

Harbours Division of the Department of Transport Isle of Man Ramsey Marina Options Assessment



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Harbours Division of the Department of Transport

Isle of Man

Ramsey Marina Options Assessment

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1 SUMMARY

Hyder Consulting (UK) Ltd has been appointed by the Harbours Division of the Department of Transport (DoT), Isle of Man to conduct an Options Assessment of different options that could be used for an impounding structure in the construction of a marina in Ramsey Harbour.

An initial feasibility study carried out by the DoT (Ramsey Inner Harbour Marina Stage 1 Report: Feb 2008) led to the identification of four possible options for the impounding structure, three of these (Options 1, 4 and 7) would provide a second road crossing, whereas Option 8 would not provide a second crossing. Option 10, the fifth Option, has been developed following completion of the Transport Assessment and also has no second road crossing. The options are shown in Figure 1 and are described below:

- Option 1 Two lane bascule bridge between harbour and north pier, east of Harbour Master's office.**
- Option 4 A bund / wall running south from the end of the existing causeway and changing direction around the swing bridge dolphin to the West Quay. Water retention gate and two lane bascule bridge at the southern end.**
- Option 7 A bund / wall running south west from the end of the existing causeway directly across the harbour to the West Quay. Water retention gate and two lane bascule bridge at the south west end.**
- Option 8 A water retention gate placed between the boat builder's yard and the Old River Road. A swinging footbridge would provide pedestrian access.**
- Option 10 Water retention gate under the existing swing bridge. No new bridge across the harbour.**

In order to assist in the selection of a preferred location for the impounding structure, this Options Assessment has used environmental baseline information to provide a preliminary assessment of the Options. In addition to the impounding structure, other components of the development could potentially include: marina facilities (toilets and changing facilities), a boat park, lifting dock, boat grid and access improvements. It should be noted that this Options Assessment is based on the information provided in Figure 1 only, with details of the retention gate provided in Figure 2. The details of the retention gate for Option 10 are similar to the other options, with the height of the gate set at mean sea level. The final layout, construction details (e.g. programme, works, phasing etc.), operational details (e.g. operation of the swing bridge, maintenance works) are not yet available. In addition, further studies are ongoing (e.g. bird surveys, inter-tidal assessments) or planned (e.g. site investigation, hydrodynamic surveys, salt marsh surveys), the findings of which will further inform the assessment.

Options Assessment Tables have been completed for the following topic areas:

- Noise
- Vehicle Movements
- Air Quality
- Landscape and Visual
- Hydrodynamics
- Geology, Soils and Contamination
- Ecology

- Cultural Heritage
- Socio-economics
- Vessel Movements

For each specialist topic area, for each option, an assessment of potential effect has been presented. Possible mitigation have then been suggested, along with the residual effect following mitigation. Any data gaps outstanding have been identified.

Summary Findings

For air quality and noise, at this stage based on the available data, there was no clear distinction between the options.

In relation to vehicle movements, the Transport Assessment concluded that a second bridge crossing was not required in Ramsey, based on the forecast traffic data. On this basis, Options 8 and 10 would be the preferred options.

In terms of landscape and visual, it is considered that options enclosing the larger harbour extent (Options 1, 4, 7 and 10) would be the preferred options as they create the largest area of retained water and thus an attractive waterside environment. Setting effects on the Conservation Area and Protected Buildings would need to be considered in conjunction with the cultural heritage assessment.

Only Options 8 and 10 were considered for the hydrodynamics assessment. Based on preliminary modelling results, it is considered that Option 8 would have the lowest hydrodynamic impact as it is expected to have a less significant reduction in flushing, no significant increase in upstream flooding and lower potential for siltation within the impounded area.

At this stage, there is no reason to differentiate the options based on geotechnical considerations; information on local variations is required to complete the assessment. In terms of geo-environmental, Options 1 and 8 have the greatest potential for significant contamination, but will produce the least waste and sediment/ground disturbance. Options 4, 7 and 10 are in a similar location and have a lower potential for contamination to be present but will necessitate greater sediment/ground disturbance and waste.

It is considered that Option 8 would be the preferred Option in terms of ecology. As the River Sulby would not be completely impounded, there would be less habitat loss, limited upstream impacts and effects on fish migration.

Options 1 and 8 have been assessed as having the lowest direct and visual archaeological impacts based on the location of the retention gate. All Options will disturb potential archaeology within the Inner Harbour, the extent depending on the final layout.

