into the ground therefore increasing localised run-off. The run-off could contain suspended silt as the compacted ground would be susceptible to erosion in the absence of vegetation cover. The areas at particular risk from compaction would include those identified as construction compounds and temporary access routes for construction traffic and related activities. Construction of the fuel farm may interfere with the base water supply to the adjacent Paisley Moss LNR due to construction activities such as piling, material removal (e.g. peat), laying of foundations and dewatering. In addition, sediment run off during construction may interfere with surface water quality at the LNR.

10.4.2. Mitigation

10.4.2.1 General Measures

In order to mitigate potential impacts during the construction phase, civil engineering works will be undertaken with due regard to SEPA guidelines for water pollution prevention from civil engineering contracts. The following Pollution Prevention Guidelines (PPG) are of particular relevance to construction activities associated with GARL:

- PPG01 - General Guide to the Prevention of Pollution
- PPG02 - Above Ground Oil Storage Tanks
- PPG05 - Works In, Near or Liable to Affect Watercourses
- PPG06 - Working at Construction and Demolition Sites
- PPG09 - Pesticides
- PPG21 - Pollution Incident Response Planning
- PPG23 - Maintenance of Structures Over Water

In addition, the following PPG will be followed during the demolition of the existing fuel farm and the design and construction of the replacement fuel farm:

- PPG02 - Above Ground Oil Storage Tanks
- PPG03 - The Use and Design of Oil Separators
- PPG05 - Working at Construction and Demolition Sites
- PPG07 - Refuelling Facilities
- PPG08 - Storage and Disposal of Used Oils
- PPG18 - Control of Spillages and Fire Fighting Run-Off
- PPG26 - Pollution Prevention Storage and Handling of Drums and Intermediate Bulk Containers
- PPG27 - Installation, Decommissioning and Removal of Underground Storage Tanks

In addition, the GARL will be constructed in accordance with all relevant legislation for the protection of water resources and a Code of Construction Practice will be implemented by the Contractor to ensure adequate protection of the water environment.

Further, the construction of the fuel farm will take into account the requirements of The Control of Major Accident Hazards (COMAH) Regulations 1999 (Statutory Instrument 1999 No. 473), and all other applicable regulatory requirements. The COMAH Regulations aim to prevent and mitigate the effects of major accidents that can cause serious damage or harm to both people and the environment.

Consultation with the competent authorities (HSE and SEPA) will establish at an early stage which tier the fuel farm would fall under and therefore the measures necessary to prevent and manage accidents that the Operator would have to employ.

As at March 2005, SEPA has not yet published guidance on the mitigation measures for engineering works subject to the Water Framework Directive. However, the “Design Manual for Roads and Bridges: Vol. 10 – Environmental Design and Management” published by the Highways Agency will apply as a minimum in the interim.

10.4.2.2 Mitigation Relating to Construction Works

At the detailed design phase, construction works will be designed to minimise disruption to flows and disturbance to the River Clyde and the White Cart Water and associated ecosystems. The construction and removal of all temporary works will be undertaken in accordance with good practice guidelines and the mitigation measures outlined in the ES. Of particular relevance to mitigating surface water impacts are the following PPG notes:

- PPG5 Works In, Near or Liable to Affect Watercourses – which sets out precautionary measures to avoid pollution of watercourses by typical construction pollutants such as silt, cement, concrete, oils and chemicals; and
- PPG6 Working at Construction and Demolition Sites – which addresses the avoidance of pollution for specific construction issues such as site drainage, deliveries, storage and waste management.
- PPG23 Maintenance of Structures over Water – which covers appropriate measures to mitigate pollution risk for watercourses from substances construction materials.

10.4.2.3 Temporary Site Drainage and Construction SUDS

Measures will be taken to prevent all untreated contaminated drainage from site compounds and construction areas (including pumped water from excavations) from entering watercourses, surface water drains and sewers. Provision will be made to collect and treat drainage from all construction areas and compounds and to remove any sediment and other contaminants before discharging the water under an

appropriate consent. Consultation with Scottish Water and SEPA during such works will facilitate adoption of the most appropriate discharge infrastructure and management strategy.

During the construction phase of the development, special temporary "Construction SUDS" will be deployed to collect discoloured and polluted groundwater and turbid surface water. A feature of many construction sites, muddy ponding and flowing waters can severely impact nearby receiving watercourses. Construction SUDS will be developed according to the procedures and guidance given in CIRIA Document C521 "Sustainable Urban Drainage Systems – Design Manual for Scotland and Northern Ireland".

