8 ENVIRONMENT

8.1 INTRODUCTION

This chapter summarises the environmental baseline for the STAG options (see Chapter 7) and an environmental appraisal of the potential impacts of each option.

8.2 SOURCES OF INFORMATION

The following sources of information have been used to inform the environmental appraisal:

- information about the proposals from ZetTrans and the project team - SIC, Anderson Solutions, Halcrow and Donaldson Associates;
- information from consultees (see Section 8.3 and Annex B);
- various site visits in 2008 and previously for other studies;
- work undertaken for the STAG 1 assessment;
- 1:25 000 Ordnance Survey (OS) map, Shetland Mainland: Central – Lerwick, Papa Stour and Foula (Explorer 367);
- Bressay Bridge Environmental Statement, Shetland Islands Council, 2003;
- Shetland Islands Local Plan, Shetland Islands Council, 2003;
- information accessed through websites including:
    - www.scottishgeology.com;
    - www.scottishairquality.co.uk;
    - www.sepa.org.uk River Quality Classification (2006 Data) and Flood Map;
    - www.jura.rcahms.gov.uk/PASTMAP/Map;
    - www.lerwick-harbour.co.uk;
    - http://gateway.snh.gov.uk/ Scottish Natural Heritage Sitelink Nature Designation Information; and
- best practice guidance including that in the Design Manual for Roads and Bridges (DMRB) Volume 11 Environmental Appraisal[25].

8.3 CONSULTATION FEEDBACK

In accordance with best practice specific consultations were undertaken in March 2008 with relevant authorities and agencies in Shetland which built on previous consultations for the STAG process (see Section 1.5). The feedback from these consultations has been used to inform the team's understanding of the baseline and in the appraisal of options. A meeting was held with SIC Planning Service on 12 March 2008. A list of those who were consulted and a summary and comment on their responses are provided in Annex B.

8.4 APPROACH TO THE APPRAISAL

The approach to the environmental appraisal has been guided by:

- relevant guidance in STAG[26];
- the guidance set out in the DMRB; and
- other relevant technical, environmental and best practice guidance.

[25] Department of Transport/ Scottish Office Industry Department/Welsh Office/ Department of Environment for Northern Ireland (1993) Design Manual for Roads and Bridges, Volume 11: Environmental Assessment. HMSO. Department of Transport/ Scottish Office Industry Department/Welsh Office/ Department of Environment for Northern Ireland. 1994. First Amendment to Design Manual Volume 11. HMSO. The technical chapters of the DMRB have subsequently been updated and amended on a number of occasions

[26] Scottish Executive, 2003. Scottish Transport Appraisal Guidance. Scottish Executive

The environmental effects of the four Bressay Link options have been considered using the following planning, land use and recommended STAG environmental categories[27]:

- Planning and Policy;
- Land Use;
- Agriculture and Soils;
- Geology;
- Water Quality, Drainage and Flood Defences;
- Landscape;
- Visual Amenity;
- Biodiversity;
- Cultural Heritage;
- Noise and Vibration; and
- Air Quality.

The environmental baseline and appraisal for each environmental category is described in the following sections. This information has been developed from that information included in the STAG 1 ASTs (see Annex F).

Qualitative commentary is also provided on the impacts of improved public transport in Section 8.16.

8.5 PLANNING

8.5.1 Environmental Baseline

This section provides a summary of the relationship between the proposal for the construction of Bressay Link and the current planning policy context for the area.

The Scottish Government on its website gives five overarching strategic objectives to 'focus Government and public services on creating a more successful country, with opportunities for all of Scotland to flourish, through increasing sustainable economic growth'. The strategic objectives are:

- **Wealthier and Fairer** – Enable businesses and people to increase their wealth and more people to share fairly in that wealth;
- **Healthier** – Help people to sustain and improve their health, especially in disadvantaged communities, ensuring better, local and faster access to health care;
- **Safer and Stronger** – Help local communities to flourish, becoming stronger, safer place to live, offering improved opportunities and a better quality of life;
- **Smarter** – Expand opportunities for Scots to succeed from nurture through to life long learning ensuring higher and more widely shared achievements; and
- **Greener** – Improve Scotland's natural and built environment and the sustainable use and enjoyment of it.

Scottish Planning Policies (SPPs) provide statements of Scottish Government policy on nationally important land uses and other planning matters. A key objective within these documents is to guide policy formation and decision-making toward the goal of sustainable development. They also provide a statutory framework for future proposals and projects to ensure quality and to safeguard the

[27] Categories re-ordered from that of STAG into those environmental topics affecting current land use, the natural and cultural heritage and those affecting people

environment. The NPPGs are supported by Planning Advice Notes (PANs), which provide good practice and other relevant information specific to the NPPG.

National planning policy documents and other plans, programmes and strategies relevant to the link are included in Appendix 8.1.

Strategic planning policy covering the development area is set out in the Shetland Structure Plan 2001 – 2016[28]. The plan sets out four strategic aims for Shetland:

- to maximise the competitiveness of the Shetland economy;
- to protect and promote the vitality and viability of the existing settlements;
- to protect and enhance the natural and built environment; and
- to promote social inclusion.

Key structure plan policies relevant to the options include:

- GDS1: sustainable development, to ensure that the needs of the current people of Shetland are met whilst conserving resources and environmental assets for future generations;
- GDS4: natural and built environment, to conserve and where possible improve the quality of life and environment;
- NE1: landscape and design: to promote high standards of design in terms of siting, scale and colour;
- CST1: coastal development: to adopt the precautionary principle when building in coastal areas;
- TP1: Transport: to integrate different modes of transport and link transport to social and economic policy, land use planning and the environment;
- TP3: ports, harbours, ferry terminals and bridges: to ensure Local Plans include policies to safeguard Shetland's ports, harbours, ferry terminals and bridging points from inappropriate development which would limit their potential; and
- WD1: water and drainage: development which is likely to have an adverse effect on Shetland's marine and freshwater resources, will not be approved.

Local planning policy covering the area is set out in the Shetland Local Plan. In the local plan the pursuit of sustainable development emerges as a key driver in the formation of local planning policy. The plan also reiterates the key issues facing Shetland and recognises the need to promote integrated transport, a strong and stable economy and access for all[29]. There have been ongoing discussions about the link to Bressay over many years. Current plans recognise the proposal for a bridge. The Council now recognises the need to re-examine local issues and needs to identify the most appropriate link in the 21st century.

SIC's Corporate Plan[30] states '*Shetland's communities are scattered and have a diverse set of needs. To best address those, we must have sustainable road, sea and air transport systems, both internal and external, that ensure everyone is able to access the places, services and opportunities they need*'. This study directly contributes to the development of sustainable internal transport systems.

[28] Shetland Islands Council (2000) The Shetland Structure Plan 2001 – 2016
[29] Shetland Islands Local Plan, Shetlands Island Council 2004
[30] Shetland Islands Council, Corporate Plan, 2008-11

Lerwick
The Lerwick Community Council Area Statement notes the need for development on Mainland and Bressay to be strictly controlled following the construction of the bridge.

On Lerwick, where the tunnel and bridge connect is zoned for Housing Zone 1 (see above) and Industrial Area LP Ind 7 which states that:

'*In Lerwick, general industrial development, and storage and distribution uses, Classes 5 and 6 in the Town and Country Planning (Use Classes) (Scotland) Order 1997*, will be directed towards the existing industrial areas at North Gremista, South Gremista and North Staney Hill. Special consideration will be given to the siting of industrial uses that are hazardous or noxious. All development must meet technical standards in terms of parking, traffic circulation, vehicular access and servicing, and pedestrian access as set out in Appendix D and E'.*

The area of the current ferry terminal is zoned as Housing Zone 1 (see above) and as a Waterfront Regeneration Area, Town Centre and a Conservation Area.
Policy LP BE8 states that '*there is a presumption against development that does not preserve and enhance the character or amenity of an existing or proposed Conservation Area. New development within these areas must be of the highest quality, respect and enhance the architectural and visual qualities that gave rise to their actual or proposed designation and conform to Appendix F of this Plan*'.

Bressay
SIC reaffirms its commitment to the construction of a bridge in the Bressay Community Council Area Statement of the Shetland Local Plan. The statement recognises that there will be a need to control development on Bressay following the construction of a bridge and that the existing road infrastructure on the island will need to be upgraded. It notes that the bridge would create the opportunity for a bus route to serve Bressay but that some ferry jobs may be lost.

Proposal 2 in the Bressay Community Area Statement states '*The council proposes to construct a bridge connecting Bressay to the Shetland Mainland at Lerwick. The land required for the construction of the bridge and improved approach roads will be safeguarded in the Bressay and Lerwick proposals maps.'*

On Bressay the area where the tunnel and ferry connect to the island is zoned for industrial use with a small area slightly inland zoned for Housing Zone 3 - LP HOU4 which sets out the requirements new housing developments must meet to be allowed in this area.

8.5.2 Environmental Appraisal

- The Bressay Link (all options) broadly complies with National and Regional Planning goals.
- Current planning policy relates to a bridge as a link to Bressay. This would require to be re-considered if a different option was taken forward.
- Option 2 (high level bridge) could have potential to interfere with port activities in Lerwick, however, the bridge has been designed to accommodate large vessels (as advised by LPA) and therefore meet Structure Plan Policy TP3.

8.6 LAND USE

8.6.1 Environmental Baseline

Two of the Bressay Link options (Option 1: Drill and Blast Tunnel and Option 2: High Level Bridge) are located within a similar corridor (see Figures 7.4, 7.6 and 8.1). The western landfall of the options would be approximately 2km north of the centre of Lerwick, within the North Gremista Industrial Estate. This site is surrounded by commercial developments including a number of large industrial buildings/warehouses separated by areas of hard standing, car parking and storage areas. Two residential properties are located on Gremista Road, Brookside on the western side of Gremista Road and an unnamed bungalow on the south eastern side. Piecemeal development extends westwards up the slopes of the Hill of Gremista, beyond which lies undeveloped heather moorland and grassland in use as rough grazing.

The eastern landfall would be on Bressay within the minor settlement of Heogan, which consists of several scattered crofts and is centred around the Bay of Heogan. A fishmeal plant, Shetland Fish Products, is located adjacent to the bay. The single storey crofts (Souter Heogan, Annfield, Garth Cottage and three unnamed cottages) are separated by areas of rough grazing and the land is partially enclosed by wire fences, some of which are broken. A ruined stone built traditional herring processing plant is located to the east of the bay. Heogan is the most northerly settlement on this coast, and is linked to the rest of the island by a single track road to the south.

Bressay Link Option 3 (Reconfigured Ferry Service) and Option 4 (Do Minimum) are located within the same corridor in which the current ferry service operates (see Figure 7.12). On the western side (Lerwick) the ferry from Lerwick to Bressay currently departs from the spur Jetty adjacent to Albert Building. On the eastern side (Bressay) the ferry arrives at the pier at Maryfield on Bressay, to the north of Leira Ness. Current ferry movements are described in Section 12.3.1.

Lerwick Port

Lerwick Port is managed by LPA. Port related development is centred on the Lerwick side of Bressay Sound (see above). The Sound provides access to shipping from the south and north. The current dredged navigation channel at Point of Scatland is 6m below Chart Datum (CD) (soon to be dredged to 9m below CD). The channel is some 95m in width in the area between the Point of Scatland and Heogan and is located close to the centre of the Sound (some 125m from the Point of Scatland and 170m from the Bressay shore). Dredging of the channel to 9m will provide deeper and wider access for larger vessels (see Section 7.4).

In 2007 a total of 5,047 vessels arrived at the port. This was a drop of 3.9% on the previous year largely due to a decrease in the number of salmon farm workboats and fewer international ferry calls. The key area of growth was in cargo with shipments increasing by 11.4% due to the significant rise in the offshore oil and gas industry traffic. This was related to work which began at the port on its largest decommissioning project to date and an increase of 14.5% in oil-related vessels. Another area of growth was in pilotage services with an increase of 42% with the total tonnage of vessels piloted rising 25% at 6,124,141 gross tonnes. Similarly this is largely as a result of increased oil related traffic.

8.6.2 Existing Road Traffic

Table 8.1 presents information about traffic flows in proximity to the link options. These data are important when considering how flows might change with any option and have been used to inform the appraisals in other sections of this chapter.

The data are taken from the Bressay Bridge ES written in 2003. SIC Roads Services considers that the flows are unlikely to have changed significantly since those counts. Annual growth into town over the past 10 years (as demonstrated by loop counters) indicates an annual growth of between 1.5 to 2% per annum.

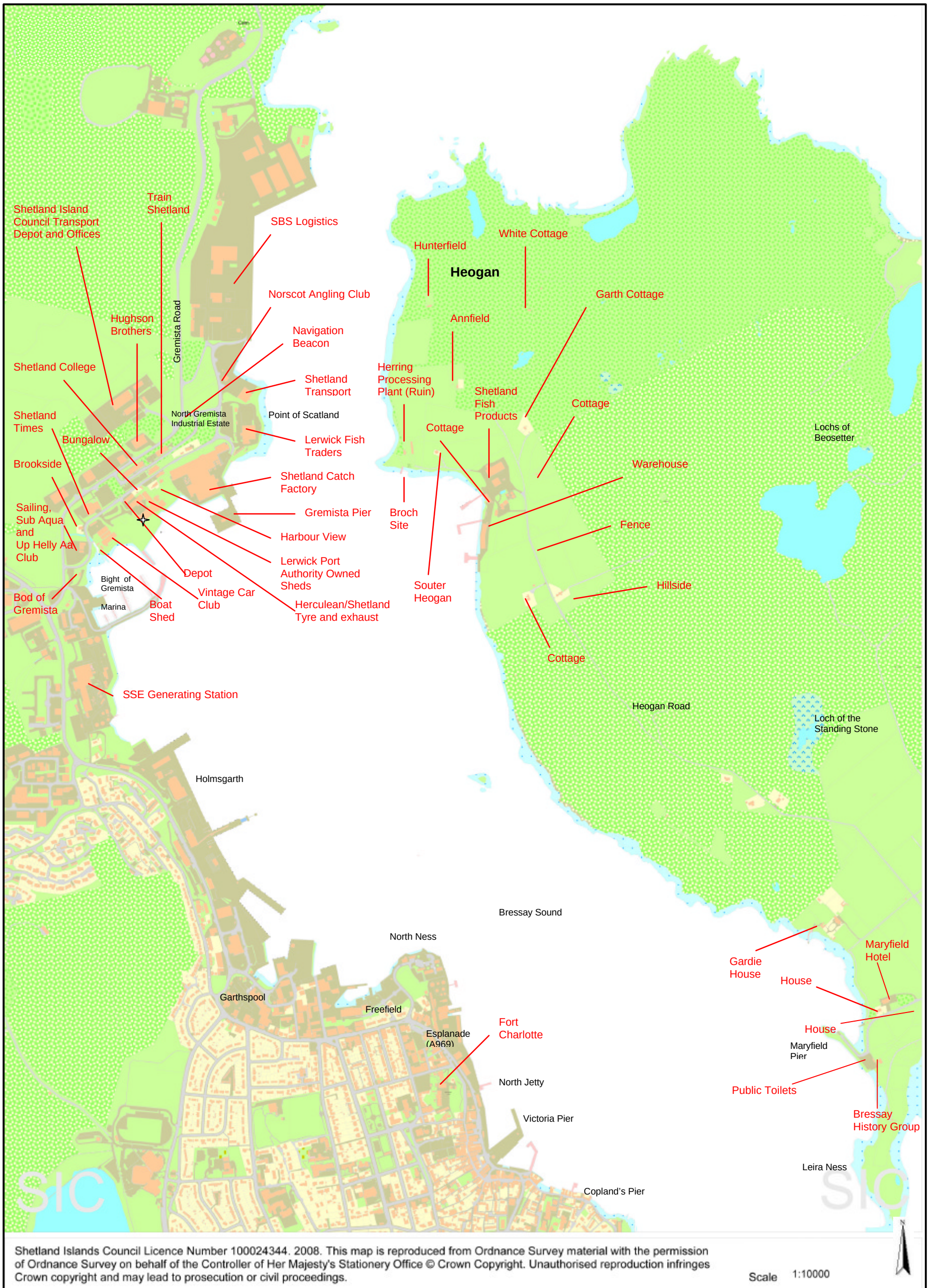
Table 8.1 Existing Traffic Flows

Road	18 hour average weekday two way flows	Average weekday daily two way flows (24hour period)	Average weekday HGV two way flows (24 hour period)	% HGVs (of 24 hour flows)	Average weekday buses two way flows (24 hour period)
Ferry	**-**	**177***	**-**	**3**	**1-2**
Lerwick					
1970	10988	11050	1485	13	202
Main Gremista Rd	5175	5219	764	15	67
Bressay**					
Heogan Rd (north)	85	87	10	11	1
Maryfield Rd	475	476	37	8	2
Heogan Rd (south past Voehead)	478	483	16	3	1

* Includes weekends as based on annual data set
**Incomplete counts on one day of the week

8.6.3 Current Ferry Use

Current ferry usage is summarised in Table 8.2 including the vehicles carried. The total number of passengers using the Bressay ferry service in the period 1 April 2007 to 30 March 2008 was 191,512 and the number of vehicles 71,960.



