15 SUMMARY OF EFFECTS AND MITIGATION

This chapter provides a summary of the environmental effects associated with the Scheme, along with the mitigation commitments that have been described in each environmental topic chapter, which will need to be part of the Scheme implementation.

15.1 Summary of Effects and Mitigation

Table 15.1 below reports the environmental effects associated with the Scheme, proposed mitigation where appropriate, and the identification of residual effects.

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
Air Quality				
Construction	Up to substantial adverse dust effects from junction and access road construction activities. No assessment of the impact from construction traffic possible, but unlikely to be significant.	Standard good practice mitigation as defined in the contractors contract documents	Up to moderate adverse dust effects from construction activities. Short term, reversible effects.	Moderate adverse within 50 m of junction and access road construction works.
Operational Traffic	Negligible beneficial at 25 properties, negligible adverse at 112 properties, 144 properties with no change	None recommended	-	Negligible
Cultural Heritage				
Site 8	Negligible effect on	None proposed	Negligible effect on setting	Negligible effect on setting

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
	setting of Negligible significance.		of Negligible significance.	of Negligible significance.
Site 9	Negligible effect on setting of Negligible significance.	None proposed	Negligible effect on setting of Negligible significance.	Negligible effect on setting of Negligible significance.
Site 10	Moderate effect on setting of Minor significance.	None proposed	Moderate effect on setting of Minor significance	Moderate effect on setting of Minor significance
Site 14	Moderate effect on setting of Minor significance	None proposed	Moderate effect on setting of Minor significance	Moderate effect on setting of Minor significance
Site 17	Negligible effect on setting of Negligible significance.	None proposed	Negligible effect on setting of Negligible significance.	Negligible effect on setting of Negligible significance.
Site 18	Negligible effect on setting of Negligible significance.	None proposed	Negligible effect on setting of Negligible significance.	Negligible effect on setting of Negligible significance.
Site 39	Negligible effect on setting of Negligible	None proposed	Slight effect on setting of Negligible significance	Slight effect on setting of Negligible significance

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
	significance			
Site 44	Negligible effect on setting of Negligible significance	None proposed	Slight effect on setting of Negligible significance	Slight effect on setting of Negligible significance
Unknown archaeological sites	Possibility that potential archaeological resources could be damaged during groundbreaking and construction activities. Potentially significant direct impacts would occur.	It is recommended that a programme of archaeological investigations be conducted in area of new land take to a strategy to be agreed with HS. Any sites identified would be fully recorded by an archaeologist if they could not be preserved *in situ*, therefore offsetting the impact.	The mitigation would offset the impact.	Potentially significant direct impacts would occur.
Disruption Due to Construction				
Details of effects and mitigation associated with construction are reported within specific sections of this table.				

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
Ecology and Nature Conservation				
Habitats	Loss of habitats and potential impacts upon watercourses. Not significant negative at the site/local level and certain to happen.	Minimise land-take. Compensatory landscape planting.	Net reduction in semi-natural habitats.	Not significant negative at the site/local level: certain.
Watercourses	Discharge of sediments and possible pollutants to surrounding watercourses during construction and operation. Not-significant negative at the local level: unlikely.	Adopt best practice construction techniques to mitigate against effects during construction and operation. Implement SUDS.	Minimised risk of negative impacts.	Not-significant negative at the local level: unlikely.

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
Breeding Birds	Outside the breeding season: removal of foraging habitat and disturbance to birds. Not significant negative at the regional/local: likely.	Advance vegetation removal prior to breeding season Compensatory landscape planting.	Net-removal of breeding bird habitat.	Not significant negative at the regional/local: likely.
Otters	Direct impacts on the otters themselves or their rest areas due to construction/operational activity. Not significant negative at the regional level and extremely unlikely to happen.	Pre-construction checks. Ecological Clerk of works.	No impacts after mitigation anticipated.	Not significant negative at the regional level and extremely unlikely to happen.
Water Voles	The direct impacts on the water voles, their burrows, or their suitable habitat due to site clearance construction activity. Not significant negative at the	Pre-construction checks.	No impacts after mitigation anticipated.	Not significant negative at the regional level: extremely unlikely.

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
	regional level: extremely unlikely.			
Bats	a) The permanent and irreversible loss/disturbance of roosting bats through tree felling. Not significant negative at the regional level: unlikely.	Pre-construction checks. Step-wise, limb by limb felling of mature trees. Retain deciduous trees where possible.	No impacts after mitigation anticipated.	Not significant negative at the regional level: unlikely
	b) Permanent and irreversible loss of bat forage habitat. Not significant negative at the regional level: unlikely.	Compensatory landscape planting.	Net-removal of bat foraging habitat.	Not significant negative at the regional level: unlikely.
Badgers	Destruction of one outlier sett, currently disused. Significant (in the absence of mitigation) at the regional level and likely to happen.	Licence from SNH, Ecological Clerk of Works on site.	Removal of disused outlier sett.	Not significant negative at the regional level: likely.

