AUGUST 2016
SHETLAND ISLAND COUNCIL

Shetland Inter-Island Transport Study - Fixed Link Working Paper – Supplement – "Bottom-Up" Cost-Estimates

ENGINEERING DELIVERABILITY AND COST RISK REVIEW
MAINLAND TO BRESSAY / WHALSAY / YELL & YELL TO UNST (BLUEMULL SOUND)

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1 Introduction

1.1 Context

In December 2014, Shetland Islands Council, HITRANS, Transport Scotland, Orkney Islands Council and ZetTrans agreed a Joint Statement establishing Partnership commitments to jointly address ferry replacement issues in Shetland and Orkney. It was recognised that there was a need for evidence gathering to support future funding and investment decisions. It was further recognised that the evidence gathering should follow Transport Scotland's established Routes and Services Methodology and STAG Appraisal approaches to ensure consistency and legitimacy alongside other transport projects and services in Scotland.

A Shetland Inter-Island Transport Study (SIITS) was commissioned to meet these requirements and to build on two recent studies undertaken by Peter Brett Associates:

- Shetland Island Routes and Services Methodology (RSM) Study, 2015
- Shetland Islands Transport Scoping Study, 2015

SIITS is delivered in two phases.

As part of Phase 1, Donaldson Associates Limited were commissioned to review all the previous fixed links studies between Bressay-Mainland, Unst-Yell, Yell-Mainland, and Whalsay-Mainland; from a cost, risk and engineering feasibility perspective; focusing solely on the deliverability, costs and cost uncertainty and risks to SIC of considering these options further.

The layout of the current position of the four prospective crossings was to be established, and identification made of any remaining gaps in knowledge, which may be preventing a definitive decision being taken.

The initial review therefore had the objective of producing an up-to-date and consistent picture of the factual position for the fixed links and considered:

- the technical arguments – is there a consensus that can be reached on the deliverability of each scheme?

- risks & uncertainty – set out the key uncertainties with respect to the information currently available, and also identify any key gaps in understanding which may prevent a meaningful decision being taken with respect to whether fixed link options are taken forward.

- costs / cost ranges – previous cost estimates are dated and are to be updated using appropriate indices.

This work was undertaken in October and November of 2015, and was summarised in the Donaldson Associates Limited report "Shetland Inter-Island Transport Study - Fixed Link Working Paper" (Ref: JS969-SIITS-Fixed-Link-Review-2015-11-20 B01).

The methodology employed within the study adjusted historical cost estimates to 2015 prices using principles recommended by the UK Government and national indices published by Royal Institute of Chartered Surveyors.

1.2 Brief

In March 2016, SIC commissioned Donaldsons Associates Limited to produce a supplemental report to the 2015 report, in which there that would be:

- a new set of 2016 prices provided by tunnelling contractors

- a non-technical description of how and why cost estimates were factored for planning purposes

1.3 Method

A number of UK tunnelling contractors and one Norwegian tunnelling contractor were asked whether they would provide independent 2016 cost estimates for the Shetland Fixed Links.

After some protracted negotiation, one UK contractor and one Norwegian contractor agreed to provide "bottom-up" cost estimates for the Bressay Fixed Link based on the design produced by Donaldsons Associates Limited in 2008.

All contractors declined to offer costs estimates for the other fixed links, on which there is limited geological and other technical engineering information.

The newly derived 2016 cost estimates for the Bressay link were compared with the historical cost estimate of 2008 and the factored "index-linked" cost estimate of November 2015.

The typical cost per meter for providing a fitted-out running tunnel based on the Bressay design was then applied on a pro-rata basis to the nominal lengths of the other fixed-links (Unst-Yell, Yell-Mainland, Whalsay-Mainland).

The 2008, 2015 and 216 cost estimates and their corresponding "planning prices" are provided and tabulated for the sake of comparison.

A non-technical summary of the planning factoring process has been provided.