Scale 1:10000

Key

✧ Demolition of this shed would be required for Option1

DRAWN BY: MJR	CHECKED BY: AS	DATE: 05.08

Bressay Link STAG 2 Report

Figure 8.1: Land Use

ZetTrans · natural CAPITAL · Anderson Solutions · Halcrow · Donaldson Associates Consulting Engineers

Table 8.3: Current Bressay Ferry Usage[31]

Passenger Type	Number (year)
Senior Citizens	26,950
Adults	64,948
Children	17,648
Schoolchildren	7,166
Infants	8,338 (0-5yrs)
SIC local scheme for disabled passengers	2,840

Vehicle Type	Number (year)
Motorbikes	48
Less than 5.5m (including cars, vans, 4X4's etc)	68,414
Trailers	1,286
Bus	512
Commercial	1,474
Tanker	182
Plant	44

NOTE: the figures for vehicles includes drivers which are not included in passenger numbers, i.e. for total people carried, the vehicles numbers need to be added to passenger numbers

Option 1: Drill and Blast Tunnel

Lerwick

The western landfall of the tunnel and associated road infrastructure would be located within the North Gremista Industrial Estate (see Figures 7.1 and 8.1) in an area which is degraded (old buildings, tipping etc). The tunnel access road would start at the existing T-junction north west of the Bod of Gremista on Gremista Road. The tunnel access road would continue for approximately 300m in a north easterly direction to the south of the industrial estate buildings before going underground at its portal at the site currently occupied by an LPA owned shed located to the south west of the Shetland Catch Factory. From here, the tunnel would follow a route under industrial buildings (part of Shetland Catch) and subsequently follow a route under the sea from Point of Scatland (see also Section 7.3).

The closest property to the proposed tunnel site is LPA owned shed which would be demolished (in part or full depending on its structure). Other properties in the area include the unnamed bungalow some 75m to the north of the proposed tunnel portal site, the Bod of Gremista Museum (category B-Listed building[32]) some 300m to the south of the portal and various industrial buildings, sheds and warehouses used by businesses (Shetland Times, some 200m north west) and local groups (Sub Aqua Club, some 250m north west) scattered in the surrounds to the portal and access road site. There is a well-used marina at the Bight of Gremista. No other sensitive properties[33] have been identified in close proximity to the site.

Bressay

The eastern landfall of the tunnel and associated road infrastructure (including a roundabout) would be located adjacent to the Bay of Heogan. The tunnel access

[31] Current Bressay Ferry usage for the period 01 April 2007 to 30 March 2008
[32] Listed buildings are statutorily protected buildings of special architectural or historic interest, designated under the Planning (Listed Buildings and Conservation Areas (Scotland) Act 1997
[33] Such as schools, churches, hospitals and public open space etc

road would follow the existing Heogan Road northwards before being diverted via a new roundabout located south west of an existing cottage and following a new road in a north westerly direction passing to the north east of the existing Shetland Fish Products factory. The tunnel portal would be located some 40m north of Shetland Fish Products and would then follow a route under an area of rough grass and heath used for grazing and follow a route under the sea to Point of Scatland.

The closest property to the proposed tunnel portal site is Shetland Fish Products with Garth Cottage some 100m north east and an unnamed croft located some 100m to the south east. Other properties in the area include scattered crofts.

Table 8.1: Properties in Proximity to Option 1 (Drill and Blast Tunnel)[34]

Distance from Proposed Tunnel Centre Line (above ground)	Lerwick	Bressay	Total
0 – 50m	Up Helly Aa shed Boat shed Vintage Car Club (warehouse) Warehouse LPA owned sheds Bod of Gremista	Unnamed cottage Shetland Fish Products Factory	8
50 – 100m	Sub Aqua Club Sailing Club Warehouse Depot Depot Bungalow	Garth Cottage	7
100 – 150 m	Brookside Shetland Times Offices Depot	Cottage	
150 – 200m	Depot Warehouse		2
200 – 300m	SSE[35] Generating Station		1
Total (approximate)			**18**

Option 2: High Level Bridge

Lerwick

The western landfall of the bridge and associated road infrastructure would also be located within the North Gremista Industrial Estate. The bridge would be accessed from a new T-junction at the west of the Upper Gremista to Greenhead Road and travel west before being diverted south east via a new roundabout located north of the SIC Gremista Depot. The bridge would then follow a route over industrial buildings (between Shetland Transport and Lerwick Fish Traders) and cross Bressay Sound (part of Lerwick Port) from Point of Scatland (see Section 7.4).

[34] All property counts are estimates and would require to be further detailed for any subsequent application
[35] Scottish and Southern Energy (SSE)

The closest properties to the proposed bridge site are the extension of the Lerwick Fish Traders building some 20m south and Shetland Transport some 20m north. Other properties in the area consist of Norscot Angling Club some 80m north of the proposed bridge and SBS Logistics Depot some 200m north of the proposed bridge. To the south of the proposed bridge are SIC Gremista Depot (some 50m), a bungalow some 150m south west and various industrial buildings, sheds and warehouses used by businesses (including Shetland Catch, some 150m south) scattered in the surrounds to the bridge and access road site. There are no other sensitive properties in close proximity to the site.

Bressay

The eastern landfall of the bridge and associated road infrastructure would be located adjacent to the Bay of Heogan. The road leading to the bridge would follow the existing Heogan Road northwards with a slight realignment at the Shetland Fish Products factory to allow for access. The bridge would follow a route with the factory to its west and the unnamed cottage and Garth cottage to its east. The bridge would then sweep round in a westerly direction and follow an existing field boundary over an area of rough grass and heath to the south of Annfield before crossing Bressay Sound.

The closest property to the proposed bridge site is the unnamed cottage (near Shetland Fish Products) some 25m east. The fishmeal factory is located some 50m west of the bridge site. Other properties in the area include scattered crofts with Garth Cottage and Annfield both located some 50m from the bridge site and Souter Heogan some 160m to the south.

Table 8.2: Properties in Proximity to Option 2 (High Level Bridge)

Distance from Proposed Tunnel Centre Line (above ground)	**Lerwick**	**Bressay**	**Total**
0 – 50m	Shetland Transport Lerwick Fish Traders	Annfield Garth Cottage Unnamed cottage	5
50 – 100m	Norscot Angling Club SIC Transport Depot and Offices	Shetland Fish Products	3
100 – 150 m	Jacmar Shetland Catch		2
150 – 200m	Hughson Brothers Train Shetland	Cottage Souter Heogan	4
200 – 300m	Warehouse Harbour View SBS Logistics Depot	Hunterfield White Cottage Herring Processing Plant (ruin)	6
Total (approximate)			**20**

Option 3: Reconfigured Ferry Service and Option 4: Do Minimum

Lerwick

The reconfigured ferry service would be located where the current ferry service operates at present, from the quay (North Jetty) adjacent to Alexandra Building in Lerwick town centre (see Figures 7.12 and 8.1). The quay is accessible by vehicle and foot from the A969 esplanade which is situated to the east of Commercial Street and Fort Charlotte.

Bressay

On the eastern side (Bressay) the ferry arrives at the pier at Maryfield, to the north of Leira Ness. The car park at Maryfield can accommodate up to 60 cars at present with land nearby that could be developed to accommodate more car parking space in the future. A public toilet block and the premises used by Bressay History Group are located at the eastern edge of the car park. From the pier and car park there is a minor road which travels east to meet Heogan Road from where access can be gained to the whole island. Four properties are located adjacent to the road to the ferry (Maryfield Hotel, two residential properties and the Bresay History Group building).

8.6.4 Environmental Appraisal

- It has been estimated that vehicle trips would double in the first few years after construction of a fixed link (Option 1 or Option 2), to approximately 650 per day. This traffic would cause changes in flows on existing roads. On some roads flows would increase and on others flows would decrease. There could be increased pressures on car parks in Lerwick.
- Options 1 and 2 would impact on properties in and around the Gremista Industrial Estate but could remove traffic from the centre of Lerwick (from where the current Bressay ferry operates). Option 3 could lead to increased levels of traffic in Lerwick centre and therefore could impact on the properties in and around the North Jetty. Option 4 would have little immediate impacts on properties in the centre of Lerwick however if ferry traffic increased over time there could be an increasing impact on properties in the area.
- The increases in traffic associated with fixed links could affect cyclists using the quiet roads on Bressay. The detailed design of all links including specific improvements to Heogan Road would consider cyclists and walkers further (see Section 7.8 and 7.9).
- Option 1 (tunnel) would require demolition of an old LPA shed but is unlikely to impact significantly on other land uses in the area. The excess material from construction could potentially be used to reclaim an area of shallow water at the Bight of Gremista marina alongside the tunnel access road and adjacent to the quay beside Shetland Catch subject to necessary consents.
- Construction of Option 1 (tunnel) would provide opportunities for environmental enhancements of a degraded area of the port with removal of dumped materials and demolition of the old property.
- Construction of a tunnel under the Sound would place some restriction on very deep dredging in the future but not on the planned -10m below CD dredge. LPA has confirmed that this is acceptable because all existing quays would have to be replaced if the harbour were dredged to below –10m which would be impractical.
- Option 2 (high level bridge) could impact on existing or future harbour activities but has been designed (air draught of 60m) to accommodate large vessels which might wish to pass through Bressay Sound in the future (see Section 7.4). The Port Entry Light could be affected by construction and mitigation would be required.

- Construction of Option 2 would have potential to disrupt some harbour activities during the works. Construction could also impact on ongoing operations at Lerwick Fish Traders during the works and would require relocation of a Liquid Petroleum Gas (LPG store).
- Construction of Options 1 and 2 would result in the change of use of some land currently used for grazing (crofting) to facilitate construction of the connecting roads.
- Option 3 (reconfigured ferry) and Option 4 (Do Minimum) would be unlikely to change the land use in the area unless new infrastructure was built at either terminal or additional car parking provided.

8.7 AGRICULTURE AND SOILS

8.7.1 Environmental Baseline

The soils in the area comprise boulder clays, which are disturbed or covered over in some areas by development and associated activities (such as in the port) and are overlaid in some areas by peat on Bressay. The soils are of generally low agricultural value. At the northern end of Lerwick there are small fields of semi-improved grassland grazed by sheep, but the area is largely paved over or occupied by buildings, car parks or hard standing. On Bressay, semi-improved fields near to the coast are used for low intensity, rough grazing. Areas of peat are wet and acidic, and are of low nutrient status.

Peat deposits on Bressay of up to 2.5m have been recorded near the coast. Peat depths are greatest in hollows and valleys. Elsewhere on Bressay the overburden comprises boulder clay and glacial deposits, largely a sandy and stoney drift with a high proportion of pebbles and some larger boulders, drift depths reaching 3m.

8.7.2 Environmental Appraisal

- No prime agricultural land would be affected by the proposals.
- The semi-improved fields at Heogan on Bressay which are used for low intensity rough grazing would be impacted by Options 1 and 2 as land would be required for access roads and improvements to Heogan Road.
- Option 1 would impact on the small field of semi-improved grassland grazed by sheep north west of Gremista Industrial Estate and construction of the extensive approach roads for Option 2 on the Lerwick side would also impact on areas of grassland and moorland used for grazing (see Sections 7.3 and 7.4).
- All construction works for Options 1 and 2 would require to be carefully planned to reduce the potential for impacts on crofting land and activities.
- Upgrade of the Heogan Road and construction of the approach roads for Options 1 and 2 with associated increases in traffic once either option was operational could impact on some stock movements across the road.
- Options 3 and 4 would have little impact on agriculture and soils unless new infrastructure was built.

8.8 GEOLOGY

8.8.1 Environmental Baseline

The geology of Shetland is varied and rather complex, principally as a result of a large number of major north-south running faults, including the northward continuation of the Great Glen Fault, which has brought a large number of different rock types together in a narrow zone.

Devonian sedimentary rocks, chiefly Middle Old Red Sandstones and conglomerates, underlie land on both sides of Bressay Sound. Conglomerates predominate on the Lerwick side and sandstone is more pronounced on Bressay. Layers of siltstone of less than 1m thick are present within the sandstone. The sandstones contain pebbles and feldspars and have a sparse carbon cement, and the rock strength ranges from moderately weak to moderately strong.

Easter Rova Head Geological Site of Special Scientific Interest (SSSI)[36] is the closest statutory designation to the proposed site. The site, located at grid reference (HU 474453), is some 3.5 hectares (ha) in area and is described as the location of '*excellent exposures of very coarse conglomerates of middle Devonian age'* [37]. The red coloured conglomerate is exposed in cliff faces, and comprises boulders of up to two feet in diameter. The site is recognised as being important because it illustrates depositional processes.

The surface of Bressay Sound near the areas, which could be affected by construction of Options 1 and 2, comprises a thin layer of sand and gravel over bedrock, and is a disturbed environment because of dredging and heavy shipping activities.

The beach at Heogan is relatively clean and there is a natural low earth and stone cliff at its head. At the Point of Scatland the beach head is on reclaimed land characterised by general fill materials and building rubble. The edge is reinforced by sandbags, concrete and metal revetments in some locations.

8.8.2 Environmental Appraisal

- The geological features of Easter Rova SSSI would not be impacted by any of the options and no significant geological resources would be affected.
- None of the options would have significant effects on important geological resources.
- Option 1 (tunnel) would require removal of 124,000m^3 of rock (168,000m^3 bulk volume). LPA has indicated that it could re-use this material (subject to receiving necessary consents) in land reclamation.

8.9 WATER QUALITY, DRAINAGE AND FLOOD DEFENCES

8.9.1 Environmental Baseline

There are no significant watercourses in the area in which new infrastructure could be provided. At the Point of Scatland the land falls from about 75m above Ordnance Datum (AOD) at the top of the Hill of Greenhead, then slopes at about 1 in 10 from 22m at the highest point on Main Gremista Road to about 8m AOD, before falling more gently to the shore.

On Bressay the land slopes from a high point of 50m on the Hill of Cruester, and falls gently at a gradient of about 1 in 20 between Annfield and the shore. There are five wells marked on the 1:25,000 scale OS map[38], near Heogan on Bressay, but there are no significant surface watercourses.

[36] A site notified by SNH under the provisions of the Wildlife and Countryside Act (1981) and amendments, as being of national nature conservation or geological importance
[37] Easter Rova Head SSSI citation
[38] 1:25 000 Ordnance Survey (OS) Map, Shetland Mainland: Central – Lerwick, Papa Stour and Foula (Explorer 367)

Groundwater
Bressay and the east side of Mainland consist of moderately permeable rock, as defined on the Ground Water Vulnerability Map[39]. These rocks are overlain by low permeability deposits of peat and boulder clay. As such the area has a low vulnerability and any contaminants are unlikely to penetrate the groundwater.

There are various small effluent discharges evident along the shoreline adjacent to the Lerwick Fish Traders fish processing plant. There is a discharge at Rova Head to the north, and another at the fish processing plant at Heogan on Bressay.

Flood Risk
The SEPA flood map shows no areas at risk of fluvial flooding on either Bressay or Lerwick but also shows extensive areas at risk of coastal flooding on both islands[40]. The A969 Esplanade Road through Lerwick as well as industrial areas to the North of Lerwick and Leiraness on Bressay are at risk of coastal flooding.

Water Quality
The water quality in Bressay Sound is generally high and of good quality, although there are some local areas where discharges affect this. There is a discharge from the fish processing plant at Heogan on Bressay and the water around the pier is affected. The coast around this area is locally downgraded. Similarly small discharges from the fish processing plant at the Point of Scatland locally affect the Mainland shore, and there is a discharge further north at Rova Head. Bressay Sound has peak tidal flows in the order of 4 knots and is therefore an area of high natural dispersion. The tidal range in the Sound is 2m.

There are no beaches identified in the Bathing Waters (Classification) (Scotland) Regulations, 1991[41] within 5km of the site, although there are many small beaches and inlets which may occasionally be used for bathing.

8.9.2 Environmental Appraisal

- There would be impacts on water quality during construction of Option 1 if land is reclaimed at the edge of the marina and near Shetland Catch. Effects would be short term and controlled by carefully planning the works and implementation of best construction practices on site.
- Construction of the high level bridge (Option 2) would result in impacts on water quality during construction particularly during construction of any temporary causeways or coffer dams because of increased loads of suspended solids and other pollutants. Implementation of best site management practices would reduce the significance of effects but some impacts could not be avoided. Bressay Sound has high natural dispersal characteristics which would aid recovery on completion of construction. If this option was taken forward modelling of the effects of the bridge on currents and dispersion would be required.
- Construction of the tunnel could result in some impacts on ground water but it is not considered at this stage that these would be significant. Further work would be undertaken if this option were taken forward to confirm this and if any impacts were identified, mitigate these.

[39] British Geological Society (1988) Hydrogeological Map of Scotland Scale 1:625,000. BGS and Association of Inspectors and River Inspectors of Scotland (1995) Groundwater Protection Strategy for Scotland. ADRIS
[40] SEPA Interactive Flood Map, 2008. http://www.sepa.org.uk/flooding/mapping/
[41] Recognised bathing waters to ensure the protection of public health and amenity through the control of pollution and the regulations of water quality (particularly microbiological contamination)

- The Lerwick tunnel portal (Option 1) would be built in an area identified as being of risk of flooding. The detailed design would be developed to mitigate this. Reclamation of land with spoil from the tunnel could help to achieve this. Further work would be required to identify the extent of the risk and all necessary mitigation.
- Any spillages of diesel and other pollutants from the ferry and/or vehicles using it in Option 3 (reconfigured ferry service) could impact on the water quality of the harbour but this is unlikely to be significantly different from at present and with stringent operating practices this risk would continue to be carefully controlled.
- Option 4 (Do Minimum) would have additional impacts on water quality.