All options bring a number of potentially beneficial socio-economic impacts, including a) Additional retained area of water bringing increased berthing opportunities for pleasure craft; b) Increased spend within the locality from berth owners and visiting craft; c) Increased property prices due to retained water frontage benefit for locals and could attract incomers; and d) Critical mass among leisure craft will enable high quality events and festivals, bringing benefits of associated spend and visitors. There are potential negative effects on harbour users arising from all the options considered, although Option 8 represents the least negative impacts. However, Option 8 potentially offers limited opportunities for socio-economic improvement within Ramsey. To assess this further, a detailed socio-economic assessment, including a cost-benefit analysis is being undertaken on Options 8 and 10.

For all the Options it is proposed to install a flap gate that would impound water to a level of half the tidal height. This means that smaller draught vessels would have their access times reduced, but this would not change for larger vessels that cannot transit until the tide level is passed mid-tide level. In addition Option 4 restricts access and turning circles to the commercial berths in the harbour.

In summary, a key output of the studies undertaken so far, is the Transport Assessment, which concluded that a second bridge crossing was not required. On this basis, Options 8 and 10 would be the preferred option. As identified above and within the assessment summary tables, there are a number of positive and negative effects arising from both of these options. Significant potential effects relate to ecology (loss of inter-tidal habitat, upstream impacts and effects on fish migration), cultural heritage (direct and visual effects), hydrodynamics (flushing, upstream flooding and siltation), and geo-environmental (potential for contamination), and socio-economics (effects on existing harbour users and opportunities for socio-economic improvement). Further studies based on forthcoming information, including the final layout, construction details and findings of ongoing surveys, would be required to fully assess the effects identified for Options 8 and 10.

DoT have instructed Hyder Consulting (UK) Ltd. to progress the Environmental Impact Assessment (EIA) for Option 10 and produce the Environmental Statement (ES). As part of the EIA Scoping exercise that commenced in April 2008, extensive consultation has been undertaken with a number of statutory and non statutory organisations on options considered for the harbour impoundment. The responses received have been considered in this Options Assessment and methodologies suggested will be adopted in the EIA. Any further consultation will also be considered within the EIA process.

A request for a Scoping Opinion together with the proposed scope of works for the EIA for Option 10 was sent to the Department of Local Government and the Environment (DLGE). A formal Scoping Opinion was subsequently received (January 2009) confirming that the proposed scope of the EIA is acceptable.

2 Option Assessment Tables

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
NOISE				
Option 1	Noise impact during construction phase. Changes in noise levels with forecast traffic need to be fully assessed, with and without marina development. See Transport table for information about predicted traffic.	Mitigation measures to be detailed in the Construction Environment Management Plan.	Mitigation during construction would ensure noise levels are within appropriate limits.	Traffic data required to complete noise assessment. Finalised masterplan, information on construction programme, works and phasing. Traffic management during construction. Information on changes in traffic due to operation of the swing bridge resulting from marine movements associated with the marina.
Option 4	As above	As above	As above	As above
Option 7	As above	As above	As above	As above
Option 8	No vehicular crossing associated with retention gate.	As above	As above	As above
Option 10	No second vehicular crossing.	As above	As above	As above.
<p>Summary statement: At this stage of the assessment, based on the available information, no clear difference has been identified between the various options assessed in relation to noise and vibration. Traffic data and information on construction activities are required before undertaking a full assessment.</p>				

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
VEHICLE MOVEMENTS				
Option 1	<p>Based on the forecast traffic movements, the Transport Assessment concluded that there was no requirement for a second road crossing.</p> <p>Notwithstanding the above, the impact of a second river crossing would be limited to the potential reassignment of traffic from the existing route north/south, which based on forecast reassigned traffic flows, is not considered to have a significant impact.</p> <p>Based on the available information, the marina development is forecast to have a negligible impact with regard to operational traffic movements at peak traffic periods. However, the changes to timing and frequency of swing bridge operation due to marine movements associated with the marina may have potential affects on traffic.</p>	<p>Consideration of traffic management due to increased operation of the swing bridge resulting from marine movements associated with the marina.</p> <p>Traffic management within the Conservation Area to be considered.</p>	<p>If a second road crossing was proposed, when comparing the various locations for the crossing, Option 1 was identified as the preferred option. This is due to the more direct route the option would provide for vehicle movements.</p>	<p>Finalised master plan required to undertake assessment - parking arrangements, road layout including access roads to marina facilities and junction arrangements.</p> <p>Swing bridge operation resulting from vessel movements associated with marina.</p>
Option 4	As above	As above	If a second road crossing was proposed, when comparing the various locations for the crossing, Option 4 would be less favourable	As above