2 Construction Cost Estimates of 2016

2.1 Introduction

Two tunnel contractors agreed to provide "bottom-up" costs estimates for the cost they believed they would submit at tender to construct the Bressay fixed-link based on an engineer's design produced by Donaldson Associates Limited in 2008.

The unofficial term "bottom-up estimate" is taken here to signify an estimate that is derived by a process of thinking through all the specific issues of the project, including project risks in the ground and how they can be mitigated though good construction practice, and includes time and motion estimation upon which manpower and equipment costs can be derived. One contractor stated that the estimate their firm submitted could be considered a bona-fide estimate of their tender price for delivering such a scheme.

The construction costs provided by the contractors are not the whole scheme capital costs of the project; as they lack the cost of items such as further ground investigation, detailed design, land acquisition and the like, which are paid for in advance of and outside of the construction contract. These client-side costs are discussed in more detail in section 2.4 below.

2.2 UK and Norwegian Construction Costs for Bressay

The prices provided by the UK and the Norwegian contractor where presented in different ways from one another and from the estimates set out in 2008/2015. In order to arrive at a presentation of costs that allowed for comparison one with another, both sets of 2016 prices where therefore reconfigured into a format that matched the 2008/2016 construction cost-estimates. For the avoidance of doubt, this process did not include any readjustment in rates. The results are presented in Table 2.1 below.

These costs are for a design at Bressay that is compliant with existing UK standards, and moreover includes provision of a cycle way. However, given the

unique situation of the Shetland Islands, a case might conceivably be made for a less costly scheme using lesser vehicle clearances as used in Norway (which are sub-standard according to UK rules). Removal of the cycle way would further reduce the cross-section of the tunnel and the volume of rock removed. This would lead to further cost reduction. Costing of such alternative design options has not been attempted in this study.

Item	Quantity	Unit	Rate GBP £ @ 2008	Cost Estimate GBP £ @ 2008	Index	Index @ Nov-15 Rel. to Aug 2008	Rate GBP £ @ Nov-2015	Cost Estimate GBP £ @ Nov-2015	Rate GBP £ @ 2016	Cost Estimate GBP £ @ 2016	Rate GBP £ @ 2016	Cost Estimate GBP £ @ 2016
Construction Costs	**Original**		**UK Contractor 2008**		**Indexed Linked Estimates**				**UK Contractor 2016**		**NOR Contractor 2016**	
Excavation and support of driven tunnel *	1,200	m	12,257	14,708,400	ROADCON Tender Price Index of Road Construction	1.3603	16,673.20	20,007,836.52	£12,257	£14,708,400	£9,107	£10,928,400
Road construction within tunnelled section	1,200	m	250	300,000	ROADCON Tender Price Index of Road Construction	1.3603	340.08	408,090.00	£250	£300,000	£708	£849,600
Drainage, concrete and associated pipes	1,200	m	500	600,000	ROADCON Tender Price Index of Road Construction	1.3603	680.15	816,180.00	£1,450	£1,740,000	£587	£704,400
M&E Equipment	1,200	m	3,000	3,600,000	ROADCON Tender Price Index of Road Construction	1.3603	4,080.90	4,897,080.00	£3,630	£4,356,000	3,630	4,356,000
Tunnel Sub-Total (without any secondary Lining)			**16,007**	**19,208,400**	-		**21,774.32**	**26,129,186.52**	**£17,587**	**£21,104,400**	**£14,032**	**£16,838,400**
Contingency for secondary lining (inc membrane) **	350	m	3,416	1,195,600	ROADCON Tender Price Index of Road Construction	1.3603	4,646.78	1,626,374.68	£3,416	£1,195,600	£2,327	£814,450
Tunnel Sub-Total (with 350m of secondary Lining)			**19,423**	**20,404,000**	-		**26,421.11**	**27,755,561.20**	**£21,003**	**£22,300,000**	**£16,359**	**£17,652,850**
Road construction outside tunnel (portal and tie-in roads)	575	m	3,000	1,725,000	ROADCON Tender Price Index of Road Construction	1.3603	4,080.90	2,346,517.50	£3,500	£2,012,500	£4,236	£2,435,700
Bressay Cutting (in Rock)	25,000	m^3	42	1,050,000	ROADCON Tender Price Index of Road Construction	1.3603	57.13	1,428,315.00	£42	£1,050,000	£35	£875,000
Lerwick Cutting (in Rock)	15,000	m^3	42	630,000	ROADCON Tender Price Index of Road Construction	1.3603	57.13	856,989.00	£42	£630,000	£35	£525,000
Labour Camp										£605,000		£605,000
Total (without any secondary Lining)				**22,613,400.00**	-			**30,761,008.02**		**£25,401,900**		**£21,279,100**
Contingency for secondary lining (inc membrane) **	350	m	3,416	1,195,600	ROADCON Tender Price Index of Road Construction	1.3603	4,646.78	1,626,374.68	£3,416	£1,195,600	£2,327	£814,450
Total (without 350m secondary Lining)				**23,809,000**	-			**32,387,383**		**£26,597,500**		**£22,093,550**