8.10 LANDSCAPE

8.10.1 Environmental Baseline

The SNH Shetland landscape character assessment[42] was used to identify broad landscape areas. The various link options fall within the broad area of Bressay and South Mainland Coast Landscape Character Area (LCA). They are within the Farmed and Settled Voes and Sounds Landscape Character Type (LCT), within a local character unit called Developed Areas. These areas represent Shetland's farmed and settled land, with a character reflecting successive settlement and include the major administrative centre and harbour at Lerwick. The document advises that '*the visual and landscape qualities of Lerwick viewed from the sea and ferry terminals are important in considering new development…The cultural heritage of Lerwick should be safeguarded….The settings for historic buildings strictly safeguarded to reinforce the traditional quality and image of the town*.'

The area Farmed and Settled Voes and Sounds LCT is subdivided into Developed Areas (covering Lerwick and the industrial fringe to the north) and Nucleated Settlements (covering Bressay).

Farmed and Settled Voes and Sounds are described as enclosed coastal waters and productive agricultural land, where pasture and rough grazing are the dominant land covers. There has been a long tradition of greater settlement in these areas, and larger settlements are included.

Developed Areas (including Lerwick) are described as being dominated by large scale development, where there is now little evidence of former vegetation or landscape character. '*Built elements and hard surfaces dominate and the character and scale of the buildings and their relationship to one another define the character*.' The cultural heritage of Lerwick should be protected, and the landscape quality of the immediate environs should be safeguarded from development. Part of Lerwick is designated as a Conservation Area reflecting its cultural heritage importance and sensitivity.

Nucleated Settlements (including the west coast of Bressay) are areas of settlement including residential development and public buildings, located around harbour facilities, set within rough grassland and heather moorland.

The Bressay and South Mainland Coast LCA is described as having a gently undulating landform which is predominantly less than 50m AOD in height. Land cover includes agricultural land and improved grassland.

[42] Shetland Landscape Character Assessment, Review Number 93, SNH, 1998

More detail about the local landscape character, and about the specific landscape resources present in the localities of the proposed elements of the development is included in Appendix 8.2.

8.10.2 Environmental Appraisal

- A tunnel (Option 1) would result in minimal long-term effects on the wider landscape. In the locality of the portals themselves and along the routes of the proposed access roads serving the tunnel, localised impacts on the landscape character would result, particularly on Bressay. On the Lerwick side, these have potential to have some positive elements, through enhancing currently degraded areas. No significant landscape resources would be affected at either tunnel portal, providing appropriate mitigation was implemented.
- A high level bridge (Option 2) would result in long-term effects on the wider landscape, as it would be apparent across an extensive area for the duration of its life span. It would form a new feature and landmark in views, rising above the industrial areas at the Point of Scatland and extending to the rural landscape of Bressay.
- In the locality of the landfalls and along the routes of the proposed access roads serving the bridge localised impacts on the landscape would result, particularly on Bressay. On the Lerwick side, these have some potential to have positive elements, though enhancing currently degraded areas (as Option 1).
- The effects of Option 3 (the reconfigured ferry service) would be unlikely to have significant impacts on the landscape as the ferry is already part of the character of the area. Localised changes to the ferry terminals and piers may occur.
- The Do Minimum option (Option 4) would result in no significant change in current levels of impact.

8.11 VISUAL AMENITY

8.11.1 Environmental Baseline

The study area extends to the theoretical Zone of Visual Influence (ZVI) of the link options, to be located under, over or on Bressay Sound, and on land either side of the Sound. This area includes part of the south of Mainland Shetland including Lerwick, the land around it, and the western side of the island of Bressay.

The surrounding area comprises predominantly of the built up area of Lerwick to the west and south, and undeveloped open rolling moorland and heath covered hills beyond the town, to the west and north. Lerwick comprises an historic core characterised by sturdy stone houses and shops focussed upon Commercial Street, and the waterfront Esplanade, along which are a series of jetties, piers and moorings. Beyond the historic core lie industrial areas (Holmsgarth), larger buildings (hospital, hotels, sports centres etc), and residential areas including Hoo to the north west, and Sound to the south west. The Broch, located in the Loch of Clickimin is an important feature of the town, located to the east of Sound, as is the historic Fort Charlotte above the Esplanade.

Bressay Sound, a 2-3 km wide channel, separates Lerwick from the island of Bressay to the east. Low intensity grazing and crofting land, with characteristic dry stone dykes, separates the scattered hamlets of Heogan, Voeside, Glebe, Grindiscol, Ham and Kirkabister along the coastal strip of Bressay, and extends up hill slopes, to hamlets such as Uphouse. Above the settled edge the 226m high Ward of Bressay is the dominant hilltop in the area. Smooth, unenclosed

moorland rises up the flanks of the hill which is topped by a prominent radio and wireless station. There are no significant trees and only small areas of shrubby vegetation, so the landscape is very open. Panoramic views are available across Bressay Sound to The Knab at the southern edge of Lerwick, and the open rolling hills of Mainland beyond.

Further detail about visual receptors (those whose visual amenity might change with any option) is included in Appendix 8.2.

8.11.2 Environmental Appraisal

- A tunnel (Option 1) would result in minimal long term visual impacts in the wider area. In the locality of the portals and along the routes of the proposed access roads serving the tunnel, localised visual impacts would result, but some of these have potential to be positive through enhancing currently degraded areas.
- A high level bridge (Option 2) of the scale proposed would result in wide scale visual impacts across north facing areas of Lerwick, from the west side of Bressay and the flanks and tops of surrounding hills which face towards the proposed bridge. If the design was of aesthetic merit, it may be considered by some to be a positive new landmark in Shetland. Viewers would vary in their feelings towards the new bridge depending upon their like or dislike of the structure.
- The cable stay towers of the bridge (Option 2) would be visible from a very long distance from the site.
- In the locality of the landfalls themselves and along the routes of the proposed access roads serving the bridge, more localised visual impacts would result. Some of these have potential to be positive through enhancing currently degraded areas.
- The effects of Option 3 (reconfigured ferry service) would depend upon the details of the final implemented option, but would be unlikely to have significant visual impacts as people are already accustomed to seeing the existing ferry.
- If more boats were introduced with any option, for example smaller boats for passengers only, then these would provide increased activity and visual interest at the existing North Jetty.
- The Do Minimum option (Option 4) would result in no significant change in current levels of impact.

8.12 BIODIVERSITY

8.12.1 Environmental Baseline

There are no statutory natural heritage sites which would be directly affected by any link between Mainland Shetland and Bressay. The closest designated site is the Easter Rova Head designated for its geological interests (see Section 8.8.1). The Isle of Noss, which lies off the east coast of Bressay, some 6km from the Sound, is designated as a Special Protection Area (SPA)[43], National Nature Reserve (NNR)[44] and SSSI for its seabird interests.

An otter survey undertaken in June 2003 indicated that there is an otter holt to the north of Bressay (near Turra Taing). Anecdotal records suggest otter may be

[43] A site designated under the European Directive on Conservation of Wild Birds (79/409/EEC) (known as the Birds Directive) to protect birds that are considered rare or vulnerable within the European Community and all regularly occurring migratory birds. Enacted in the UK through the Wildlife and Countryside Act (1981) and amendments and the Conservation (Natural Habitats &c) Regulations (1994)

[44] A site designated under the Wildlife and Countryside Act (1981) and amendments or the National Parks and Access to the Countryside Act (1949) and are notified as SSSI

seen anywhere in Shetland and thus it can be assumed that otter may at times frequent any area of the coast. Otter (*Lutra lutra*) is protected under British and European law under the Wildlife and Countryside Act, 1981, the Nature Conservation (Scotland) Act, 2004 and under the Habitats Directive and the Habitats Regulations. It is also listed on Appendix 1 of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); Appendix 2 of the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) and as a globally threatened species on The World Conservation Union (IUCN) Red Data List. This makes it illegal to:

- Intentionally or recklessly kill, injure or take an otter.
- Intentionally or recklessly damage or destroy, or obstruct access to, any structure or place used by an otter for shelter or protection.
- Intentionally or recklessly disturb an otter, whether in a place of shelter or protection or not.

Other marine mammals recorded from the Bressay Sound include grey seal, which is protected under the Conservation of Seals Act, 1970 and pilot whale and harbour porpoise, protected under Wildlife and Countryside Act, 1981 and amendments, the Nature Conservation (Scotland) Act 2004 and the Conservation (Natural Habitats &c) Regulations, 1994. The UK is a signatory to the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS), (1994) which is seeking to work towards the prevention of disturbance of sea mammals, especially from acoustic sources.

Various bird species recorded from Bressay Sound are protected including red-throated diver, great northern diver, and long tailed duck[45]. Skylark is recorded on Bressay and is a red list[46] species. Local Biodiversity Action Plan interests include eider (5 - 5.5% of the Shetland population can winter in Bressay Sound) and harbour porpoise.

The main channel of Bressay Sound is dredged (see Section 8.6.2) and it is considered that there is therefore unlikely to be any significant habitat interest in the Sound in the areas that could be affected.

Fixed Links

Lerwick

Both fixed links (Options 1 and 2) would have similar landfalls (see above). The bridge approach would launch from north west of the Main Gremista Road, which is bordered on the east and west by areas of grassland and heath, some of which has been disturbed in the past during road construction. The tunnel access road would be located north of the Bight of Gremista. Both links would cross disturbed industrial land with evidence of scattered ruderal[47] species. At the water's edge below the developed area there is a narrow strand with outcropping rocks and a pebble beach. The edge of the beach is protected in parts with large boulders. A narrow band of vegetation below the boulders consists of scattered plants typical of the location including the herbs *Potentilla anserina* (silverweed), *Cochlearia officinalis* (scurvy grass), and *Atriplex* spp (oraches) and the grasses *Elytrigia repens* (couch) and *Agrostis stolonifera* (creeping bent).

[45] Protected under Schedule 1 of the Wildlife and Countryside Act (1981) and amendments. Divers also listed under Annex 1 of the EC Wild Birds Directive 79/409/EEC

[46] A species whose population or range is rapidly declining, recently or historically or of global conservation concern. (RSPB et al, 2002. The Population Status of Birds in the UK)

[47] Typical of waste ground

Bressay

The Bressay landfall of both fixed link options cut through fields of semi improved grassland and heath at Heogan to join the existing track to Garth Cottage and Annfield. The acid grassland and heath fields are grazed and, in areas of deeper peat, poorly drained. Species are widespread and typical of Shetland with frequent grasses including *Agrostis* spp (bents), *Festuca* spp (fescues), *Anthoxanthum odoratum* (sweet vernal grass), *Dactylis glomerata* (cock's-foot) and *Holcus lanatus* (Yorkshire fog), rushes including *Juncus squarrosus* (heath rush) and clumps of *Juncus effusus* (soft rush), and herbs including *Potentilla erecta* (tormentil), *Rumex acetosa* (common sorrel) and *Hypochoeris radicata* (cat's ear). *Sphagnum* mosses are common in the wetter areas. Limpet shells dropped by birds are common in the fields.

Poorly drained, semi-improved grazed meadows (some divided by dry stone walls) edge the existing Heogan Road and at the road side herbs including *Rumex* spp (docks)*, Trifolium* spp (clovers)*, Plantago lancelolata* (ribwort plantain) and *Bellis perennis* (daisy) increase amongst bents and fescues.

At the coast there is a low eroding cliff and a narrow pebble and boulder beach with exposures of conglomerate. A post and wire fence edges the field above the cliff but gaps in it allow sheep to graze on the beach. *Fucus* spp are common, but there are fewer species than at the Lerwick landfall.

Reconfigured Ferry and Do Minimum

Bressay Sound

The main channel of Bressay Sound is dredged and to be dredged again in the near future so there is unlikely to be any significant habitat interest in this area. The Sound is visited by various animal species of interest (see above).

8.12.2 Environmental Appraisal

- None of the options would directly affect any site designated for its nature conservation interests.
- The risk of fixed links facilitating the access of polecat ferrets to the Isle of Noss and its important bird communities has been raised by SNH (see Annex B). This risk would need to be taken into account in the detailed design of a tunnel or bridge.
- Option 2 (high level bridge) could result in collisions between eiders and other seabirds with the structure.
- The fixed links would involve heavy construction which could impact on marine life such as cetaceans (European Protected Species (EPS)), which are particularly sensitive to subterranean acoustic disturbance and vibration. The impact during any construction works may extend to several metres from the sound source. Specific mitigation would need to be agreed with SNH and Scottish Government[48] to ensure the risk of disturbance was reduced to the minimum necessary for the works if either fixed link option was taken forward and in particular Option 2 (high level bridge).
- Otter (an EPS) is widespread in Shetland in the marine environment and on land. Any option with new infrastructure could cause disturbance but on the information known at present it is considered unlikely that licensing would be required. Surveys would be required to confirm this. Additional ferry services

[48] Licensing might be required

are considered unlikely to disturb otter because they would be habituated to the current service and also much other traffic in the Sound.
- The fixed link options both involve the construction of new roads on Bressay which could disturb breeding waders. Pre-construction surveys would be required to identify any specific mitigation requirements including timing of the works.
- Option 4 (Do Minimum) would have no additional effects on biodiversity as compared with the current situation.

8.13 CULTURAL HERITAGE

8.13.1 Environmental Baseline

Shetland is rich in archaeological remains, with over 6000 sites currently on record. In the study area these include:

Fixed Links

Lerwick
- Bod of Gremista: a Category B Listed Building, approximately 300m south of the tunnel portal and some 500m south of the bridge;
- various archaeological sites recorded on the National Monuments Record of Scotland (NMRS) including a beacon and breakwater at the Bight of Gremista, approximately 300m south of the tunnel portal and some 500m south of the bridge.

Bressay
- Former fishing station: a Category B Listed building, approximately 100m south of the tunnel portal and 100m west of the bridge;
- Gardie House gardens are listed in the Inventory of Historic Gardens and Designed Landscapes[49] and the house is a Category A Listed building, approximately 1.6km south of the tunnel portal and bridge;
- various archaeological sites recorded on the NMRS including the remains of a former Iron Age broch some 350m east of the tunnel portal and some 200m south of the bridge on the north side of Heogan Bay. It is considered that this area may have been a focus of Iron Age activity and may contain significant archaeological deposits.

Reconfigured Ferry and Do Minimum

Lerwick
- Fort Charlotte: Scheduled Ancient Monument (SAM)[50], approximately 125m west of the quay (North Jetty);
- Albert Building: a Category B Listed Building, approximately 50m west of the quay (North Jetty);
- Various archaeological sites recorded on the National Monuments Record of Scotland (NMRS) including Lerwick Harbour Cafeteria, some 50m west of the quay (North Jetty).

[49] The Inventory of Historic Gardens and Designed landscapes is a systematically obtained list of 275 of the more important historic gardens and designed landscapes in Scotland published by Historic Scotland in 1987

[50] Archaeological or cultural heritage site afforded statutory protection under the Ancient Monuments and Archaeological Areas Act 1979

Bressay

- Maryfield Boat Store and Slipway: a Category B Listed Building, approximately 20m east of Maryfield Pier;
- Gardie House gardens are in the Inventory of Historic Gardens and Designed Landscapes[51] and the house is a Category A Listed Building, approximately 20m east of Maryfield Pier; and
- Various archaeological sites recorded on the NMRS including a beacon at Maryfield Pier.

8.13.2 Environmental Appraisal

- Options 1 and 2 would impact on the setting of the Bod of Gremista Category B Listed museum building. The effects of Option 1 could be positive by tidying up a currently degraded area in the locality of the Lerwick portal. Options 3 and 4 would have no impact on the Bod of Gremista.
- Option 2 (high level bridge) could have an effect on the setting of cultural heritage resources across a wide area.
- Impacts of the fixed links and their access roads on the cultural heritage interests in Gremista and Heogan would be low but would be taken into account during construction.
- Options 3 and 4 would have no significant impact on the cultural heritage in Lerwick or Bressay.
- Option 4 (Do Minimum) would have no additional effects on cultural heritage.

8.14 NOISE AND VIBRATION

8.14.1 Introduction

Predicted traffic flows have been used as a proxy for potential noise impacts of each option as well as noise from the ferry itself for Options 3 and 4 (see Section 8.6). Further more detailed noise predictions would be required if either fixed link is taken forward to consider the impacts at those properties which would be most likely to be affected by the changes in traffic movements associated with either fixed link option and mitigation included in the detailed design if required.

8.14.2 Environmental Baseline

Current noise sources in the area of all link options are:

- road traffic;
- planes/helicopters;
- boats;
- the sea;
- wind; and
- activities in the port development in Lerwick and at the fishmeal factory on Bressay.

At the Point of Scatland, on a working day, existing noise levels are elevated, primarily due to the movement of HGVs at Shetland Transport and traffic on the main Gremista Road. The noise environment at Heogan is quiet. At the two ferry terminals noise can be elevated by the ferry and associated traffic.