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
	Removal of badger habitat. Not significant at the regional level and likely.	Minimise land-take required.	Minimal impacts on badger foraging habitat.	Not significant at the regional level and likely.
Landscape Effects				
Landscape Character	There will be an adverse impact on the landscape character as the structures and link roads are anomalous to the existing landscape character	Reduce the impact of the new roads and structures by additional hedge and tree planting to reflect the existing landscape character	Moderate adverse	As the planting matures and the construction effects are lost, the residual effects should be minor adverse.
Properties at Bogend Toll	Substantial impact to the visual amenity during the works and immediately following completion of works.	Attempt to minimise impact by sympathetic alignment of link roads, materials selection and new hedgerow / tree planting.	Moderate adverse	Moderate to minor adverse impact
Properties in	No direct views of the	Minimise impact by	Moderate overall adverse	Moderate to minor impact

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
Symington	works, but significant impact to visual amenity when accessing Symington	landscape planting to reduce the effects due to the new structures and link roads	impact to the visual amenity	once mitigation measures blend the works into the surrounding landscape character
Properties close to A77 corridor	There will be considerable disturbance during the works, especially to those who presently access directly onto the A77, but who will be accessed via link roads following the development.	Improve the visual appearance of these properties by removing the A77 accesses. Access will be via a series of link roads, which will be hedge and tree planted to reflect the surrounding landscape.	Minor / moderate adverse	Some changes to the landscape pattern and the means of access to these properties. Negligible overall adverse impact.
Properties with medium distance views of the work	The works will be visible from a number of locations, as aberrations in the visual appearance of the landscape	The structures and link roads will be planted with hedgerows and trees to soften the impact and reflect the surrounding landscape character	Minor adverse	Some changes to the landscape pattern and the means of access to these properties. Negligible overall adverse impact.
Properties with long distance	The works will be visible from a number of	The structures and link roads will be planted with	Negligible adverse	Some changes to the landscape pattern and the

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
views of the works	locations, as aberrations in the visual appearance of the landscape	hedgerows and trees to soften the impact and reflect the surrounding landscape character		means of access to these properties. Negligible overall adverse impact.
Users of the A77 (vehicular)	The most obvious features will be the 2 bridged access arrangements. There will be fewer breaks in the central reservations and side accesses	Planting of the embankments should soften the impact of the bridges.	The minor works (central reservations and accesses) will be minor beneficial. The link roads will be largely screened or not visible from the carriageway. The bridges will have a moderate adverse long-term effect.	Moderate adverse, reducing to minor adverse once the hedgerow and tree planting matures.
Land Use				
Agricultural land.	Potential severance of field boundaries and accesses. Permanent land take of 8ha.	Keep area of land take require for scheme to minimum. Avoid severance of fields and access.	The mitigation measures would lessen the impact of any agricultural land take.	Minor Adverse.
Residential	Permanent land take of	Compensation.	Residential land will be	None predicted

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
Properties	small areas of residential gardens.	Landscaping. Minimise land take.	permanently removed from private garden use.	
Traffic Noise and Vibration				
Construction Noise	Moderate adverse impact at small number of properties along Kilmarnock Road, Whitelees, during construction of new access road. At most minor adverse at properties in the vicinity of Symington and Bogend Toll junctions	Use of site boundary noise barriers during construction of the new access road at the rear of properties on Kilmarnock Road, Whitelees	Reduction of predicted worst case construction noise levels to below South Ayrshire guidelines at all locations	Minor adverse
Traffic Noise	Long term adverse impact at 379 properties, negligible at 321, minor at 46, and moderate at 12. Long term beneficial impact at 46 properties,	None recommended, moderate increases occur at properties along an existing side road where noise barriers would be impractical	N/A	Overall ranked as negligible in the long term

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
	35 negligible and 11 minor.			
Traffic Vibration	Negligible	None recommended	Negligible	Negligible
Pedestrians, Cyclists, Equestrians and Community Effects				
B730 Bogend Toll Junction	Temporary disturbance to access to/from B730.	Use of temporary traffic lights to control flow of traffic on B730 onto the A77.	There may be slight increases in journey time due to no turning point as a result of central reservation being closed up. However, the bridge will improve safety greatly.	Minor impact
New stretch of carriageway between Bogend Toll and Whitelees	Temporary disturbance to unclassified road at Whitelees to the A77.	Use of temporary traffic lights to control flow of traffic on already existing unclassified road.	The only access point to the northbound A77 is via the Bogend Toll or the Jeanfield overbridge. Existing access and central reserves stopped up.	Minor impact
New stretch of	Temporary disturbance to	Use of temporary traffic	No access from this new	Minor impact