TABLE 2.1 – BRESSAY FIXED-LINK – CONSTRUCTION COST-ESTIMATES OF 2008, NOV 2015, AND UK AND NORWEGIAN OF 2016 (EXCLUDES LAND ACQUISITION / FURTHER GI / DESIGN FEES)

2.3 UK and Norwegian Costs - Discussion

In March and April of 2010 a series of meeting were held in Lerwick and Glasgow that culminated in a workshop at which, inter alia, it was sought to understand why there was an apparent difference between UK and Norwegian bored tunnel construction costs. The findings following those meeting were summarised in the workshop report as follows:

- There tend to be fewer but highly skilled experienced personnel on Norwegian tunnelling projects who work very efficiently
- 'Active design' at the face during construction means decisions are taken in 'real time' enabling quick and efficient progress
- Competition is high
- Low profit margin – two to three percent
- High productivity
- Dedicated and modern equipment
- Rarely line tunnels with secondary lining and it is more common to line with spray concrete (shotcrete) - over rock bolts with waterproof membrane which provides a water seal
- Quite minimum design - no provision for pedestrians or cyclists therefore smaller tunnel cross section leading to lower volume to be excavated
- The contractual system in Norway helps – risk sharing keeps costs down
- It was noted that Norwegian costs would most likely rise if they were working outside the Norwegian market
- Norwegian contractors are giving up on working outside of Norway, e.g. when working in Sweden the Norwegian contractors find that they face much slower progress because of issues with contracts, regulations, culture, etc and the costs become higher with reduced profits
- The Government 'self insures' in Norway and has a dedicated budget for this
- Insurers share the risk in Norway (up to 30%)
- Tunnel insurance tends to be higher in UK
- The Contractor provides insurance for machinery, labour, and tunnel collapse (under certain circumstances only)
- Taxes are applied to waste (excavated rock) in the UK if taken 'off-site', sold as aggregate or put in landfill whereas waste can be disposed of in land around the tunnel in Norway with no disposal cost without planning permission or Environmental Impact Assessment (EIA), if placed to a thickness of less than 0.5m thick

Other considerations:

› Norwegian tunnels are paid for with tolls (usually paid off in 12 to 15 years). Tolls are comparable with ferry costs or even higher in some cases

2.4 Client Side Scheme Costs

Client side costs for the Bressay bored tunnel scheme were identified in Annex G of the 2008 STAG 2 report.

A client side cost for risk management was subsequently identified and was priced at £2,125,000. This included sizeable payments in duty for landfill or aggregate tax and duty to Crown Estates of £800,000 and £900,000 respectively. This cost is uplifted suing the retail Price Index to £2,533,000.

The totals for client side scheme costs are set out in Table 2.2 below.