[51] The Inventory of Historic Gardens and Designed landscapes is a systematically obtained list of 275 of the more important historic gardens and designed landscapes in Scotland published by Historic Scotland in 1987

Lerwick
Sensitive receptors which could be affected by noise are concentrated in the more densely populated Lerwick side of the Bressay Sound and include residential properties as well as Shetland College. The industrial area of Lerwick Port and associated businesses extends along much of the water's edge from Victoria Pier northwards. These commercial properties provide some screening of activities in the Sound for residential properties behind. Key current sources of noise include traffic and port-related activities (including the Bressay ferry terminal) as well as a range of activities in Lerwick itself.

Bressay
There are a number of scattered residential properties along the Bressay side of the Sound which could be affected by any construction works and all are either single or two storey crofts and cottages.

8.14.3 Environmental Appraisal

It is assumed that all current car trips across the ferry would continue with any option and that trips could increase with a reconfigured ferry option (Option 3) as compared with Option 4 (Do Minimum) and increase more significantly with either fixed link option (see Chapter 7). Consideration of current traffic flows (see Section 8.6 and research elsewhere as described in Section 12.3 suggests that some 650 vehicles a day could use a fixed link in the first years after its construction. This figure could increase if the link stimulated new development and/or housing on Bressay.

- Noise and vibration would be created during construction of either fixed link option (Options 1 and 2) or any new ferry infrastructure if required (Option 3) and is likely to be significant at some locations over short periods but could be managed through implementation of mitigation measures to reduce the magnitude of the impacts.
- During operation, both fixed link options would remove traffic and therefore noise impacts from the current quay in Lerwick and potentially from Lerwick centre itself. Similarly, the existing road from Maryfield to the Heogan Road on Bressay would experience a reduction in traffic levels and associated noise. On both the Lerwick (western) landfall and Bressay (eastern) landfall of the fixed links there would be increased traffic movements in the area (Gremista Industrial Estate and Gremista Road and Heogan Road) and associated noise and vibration impacts. It would be anticipated that operational noise would be greater from the high level bridge option (Option 2) than the tunnel option (Option 1) because it would all be open to the environment.
- A fixed link would increase ease of access between Bressay and Lerwick with associated increases in traffic. Noise levels could increase on the island as a whole but this would not be anticipated to be significant, as flows would be spread throughout the day with concentrations in the peak periods but flows would remain relatively low.
- The reconfigured ferry service could lead to a small reduction in traffic and associated noise as the enhanced service could result in more foot passenger movements rather than car movements, although there would be increased noise from the increased ferry movements.
- Option 4 (Do Minimum) would not increase or reduce noise emissions.

8.15 AIR QUALITY

8.15.1 Environmental Baseline

Existing air quality in the area is good. It is currently influenced by:

- traffic emissions;
- emissions from sea borne traffic;
- odours from fish processing plants; and
- a small sewage outlet on the Lerwick shore which locally affects air quality.

The Scottish Air Quality web database[52] was searched, and recent monitoring data held for the Lerwick monitoring station show Low (0 – 99 μgm^{-3}) levels of ozone for April 2008. No other air pollutants are currently monitored and there are no local air quality management areas[53] on Mainland Shetland or on Bressay. When assessed in 2005, concentrations of all seven pollutants covered by the National Air Quality Strategy[54] were predicted to be below levels that would impact on human health.

8.15.2 Carbon Footprint

One of the planning objectives for the study is '*to provide a link that seeks to minimise carbon emissions and the use of finite resources'* (see Section 4.2). To help in the appraisal of this objective, indicative inventories of the CO_2 emissions associated with the options have been compiled (see Appendix 8.3).

Reasons for incorporating carbon footprinting in the STAG appraisal include the following:

- so that carbon intensity can be included as one of the sustainability criteria for comparisons between the various options alongside social and economic criteria;
- so that the social cost of carbon can be included in the economic appraisal of the options;
- to comply with the UK Government's Energy White Paper (2003) which sets out a requirement to make carbon impact assessment an integral part of assessing environmental impact;
- to provide initial inventories so that carbon intensity considerations and innovations can be incorporated into the design/procurement phases of the preferred option; and
- because future STAG guidance to be published in 2008 will require this.

Using the available data and making estimates where necessary, the following (Table 8.3) provides an initial indication of the carbon footprint of each of the options, over the lifetime of the project (60 years).

[52] www.scottishairquality.co.uk

[53] Declared by local authorities when as a result of an air quality review it appears that air quality standards or objectives are not being achieved or are not likely to be achieved within the defined period

[54] DEFRA (was DETR) (2000), The Air Quality Strategy for England, Scotland, Wales and Northern Ireland. Working Together for Clean Air. DETR, London

Table 8.3: Carbon Footprints

Option	Tonnes CO_2e over 60 years
Current Ferry Service	39,281
Reconfigured Ferry Service	58,106
Tunnel	20,884 including electricity consumption for ventilation, lighting etc.
High Level Bridge	23,525

It should be noted that the carbon footprints for the two ferry options do not, as yet, include the embedded carbon (CO_2e) in the replacement of the ferry itself. In addition, the tunnel and bridge options do not include the embedded energy associated with the decommissioning of the infrastructure when/if appropriate. The figures do however facilitate a broad comparison of the options.

8.15.3 Environmental Appraisal

- Option 1 (tunnel) and Option 2 (high level bridge) would lead to increased levels of traffic and therefore localised reduction in air quality in Gremista and Heogan but could remove traffic and therefore relieve congestion and improve air quality in some areas of Lerwick centre and Maryfield. Impacts are not considered to be significant because flows would still be comparatively low as compared with for example the Scottish mainland.
- Option 3 (reconfigured ferry service) could lead to decreased levels of congestion as traffic for the ferry service would be spread out over a longer period of time compared to the present situation.
- The increased level of service with Option 3 would result in increased levels of emissions from the ferry vessels unless vessels with new technology were introduced in the future with potential for decreased emissions.
- Option 1 (tunnel) would have a smaller carbon footprint over 60 years than other options.
- Option 4 (Do Minimum) would not significantly increase or reduce air quality.

8.16 ADDITION: IMPROVED PUBLIC TRANSPORT

8.16.1 Environmental Baseline

Current facilities and the proposed improvements are described in Section 7.7 and Annex J.

8.16.2 Environmental Appraisal

- All options for improved public transport have potential to encourage modal shift with subsequent benefits in terms of noise and air quality.

8.17 ENVIRONMENTAL SUMMARY

This section presents the key findings from the appraisals set out above.

8.17.1 Planning

- All options for the link broadly comply with National and Regional Planning goals. Current local planning policy relates to a bridge as a link to Bressay. This would require to be re-considered if a different option was taken forward.

8.17.2 Land Use

- Some 650 vehicles per day could use a fixed link (Option 1 or Option 2) in the first few years after its construction. This traffic would cause changes in flows on existing roads in Lerwick and Bressay. On some roads flows would increase and on others flows would decrease. There could be increased pressures on car parking facilities in Lerwick.
- Option 1 (tunnel) would require demolition of an LPA shed but is unlikely to impact significantly on other land uses in the area. The excess material from construction could potentially be used to reclaim an area of shallow water at the Bight of Gremista marina alongside the tunnel access road and an area near Shetland Catch.
- Construction of Option 1 (tunnel) would provide opportunities for environmental enhancements of a degraded area of the port with removal of dumped materials and demolition of an old property.
- Option 2 (high level bridge) could impact on existing or future harbour activities but has been designed (air draught of 60m) to accommodate large vessels which might wish to pass through Bressay Sound in the future. The Port Entry Light could be affected and mitigation would be required.
- Option 2 would disrupt some harbour activities during the construction works and would require harbour activities to be carefully managed around the construction activities.
- Construction of Option 2 would impact on current operations at Lerwick Fish Traders during the works and would require relocation of a Liquid Petroleum Gas (LPG store).
- Construction of Options 1 and 2 would result in the change of use of some land currently used for grazing (crofting) to facilitate construction of the connecting roads.
- Option 3 (reconfigured ferry) and Option 4 (Do Minimum) would be unlikely to change the land use in the area unless new infrastructure was built at either terminal or additional car parking provided.

8.17.3 Agriculture and Soils

- No prime agricultural land would be affected by the proposals.
- Small areas of semi improved fields used for grazing near Gremista and Heogan would be lost to facilitate construction of the access roads.
- The increased traffic associated with a fixed link could impact on some stock movements across the road.
- Options 3 and 4 would have little impact on agriculture and soils unless new infrastructure was built.
- Further work is required to identify the location of any made ground which could be affected at the edge of the harbour by Option 1 (tunnel). SEPA confirmed this (April 2008). The detailed design would be required to mitigate any potential adverse effects.

8.17.4 Geology

- No designated sites or important geological resources would be affected by any option.
- Option 1 (tunnel) would require removal of 124,000m^3 of rock (168,000m^3 bulk volume). LPA has indicated that it could re-use this material (subject to receiving necessary consents) in land reclamation.

8.17.5 Water Quality, Drainage and Flood Defences

- There would be impacts on water quality during construction of Option 1 if land were reclaimed at the edge of the marina and adjacent to Shetland Catch. Effects would be short term and controlled by carefully designing the works including appropriate mitigation and implementation of best construction practices on site.
- Construction of the high level bridge (Option 2) would result in impacts on water quality during construction particularly during construction of any temporary causeways or cofferdams because of increased loads of suspended solids and other pollutants. Implementation of best site management practices would reduce the significance of effects but some impacts could not be avoided. Bressay Sound has high natural dispersal characteristics which would aid recovery on completion of construction. If this option was taken forward modelling of the effects of the bridge on currents and dispersion would be required.
- Construction of the tunnel could result in some impacts on ground water but it is not considered at this stage that these would be significant. Further work would be required to confirm this.
- The Lerwick tunnel portal (Option 1) would be built in an area at risk of flooding. Reclamation of land with spoil from the tunnel could help to achieve this. Further work would be required to identify the extent of the risk and necessary mitigation as part of the detailed design.
- Any spillages of diesel and other pollutants from the ferry and/or vehicles using it in Option 3 (reconfigured ferry service) could impact on the water quality of the harbour but this is unlikely to be significantly different from at present and with stringent operating practices this risk would continue to be carefully controlled.
- Option 4 (Do Minimum) would have no additional effects on water quality unless works were required at the terminal when minor short-term impacts could result.

8.17.6 Landscape

- A tunnel (Option 1) would result in minimal long-term effects on the wider landscape. In the locality of the portals themselves and along the routes of the proposed access roads serving the tunnel, localised impacts on the landscape would result, particularly on Bressay. On the Lerwick side, these have potential to be positive though enhancing currently degraded areas.
- A high level bridge (Option 2) would result in long-term effects on the wider landscape, as it would be apparent across a wide area for the duration of its life span. It would form a new feature and landmark, rising above the industrial areas at the Point of Scatland and extending to the rural landscape of Bressay.
- In the locality of the landfalls and along the routes of the proposed access roads serving the bridge localised impacts on the landscape would result, particularly on Bressay. On the Lerwick side, these have potential to be positive though enhancing currently degraded areas.
- The effects of Option 3 (the reconfigured ferry service) would be unlikely to have significant impacts on the landscape, as the ferry is already part of the character of the area.
- The Do Minimum option (Option 4) would result in no significant change in current levels of impact.

8.17.7 Visual Amenity

- A tunnel (Option 1) would result in minimal long term visual impacts in the wider area. In the locality of the portals themselves and along the routes of the proposed access roads serving the tunnel, localised visual impacts would result, but some of these have potential to be positive through enhancing currently degraded areas.
- A high level bridge (Option 2) of the scale proposed would result in wide scale visual impacts across north facing areas of Lerwick, from the west side of Bressay and the flanks and tops of surrounding hills which face towards the proposed bridge. If the design was of aesthetic merit, it may be considered by some to be a positive new landmark in Shetland. Viewers would vary in their feelings towards the new bridge depending upon their like or dislike of the structure.
- The cable stay towers of the bridge (Option 2) would be visible from a very long distance from the site.
- In the locality of the landfalls themselves and along the routes of the proposed access roads serving the bridge, more localised visual impacts would result. Some of these have potential to be positive through enhancing currently degraded areas.
- The effects of Option 3 (reconfigured ferry service) would depend upon the nature and scale of the proposals, but would be unlikely to have significant visual impacts as people are already accustomed to seeing the existing ferry.
- If more boats were introduced with any option, for example smaller boats for passengers only, then these would provide increased activity and visual interest at the existing North Jetty.
- The Do Minimum option (Option 4) would result in no significant change in current levels of impact.

8.17.8 Biodiversity

- None of the options would directly affect any site designated for its nature conservation interests.
- Fixed links could facilitate access of polecat ferrets to the Isle of Noss and its important bird communities. This risk would need to be taken into account in the detailed design of a tunnel or bridge (Options 1 and 2).
- Option 2 (high level bridge) could result in collisions between eiders and other seabirds with the structure.
- Construction of fixed links (Options 1 and 2) could disturb important wildlife including cetaceans (sea mammals) and otter which are European Protected Species (EPS). Specific mitigation be identified and implemented to reduce the level of impact if either option was taken forward. Additional ferry services (Option 3) are considered unlikely to disturb otter because they would be habituated to the current service and also much other traffic in the Sound.
- The fixed link options both involve the construction of new approach roads and upgrade of the existing Heogan road on Bressay which could disturb some breeding waders. Pre-construction surveys would be required to identify any specific mitigation requirements including timing of the works.
- Option 4 (Do Minimum) would have no additional effects on biodiversity as compared with the current situation.

8.17.9 Cultural Heritage

- Options 1 and 2 would impact on the setting of the Bod of Gremista Category B Listed museum building. The effects of Option 1 could be positive by tidying

up a currently degraded area in the locality of the Lerwick portal. Options 3 and 4 would have no impact on the Bod of Gremista.
- Option 2 (high level bridge) could have an effect on the setting of cultural heritage resources across a wide area.
- Impacts of the fixed links and their access roads on the cultural heritage interests in Gremista and Heogan would be low but would be taken into account during construction.
- Options 3 and 4 would have no significant impact on the cultural heritage in Lerwick or Bressay.
- Option 4 (Do Minimum) would have no additional effects on cultural heritage.

8.17.10 Noise and Vibration

- Noise and vibration would be created during construction of either fixed link option (Options 1 and 2) or any new ferry infrastructure if required (Option 3) and is likely to be significant at some locations over short periods but could be managed through implementation of mitigation measures to reduce the magnitude of the impacts.
- During operation, both fixed link options would remove traffic and therefore noise impacts from the current quay in Lerwick and potentially from Lerwick centre itself. Similarly, the existing road from Maryfield to the Heogan Road on Bressay would experience a reduction in traffic levels and associated noise. On both the Lerwick (western) landfall and Bressay (eastern) landfall of the fixed links there would be increased traffic movements in the area (Gremista Industrial Estate and Gremista Road and Heogan Road) and associated noise and vibration impacts. It would be anticipated that operational noise would be greater from the high level bridge option (Option 2) than the tunnel option (Option 1) because it would all be open to the environment.
- A fixed link would increase ease of access between Bressay and Lerwick with associated increases in traffic. Noise levels could increase on the island as a whole but this would not be anticipated to be significant, as flows would be spread throughout the day with concentrations in the peak periods but flows would remain relatively low.
- The reconfigured ferry service could lead to a small reduction in traffic and associated noise as the enhanced service could result in more foot passenger movements rather than car movements, although there would be increased noise from the increased ferry movements.
- Option 4 (Do Minimum) would not significantly increase or reduce noise emissions.

8.17.11 Air Quality

- Option 1 (tunnel) and Option 2 (high level bridge) would lead to increased levels of traffic and therefore localised reduction in air quality in Gremista and Heogan but could remove traffic and therefore relieve congestion and improve air quality in some areas of Lerwick centre and Maryfield. Impacts are not considered to be significant because flows would still be comparatively low as compared with for example the Scottish mainland.
- Option 3 (reconfigured ferry service) could lead to decreased levels of congestion as traffic for the ferry service would be spread out over a longer period of time compared to the present situation.
- The increased level of service with Option 3 would result in increased levels of emissions from the ferry vessels unless vessels with new technology were introduced in the future with potential for decreased emissions.

- Option 1 (tunnel) would have a smaller carbon footprint over 60 years than other options.
- Option 4 (Do Minimum) would not significantly increase or reduce air quality.

8.17.12 Addition: Improved Public Transport

- All options for improved public transport have potential to encourage modal shift with subsequent benefits in terms of noise and air quality.