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
			than Option 1 as it would provide a less direct route for vehicle movements.	
Option 7	As above	As above	If a second road crossing was proposed, when comparing the various locations for the crossing, Option 7 would be less favourable than Option 1 as it would provide a less direct route for vehicle movements.	As above
Option 8	<p>Option 8 does not provide a vehicular crossing.</p> <p>Based on the available information, the marina development is forecast to have a negligible impact with regard to operational traffic movements at peak traffic periods. However, the changes to timing and frequency of swing bridge operation due to marine movements associated with the marina may have potential affects on traffic.</p>	As above	This Option does not provide a vehicular crossing. The effects of changes in operation of the swing bridge will need consideration.	As above
Option 10	<p>Option 10 does not provide a second vehicular crossing.</p> <p>Based on the available information, the marina development is forecast to have a negligible impact with regard to operational traffic movements at peak traffic periods. However, the</p>	As above.	This Option does not provide a second vehicular crossing and so is in keeping with the findings of the Transport Assessment. The effects of changes in operation of the swing bridge will need consideration.	As above

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	changes to timing and frequency of swing bridge operation, due to marine movements associated with the marina may have potential affects on traffic.			
<p>Summary statement: The Transport Assessment concluded that based on forecast traffic, a second road crossing was not required. Based on the available data, the marina development (any option) is forecast to have a negligible impact with regard to operational traffic movements during the peak traffic periods.</p> <p>Further information in relation to the marina design, including the changes to timing and frequency of swing bridge operation due to marine movements associated with the marina; junction arrangements; access to moorings; parking arrangements is required to complete the assessment.</p> <p>If a second crossing was proposed, based on the available information, it was considered that Option 1 would provide the most appropriate location due to the more direct route this option would provide for vehicle movements.</p>				

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
AIR QUALITY				
Option 1	<p>Impact of dust generation during construction.</p> <p>Although the marina development (any option) is forecast to have a negligible impact with regard to operational traffic movements during the peak traffic periods, there may be changes in traffic characteristics as a result of the development (particularly changes in swing bridge operation due to increased marine movements) and the addition of a second crossing.</p> <p>Consideration of air quality effects of marina facilities (e.g. car park, junction arrangements) and increased vessels numbers.</p> <p>Possible increased traffic generation as a result of the increase in number of marina berths and change in traffic characteristics as a result of the addition of a second crossing.</p>	Mitigation measures for construction works to be detailed in the Construction Environmental Management Plan	Unlikely that there will be any exceedances of air quality objectives as the pollutant concentrations (represented by measured low NO ₂ concentrations) in Ramsey are historically very low.	<p>Traffic data to complete air quality assessment.</p> <p>Finalised masterplan, information on construction programme, works and phasing. Traffic management during construction.</p> <p>Information on changes in traffic due to operation of the swing bridge resulting from marine movements associated with the marina.</p>
Option 4	As Option 1 above.	As above.	As above.	As above.
Option 7	As Option 1 above.	As above.	As above.	As above.
Option 8	No vehicular crossing associated with retention gate – pedestrian	As above.	As above.	As above.

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	access only. As Option 1 above.			
Option 10	No second vehicular crossing across harbour. As Option 1 above.	As above.	As above.	As above.

Summary statement: At this stage of the assessment, based on the available information, no clear difference has been identified between the various options assessed in relation to air quality. Further information is required to complete the air quality assessment.

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
LANDSCAPE AND VISUAL				
Option 1	<p>There will be an introduction of an additional built element cutting across the harbour entrance; although this will be in ‘keeping’ with a working maritime environment.</p> <p>There will be beneficial effects on the landscape character through retention of water to create an attractive ‘harbour’ and waterside environment.</p> <p>An assessment on the effects of the option on the setting of the Conservation Area and Protected Buildings would need to be undertaken.</p> <p>The changes in views from adjacent sensitive visual amenity receptors including residential properties along West Quay and the Raad ny Foillan long distance footpath will vary. There will be changes in views, with adverse effects through the addition of another built structure cutting across the harbour and beneficial effects through increase in views of an attractive ‘harbour’ and waterside environment.</p> <p>Consideration of potential changes in traffic movements</p>	<p>During construction - minimise construction traffic/disruptions to adjacent Conservation Area and Protected Buildings, residents, commercial and other road users.</p> <p>Traffic management during operation to consider diverting traffic away from Conservation Area as appropriate.</p> <p>Consideration of marina layout, elevations and style of any buildings.</p>	<p>The majority of impacts and effects are likely to be similar for each option. Possible reduction in effects of traffic within and in proximity to the Conservation Area and Protected Buildings along South Promenade with implementation of traffic management.</p>	<p>Finalised masterplan including elevations.</p> <p>Assessment of effects on Conservation Area and Protected Buildings to be undertaken in conjunction with cultural heritage assessment.</p>