Item	Unit	Cost Estimate GBP £ @ 2008	Index	Index @ Nov-15 Rel. to Aug 2008	Cost Estimate GBP £ @ Nov-2015
Client Side CAPEX Costs					
Investigations and Survey ***	Sum	£ 950,000	ALLCOS Resource Cost Index of All Construction: All New Work	1.1167	£ 1,060,865
Professional Fees****	Sum	£ 1,100,000	Retail Price Index	1.192	£ 1,311,200
Land Acquisition	Sum	£ 20,000	Retail Price Index	1.192	£ 23,840
Accommodation Works	Sum	£ 180,000	ALLCOS Resource Cost Index of All Construction: All New Work	1.1167	£ 201,006
Hoegan Road Improvements	Sum	£ 200,000	ROCOS Resource Cost Index of Road Construction: Combined	1.1422	£ 228,440
Client Side CAPEX Total		**£ 2,450,000**			**£ 2,825,351**
Cost of Risk Management		**£ 2,125,000**	**Retail Price Index**	**1.192**	**£ 2,533,000**

TABLE 2.2 – BRESSAY FIXED-LINK – CLIENT SIDE COSTS

2.5 Bressay Scheme Cost

The spread of scheme costs for the Bressay fixed-link is set out in Table 2.3 below.

Item	Cost Estimate GBP £ @ 2008	Cost Estimate GBP £ @ Nov-2015	Cost Estimate GBP £ @ 2016	Cost Estimate GBP £ @ 2016	Cost Estimate GBP £ @ 2008	Cost Estimate GBP £ @ Nov-2015	Cost Estimate GBP £ @ 2016	Cost Estimate GBP £ @ 2016
		Indexed Linked Estimates	UK Contractor 2016	NOR Contractor 2016		Indexed Linked Estimates	UK Contractor 2016	NOR Contractor 2016
	Total (without any secondary Lining)				Total (with 350m of secondary Lining)			
Construction Costs (Tunnel, Portals and connecting Raods)	£ 22,613,400	£ 30,761,008	£ 25,401,900	£ 21,279,100	£ 23,809,000	£ 32,387,383	£ 26,597,500	£ 22,093,550
Client Side Costs	£ 2,450,000	£ 2,825,351	£ 2,825,351	£ 2,825,351	£ 2,450,000	£ 2,825,351	£ 2,825,351	£ 2,825,351
Capital Cost	£ 25,063,400	£ 33,586,359	£ 28,227,251	£ 24,104,451	£ 26,259,000	£ 35,212,734	£ 29,422,851	£ 24,918,901
Contingency (10%)	£ 2,506,340	£ 3,358,636	£ 2,822,725	£ 2,410,445	£ 2,625,900	£ 3,521,273	£ 2,942,285	£ 2,491,890
Optimism Bias (12.6%)	£ 3,157,988	£ 4,231,881	£ 3,556,634	£ 3,037,161	£ 3,308,634	£ 4,436,804	£ 3,707,279	£ 3,139,782
Risk Management Costs	£ 2,125,000	£ 2,533,000	£ 2,533,000	£ 2,533,000	£ 2,125,000	£ 2,533,000	£ 2,533,000	£ 2,533,000
Budget Cost	£ 32,852,728	£ 43,709,876	£ 37,139,610	£ 32,085,057	£ 34,318,534	£ 45,703,812	£ 38,605,415	£ 33,083,573

TABLE 2.3 – SHETLAND FIXED-LINKS – FITTED-OUT RUNNING TUNNEL PRO-RATA CONSTRUCTION COST-ESTIMATES OF 2008, NOV 2015, AND UK AND NORWEGIAN OF 2016 (EXCLUDES ANYTHING THAT IS NOT IN THE TUNNEL SUCH AS PORTALS / CONNECTING ROAD LINKS / LAND ACQUISITION / FURTHER GI / DESIGN FEES)

2.6 Operation and Maintenance

In Chapter 15.7 "Transport Economic Efficiency" of the 2008 STAG Stage 2 report for Bressay, the cost of the operation and maintenance of the bored tunnel was discussed (along with the other options).