Appendix 8.1

Planning Guidance

Appendix 8.1 Bressay Link Planning Context

Table A8.1.1 Planning Context

Name of Plan, Programme or Strategy	Nature of Plan, Programme of Policy	Relevance
National Planning Framework for Scotland (NPFS)[1]	The NPFS is not statutory however it is a material consideration in planning terms. It identifies key issues, drivers of change, priorities and objectives for the whole of Scotland and distinguishes these for different areas such as the central belt and rural areas. The NPFS centres on the significant areas of importance for sustainable development in Scotland, paying particular attention to economy, energy, environment and transport. It has several key strategic aims including: • to promote social and environmental justice; • to promote sustainable development and protect and enhance the quality of natural and built environments; and • to increase economic growth and competitiveness	All options continue to provide a good transport link. The fixed links and the reconfigured ferry service could stimulate economic growth in the longer term. Public transport measures would be essential to ensure these links were as accessible to those without a car as the ferry. A reconfigured ferry service would be beneficial to those without a car The carbon footprint of all options has been calculated and taken into account in the appraisal of options
Scotland's National Transport Strategy[2]	Scotland's National Transport Strategy builds on the Transport White Paper of 2004 and outlines how the vision and objectives set out in the white paper can be implemented throughout the country. The strategy sets out three key strategic outcomes that must be focussed on. They are to: • improve journey times and connections, to tackle congestion and the lack of integration and connections in transport which impact on the high level objectives for economic growth, social inclusion, integration and safety; • reduce emissions, to tackle the issues of climate change, air quality and health improvement which impact on the high level objective for protecting the environment and improving health; and • improve quality, accessibility and affordability, to give people a choice of public transport, where availability means better quality transport services and value for money or an alternative to the car	**Fixed Links** **Reconfigured Ferry Service / Do Minimum**
Scotland's Transport Future: The Transport White Paper[3]	Scotland's Transport White Paper sets out the challenge to transform Scotland's transport. It encourages the promotion of economic growth and social inclusion through transport and looks towards creating a safer,	See NPFS summary

[1] Scottish Executive (2004) National Planning Framework for Scotland. Scottish Executive
[2] Scottish Executive, 2006. Scotland's National Transport Strategy. Scottish Executive, December 2006
[3] The Scottish Executive (2004) Scotland's Transport Future – The Transport White Paper. The Scottish Executive

Name of Plan, Programme or Strategy	Nature of Plan, Programme of Policy	Relevance
	integrated and less environmentally damaging transport system	
Scotland's Transport: Delivering Improvements[4]	With an aim to improve transport across all modes in Scotland whilst tackling the key transport challenges of congestion, integration and completing missing links, this report aims to build a sustainable, effective and integrated 21st century transport system.	See NPFS summary
Scottish Environment Protection Agency (SEPA) Policy 19: Groundwater Protection Policy for Scotland[5]	This policy aims to provide a sustainable future for Scotland's groundwater resources by protecting legitimate uses of groundwater and providing a common SEPA framework to protect groundwater quality by minimising the risks posed by point and diffuse sources of pollution and maintain the groundwater resource by influencing the design of abstractions and developments which could affect groundwater quantity	**Fixed Links** The new infrastructure would be designed to minimise risks to groundwater **Reconfigured Ferry Service / Do Minimum** No significant changes to groundwater resources
SEPA Policy 26: Policy on the Culverting of Watercourses[6]	This policy sets out the environmental issues associated with culverting and ways in which the impact of culverting on the environment can be mitigated	Any new culverts would be designed in accordance with recognised best practice to protect surface waters
The Water Environment (Controlled Activities) (Scotland) Regulations 2005 (as amended) (CAR)[7]	Regulation which controls discharges to watercourses and land but also cover abstractions, impoundments and engineering works within and in the vicinity of inland surface waters. This means that activities such as culverting, ditch clearing, dredging, bridging and damming all now require to be authorised under CAR	All new infrastructure works would take account of CAR and would be implemented with relevant licences
The Pollution Prevention and Control (Scotland) Regulations 2000 (PPC)[8]	Regulations which are concerned with the prevention or minimisation of emissions to air, water and soil, as well as waste, from industrial and agricultural installations	**Fixed Links** Would lead to increased levels of traffic and therefore localised reduction in air quality in Gremista and Heogan but could remove traffic and therefore relieve congestion and improve air quality in some areas of Lerwick centre and Maryfield. Rock removed

[4] The Scottish Executive (2002) Scotland's Transport: Delivering Improvements. The Scottish Executive
[5] Scottish Environmental Protection Agency (2003) Policy Number 19: Groundwater Protection Policy for Scotland. Scottish Environmental Protection Agency
[6] Scottish Environmental Protection Agency (1998) Policy Number 26: Policy on the Culverting of Watercourses. Scottish Environmental Protection Agency
[7] Scottish Environmental Protection Agency (2005) The Water Environment (Controlled Activities) (Scotland) Regulations 2005 (as amended) (CAR), Scottish Environmental Protection Agency
[8] Scottish Environmental Protection Agency (2000) The Pollution Prevention and Control (Scotland) Regulations 2000, Scottish Environmental Protection Agency

Name of Plan, Programme or Strategy	Nature of Plan, Programme of Policy	Relevance
		in tunnel option could be re-used to reclaim land at the Bight of Gremista Marina **Reconfigured Ferry Service** Could lead to decreased levels of congestion as traffic for the ferry service would be spread out over a longer period of time compared to the present situation. The increased level of service would result in increased levels of emissions from the ferry vessels unless vessels with new technology were introduced in the future with potential for decreased emissions. **Do Minimum** No significant change from current situation Potential for reduced emissions in future with improved technology of new vessels
SPP 1: The Planning System[9]	SPP 1 defines the primary objectives of the planning system as being: • to set the land use framework for promoting sustainable economic development; • to encourage and support regeneration; and • to maintain and enhance the quality of the natural heritage and built environment.	See NPFS summary All options would be detailed to protect the natural and built environment
SPP 2: Economic Development[10]	SPP 2 provides guidance on how the Scottish Government's economic vision "*economic development should raise the quality of life of all the Scottish people through increasing economic opportunities for all, on a socially and environmentally sustainable basis*" can be implemented through planning and development. SPP 2 notes that existing business locations should be able to meet changes in the economy and provide	All proposals seek to safeguard the environment. All options could provide some benefits. Lerwick landfalls for fixed links are sited in developed land

[9] The Scottish Executive Development Department Planning Services (2002) Scottish Planning Policy (SPP) 1: The Planning System. The Scottish Executive
[10] The Scottish Executive Development Department (2002) Scottish Planning Policy (SPP) 2: Economic Development. The Scottish Executive

Name of Plan, Programme or Strategy	Nature of Plan, Programme of Policy	Relevance
	choice for a diverse range of developments, as well as providing development for small towns and rural areas. It includes the need to safeguard the environment and the reuse of previously developed sites.	
SPP 7: Planning and Flooding[11]	SPP 7 provides guidance to developers and planning authorities on planning and flooding. New development should not take place if it would be at significant risk of flooding from any source or would materially increase the probability of flooding elsewhere.	Lerwick portal for a tunnel could be at risk from flooding and this would have to be taken into account in the detailed design and mitigated
SPP 15: Planning for Rural Development[12]	This SPP sets out the approach, key messages and objectives that should underpin planning policies and decisions affecting rural areas. It also describes the increasingly important links between development planning and community planning. This SPP's objectives and main principles should also apply to protected landscapes, including National Parks, but in ways appropriate and sympathetic to their special context This SPP lays particular emphasis on the need for a more aspirational planning vision for rural Scotland. This SPP encourages a more supportive attitude towards 'appropriate' development whilst acknowledging and valuing the enormous diversity of rural Scotland	The STAG process has taken account of the links between landuse and transport planning and the opportunities each option provides
SPP 17: Planning for Transport[13]	SPP 17 sets out the Scottish Executive's focus on transport policy as the delivery of transport projects and the positive role land use and transport planning takes in supporting and building upon the Scottish Executive's transport delivery agenda. The key objectives of SPP17 are as follows: • the transport network should support the economy, assist in reducing the need to travel, create the right conditions to promote sustainable transport nodes and restrict adverse environmental impacts; • the interaction of accessibility, transport and the development strategy to be considered early in the planning process with land allocations taking into account transport opportunities alongside economic competitiveness and sustainable development; • strategic land use plans to coordinate with Regional and Local Transport Strategies, and settlement strategies and identify where economic growth or regeneration requires additional infrastructure; • local plans to relate new land use allocations to transport opportunities	The STAG process has taken account of the links between landuse and transport planning and the opportunities each option provides in terms of the economy etc

[11] The Scottish Executive Development Department (2004) Scottish Planning Policy (SPP) 7: Planning and Flooding. The Scottish Executive
[12] The Scottish Executive Development Department (2005) Scottish Planning Policy (SPP) 15: Planning for Rural Development. The Scottish Executive
[13] The Scottish Executive Development Department (2005) Scottish Planning Policy (SPP) 17: Planning for Transport. The Scottish Executive

Name of Plan, Programme or Strategy	Nature of Plan, Programme of Policy	Relevance
	and constraints and locate new developments to maximise sustainable transport modes; • development likely to affect trunk and other strategic roads to be managed so as not to adversely impact on safe and efficient strategic traffic flows. New trunk road or motorway junctions will only be considered exceptionally and will require significant developer funding; and • roadside facilities to be considered under a special case for development affecting strategic routes. The comfort and safety of drivers should be accommodated through opportunities to stop and rest.	
NPPG 5: Archaeology and Planning[14]	NPPG 5 sets out policy on handling archaeological issues in new developments.	Archaeological constraints have been taken into account in the appraisal of options
NPPG 13: Coastal Planning[15]	NPPG 13 notes that the developed coast should be the focus of developments requiring a coastal location, or which contribute to economic regeneration of settlements whose livelihoods is dependant on coastal or marine activities and features.	The links by definition are located in coastal locations
NPPG 14: Natural Heritage and PAN 60: Planning for Natural Heritage[16]	NPPG 14 provides guidance on how the Government's policies for conserving and enhancing Scotland's natural heritage should be reflected in land use planning. It sets out the commitment to sustainable development, which avoids significant adverse impacts on the natural heritage and recognises the importance of locally important landscapes and ecology. Planning advice note which aims to provide guidance on planning for natural heritage within the context of: • maintaining and enhancing landscape character • providing for a diversity of wildlife habitats • making provisions for a wide range of out-door recreational activities • fostering opportunities for learning about the environment	Nature conservation constraints have been taken into account in the appraisal of options
NPPG 18: Planning and the Historic Environment[17]	The Government's guidance to planning authorities and developers on historic buildings and townscapes, historic gardens, designed landscapes	Archaeological constraints have been taken into account in the appraisal of

14 The Scottish Office (1998) National Planning Policy Guidance (NPPG) 5: Archaeology and Planning. The Scottish Office
[15] The Scottish Executive Development Department Planning Services (1997) National Planning Policy Guidance (NPPG) 13: Coastal Planning. The Scottish Executive
[16] The Scottish Executive Development Department Planning Services (2000) Planning Advice Note 60: Planning for Natural Heritage. The Scottish Executive
[17] The Scottish Office (1999) National Planning Policy Guidance (NPPG) 18: Planning and the Historic Environment. The Scottish Office

Name of Plan, Programme or Strategy	Nature of Plan, Programme of Policy	Relevance
	and archaeological sites. Central to the Government's approach is the need to secure preservation whilst accommodating present day needs.	options
PAN 51: Planning, Environmental Protection and Regulation[18]	The purpose of the Planning and advice note is to support the existing policy on the role of the planning system in relation to environmental protection regimes, as expressed in SPP1 as: • 'Planning decisions should always be made on planning grounds and in the public interest. The planning system should not be used to secure objectives that are more properly achieved under other legislation. The grant of planning permission does not remove the need to seek other statutory consents nor does it imply that these consents will be forthcoming. Even where legal or administrative measures outwith the planning system may exist for controlling a particular activity, this can still be a consideration to which weight is given in reaching a planning decision. If a consideration is material in planning terms, it must be taken into account in reaching a decision. For example, the planning authority should have regard to the impact of a proposal on air or water quality although the regulation of emissions or discharges will fall to be dealt with under other legislation' (paragraph 57 of SPP1). This PAN also summarises the statutory responsibilities of the environmental protection bodies.	Noted and taken into account in principle
PAN 56: Planning and Noise[19]	This advice note demonstrates the role of the planning system in preventing and limiting the adverse effects of noise without prejudicing investment in enterprise, development and transport. It builds on principles set out in SODD Circular 10/1999 Planning and Noise and takes account of the recommendations of the Noise Review Working Party (HMSO, 1990). This PAN: • indicates how noise issues should be handled in development plans and development control; • outlines ways of mitigating the adverse impact of noise; • provides specific guidance on noisy and noise-sensitive development; • introduces the use of noise exposure categories; • gives guidance on the use of planning conditions relating to noise.	Noise has been taken into account in a qualitative manner in the appraisals and the need for detailed work on any new infrastructure noted

[18] The Scottish Office Development Department (2006) Planning Advice Note 51: Planning, Environmental Protection and Regulation. The Scottish Office
[19] The Scottish Office Development Department (1998) Planning Advice Note 58: Environmental Impact Assessment. The Scottish Office

Name of Plan, Programme or Strategy	Nature of Plan, Programme of Policy	Relevance
PAN 65: Planning and Open Space[20]	Provides advice on the role of the planning system in protecting and enhancing existing open spaces and providing high quality new spaces	Any design for a new fixed link would take this into account
PAN 68: Design Statements[21]	This PAN focuses on design statements, it is one of a series of advice notes which address design in more detail and should be read in conjunction with them. It explains what a design statement is, why it is a useful tool, when it is required and how it should be prepared and presented. This PAN does not introduce a prescriptive approach. It seeks to ensure that local authorities and applicants are clear about the role of design statements and applicants, in particular, become more confident in preparing them. The aim is to see design statements used more effectively in the planning process and to create places of lasting quality.	Any design for a new fixed link would take this into account
PAN 69: Planning and Building Standards Advice on Flooding[22]	This advice note provides background information and best practice advice in support of Scottish Planning Policy (SPP) 7: Planning and Flooding, and the Technical Handbooks published by the Scottish Building Standards Agency which provide guidance for the Building (Scotland) Regulations 2004. SPP 7 aims to prevent future development which would have a significant probability of being affected by flooding or which would increase the probability of flooding elsewhere. The Technical Handbooks provide improved guidance on building in areas where there is a risk of flooding.	Lerwick portal for a tunnel could be at risk from flooding and this would have to be taken into account in the detailed design and mitigated
PAN 75: Planning for Transport	PAN 75 accompanies SPP 17 (see above) and provides good practice guidance which planning authorities, developers and others should follow in their policy development, proposal assessment and project delivery. The document aims to create greater awareness of how linkages between planning and transport can be managed. It highlights the roles of different bodies and professions in the process and points to other sources of information.	The STAG process has taken account of the links between landuse and transport planning and the opportunities each option provides in terms of the economy etc

[20] The Scottish Executive Development Department (2003) Planning Advice Note 65: Planning and Open Space. The Scottish Executive
[21] The Scottish Executive Development Department (2003) Planning Advice Note 68: Design Statements. The Scottish Executive
[22] The Scottish Executive Development Department Planning Services (2004) Planning Advice Note 69: Planning and Building Standards Advice on Flooding. The Scottish Executive

Appendix 8.2

Landscape and Visual

1 Assessment Methodology

1.1 Definitions and Approach

The assessment was prepared in accordance with STAG and good practice, as described in the Guidelines for Landscape and Visual Impact Assessment produced jointly by the Landscape Institute and the Institute of Environmental Management and Assessment (The Landscape Institute and Institute of Environmental Management and Assessment (2002), Guidelines for Landscape and Visual Impact Assessment, Second Edition). This methodology is applicable to the assessment of short-term effects during the construction of the project, and to long-term effects during its operation.

Key definitions and terms used in the assessment are stated below:

- landscape value (low, medium high) is the relative value or importance attached to a landscape (often as a basis for designation or recognition), which expresses national or local consensus, because of its quality, special features including perceptual aspects such as scenic beauty, tranquillity or wildness, cultural associations or other conservation issues;
- landscape character is the distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people.
- landscape quality (or condition) (low, medium high) is based upon judgements about the physical state of the landscape and about its intactness from visual, functional, and ecological perspectives. It also reflects the state of repair of individual features and elements which make up the character in any one place;
- landscape capacity (low, medium high) is the degree to which a particular landscape character type or area is able to accommodate change without unacceptable adverse effects on its character. Capacity varies according to the type and nature of the change being imposed;
- landscape sensitivity (low, medium high) is '*related to landscape character and how vulnerable this is to change… Landscapes which are highly sensitive are at risk of having their key characteristics fundamentally altered, leading to a different landscape character… Sensitivity is assessed by considering the physical characteristics and the perceptual characteristics of landscapes in light of particular forms of development'* (SNH and The Countryside Agency (2006) Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity. P 2-5). In this assessment, the term sensitivity refers to the sensitivity of the landscape to the proposed change in the proposed location.

The key steps in the approach were as follows:

- to describe the landscape character areas present in the area;
- to identify significant landscape features that would be affected by the project;
- to identify key viewpoints and viewers likely to be affected by the project;
- to predict the effects of the project on landscape resources and character and on visual amenity;
- to evaluate the levels of significance of these effects;
- to identify measures that would be taken to mitigate significant adverse effects; and
- to evaluate residual effects.

1.2 Assessment Criteria

1.2.1 Overview

Levels of significance of landscape and visual effects are identified as being of:

- none;
- minor significance;
- moderate significance; or
- major significance.

The level of significance of the effect depends both upon the sensitivity of the landscape or viewer to the proposed change, and on the magnitude of the change. Definitions of receptor sensitivity and magnitude, which are used in this assessment, are presented in Tables A8.2.1 and A8.2.2 Definitions of levels of significance of effect are presented in Table A8.2.3.