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
road between Helenton Mains and Jeanfield.	unclassified road between Symington Road South and Symington Road North.	lights to control flow of traffic during construction of new road where it meets unclassified road opposite Trynlaw.	stretch of road onto unclassified road to Trynlaw. North and southbound traffic only have access at new Jeanfield overbridge.	
New stretch of road from Symington Road North to Trynlaw, that rejoins the A77.	Temporary disturbance to existing junction at Trynlaw.	Use of temporary traffic lights to control flow of traffic where it crosses existing road at Trynlaw.	Access points via Trynlaw and Symington Road North onto A77 to be stopped up. Traffic from Trynlaw and Symington Road North have to access A77 via Symington Road South. This will add on to the overall journey time.	Minor impact
New junction on the north side of Symington Road South.	Temporary disturbance to A77 during construction of overbridge.	Temporary traffic lights to control flow of traffic on A77.	Access to A77 southbound via overbridge.	Minor impact
A new short	Temporary disturbance to	Use of traffic lights to	Access to Symington Road	Minor impact

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
stretch of road to be improved between Symington Road South and the existing unclassified road heading south towards Danepark.	Symington Road South during construction phase of new stretch of road.	control vehicular flows during road construction.	South is still available but the access point to the A77 has been closed up. Access to the A77 has to be via Symington Road South carriageway.	
New road from the C134 to Hansel Village.	Temporary disturbance to existing road at Hansel Village.	Use of traffic lights to control vehicular flows during road construction.	Unclassified road access point to be closed up. Only access point to/from Hansel Village to A77 is via C134.	Minor impact
New stretch of road between Underwood Junction and Brocket	Temporary disturbance to access from Rosemount during construction.	Use of temporary traffic lights to control traffic at Rosemount where new road meets existing road.	Access only available to A77 at Brocket and northbound traffic will have to travel to Dutch House Roundabout and double back.	Minor impact

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
Vehicle Travellers				
N/A	N/A	N/A	N/A	N/A
Water Quality and Drainage				
Surrounding watercourses	Sediment mobilisation and spillage or discharge of other pollutants in watercourses (Construction Phase)	The Contractor shall implement best practice guidance as detailed in PPG's published by SEPA and CIRIA Report C532, as a minimum. The Contractor shall produce a site management plan covering the areas noted above, and all staff on site should be trained in the relevant best practice. In particular, construction materials should be stored and maintained away from	Potential effects will be minimised	Minor Adverse

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
		watercourses, silt fences or similar should be placed around exposed ground and stockpiles, and early re-vegetation of the completed elements of the scheme should be undertaken to reduce further erosion. A general methodology for construction of watercourse crossings should be developed by the Contractor in consultation with SEPA.		
Infrastructure surrounding watercourse crossings	Flood risk to surrounding land from development (Construction Phase)	Temporary provisions for diverting flow from a watercourse during construction or extension of culverts should cater for a 1 in 10 year return period flow in that watercourse (as defined in current	Potential effects will be minimised	Negligible/Minor Adverse

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
		guidance). Current guidance also recommends contingency planning for flows greater than this. It is recommended that the contractor should undertake some form of flood risk assessment where residential property or other infrastructure could be affected, and design temporary measures to ensure flood risk is not increased during the works.		
Surrounding watercourses	Alteration / addition of watercourse crossings (Construction Phase)	The Contractor shall construct culverts and other watercourse crossings, where possible, as the works progress to avoid creation of temporary watercourse crossing to be replaced at a later date. A	Potential effects will be minimised	Minor Adverse

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
		full topographic and photographic survey should be completed along each watercourse covering the area to be disturbed during the works. This information should provide sufficient detail to allow the watercourse to be reinstated after the works. Reinstatement should include re-vegetation with local plant species to stabilise the banks. The Contractor should clearly mark out working zones around each watercourse, and these should be the minimum area required to safely complete the works. Surface water run off from the site should be attenuated to ensure		

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
		discharges suit the capacity of each watercourse.		
Groundwater under the proposed scheme	Potential disturbance of groundwater movement (Construction Phase)	The Contractor should produce a method statement regarding the control of ground water in the overlying drift deposits. Groundwater collecting on the site should not be allowed to discharge in an uncontrolled fashion into watercourses.	Potential effects will be minimised	Negligible Adverse (moderate confidence)
Groundwater under the proposed scheme	Potential contamination to shallow groundwater (Construction Phase)	See above. Specific measures would include, for example; lined bunds around all fuel, oil, and other chemical stores; centralise and minimise the number of these stores; complete all servicing, fuelling, and storage of	Potential effects will be minimised	Minor Adverse