The cost provided in that study was an average of £195,000 per year over sixty years at 2008 prices.

The main operating costs of the tunnel will be that of wages and electricity.

The increase in cost of labour in the UK between 2008 and 2016 is approximately 14% - as derived from Statistical bulletin: Index of Labour Costs per Hour (ILCH): Quarter 1 (Jan to Mar) 2016 (experimental) Changes in the costs of employing labour, analysed by sector and industry as published by the government at http://www.ons.gov.uk/employmentandlabourmarket/peopleinwork/earningsandworkinghours/bulletins/indexoflabourcostsperhourilch/quarter1jantomar2016experimental.

Over the same period, the increase in the industrial price of electricity is approximately 18% - as derived from "Fuel price indices for the industrial sector in current and real terms: excluding/including CCL (QEP 3.3.1 and 3.3.2)" as published by the government at https://www.gov.uk/government/statistical-data-sets/industrial-energy-price-indices.

For planning purposes a simplistic increase of 16% is adopted. A simplistic approach is justified given that major changes in energy generation and supply are likely over the coming decades as renewable energy becomes more dominant; and consequently there are major uncertainties in the changes to prices over the forthcoming planning period of sixty years.

Using an uplifted average of 16% gives a figure of £226,200 per year for sixty years at 2016 prices.

2.7 Pro-rata costs for other Fixed Links

To obtain a minimum benchmark construction cost for the Unst, Yell and Whalsay fixed-link tunnels, the rates for providing a fitted-out running-tunnel for Bressay have been used. These pro-rated tunnel costs are set out in Table 2.4 below.

Fixed Link Details									Unlined				1/3 length Lined			
From/To	Date	Type	Ref	Title	Depicts	Max Gradient [%]	Submarine Rock cover [m]	Tunnel Length [m]	UK 2008	UK 2015 Indexed	UK 2016 Bottom Up	NOR 2016 Bottom Up	UK 2008	UK 2015 Indexed	UK 2016 Bottom Up	NOR 2016 Bottom Up
Mainland / Bressay	Mar-08	Drawing	JS533/101 Rev 0	Lerwick - Bressay Stage 2 fixed link horizontal and vertical tunnel alignment	Plan & Long Section	8	25	1200	£ 19,208,400	£ 26,129,187	£ 21,104,400	£ 16,838,400	£ 20,574,800	£ 27,987,900	£ 22,470,800	£ 17,769,200
Yell / Unst	Jan-08	Figure	Figure 2	Yell to Unst Crossing	Plan & Long Section	7	50	4050	£ 64,828,350	£ 88,186,005	£ 71,227,350	£ 56,829,600	£ 69,439,950	£ 94,459,164	£ 75,838,950	£ 59,971,050
Mainland / Yell	Jan-08	Figure	Figure 1	Mainland to Yell Crossing	Plan & Long Section	7	50	5438	£ 87,046,066	£ 118,408,764	£ 95,638,106	£ 76,306,016	£ 93,238,135	£ 126,831,835	£ 101,830,175	£ 80,524,091
Mainland / Whalsay	Mar-10	Drawing	JS533-510 Rev 0	Shetland - Whalsay Fixed Tunnel Link Tunnel Option 1A - Overview Drawing	Plan	7	40	6147	£ 98,395,029	£ 133,846,758	£ 108,107,289	£ 86,254,704	£ 105,394,413	£ 143,368,020	£ 115,106,673	£ 91,022,727
			JS533-51i Rev 0	Shetland - Whalsay Fixed Tunnel Link Tunnel Option 1A - Proposed Long Section	Long Section											
Unlined rate* per meter to provide tunnel =									£ 16,007	£ 21,774	£ 17,587	£ 14,032	x	x	x	x
Lined rate* per meter to provide tunnel =									>	>	>	>	£ 19,423	£ 26,421	£ 21,003	£ 16,359