1.2.2 Evaluation of Receptor Sensitivity

The sensitivity of the landscape depends upon its inherent nature, quality, condition and ability to accommodate change; and on any specific values (such as landscape designations) that apply.

The sensitivity of viewers depends upon the type of receptor, ie residential, industrial worker and traveller and on their viewing opportunity. Hence, a resident with a permanent view is considered to be of higher sensitivity than an industrial worker or traveller with only a passing interest in the environment.

Sensitivity is described as low, medium or high. The following definitions, as detailed in Table A8.2.1, are used in this assessment.

Table A8.2.1 Definitions of Receptor Sensitivity

Sensitivity	Receptor	Definition
Low	Landscape	A landscape that is not valued for its scenic quality and is tolerant to change
	Visual	Viewers with a passing interest in their surroundings, motorists or workers in industrial premises
Medium	Landscape	A moderately valued landscape, perhaps a locally important landscape, tolerant of some change
	Visual	Viewers with a moderate interest in their environment such as users of recreational facilities
High	Landscape	A landscape of particularly distinctive character or one that is highly valued for its scenic quality
	Visual	Viewers with proprietary interest and prolonged viewing opportunities, such as residential receptors

1.2.3 Evaluation of Magnitude of Change

The magnitude of change affecting landscape or visual receptors depends upon the nature and scale of the development and its location in relation to the receptor. The magnitude of change is described as being low, medium or high.

The following definitions, as detailed in Table A8.2.2, are used in this assessment.

Table A8.2.2 Definitions of Magnitude of Change

Magnitude of Change	Receptor	Definition
Low	Landscape Visual	A virtually imperceptible change in components of the landscape Few viewers affected by minor changes in views
Medium	Landscape Visual	Moderate changes in landscape components A moderate number of viewers affected by moderate changes in views
High	Landscape Visual	A notable change in landscape characteristics over an extensive area A large number of viewers affected by major changes in view

1.2.4 Evaluation of Levels of Significance of Effect

The levels of significance of effects is determined by cross-referencing the sensitivity of the landscape or viewer to the change, with the magnitude of change expected as a result of the proposed development. Thus an effect of major significance would usually occur where both sensitivity of the landscape or viewer and the magnitude of the change are high.

The significance of each effect is described as being none, minor, moderate or major, or where it is border line, a grade spanning the two (e.g. moderate to major). Grades merge and there is no absolute threshold between them, and so can be subjective. Each is therefore determined on a case-by-case basis by the application of professional judgement and experience, taking account of the wide range of variables which influence the predicted outcome. Significant effects can be positive (beneficial), negative (adverse) or neutral, and short (temporary) or long term (permanent). The following definitions, as described in Table A8.2.3, are used in this assessment.

Table A8.2.3 Definitions of Levels of Significance of Effect

	High Magnitude of Landscape or Visual Change	Moderate Magnitude of Landscape or Visual Change	Low Magnitude of Landscape or Visual Change
High Landscape or Viewer Sensitivity	Major	Moderate/Major	Minor/Moderate
Moderate Landscape or Viewer Sensitivity	Moderate/Major	Moderate	Minor
Low Landscape or Viewer Sensitivity	Minor/Moderate	Minor	None

2 Landscape and Visual Effects – Bressay

2.1 Introduction

The landscape and visual assessment considers effects upon:

- Landscape (and townscape) character and resources, including effects on the physical and aesthetic values of the landscape caused by changes in its elements and qualities as a result of the development; and
- visual amenity, including effects upon potential viewers and viewing groups (residents, employees, tourists etc) caused by changes in the appearance of the landscape as a result of the development, and experienced by people at locations where viewers are present (visual receptors).

The term landscape is also taken to include the townscape of Lerwick.

A clear distinction is drawn between effects on landscape character and effects on views. Landscape character and resources are considered to be of importance in their own right and are valued for their intrinsic qualities regardless of whether they are seen by people. Effects on visual amenity as perceived by people are therefore clearly distinguished from, although closely linked to, effects on landscape character and resources.

The various schemes would have effects upon the character of the landscape, which would be positive (beneficial) or negative (adverse) according to the nature, quality and sensitivity of the existing baseline environment, and according to the particular scheme which is progressed. Effects on visual amenity would affect viewers depending upon their identity and sensitivity.

2.2 Sources of Information

2.2.1 Collection of Baseline Data

Baseline information concerning the landscape of the area was collected in January 2008 through a desk top study of OS maps, plans and documents. Field surveys were undertaken in March 2008 and the information supplemented by inputs from the project team. Information sources included the following:

- OS Explorer Sheet 466 1:25,000 scale;
- plans provided by SIC, Halcrow and Donaldson Associates;
- photographs;
- A Landscape Assessment of the Shetland Isles, Gillespies, 1988, SNH Review Series No 93;
- Shetland Structure Plan, 2001-2016, Shetland Islands Council;
- Shetland Local Plan. Adopted 2004, Shetland Islands Council; and
- consultations with statutory bodies.

2.2.2 Consultations

Comments relating to landscape and visual issues have been raised by consultees, including Historic Scotland, and are detailed in Annex B.

2.3 Baseline

2.3.1 The Study Area

The study area extends to the theoretical Zone of Visual Influence (ZVI) of the proposed new development alternatives, to be located under, over or on Bressay Sound, and on land either side of the Sound. The study area includes part of the south of Mainland Shetland including Lerwick, the land around it, and the western side of the island of Bressay.

The surrounding area predominantly comprises the built up area of Lerwick to the west and south, and undeveloped open rolling moorland and heath covered hills beyond the town, to the west and north. Lerwick comprises an historic core characterised by sturdy stone houses and shops focussed upon Commercial Street, and the waterfront Esplanade, along which are a series of jetties, piers and moorings. Beyond the historic core lie industrial areas (Holmsgarth), larger buildings (hospital, hotels, sports centres etc), and residential areas including Hoo to the north west, and Sound to the south west. The Broch, located in the Loch of Clickimin is an important feature of the town, located to the east of Sound, as is the historic Fort Charlotte above the Esplanade.

Bressay Sound, a 2-3km wide channel, separates Lerwick from the island of Bressay to the east. Low intensity grazing and crofting land, with characteristic dry stane dykes, separates the scattered hamlets of Heogan, Voeside, Glebe, Grindiscol, Ham and Kirkabister along the coastal strip of Bressay, and extends up hill slopes, to hamlets such as Uphouse. Above the settled edge the 226m high Ward of Bressay is the dominant hilltop in the area. Smooth, unenclosed moorland rises up the flanks of the hill which is topped by a prominent radio and wireless station. There are no significant trees and only small areas of shrubby vegetation, so the landscape is very open. Panoramic views are available across Bressay Sound to The Knab, Lerwick, and the open rolling hills of Mainland beyond.

2.3.2 Planning Policy

Various planning policies and designations relevant to landscape and visual issues are summarised below.

Shetland Structure Plan, 2001-2016

The scheme lies within the area covered by Shetland Structure Plan. The following planning policies (listed below together with their policy numbers) are relevant to the scheme in the context of effects on landscape and visual resources:

- General Development Policy Natural and Built Environment GDS4 states that new development should respect, protect and conserve the natural and built environment; and
- Policy SP NE1 encourages developers to produce a high standard of design for all new developments, ensuring that they are sympathetic to the landscape.

Shetland Local Plan, Adopted 2004

The scheme lies within the area covered by Shetland Local Plan. The following local planning policies (listed below together with their relevant policy numbers) are relevant to the scheme in the context of effects on landscape and visual resources:

- Policy LP NE10 Development and the Environment: states that impacts upon the natural heritage, including upon landscape character and visual amenity, will be taken into account;
- Policy LP NE11 Local Protection Areas (LPAs): states that where an area has been identified as a LPA, only applications for the development of facilities which will benefit the community as a whole will be considered. It is not anticipated that any LPAs will be directly affected.
- Policy LP BE4: Preservation and Re-use of Disused Buildings, and LP BE5: Protection and Enhancement of Buildings, encourage preservation or enhancement of buildings of historic or architectural interest. A ruined Herring Processing Plant is present on Bressay near to aspects of the proposals.
- Policy LP BE6: Listed Buildings, protects against demolition of Listed buildings and their settings. It is not expected that any Listed buildings would be affected.
- Policy LP BE8: Development in Conservation Areas, protects against inappropriate development in these areas. The setting to the Lerwick Conservation Area will need to be considered.
- Policy LP BE13 Design: states that high standards of appropriate design for all new developments will be required, and refers to Appendix F of the Plan (see below); and
- Appendix F Siting and Design Guidance: Development Affecting National Scenic Areas and Important Views and Landscapes acknowledges that Shetland has exceptionally fine landscapes. It is vital that these landscapes are not scarred by insensitive development and that Shetland's identity is conserved. No NSAs would be affected but important views and landscapes may be.

2.3.3 Other Development Proposals in the Area

- There are no consented other development proposals of a significant scale in close proximity to the proposed development.

2.3.4 Landscape Designations

There are no national landscape designations within the areas which may be affected. In the wider area, Fort Charlotte and Clickimin Broch are Scheduled Ancient Monuments (SAMs) (see Section 8.13, Cultural Heritage).

Local designations include the following:

- various areas of land within and around Lerwick are designated as Local Protection Areas (LPA), Policy LP NE 11 (see above); and
- Lerwick Conservation Area covers the old part of the town.

2.3.5 Relevant Landscape Character Assessments

A Landscape Assessment of the Shetland Isles

The landscape character assessment of the Shetland Isles was carried out in 1998 by Gillespies (Gillespies (1998) A Landscape Assessment of the Shetland Isles). The Landscape Assessment identifies the landscape types present across Shetland, describes the key features of each and provides some guidance on landscape management and accommodating change within these areas.

The various scheme alternatives fall within the broad area of Bressay and South Mainland Coast Landscape Character Area (LCA)[1] (page 25). They are within the

[1] Shetland Landscape Character Assessment, Review Number 93, SNH, 1998

Farmed and Settled Voes and Sounds Landscape Character Type (LCT) (pages 60, 103 and 107), within a local character unit called Developed Areas. These areas represent Shetland's farmed and settled land, with a character reflecting successive settlement and include the major administrative centre and harbour at Lerwick. The document advises that 'the visual and landscape qualities of Lerwick viewed from the sea and ferry terminals are important in considering new development…The cultural heritage of Lerwick should be safeguarded….The settings for historic buildings strictly safeguarded to reinforce the traditional quality and image of the town.'

The area Farmed and Settled Voes and Sounds LCT is subdivided into Developed Areas (covering Lerwick and the industrial fringe to the north) and Nucleated Settlements (covering Bressay).

Farmed and Settled Voes and Sounds are described as enclosed coastal waters and productive agricultural land, where pasture and rough grazing are the dominant land covers. There has been a long tradition of greater settlement in these areas, and larger settlements are included.

Developed Areas (Lerwick): are described as being dominated by large scale development, where there is now little evidence of former vegetation or landscape character. 'Built elements and hard surfaces dominate and the character and scale of the buildings and their relationship to one another define the character.' The cultural heritage of Lerwick should be protected, and the landscape quality of the immediate environs should be safeguarded from development. Part of Lerwick is designated as a Conservation Area reflecting its cultural heritage importance and sensitivity.

Nucleated Settlements (Bressay): these are areas of settlement including residential development and public buildings, located around harbour facilities, set within rough grassland and heather moorland.

The Bressay and South Mainland Coast LCA is described as having as gently undulating landform, predominantly less than 50m AOD in height. Landcover includes agricultural land and significant improved grassland.

2.3.6 Local Landscape Character Areas

A Landscape Assessment of the Shetland Isles provides useful background to landscape character in the area, but it is too general to be of practical use in terms of identifying locally important landscape characteristics. A detailed landscape assessment was therefore undertaken across the area, which identified a number of distinct local landscape character areas.

These comprise:

1) Point of Scatland and Gremista;
2) Lerwick;
3) Sound;
4) Bressay Sound;
5) Northern Bressay - Heogan;
6) Central West Bressay Coast;
7) Upland and Southern Bressay.

Each local landscape character area is described below and judgements made on its landscape quality and sensitivity to change. Sensitivity to change relates to the

sensitivity to the predicted proposed changes due to the various alternatives under consideration.

1) Point of Scatland, Gremista and Hill of Greenhead
An industrial fringe extends from Lerwick up the east coast of Mainland in a strip approximately 400m wide. Units in North Gremista Industrial Estate include: Shetland Catch (a fish processing plant at Gremista Pier), the SIC transport depot (to the west of Main Gremista Road), LFT fish processing plant and Shetland Transport at the Point of Scattland, SBS to the north of the Point of Scattland, and others of varied use. Norscot Angling Clubhouse, a navigation beacon indicating the channel, a Submarine Power Cable Terminus and berthing facilities at South Bight of Greenhead are also present in the area.

Hardstanding (hardcore) around the units is used for parking and for storage of a range of products related to the industrial units which are present. Much of the coastline in this area comprises made ground, and dumped material is present along the coast south east of Gremista.

The sensitivity of the North Gremista Industrial Estate landscape to the changes which would result from the proposed development alternatives is low, as the area is already substantially altered by industrial development. The poor condition of the landscape here means that aspects of the proposed development could be used to improve upon the existing landscape quality in the area.

West of Main Gremista Road, with the exception of the council transport depot and offices, the land is dominated by open heather moorland on the higher slopes (Hill of Greenhead rising to 70m and Hill of Gremista rising to 110m), with semi-improved grassland with herbs nearer the coast and Main Gremista Road. The land east of Main Gremista Road is enclosed with post and wire fences and sheep graze the fields. There is a landfill site on the north east slope of the hill.

The sensitivity of the Hill of Greenhead landscape to the changes which would result from the proposed development alternatives is medium: it is a predominantly undeveloped landscape, but overlooks industrial areas.

2) Lerwick
Lerwick is the main Shetland Isles settlement, and is located on the east coast of the Mainland. This local landscape character area includes the Lerwick Conservation Area, reflecting the good condition and high sensitivity of the core part of the area, but also the main extent of Lerwick, including the Esplanade and jetties, Commercial Road and the docks, and development around Brei Wick. The settlement effectively bridges a ridge and rises to a highpoint before dropping away again to the south.

This Conservation Area contains numerous historic stone buildings (*eg* Fort Charlotte), and other mainly two storey buildings, including residences, hotels, churches and shops. Many buildings along the waterfront would have historically been used for off-loading fish, and their stone court yards are designed to drain back to the sea. The older part of Lerwick comprises sturdy stone buildings located along a series of very narrow lanes. Along the Esplanade are a series of active wharfs and jetties: Alexandra Wharf, North jetty, Albert Wharf, Victoria Pier, Small Boat Harbour, and Lifeboat Pier. Numerous and varied boats are located along the seafront.

The built up area extends westwards, streets being in a grid pattern. Development includes both historic and newer and modern elements: churches, the large scale hilltop Montfield Hospital, hotels, community centre, primary school, library etc. There is a prominent cemetery at South Ness.

Beyond the core of the town more recent development is more utilitarian in design, and becomes increasingly industrial towards it edges, with the ferry terminal at Holmsgarth, and a large power station being amongst the development on the east coast north of Lerwick.

The historic area of Lerwick is of good landscape condition, high quality and high sensitivity to the proposed changes, from locations such as Fort Charlotte, where Bressay Sound maybe affected. Elsewhere, from locations through the town from where the various development proposals would not be seen, and from the modern fringes of the town, which include areas of lower quality and poorer condition, it is of lower sensitivity to change.

3) Sound

Sound largely comprises newer areas of Lerwick, located west of the Loch of Clickimin and extending south west along the A970. Sound rises up the hill slopes in a westerly direction, and consequently affords panoramic views over Brei Wick to Lerwick, and Bressay. The area includes numerous newer housing estates, as well as shops and industrial units located near North Taing. It is of medium sensitivity to change.

4) Bressay Sound

The Mainland coastal strip comprises a narrow shore with exposed conglomerate rock ('pudding stone'), pebbles, mud and sand. The shoreline is reinforced on the landward side with a mixture of materials: concrete, steel and rock. Debris, which has been dumped over the edge is present. The tidal range is low (2m) so there is little variation in the width of shore between high and low tide.

Bressay Sound is approximately 385m wide at the Point of Scattland. It is used for the passage of boats, including into the docking facilities at Green Head (Norscot Base). The channel is dredged to 6m below CD at the Point of Scattland and to 9m below CD at Green Head, allowing deep water access from the north.

The Bressay shore is similar to the Mainland side, comprising rock and stone and a low earth cliff (1m) at the landward side. It is cleaner and more natural than the Mainland shore.

The sensitivity of Bressay Sound landscape to the changes which would result from the proposed development alternatives is medium, as its shorelines are already substantially altered. The existing landscape is in good condition, reducing to poor at its fringes.

4) Northern Bressay and Heogan

On the Bressay side of Bressay Sound, land uses are rural although there is a large fish gut processing plant (SFP) at Heogan, which is often odorous. This is located near to a former, and now part ruined, traditional stone built herring processing plant, on the coastal edge. This is an attractive historic stone building. It is located next to the site of an Iron Age broch, and an old stone pier. There are various scattered dwellings including Souter Heogan, Annfield, Garth Cottage and Hillside. There are a five wells marked on the 1:25,000 OS map near Heogan.