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
		vehicles at these major construction compounds; provide dedicated wash down areas for concrete and other delivery vehicles and capture and treat the effluent from these facilities. See above. Where collection of water at the site is unavoidable, provision should be made for this water to undergo some form of treatment, and the Contractor would be required to liaise with SEPA regarding any proposed discharge to ensure compliance with the Controlled Activities Regulations (2005).		
Surrounding watercourses	Discharge of road run off to watercourses	Inclusion of primary mitigation measures within	Potential effects will be minimised	Negligible to Minor Adverse (moderate confidence)

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
	(Operational Phase)	the design to control the levels of pollution reaching watercourses with outfalls e.g. oil interceptors and attenuation / treatment ponds		
Surrounding watercourses	Discharge of pollutants from other road and infrastructure maintenance (Operational Phase)	Works to culverts and other 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 physical disturbance of, or major spillages to, watercourses.	Potential effects will be minimised	Neutral / Minor Adverse
Infrastructure surrounding watercourse	Flood Risk to surrounding land from development (Operational Phase)	New culverts should be sized to accept a defined return period storm, which	Potential effects will be minimised	Minor Adverse

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
crossings		in turn should be set by the scheme designers in accordance with current best practice. The storm flows should be calculated for each watercourse using FEH or similar accepted methods. The culverts should be no smaller than the existing watercourse crossings.		
Surrounding watercourses	Alteration / addition of watercourse crossings (Operation Phase)	The design of the extended / new crossings shall be such as to avoid changing the alignment and concentration of flows upstream and downstream of each crossing point. Bank protection works upstream and downstream should be kept to the minimum length required.	Potential effects will be minimised	Negligible

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
		Analysis of the potential for scour at all bridge and culvert sites, and good design of scour protection works. 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 all new river crossings and culvert works for the scheme in accordance with the Scottish Executive's "River Crossings and Migratory Fish: Design Guidance".		
Surrounding watercourses	Run off from the scheme into watercourses (Operation Phase)	Survey of the culvert and channel downstream of each proposed outfall location to determine the condition and capacity of	Potential effects will be minimised	Minor Adverse (temporal)

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
		each channel. Assessment of the flows within each watercourse and limiting the discharge rate from road drainage to an appropriate rate for each watercourse. One method would be to adopt a common Greenfield run off rate of 5 - 7l/s/ha (CIRIA C609), but this would need to be assessed against the capacity of each watercourse. Design of outfalls in accordance with current best practice to prevent scour and erosion of adjacent channel.		
Surrounding watercourses	Alteration to land drainage patterns (Construction and Operation Phase)	Surface flows collected upslope of the new offline road alignment should be discharged to the nearest watercourse or drainage	Potential effects will be minimised	Neutral / Minor Adverse

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
		feature, thereby retaining the water within its natural drainage catchment and minimising hydrological changes to each watercourse. The drainage discharge points at each watercourse should be designed in accordance with best design practice to prevent erosion of the channel and banks. Green bank reinforcement should be included locally around each culvert to prevent the additional flow input from causing erosion.		
Groundwater under the proposed scheme	Potential disturbance of groundwater movement from the new road construction (Operational Phase)	None included at this stage.	Potential effects will be minimised	Neutral / Minor Adverse

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
Groundwater under the proposed scheme	Potential contamination to shallow groundwater (Operational Phase)	None included at this stage.	Potential effects will be minimised	Minor Adverse (moderate confidence)
Geology and Soils				
Geomorphology	Construction of the scheme will have adverse impact on the topography of the area due to embankment construction, excavation and structure construction.	No measures Landscaping and re-planting will be undertaken to merge new earthworks with existing land.	Landscape altered to accommodate the scheme alignment	Negligible residual effect
Agriculture	Loss of agricultural soils from site operations and construction of the scheme.	Stripping topsoil and managing stockpiles for reuse. Consultation with farmers.	Minimisation of agricultural soil removed from site.	Negligible residual effect

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
		Organise plant movements to minimise loss or damage to agricultural soils.		
Drift Deposits	Compaction of superficial geology.	No measures	Varying magnitudes of consolidation to the superficial geology	Negligible residual effect
Bedrock	Minor changes to solid geology due to excavation and possible piling for bridge structures. Possible grouting to suspected mine workings (to be confirmed by ground investigation).	No measures	Change in Bedrock profile at selected locations. Grouting, if required, would increase the stability of the area.	Negligible residual effect
Groundwater	Possible contamination of groundwater from site operations. Potential to encounter	Pollution control measures to deal with leachates from contaminated soils. Silt management to deal	Groundwater in accordance water quality standards during and after site operations.	Negligible residual effect

Table 15.1: Summary of Effects and Mitigation

Receptor / Source Of Impact	Summary Of Effects Before Mitigation	Mitigation	Summary Of Effects After Mitigation	Significance Of Residual Effects
	water in suspected mine workings.	with run-off dewatering of excavations. Mine water arising from mine workings (if encountered) to be contained and treated prior to discharge.		
Policy and Plans				
N/A				