***(excluding portals and connecting roads)**

TABLE 2.4 – SHETLAND FIXED-LINKS – FITTED-OUT RUNNING TUNNEL PRO-RATA CONSTRUCTION COST-ESTIMATES OF 2008, NOV 2015, AND UK AND NORWEGIAN OF 2016 (EXCLUDES ANYTHING THAT IS NOT IN THE TUNNEL SUCH AS PORTALS / CONNECTING ROAD LINKS / LAND ACQUISITION / FURTHER GI / DESIGN FEES)

3 Planning Cost Estimates

3.1 Reasons for and use of "Optimism Bias"

Government at all levels is required to seek to maximise the return to the taxpayer when buying roads, bridges, tunnels, hospitals, schools & etc. on behalf of the public.

When deciding whether to spend money on a particular project, the benefit of the project to the community has to be assessed before a decision can be taken on whether to invest the taxpayer's money.

This is a complicated process, and involves predicting how things will change after the project is complete, and whether the likely anticipated changes are significant enough to justify the cost of funding the project.

Other consideration include whether the cost of providing the project produces the greatest benefit for the greatest number of citizens and also whether the project is aligned with government policy objectives.

A critical part of the cost-benefit assessment is assessing the likely cost to buy or procure the project (including the ongoing costs of its operation and maintenance); as it is against this figure that the benefits can be compared. When considering civil engineering projects we can call this engineer's cost-estimate a "construction cost estimate".

Historically, the prediction of the costs to buy and procure projects displayed a pattern of inaccuracies; where almost every estimate significantly underestimated the costs.

In order to offset this systematic underestimation of costs, the government required that the planning process use a technique called "Optimism Bias" which requires that construction cost-estimates be increased to offset the tendency for cost estimators to underestimate the costs of providing a project.

The "Optimism Bias" is a percentage by which the construction cost-estimate is increased to produce a larger "planning cost-estimate".

It was observed that the amount of project specific information available significantly influenced the accuracy of construction cost-estimates. If specific information was lacking, cost estimators were overly optimistic in their costing. In other words, the cost estimators where not properly pricing the risk of the uncertainties in the project.

Some things that the Government buys have more uncertainty associated with their delivery and purchase than other things; and as was explained in section 6.4 of Donaldsons Associates report of November 2015 (of which this current report is a supplement), inter-island fixed links (bridges or tunnels), as contemplated here in the Shetlands, are regarded as having considerable technical uncertainties; and so are consequently classified as high risk "non-standard civil engineering" projects under HM Treasury guidance (ref: Mott MacDonald 2002).

Such non-standard projects carry more uncertainty in their delivery than most projects and consequently more risk to the taxpayer, and so have large "optimism bias" numbers.

Currently there is not much project specific information for the Ust-Yell, Yel-Mainland, and Whalsay-Mainland fixed links, and so consequently large "optimism bias" numbers are used by planners to convert the engineers cost-estimates into "planning estimates".

Referring once again to section 6.4 of the Donaldson Associates report of November 2015, it was reported that as regards fulfilment of the necessary risk mitigation / management standards required by HM Treasury, it is evident that:

- none of the crossings have achieved the lower bounds of 3% (duration) and 6% (CAPEX) permitting a works contract to be drawn up and awarded;
- the Bressay to Mainland tunnel option will qualify as a "project" under HM Treasury procedures, as there is a clearly defined design option which has been subjected to robust risk management protocols that have resulted in derivation of project specific mitigation factors; and these factors bring the project optimism bias levels to within credible values for sensible project progression towards confirmatory ground investigation and detailed design; in anticipation of subsequent progression to award of a works contract;
- the remaining crossings currently lack any clear selection of a preferred design option; so that there is effectively no "project" on which to commence a meaningful project risk management process. The current status of risk management of each fixed link is as follows:

Fixed Link	Adjusted CAPEX Optimism Bias
Bressay to Mainland: Bored Tunnel	12.8%
Unst to Yell: Any Option	66%
Yell to Mainland: Any Option	66%
Whalsay to Mainland: Any Option	66%

TABLE 3.1 – ALLOCATION OF MITIGATED OPTIMISM BIAS BY PROJECT

3.2 "Planning Estimates" based on 2016 Cost-Estimates

The construction cost-estimates are converted into "planning estimates" by increasing the construction cost-estimate by the "optimism bias" percentage set out in Table 3.1 above.