In addition, the adoption of good site practices for the prevention of pollution will prevent any fuel or oil entering the drainage system. All the necessary consents for land drainage works, drainage discharge and other authorisations will be obtained from the appropriate body, such as SEPA and Scottish Water. Any increases in run-off caused by soil compaction will be accommodated in the temporary Construction SUDS and drainage would be attenuated to prevent increased risk of flooding in adjacent watercourses or overload the public sewer network.

10.4.2.4 Prevention of Pollution from Plant and Machinery

In order to prevent materials leaking from static plant, such as pumps and generators, contaminating the ground and being washed into the drainage system, static plant will be placed on drip trays wherever practicable. Facilities for washing plant and equipment contaminated with concrete or other chemicals will be provided. Wash water from the facilities will be managed so as to prevent pollution of surface water and groundwater. If on-site batching facilities are required they will be operated under the conditions of the appropriate authorisation.

10.4.2.5 Storage and Use of Chemicals, Fuel/Oil and Other Construction Material

Chemicals will be stored in secure and designated (bunded where necessary) storage areas and in accordance with the appropriate regulatory requirements, including COSHH Regulations 1994. Re-fuelling of vehicles and machinery will be undertaken in accordance with specified procedures that will include designated refuelling areas. Spill contingency plans will be drawn up and included in the CoCP.

Stockpiles of dry materials will be stored in locations that prevent contamination of surface waters and materials will not be stockpiled without appropriate safety and mitigation systems in place.

Emergency procedures, to be implemented in the event of a spillage or leakage of any polluting material such as fuel, oil or silt-laden drainage, will be in place on-site. Provision for containment and clean-up of the material will be made. The procedure would follow the recommendations in PPG21.

10.4.2.6 Groundwater and Contaminated Land

The potential for hydrogeological interactions between the water environment and contaminated land will be considered and appropriate mitigation measures proposed to minimise and control associated risk. Areas of contaminated land and areas where potentially contaminating activities have been carried out are assessed in the Geology, Soils and Contamination section of this ES (Chapter 11).

The decommissioning of the existing fuel farm would be undertaken in accordance with all relevant regulatory requirements and guidance, including SEPA Pollution Prevention Guidance (such as PPG27 – Installation, Decommissioning and Removal of Underground Storage Tanks). Of particular concern would be the potential for surface and groundwater pollution from the decommissioning and removal of any underground storage tanks or pipe runs.

An assessment of residual contamination of the site such as petrol contamination of the soil and groundwater will be undertaken. For example, once any tanks/pipework have been removed, samples of soil and groundwater (if present) will be taken to check for subsurface contamination. The samples will then be analysed for the parameters appropriate to the type of product stored (hydrocarbons).

If soil or groundwater contamination is found, additional investigations (possibly including a risk assessment) would be carried out to determine the need for and extent of remediation. Any tanks, pipe work or associated decommissioned infrastructure would be disposed of appropriately to mitigate contamination.

10.4.2.7 Fuel Farm Construction

The new airport fuel farm will be constructed close to the Paisley Moss LNR. The location and possible arrangement for the fuel farm are shown on Figure 2.1 and a description of the facility is given in Chapter 2 of the ES. However, in summary the facility will comprise a number of above ground tanks each surrounded by a bund that represents 110% of the capacity of each tank. In addition, the entire facility will be surrounded by a 0.5m bund and all pipework, other than drainage, will be above ground. The proposed construction methodology is given in section A2.10 of the Appendix to Chapter 2 of the ES, which is summarised below.

The replacement fuel farm and new access road will be constructed on a previously undeveloped site to the west of St Andrew's Crescent adjacent to Paisley Moss LNR. Ground conditions are thought to comprise made ground and peat over alluvial deposits and glacial till (encountered at depths of 45-50m). It is therefore proposed to found the fuel farm facility on a ground slab supported by bored piles terminating in suitable material such as the glacial till. The pile design may also incorporate a base grouting system.

The use of piles presents a number of risks including cross-contamination of separate ground water bodies and groundwater drawdown caused by leakage from higher perched aquifers that may affect surface water levels. It is proposed therefore to adopt suitable construction techniques to prevent these pathways forming, e.g., by advancing pile casings simultaneously with pile boring. Concrete-mix additives and grouts will also be chosen to be compatible with the ambient ground water chemistry and end users of the waters.