The surrounding land largely comprises semi-improved grassland and moorland, with herbs, some of which is rushy, enclosed by distinctive typical Bressay flagstone dry stone walls or post and wire fences. Livestock including Shetland ponies and sheep currently graze the land. Above the enclosed land is the Hill of Cruester (50m) where there is a disused stone quarry. Surrounding land is moorland.

The sensitivity of the North Bressay landscape to the changes which would result from the proposed development alternatives is medium, as its largely an undeveloped landscape, but the existing SFP plant at Heogan detracts from its rural undeveloped qualities. The existing landscape is in good condition, reducing to poor at the fish products plant.

5) Central West Bressay Coast
Focused upon Maryfield and the Bressay Pier, landscape character and land uses across western Bressay are similar to those in the north of Bressay, with settlement mainly along the coastal edge and on the lower land, semi-improved grassland enclosed with characteristic dry stone walls or post and wire fences, and more open grassland or moorland on higher slopes. The west facing slopes and land along the west coast of the island of Bressay are occupied by scattered hamlets and crofts. There is no significant woodland or shrubby vegetation cover. Roads extend south to a light house at Daal, along which are scattered settlements including Voeside, Glebe, Grindiscol, Ham and Kirkabister. There is a marina at Voeside. It a predominantly undeveloped landscape, but it is at some distance from the location of the larger elements of the proposed development.

The area is of good landscape condition and high quality and of medium to high sensitivity to the proposed change.

6) Upland and Southern Bressay
The Ward of Bressay is representative of the open upland moorland and heath covered hills of Bressay. This distinctive rounded hill is topped by a television and wireless station with tall masts, and forms the backdrop to many views in the area. Focused upon Kirkabister, landscape character and land uses in this area are similar to those in Mid Bressay. The lighthouse at Kirkabister Ness is a prominent feature. It a predominantly undeveloped landscape, but it is at a distance from the location of the larger elements of the proposed development alternatives.

It is of medium to good/high landscape condition and quality (due to the presence of the masts) and of low sensitivity to proposed changes.

In summary, the landscape quality of the whole study area is not recognised by any national landscape designations, but does have some landscape protection at a local level (LPA areas). Nationally protected of SAMs are present in the study area. Local built heritage is protected by the Lerwick Conservation Area. As such, the area is considered to be of medium to high value. The capacity of the landscape to accept the proposed changes is medium.

2.3.7 Visual Receptors

In each landscape character area described above, the visual receptors (ie locations where people would have a view of the proposed scheme) were identified.

A summary of the main visual receptors identified in each character area is provided below.

Table A8.2.4 STAG 2 Appraisal Summary: Landscape and Visual: Option 1

Environment: Landscape and Visual			
Option	**Bressay Link Option 1: Drill and Blast Tunnel**		
Mitigation Options Included: (Costs & Benefits)	• Tunnel portals and entrance/exit areas to be designed so as to be sympathetic in character with surrounding areas. Design to be simple. • Earthworks to be graded to fit into surrounding contours. Convex and concave rounded slopes with gentle gradients to be created. Steep engineered embankments to be avoided. • Lighting to tunnel portals and associated areas to be designed to be sympathetic and not to shine into property windows or cause unnecessary pollution of the night sky. Avoid any unnecessary lighting. • Planting of trees and shrubs is inappropriate, so surrounding disturbed areas are to be topsoiled and cultivated and returned to vegetation types to match surrounding areas, generally rough grass and heathland. Where peat is present then this will be removed, carefully stored and returned to the areas from where it originated, so that the seed bank within it can promote regeneration. • Detailed design will avoid landscape and visual impacts, such as disturbance to areas or features of high landscape value, or intrusion into close views from residential properties. • The shoreline in the vicinity of Gremista and Point of Scatland comprises made ground and is unsightly, with debris and dumped material being present. Mitigation will include tidying up the waterfront and improving the environmental quality of this area. A landscape design for the shore front and tunnel portal areas will be recommended.		
Sub-objective	**Qualitative Information**	**Quantitative Information**	**Significance of Impact**
Visual Amenity	Existing views in the vicinity of the west tunnel portal are generally low quality as they are dominated by the industrial infrastructure around Gremista, and the made ground which forms the shore in this location. Wider views are available from higher open ground to the west (Hill of Greenhead and North Hoo) and from the northern side of Lerwick. In the vicinity of the proposed east tunnel portal, the Shetland Fish Products (SFP) factory is a dominant feature in views, reducing their quality in this area. Beyond this, views are available from small scale scattered properties, across an open rolling landscape, and over Bressay Sound. Wider views are available from the low rolling hills to the east (eg Hill of Cruester). Views are available from:	Residential receptors with long viewing opportunities from their homes are usually of high sensitivity to change, unless they are conditioned by their existing view, which is the case at the Point of Scatland, where the existing industrial context of views reduces viewer sensitivity to medium. Recreational travellers with a passing interest in their view are usually considered to be of medium sensitivity to change. Industrial workers (particularly those inside enclosed sheds) and regular road users who are travelling to and from work are of low sensitivity. Views of proposed tunnel portals either side of Bressay Sound will be possible from a number of locations, but particularly those properties and closest locations listed in the column to the left. Of these, the closest residential and recreational	The creation of a tunnel portal on the west side of Bressay Sound offers the opportunity to tidy up an area which is currently degraded. Careful design and detailing will be required in order to do this. If this is successfully implemented then visual impacts in this area could be positive. The portal on the east side of Bressay Sound will give rise to more significant visual impacts. The area is currently rural and open, and the urban form of the portal and associated road network will be out of character, with less opportunity to provide enhancements, than at the west portal. The tunnel portal should consequently be more rural and very simple in design. The use of typical design features such as the Bressay dry stane dykes, and restoration of marsh and heathland vegetation post construction will help tie the new development into the landscape. Features such as the old Herring Processing Plant (a ruin)

Environment: Landscape and Visual			
Option	**Bressay Link Option 1: Drill and Blast Tunnel**		
	Lerwick side: • Point of Scatland • Gremista and residential properties in this area on Gremista Road including Brookside, Bungalow, Harbour View • College Road • Upper and Lower Gremista Roads • Shetland College • A970 • Gremista Farm • Bight of Gremista Marina • Gremista Pier • Bod of Gremista Museum • Up Helly Aa Shed • Sub-aqua Club • Norscott Angling Club • Sailing Club • North Gremista Industrial Estate and commercial properties including Shetland Catch, warehouses used by the Vintage Car Club, Shetland Times and Litho, Herculean, Shetland Tyre and Exhaust, the District Heating Plant • Further away, from Holmsgarth, Garthspool, Freefield, North Ness, Central Lerwick, the Knab and Lerwick waterfront. **Bressay side:** • Properties including Heogan, Souter Heogan, Annfield, Garth Cottage and unnamed properties the road to Heogan on Bressay, in the immediate vicinity of the proposed tunnel portal • Shetland Fish Products (SFP) factory • Old Herring Processing Plant – ruin • Boats etc on Bressay Sound.	receptor locations are of highest sensitivity to change. At shore level, from piers and quays, viewers within commercial areas will be of low sensitivity to change. There are a number of residential properties and tourist facilities, including the Bod of Gremista Museum, and further away at the new Shetland Museum, and various hotels (such as the Queens Hotel) with views to Bressay Sound, at or near Lerwick waterfront which are of high sensitivity. Glimpsed distant views will be available from houses and hotels in Lerwick, and from the surrounding hills where residential and recreational receptors are of high sensitivity. Clear views will be possible from properties on Bressay at Heogan, and further away at Maryfield, and from hills including Hill of Cruester, and Hill of Setter. Most receptors on Bressay are residential or tourists and therefore of high sensitivity to change. Industrial workers at Shetland Fish Products (SFP) factory on Bressay are of low sensitivity. Most receptors on Bressay Sound are of low sensitivity to change, as they are largely fishermen, sailors and seafarers who pass through the area. Tourists on cruises are of medium sensitivity to any change, as they will be moving on elsewhere. The magnitude of visual change in the immediate	and a suspected Broch could be used to create new points of interest at the new tunnel portal – ie they could be restored and a visitor attraction, with interpretation, created, such as the visitor centre at the existing Bressay Pier. Visual impacts will arise from the creation of the proposed new tunnel portal areas, and particularly associated roads, night time lighting, signage and lining required to direct traffic. The portal itself should be designed to be a visual feature of interest which would enhance views and create a new 'gateway' to Bressay. Particular care will be required with lighting – low level lighting will be preferable to tall pole mounted lighting. This can be used to create a feature. Vehicular traffic (and vehicle lights etc) on new access roads will also contribute to visual impacts, although it is not expected that this will be heavy. The road to the new portal may require embankments which will contribute to visual impacts, so it is important that these are graded, topsoiled and grassed to help them tie into the existing landform and vegetation. A new roundabout may be located close to the shoreline near the Bod of Gremista Museum, resulting in visual impacts. Detailed design and restoration will be of importance in reducing visual impacts. Depending upon the location selected for spoil disposal, this could result in visual impacts elsewhere. During construction, machinery, lighting, equipment storage, accommodation and large scale excavation will give rise to wider visual impacts.

Environment: Landscape and Visual			
Option	**Bressay Link Option 1: Drill and Blast Tunnel**		
		vicinity of the infrastructure will be medium. Beyond this, the magnitude of change will be low, as the tunnel will be underground. Only the portals (which will be low lying) and associated access roads, will be apparent.	**Summary** A tunnel would result in minimal long term visual impacts in the wider area. In the locality of the portals themselves and along the routes of the proposed access roads serving the tunnel, localised visual impacts will result, but some of these have potential to be positive though enhancing currently degraded areas.
Landscape	**Landscape Designations:** None within 500m. **Landscape Resources** *Lerwick side:* • Industrial areas with some rough grassland separating areas of sheds, hard standing and access roads. • Semi improved grassland and heath beyond developed area. • Disturbed shore line comprising made ground, with tipped waste materials. *Bressay side:* • Open moorland grassland and heath, wetland areas. • Natural shoreline – low earth bank and shingle. • Gently rolling open hills dropping to the shore. • Traditional Bressay stone dykes separate rough fields. • Scattered traditional properties are apparent across the area. • Shetland Fish Products (SFP) factory is a landscape detractor.	The landscape on the Lerwick side (the Developed Areas, within the vicinity of the proposal) is dominated by industrial uses, is of low landscape quality and sensitivity, and is not designated for its landscape value. The landscape on the Bressay side is of medium sensitivity. It is not designated for its landscape value but does contain some traditional landscape features and is predominantly open and rural in character. SFP detracts from the character of the landscape reducing its quality, and sensitivity, within the area of the factory, to low. The magnitude of landscape change will be medium in the vicinity of the tunnel portals and access roads. Beyond this, the magnitude of change in the wider landscape will be low. New elements will be low lying, small in scale or underground.	The landscape character of the wider area will not be significantly affected by the construction of a tunnel. The features will be low lying and not apparent within the wider landscape. Locally, the landscape character will be affected by the presence of the portals, associated access roads, lighting, road signage, lining etc. On the Lerwick side there is potential for localised improvement in landscape character through tidying up a currently degraded area. Debris associated with excavation works may alter the character of the area where this material is to be disposed of. No significant landscape features or resources will be affected. Disturbed areas of vegetation will be restored and slopes graded to tie in with adjacent contours. Properties, dry stane dykes and historic features will be avoided. Road widening will give rise to the permanent displacement of areas of rough moorland grasses and heath. Careful restoration will be essential so that the rural character of Bressay is not eroded. **Summary**

[2] Shetland Landscape Character Assessment, Review Number 93, SNH, 1998

Environment: Landscape and Visual			
Option	**Bressay Link Option 1: Drill and Blast Tunnel**		
	• Historic remains including a suspected broch and old Herring Processing Plant. **Landscape Character Areas /Types** The area near Bressay Sound lies within the Bressay and South Mainland Coast Landscape Character Area (LCA)[2], on the edge of the South Mainland Upland Spine LCA.		A tunnel would result in minimal long term impacts on the wider landscape. In the locality of the portals themselves and along the routes of the proposed access roads serving the tunnel, localised impacts on the landscape will result, particularly on Bressay. On the Lerwick side, these have potential to be positive though enhancing currently degraded areas.

Table A8.2.5 STAG 2 Appraisal Summary: Landscape and Visual: Option 2

Environment: Landscape and Visual			
Option	**Bressay Link Option 2: High Level Bridge**		
Mitigation Options Included: (Costs & Benefits)	• The proposed bridge will form a dramatic new feature in the landscape. It is important that this is designed to fit in with and respect the landscape into which it is placed. The scale, size, bulk and form need to be carefully designed and attention paid to aesthetics at all levels, from the overall form of the bridge, abutments and columns, though to detailing of features such as wind shielding and lighting. Multiple visualisations of each alternative design will need to be produced and analysed to ensure that the design complements and is in scale with its environment, rather than being out of character or dominating. • Bridge abutments, land falls and access roads are to be designed so as to be sympathetic in character with surrounding areas. Design to be simple. • Embankments to be graded to fit into surrounding contours. Convex and concave rounded slopes with gentle gradients to be created. Steep engineered slopes to be avoided. • Lighting to bridge and associated access roads to be designed to be sympathetic and not to shine into property windows or cause unnecessary pollution of the night sky. Avoid any unnecessary lighting. • Planting of trees and shrubs is inappropriate, so surrounding disturbed areas are to be topsoiled and cultivated and returned to vegetation types to match surrounding areas, generally rough grass and heathland. Where peat is present then this will be removed, carefully stored and returned to the areas from where it originated, so that the seed bank within it can promote regeneration. • Detailed bridge and access road design will avoid landscape and visual impacts, such as disturbance to areas or features of high landscape value, or intrusion into close views from residential properties. • The shoreline in the vicinity of Point of Scatland comprises made ground and is unsightly, with debris and dumped material being present. Mitigation will include tidying up the waterfront and improving the environmental quality of this area. A landscape design for the shore front and bridge embankment and abutments will be recommended.		
Sub-objective	**Qualitative Information**	**Quantitative Information**	**Significance of Impact**
Visual Amenity	Existing views in the immediate vicinity of the west bridge landfall are generally low quality as they are dominated by the industrial infrastructure around Point of Scatland. Wider views are available from higher open ground to the west (Hill of Greenhead, onto which the landfall will extend, and North Hoo) and from the northern side of Lerwick. In the vicinity of the proposed east bridge landfall, the Shetland Fish Products (SFP) factory is a dominant feature in views, reducing their quality in this area. Beyond this, views are available from small scale scattered properties, across an open rolling landscape, and over Bressay Sound. Wider views are available from the low rolling hills to the	Residential receptors with long viewing opportunities from their homes are usually of high sensitivity to change, unless they are conditioned by their existing view, which is the case at Point of Scatland, where the existing industrial context of views reduces viewer sensitivity to medium. Recreational travellers with a passing interest in their view are usually considered to be of medium sensitivity to change. Industrial workers (particularly those inside enclosed sheds) and regular road users who are travelling to and from work are of low sensitivity. Views of the proposed bridge will be very widely seen from the surrounding area. Many visual receptors of high sensitivity are located in Lerwick and on Bressay. These	The creation of a bridge across Bressay Sound offers the opportunity to provide an iconic new landmark for Shetland. Careful design and detailing will be required in order to do this. If this is successfully implemented then visual impacts in this area could be positive. The western land fall lies above an industrial area, where, with careful design and detailing, some visual benefits could result due to the tidying up of a degraded area. Attention to detail will be required at the tie in of the landfall with the adjacent landscape and the new road embankments. The land fall on the east side of Bressay Sound will give rise to more significant visual impacts than that to

Environment: Landscape and Visual			
Option	**Bressay Link Option 2: High Level Bridge**		
	east (eg Hill of Cruester). Views of Bressay Sound from the wider area are extensive. This open water forms the setting to and backdrop to views from Lerwick, Bressay and the wider surrounding landscape of open, low, rolling hills, across which are scattered a large number of sensitive visual receptors. Views are available from: **Lerwick side:** • Point of Scatland • Shetland Transport • Council Transport Depot and Offices • SBS Logistics • Lerwick Fish Traders • Shetland Catch • Green Head Base • Norscott Angling Club • Gremista and residential properties in this area on Main and Lower Gremista Road including Brookside, Bungalow, Harbour View • Gremista Pier • Upper and Lower Gremista Roads • College Road • Shetland College • A970 • Gremista Farm • Bight of Gremista Marina • Bod of Gremista Museum • Up Helly Aa shed • Sub-aqua Club • Sailing Club • North Gremista Industrial Estate and commercial properties including warehouses used by the Vintage Car Club, Shetland Times	include many residential properties and tourist facilities, such as the Bod of Gremista Museum, the new Shetland Museum, and various hotels (such as the Queens Hotel) with views to Bressay Sound. Views of the bridge will be available from the surrounding hills where and recreational receptors are of high sensitivity. Those properties and closest locations are listed in the column to the left. Of these, the nearest residential and recreational receptor locations are of highest sensitivity to change. Viewers within commercial areas, particularly those working in enclosed sheds around the Point of Scatland, will be of low sensitivity to change. Clear views will be possible from properties on Bressay at Heogan, and further away at Maryfield, Glebe, Grindiscol, Kirkabister and from hills including Hill of Cruester, Hill of Setter, and the Ward of Bressay. Most receptors on Bressay are residential or tourists and therefore of high sensitivity to change. Industrial workers at Shetland Fish Products (SFP) factory on Bressay are of low sensitivity. Most receptors on Bressay Sound are of low sensitivity to change, as they are largely fishermen, sailors and seafarers who pass through the area. Tourists on cruises are of medium sensitivity to any change, as they will be moving on elsewhere. The magnitude of visual change in the immediate vicinity of the infrastructure will be high.	the west. The area is currently rural and open, and the engineered form of the bridge and associated road network will be out of character, with less opportunity to provide enhancements, than at the western land fall. The land fall should consequently be very simple in design, avoiding clutter such as signage and lighting. The use of typical design features such as the Bressay dry stane dykes, and restoration of marsh and heathland vegetation post construction will help tie the new development into the landscape. Features such as the old Herring Processing Plant (a ruin) and a suspected Broch could be used to create new points of interest at the new land fall – ie they could be restored and a visitor attraction, with interpretation, created, such as the visitor centre at the existing Bressay Pier. Visual impacts will arise from the creation of the new large scale bridge and associated roads, night time lighting, signage and lining required to direct traffic. Particular care will be required with lighting – low level lighting will be preferable to tall pole mounted lighting. This can be used to create a feature. Vehicular traffic (and vehicle lights etc) on new access roads will also contribute to visual impacts, although it is not expected that this will be heavy. The road to the bridge landfalls will require embankments which will contribute to visual impacts, so it is important that these are graded, topsoiled and grassed to help them tie into the existing landform and vegetation. During construction, tall machinery, lighting, equipment storage, accommodation and excavation for