The fitted-out running tunnel construction cost-estimates set out in Table 2.4 above in this report are therefore increased by the percentages set out in Table 3.1 to produce "planning estimates" which are in turn presented in Table 3.2 below.

The whole scheme planning cost for the Bressay fixed-link with and without permanent linings are set out in Table 2.3 above.

HM Treasury Adjustment 2016

Contingency	10%	Bressay
Optimism Bias	12.6%	
Contingency	20%	Yell, Unst, Whalsay
Optimism Bias	66%	

Fixed Link Details										**Unlined**				**1/3 length Lined**			
From	**To**	**Date**	**Type**	**Ref**	**Title**	**Depicts**	**Max Gradient [%]**	**Submarine Rock cover [m]**	**Tunnel Length [m]**	**UK 2008**	**UK 2015 Indexed**	**UK 2016 Bottom Up**	**NOR 2016 Bottom Up**	**UK 2008**	**UK 2015 Indexed**	**UK 2016 Bottom Up**	**NOR 2016 Bottom Up**
Mainland	Bressay	Mar-08	Drawing	JS533/101 Rev 0	Lerwick - Bressay Stage 2 fixed link horizontal and vertical tunnel alignment	Plan & Long Section	8	25	1200	£ 23,549,498	£ 32,034,383	£ 25,873,994	£ 20,643,878	£ 25,224,705	£ 34,313,166	£ 27,549,201	£ 21,785,039
Yell	Unst	Jan-08	Figure	Figure 2	Yell to Unst Crossing	Plan & Long Section	7	50	4050	£ 120,580,731	£ 164,025,968	£ 132,482,871	£ 105,703,056	£ 129,158,307	£ 175,694,045	£ 141,060,447	£ 111,546,153
Mainland	Yell	Jan-08	Figure	Figure 1	Mainland to Yell Crossing	Plan & Long Section	7	50	5438	£ 161,905,683	£ 220,240,300	£ 177,886,877	£ 141,929,190	£ 173,422,932	£ 235,907,214	£ 189,404,126	£ 149,774,810
Mainland	Whalsay	Mar-10	Drawing	JS533-510 Rev 0	Shetland - Whalsay Fixed Tunnel Link Tunnel Option 1A - Overview Drawing	Plan	7	40	6147	£ 183,014,754	£ 248,954,970	£ 201,079,558	£ 160,433,749	£ 196,033,608	£ 266,664,517	£ 214,098,412	£ 169,302,272
				JS533-51i Rev 0	Shetland - Whalsay Fixed Tunnel Link Tunnel Option 1A - Proposed Long Section	Long Section											

TABLE 3.2 – SHETLAND FIXED-LINKS – FITTED-OUT RUNNING TUNNEL PRO-RATA CONSTRUCTION COST-ESTIMATES OF 2008, NOV 2015, AND UK AND NORWEGIAN OF 2016 (EXCLUDES ANYTHING THAT IS NOT IN THE TUNNEL INCLUDING PORTALS, ROAD LINKS, LAND ACQUISITION / FURTHER GI / DESIGN FEES)

4 Summary and Conclusions

4.1 Conclusions

The results of this 2016 project specific bottom-up construction cost-estimate exercise has indicated that the indices published by RICS, as used in the November 2015 cost updating process, were overly pessimistic and led to an overestimate in construction cost.

The difference between the UK and Norwegian construction cost-estimates can be attributed to a number of reasons, which include things as diverse as recent exchange rate discounts following Brexit, to greater efficiencies in tunnelling in Norway construction realised by the availability of small highly multi-skilled workforce.