The ground water table is thought to lie at 2 – 3 m below ground level and it is possible that it could be affected by tidal movements in the Clyde and associated rivers. Ground slab construction is not currently anticipated to require excavation of existing soils to depths requiring prolonged pumping for excavation dewatering. However, if the formation level of the fuel farm is such that soils have to be removed below the water table pumping may become necessary. If groundwater is to be disposed of, SEPA will be contacted for information on the appropriate chemical parameters to allow categorisation and disposal within current legislative requirements.

If dewatering is required, the potentially habitat changing drawdown of ground water levels across the adjacent wetland would be mitigated and mainly eliminated by careful choice of construction technique (e.g., by excavating within an impermeable cofferdam and improvement of the base of the excavation through grouting). The construction of the ground slab will be followed by other civils and building work including the formation of bunds around the fuel tanks and the site boundary.

10.4.3. Residual Impacts

Table 10.3 below describes the potential residual impacts on the surface water environment from construction activities.

Table 10.3 Residual Impacts on the Water Environment from Construction of the Scheme

Criteria	Impact Rating	Potential Impact
Water Quality	Negligible	Deterioration in water quality of the River Clyde and Black Cart is considered to be negligible as a direct result of construction works and the adoption of appropriate mitigation measures.
	Minor to negligible	Potential Minor change in water quality for a temporary period during construction work at the White Cart around Paisley Gilmour Street Station. Pollution control measures (such as Construction SUDS) would be incorporated into the works to minimise the temporary deterioration in water quality and to provide a clear mitigation and management strategy.
	Minor	Impacts on Paisley Moss LNR from fuel farm construction activities would be minor if the construction and mitigation measures outlined above are implemented.
Aquatic Ecology – macro-invertebrate habitats	Minor	Aquatic habitats of Paisley Moss could be subject to temporary construction related impacts affecting water quality. However, mitigation measures will ensure the impacts are Minor.
Watercourse Characteristics (Hydrology and Geomorphology)	Negligible	During the detailed design stage, temporary works will be designed so as not to exacerbate flooding and to minimise the disruption to the flow regime and geomorphology of the water resources.
Flooding	Negligible	The scheme is not considered likely to increase flood risk to adjacent receptors nor is flooding of adjacent land considered to pose a risk to the scheme.
Drainage Network	Minor	During construction, the adoption of SUDS and other appropriate mitigation measures should ensure the drainage network is not a pathway for pollution transfer to surface water receptors.
Water Frame Work Directive	Minor	Assuming implementation of pollution prevention measures, impacts on the designated River Basin District during construction are likely to be Minor

The implementation and enforcement of the above mitigation measures would ensure construction impacts on the water environment are controlled. It is concluded that the risk to the Black Cart, White Cart and River Clyde would be negligible. The activities posing the highest risk to deterioration in the surface water environment would be the temporary works associated with the construction of the branch line to Glasgow

Airport, in addition to construction of the new fuel farm facility and associated activities, although none of these should present more than a Minor negative impact.

10.5. Permanent and Operational Impacts

10.5.1. Potential Impacts

Permanent and operational impacts on the surface water environment may occur as a result of:

- Increased run-off contaminants through seepage from new track lines (sewage, oils, lubricants etc) that might reach nearby surface waters;
- Track and station area contaminants in surface water run-off via outfalls and direct impacts from spillages and pollution incidents;
- Herbicide use on trackside vegetation (i.e. to control weed growth) could migrate to groundwater or nearby surface water bodies, affecting water quality;
- Railway infrastructure maintenance posing a risk of inadvertent contamination of nearby watercourses with paint, cement or other materials;
- New pitch drainage and piling works that may alter the drainage pattern around St James' Park;
- Alteration of areas of hard standings, such as within St James' Park that could increase the area of impermeable ground and surface water runoff generation;
- Localised pollution risk associated with the maintenance and repair of road surfaces (e.g. fuel farm access road), including potential seasonal increases in salt and grit applications during de-icing activities and
- Operational accidents and emergencies at the new fuel farm facility.

The following section describes the mitigation that would be incorporated into the scheme design in order to minimise changes to the run-off regime, water quality, and contaminated drainage.

10.5.2. Mitigation

10.5.2.1 General

The drainage system for the GARL route will incorporate Sustainable Urban Drainage Systems (SUDS) where appropriate, which would contribute towards minimising any increase in the volume of surface water run-off from new areas of hardstanding, pitch drainage systems, etc., that are directed towards or reach surface water drains and watercourses. This will be achieved by attenuation devices such as the use of permeable hard surfacing materials or swales, holding tanks, etc. Where required, interceptors to removal contaminants in run-off would be provided. The guidelines contained in CIRIA Document C521: "SUDS – Design Manual for Scotland and Northern Ireland" will be followed during the detailed design stage of the route alignment.