Environment: Landscape and Visual			
Option	**Bressay Link Option 2: High Level Bridge**		
	and Litho, Herculean, Shetland Tyre and Exhaust, the District Heating Plant • Further away, from Holmsgarth, Garthspool, Freefield, North Ness, Central Lerwick, the Knab and Lerwick waterfront. • Recreational receptors including the new Shetland Museum, and various hotels (such as the Queens Hotel) with views to Bressay Sound, along and rising above Lerwick waterfront. **Bressay side:** • Properties including Heogan, Souter Heogan, Annfield, Garth Cottage and unnamed properties the road to Heogan on Bressay, within the immediate vicinity of the proposed bridge • Shetland Fish Products (SFP) factory • Old Herring Processing Plant –ruin • Further away at Maryfield, Glebe, Grindiscol, Kirkabister, and hills such as the Ward of Bressay • Boats etc on Bressay Sound	Beyond this, the magnitude of change will remain high for several km from the proposed bridge in all directions. The proposed bridge is over 60m high and 260m long, and therefore will be seen very widely	foundations of abutments will give rise to visual impacts. **Summary** A bridge of the scale proposed would result in wide scale visual impacts across north facing areas of Lerwick, from the west side of Bressay and the flanks and tops of surrounding hills which face towards the proposed bridge. If the design is of aesthetic merit, it may be considered to be a positive new land mark in Shetland. Viewers will vary in their feelings towards the new bridge depending upon their like or dislike of the design. In the locality of the land falls themselves and along the routes of the proposed access roads serving the bridge, more localised visual impacts will result. Some of these have potential to be positive though enhancing currently degraded areas.
Landscape	**Landscape Designations:** None within 500m. **Landscape Resources** *Lerwick side:* • Industrial areas with some rough grassland separating areas of sheds, hard standing and access roads. • Semi improved grassland and heath beyond and above developed area. • Disturbed shore line comprising made ground. *Bressay side:*	The landscape on the Lerwick side (the Developed Areas in the vicinity of the proposal) is dominated by industrial uses, is of low landscape quality and sensitivity, and is not designated for its landscape value. The landscape on the Bressay side is of medium sensitivity. It is not designated for its landscape value but does contain some traditional landscape features and is predominantly open and rural in character. SFP detracts from the character of the landscape reducing its quality, and sensitivity, within the area of the factory, to low. The magnitude of landscape change will be high. The	The new bridge will form a dramatic new feature in the landscape, which may be considered to be out of scale with other development in the area. It will not adversely affect the character of the wider area, but will form a new land mark. Locally, the landscape character will be affected by the presence of the bridge abutments, embankments, associated access roads, lighting, road signage, lining etc. The large scale bridge may result in it dwarfing the properties and features which lie adjacent to it, although, to the west, the new proposals are in scale

[3] Shetland Landscape Character Assessment, Review Number 93, SNH, 1998

Environment: Landscape and Visual			
Option	**Bressay Link Option 2: High Level Bridge**		
	• Open moorland grassland and heath, wetland areas. • Natural shoreline – low earth bank and shingle. • Gently rolling open hills dropping to the shore. • Traditional Bressay stone dykes separate rough fields. • Scattered traditional properties are apparent across the area. • Shetland Fish Products (SFP) factory is a landscape detractor. • Historic remains including a suspected broch and Herring Processing Plant. **Landscape Character Areas /Types:** The area near Bressay Sound lies within the Bressay and South Mainland Coast Landscape Character Area (LCA)[3], on the edge of the South Mainland Upland Spine LCA.	proposed bridge will be a large new feature across a currently open stretch of water. The magnitude of change in the wider landscape will be medium. The bridge will be apparent as a new feature in the landscape from several km away	with the existing large scale industrial sheds. On the Lerwick side there is potential for localised improvement in landscape character through tidying up a currently degraded area. No significant landscape features or resources will be directly affected. Disturbed areas of vegetation will be restored and slopes graded to tie in with adjacent contours. Properties, dry stane dykes and historic features will be avoided. Road widening will give rise to the permanent displacement of areas of rough moorland grasses and heath. Careful restoration will be essential so that the rural character of Bressay is not eroded. **Summary** A bridge would result in long term impacts on the wider landscape, as it will be apparent across a wide area for the duration of its life span. It will form a new feature and land mark, rising above the industrial areas at the Point of Scatland and extending to the rural landscape of Bressay. In the locality of the land falls and along the routes of the proposed access roads serving the bridge, localised impacts on the landscape will result, particularly on Bressay. On the Lerwick side, these have potential to be positive though enhancing currently degraded areas.

Table A8.2.6 STAG 2 Appraisal Summary: Landscape and Visual: Option 3

Environment			
Option	**Bressay Link Option 3:** Reconfigured Ferry Service		
Mitigation Options Included: (Costs & Benefits)	• If new piers and slip ways are required then these will be designed to be of high standard, and to tie in with their adjacent landscape and visual environment. A landscape design for the land falls will be recommended, ie streetscape works around the ferry terminal at the Lerwick end and a more rural landscape design on Bressay. • Associated clutter such as signage, lighting and street furniture will be designed so as to be unified and minimised, ie pole sharing for signs and lights, a 'family' of signs, attention to car park surfacing and road markings etc.		
Sub-objective	**Qualitative Information**	**Quantitative Information**	**Significance of Impact**
Visual Amenity	This depends upon the location of the reconfigured ferry service. If at its current location then receptors would be the same as for the current service. **Lerwick:** • Properties and locations around North Jetty and the Esplanade, including Fort Charlotte • Commercial Street • Alexandra Wharf • Alexandra Building • Stewart Building • North Ness • Harbour House • Albert Wharf • Victoria Pier • Small Boat Harbour • Hotels such as Queens Hotel on the Lerwick Waterfront. **Bressay:** • Maryfield • Gardie House • Voeside • Glebe • Grindiscol	Receptors are already accustomed to seeing the existing ferry service. Their sensitivity depends upon the nature and location of the proposals. Receptors which see the existing service will be of low sensitivity to seeing a new service, depending upon what is proposed. Eg, if longer hours are proposed then potential visual impacts due to lighting may cause the sensitivity of adjacent residential receptors to be high.	Depends upon the nature and scale of the proposals, but unlikely to have significant visual impacts as people are already accustomed to seeing the existing ferry. If more boats are proposed, for example smaller boats for passengers only, then these will provide increased activity and visual interest at the existing North Jetty.

Environment			
Option	**Bressay Link Option 3:** Reconfigured Ferry Service		
Landscape	This depends upon the location of the reconfigured ferry service. If at its current location then the landscape setting would be the same as for the current service, i.e. part of Lerwick Developed Area LCT. Landscape Designations Central Lerwick is a Conservation Area. Landscape Resources **Lerwick side:** • Existing pier, car park and waiting facilities. • Fort Charlotte overlooking North Jetty and the Esplanade. **Bressay side:** • Existing pier at Maryfield, car park and waiting area. **Landscape Character Areas /Types** The area near Bressay Sound lies within the Bressay and South Mainland Coast Landscape Character Area (LCA), on the edge of the South Mainland Upland Spine LCA.	Landscape sensitivity depends upon the nature and location of the proposals. The landscape already accommodates the existing ferry service and is not likely to be sensitive to a reconfigured service depending upon the nature of the proposals. A new or altered slipway or pier/jetty may be required resulting in very localised works.	Depends upon the nature and scale of the proposals, but unlikely to have significant impacts on the landscape as it the ferry is already part of the character of the area.

Table A8.2.7 STAG 2 Appraisal Summary: Landscape and Visual: Option 4

Environment: Landscape and Visual			
Option	**Bressay Link Option 4: Do Minimum**		
Mitigation Options Included: (Costs & Benefits)	Maintain the existing landscape and townscape character associated with the existing services. Maintain facilities in good condition and take opportunities to enhance when replacements are required.		
Sub-objective	**Qualitative Information**	**Quantitative Information**	**Significance of Impact**
Visual Amenity	As existing baseline. Viewers include: **Lerwick:** • Properties and locations around North Jetty and the Esplanade, including Fort Charlotte • Commercial Street • Alexandra Wharf • Alexandra Building • Stewart Building • North Ness • Harbour House • Albert Wharf • Victoria Pier • Small Boat Harbour • Hotels such as Queens Hotel on the Lerwick Waterfront. **Bressay:** • Maryfield • Gardie House • Voeside • Glebe • Grindiscol	As existing	No significant change in current levels of impact
Landscape	As existing baseline. Landscape Designations Central Lerwick is a Conservation Area. **Landscape Resources**	As existing	No significant change in current levels of impact

[4] Shetland Landscape Character Assessment, Review Number 93, SNH, 1998

Environment: Landscape and Visual			
Option	**Bressay Link Option 4: Do Minimum**		
	Lerwick side: • Existing pier, car park and waiting facilities. • Fort Charlotte overlooking North Jetty and the Esplanade. *Bressay side:* • Existing pier at Maryfield, car park and waiting area. • Landscape Character Areas /Types The area near Bressay Sound lies within the Bressay and South Mainland Coast Landscape Character Area (LCA)[4], on the edge of the South Mainland Upland Spine LCA.		

Appendix 8.3

Carbon Footprint Worksheets

Appendix 8.3 Carbon Footprints

1 Carbon Protocol

Objective: To compile indicative inventories of the CO_2 emissions associated with the options being assessed for the Bressay Link.

Reasons:

- So that carbon intensity can be included as one of the sustainability criteria for comparisons between the various options alongside social and economic criteria.
- So that the social cost of carbon can be included in the economic appraisal of the options.
- To comply with the UK Government's Energy White Paper (2003) which sets out a requirement to make carbon impact assessment an integral part of assessing environmental impact.
- To comply with planning objective Env 2 from the Bressay STAG 1 Report (Feb 2008): "to provide a link that seeks to minimise carbon emissions and the use of finite resources".
- To provide initial inventories so that carbon intensity considerations and innovations can be incorporated into the design/procurement phases of the preferred option.

Scope: The potential impact of each option on the CO_2 emissions associated with connections between Bressay to Mainland Shetland over the lifetime of the project (construction, operation, decommissioning).

Tools:

Simplified version of Environment Agency Construction Projects Carbon Calculator

Life Cycle Analysis

Scenarios:

1. Baseline (Current Ferry Service)		
Operational Phase	Fuel Consumption	Litres per annum
	Business Energy	KWh per annum
	Staff/Business Travel	Miles per annum (by mode of transport)
	Waste	Tonnes per annum (by disposal method)
New ferry in 2012 and every 20 years there after	Embedded CO_2 in construction	Tonnes CO_2e according to life cycle analysis
	Transportation of new ferry	Miles

2. Enhanced Ferry Service		
Operational Phase	Fuel Consumption	Litres per annum

2. Enhanced Ferry Service		
	Business Energy	KWh per annum
	Staff/Business Travel	Miles per annum (by mode of transport)
	Waste	Tonnes per annum (by disposal method)
New ferry in 2012 and every 20 years there after	Transportation of new ferry	Miles
	Embedded CO_2 in construction	Tonnes CO_2e according to life cycle analysis

3. High Level Bridge		
Construction Phase	Embedded CO_2 in construction of bridge (design, materials, construction methods, transportation etc)	Tonnes CO_2e according to life cycle analysis/ simplified EA carbon calculator
Operational Phase	Vehicle Emissions	Litres/miles per annum
Decommissioning Phase?	Embedded CO_2 in decommissioning of bridge	Tonnes CO_2e according to life cycle analysis/ simplified EA carbon calculator

4. Tunnel		
Construction Phase	Embedded CO_2 in construction of tunnel (design, materials, construction methods, transportation etc)	Tonnes CO_2e according to life cycle analysis/EA carbon calculator
Operational Phase	Vehicle Emissions	Litres/miles per annum
	Energy for Ventilation	KWh per annum – opportunity to generate renewable energy onsite?
	Business Energy?	KWh per annum
	Staff/Business Travel?	Miles per annum (by mode of transport)
	Waste?	Tonnes per annum (by disposal method)
Decommissioning Phase?	Embedded CO_2 in decommissioning of tunnel	Tonnes CO_2e according to life cycle analysis/simplified EA carbon calculator

2 Carbon Footprint Calculations

2.1 Drill and Blast Tunnel

Title of option: **Bressay Fixed Link STAG**

Construction cost: **28000**

Total Carbon Footprint: **2672** **tonnes fossil CO_2**

Sub-totals	tonnes	%
Quarried Material	**86.5**	**3%**
Timber	**0.0**	**0%**
Concrete, Mortars & Cement	**1438.8**	**54%**
Metals	**231.7**	**9%**
Plastics	**33.0**	**1%**
Miscellaneous	**24.6**	**1%**
Plant emissions	**550.0**	**21%**
Waste Removal	**7.2**	**0%**
Portakabins	**28.2**	**1%**
Material transport	**60.2**	**2%**
Personnel travel	**212.2**	**8%**

Significant materials (figures include transport to site)	
Damp Proof Course/Membrane	24.6 tonnes CO2
Concrete: XS1	**749.2 tonnes CO2**
Concrete: XS2	**724.3 tonnes CO2**
Steel: bar & rod	**232.1 tonnes CO2**
Plant emissions (estimated)	**550.0 tonnes CO2**
Stone gravel/chippings	67.3 tonnes CO2
PVC: pipe	33.0 tonnes CO2
Portakabins	28.2 tonnes CO2
Asphalt	26.3 tonnes CO2
Recycled aggregate	10.7 tonnes CO2
Disposal at sea	7.2 tonnes CO2

Personnel Travel (estimated) **212.2 tonnes CO2**

2.2 High Level Bridge

Title of option: **HIGH LEVEL BRIDGE**

Construction cost: **49000000**

Total Carbon Footprint: **20825** **tonnes fossil CO_2**

Sub-totals	tonnes	%
Quarried Material	**409.5**	**2%**
Timber	**3750.0**	**18%**
Concrete, Mortars & Cement	**5730.3**	**28%**
Metals	**9987.7**	**48%**
Plastics	**0.0**	**0%**
Miscellaneous	**0.0**	**0%**
Plant emissions	**750.0**	**4%**
Waste Removal	**0.0**	**0%**
Portakabins	**90.9**	**0%**
Material transport	**106.3**	**1%**
Personnel travel	**0.0**	**0%**

Plant emissions (estimated)	750.0	tonnes CO2
Concrete: XC4	**3713.0**	**tonnes CO2**
Concrete: XC3	**2123.6**	**tonnes CO2**
Steel: wire	1004.7	tonnes CO2
Handrail: galvanised with fittings	**4554.0**	**tonnes CO2**
Steel: bar & rod	**4429.0**	**tonnes CO2**

2.3 Reconfigured Ferry Service

Reconfigured Ferry Service

Component of Carbon Footprint	*Units*	*kgCO_2e per unit*	*tonnes CO_2e per annum*	*tonnes over 60 years*
Fuel Consumption	351,000 litres of gas oil per annum	2.674	938.574	56,314
Staff Travel	18,250 miles per annum	0.3	5.475	329
Electricity	18,600 kilowatt hours per annum	0.43	7.998	480
Waste	548 black bags per annum	4.3	2.3564	141
			TOTAL	**57,123**

2.4 Do Minimum (Current Ferry Service)

Current Ferry Service

Component of Carbon Footprint	*Units*	*kgCO_2e per unit*	*tonnes CO_2e per annum*	*tonnes over 60 years*
Fuel Consumption	234,000 litres of gas oil per annum	2.674	625.716	37,543
Staff Travel	18,250 miles per annum	0.3	5.475	329
Electricity	18,600 kilowatt hours per annum	0.43	7.998	480
Waste	365 black bags per annum	4.3	1.5695	94
			TOTAL	**38,351**