Following consultation with SEPA, it is proposed that there will be two "levels" of SUDS covering source control and the conveyance elements within the drainage system. Conveyance SUDS in the form of swales or filter drains will be used and, if adequate land exists, end-of-pipe SUDS in the form of extended detention basins or ponds will give an extra level of treatment and afford extra protection to water environment receptors.

The discharge of polluted surface water runoff into receiving watercourses will also be mitigated by minimising the number of discharge points along the scheme length and using existing surface water drainage where possible. This will be undertaken in consultation with Scottish Water and SEPA. A Drainage Risk Assessment will be undertaken.

10.5.2.2 Fuel Farm

The design of the new fuel farm facility, with it system of containment bunds that exceed recommendations for protection of a facility of this type, will be the main method for mitigating impacts on surface water from contamination by hydrocarbons. The 110% bunding around each tank and the additional bunding around the entire facility will contain primary spills as well as operational and emergency situations.

In addition, the site drainage system, designed in accordance with SEPA PPG7 Section 4 (Site Drainage) and following consultation with SEPA and Scottish Water, will ensure that appropriate interceptors and protection measures are fitted so that any spills that enter the drainage system are contained before they reach the public sewer. Details of the design of the facility are given in Chapter 2 of the ES.

In addition, it should be noted that the future Operator of the fuel farm would be expected to comply with all Statutory Guidance and Regulations concerning operation of such as facility.

10.5.3. Residual Impacts

Table 10.4 below describes the potential permanent residual impacts from the operation of the scheme.

Table 10.4 Residual Operational Impacts on Surface Water from Operation of the GARL

Criteria	Impact Rating	Potential Impact
Water Quality	Negligible to Minor	The impacts on water quality resulting from the operation of the scheme would be negligible to minor. There would be minor potential for accumulated pollutants to be washed from the track and bridge surfaces to the drainage system. Pollution control measures will be incorporated into the drainage system wherever necessary. Incorporation of Sustainable Urban Drainage Systems (SUDS) will be developed at the detailed design stage.
	Minor	However, the operation of the fuel farm poses specific surface water risks particularly to Paisley Moss LNR, mostly relating to pollution potential from aviation fuel and other hydrocarbons and fluids. Based on the proposed design of the facility, the operational impacts of the fuel farm on Paisley Moss LNR would be Minor negative. In addition, the Operator would be expected to comply with all appropriate Statutory regulations and requirements in consultation with the appropriate regulatory bodies.
Flooding	Negligible	The design is unlikely to increase flood risk in the vicinity.
Watercourse Characteristics (Hydrology & Geomorphology)	Negligible	There will be a slight overall increase in the area of impermeable surface through the construction and operation of track and associated hard standing, which will generate an increase in the volume of surface runoff, particularly where grassed areas have been acquired for the alignment. With the incorporation of SUDS, the effects would be minimised to a minor impact. Provided adequate mitigation resulting from the flood risk assessment and the detailed design process is in place, the permanent effects associated with the operational phase of the scheme would be minor.
Climate Change	Negligible	Increase of flood risk to all low lying areas. The design of structures and embankments will take into account climate change predictions and impacts.
Drainage Network	Minor	During operation, the adoption of SUDS and other appropriate mitigation measures should ensure the drainage network is not a pathway for pollution transfer to surface water receptors.
Water Framework Directive	Negligible to Minor	Assuming implementation of proposed design and pollution prevention measures such as secure drainage and SUDS, impacts on the designated River Basin District during operation of GARL are likely to be Negligible (for operation of the railway) and Minor (for operation of the fuel farm).

Overall there would be a potential Minor adverse impact from the operation of the scheme, the fuel farm being the most adverse potential impact.

10.6. Summary

In summary, the potential impacts associated with the construction and operation of the GARL scheme would be Minor, largely due to the implementation of appropriate design and mitigation strategies outlined above.

Although there is potential for significant impacts on Paisley Moss LNR during the construction and operation of the new fuel farm facility, it is concluded that with the proposed design and construction methodology, the impacts on Paisley Moss LNR will be Minor.

Implications for the scheme under the Water Framework Directive are largely dependent on the detailed design of the bridge structure, associated works and the new fuel farm facility. However, consultation with SEPA throughout the detailed design, construction and operation of the scheme, that will cover issues such as appropriate implementation of SUDS as well as the secure design of the fuel farm will minimise impact on the developing River Basin Management Plan for the local River Bain District as defined by the WFD.