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	within the Conservation Area and along South Promenade.			
Option 4	As Option 1 but with the new crossing cutting across the harbour rather than the harbour mouth.	As above	As above	As above
Option 7	As Option 1 but with the new crossing cutting across the harbour rather than the harbour mouth.	As above.	As above	As above
Option 8	<p>There will be no second bridge crossing associated with this option. Pedestrian access will be across the inner harbour entrance associated with the retention gate. There will be beneficial effects on the landscape character through retention of water to create an attractive 'harbour' and waterside environment to the north.</p> <p>An assessment on the effects of the option on the setting of the Conservation Area and Protected Buildings would need to be undertaken. There is expected to be limited impacts to the Conservation Area and Protected Buildings, due to the distance of this option from these sensitive areas.</p> <p>Views from adjacent sensitive visual amenity receptors, including the rear of residential properties to the east and users of</p>	As above.	As above.	As above

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	the footpath adjacent to Old River Road would also have beneficial effects through changes in views to an attractive 'harbour' and waterside environment. There is also potential for indirect improvements through regeneration of the harbourside, with associated beneficial effects.			
Option 10	As Option 1 but with the new crossing cutting across the harbour rather than the harbour mouth.	As above.	As above.	As above.

Summary statement: It is considered that options enclosing the larger harbour extent (Options 1, 4, 7 and 10) would be the preferred options in terms of landscape and visual as they create the largest area of retained water and thus an attractive waterside environment. Option 1 would result in the largest area of retained water. Setting effects on the Conservation Area and Protected Buildings would need to be considered in conjunction with the cultural heritage assessment.

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
HYDRODYNAMICS				
Option 1	These options were not assessed as part of the Options Study for Hydrodynamics.			
Option 4				
Option 7				
Option 8	<p>Flushing – some reduction in flushing may cause minor water quality issues.</p> <p>Operational window – 2.5 to 4 hours around High Water depending on tidal range.</p> <p>Upstream flood risk – no significant increase.</p> <p>Siltation – low potential for siltation in impounded area.</p>	<p>Flushing – wider entrance to impoundment may increase exchange rate with impounded water.</p> <p>Operational window – lower gate height could increase the operational window.</p> <p>Upstream flood risk – no mitigation required.</p> <p>Siltation – maintenance required to remove excess silt.</p>	<p>Flushing – flushing rate closer to existing rate is less likely to cause significant water quality issues.</p> <p>Operational window – operational window of over 5 hours may be achieved.</p> <p>Upstream flood risk – no significant increase.</p> <p>Siltation – marina depth maintained.</p>	<p>The numerical model used to provide this assessment is unverified and requires calibration/ validation before a quantitative assessment can be carried out. Water level and current data within the harbour are required to validate the model.</p>
Option 10	Flushing – more significant reduction in flushing may cause	Flushing - As above.	Flushing - As above.	As above, plus numerical modelling required to quantify

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>significant water quality issues</p> <p>Operational window – 2.5 to 4 hours around High Water depending on tidal range</p> <p>Upstream flood risk – Potentially significant increased risk.</p> <p>Siltation – high potential for siltation in impounded area.</p>	<p>Operational window - As above.</p> <p>Upstream flood risk - Re-design impoundment to increase flood flow conveyance across tide gate.</p> <p>Siltation – As above.</p>	<p>Operational window - As above.</p> <p>Upstream flood risk - Reduced flood risk from current design. Still potentially higher flood risk than baseline conditions due to impounded water.</p> <p>Siltation – As above.</p>	<p>potential impact on flood risk.</p>
<p>Summary statement: Based on preliminary modelling results, it is considered that Option 8 would have the lowest hydrodynamic impact as it is expected to have less significant reduction in flushing, no significant increase in upstream flooding and lower potential for siltation within the impounded area.</p>				

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
GEOLOGY, SOILS AND CONTAMINATION				
Option 1	<p>Long history of industrial use at southern end.</p> <p>Made Ground at each end.</p> <p>Contaminants in sediments from harbour wide industrial use.</p> <p>Waste disposal is low compared to other options.</p>	<p>Use of specialist piling techniques.</p> <p>Minimise ground and sediment disturbance.</p> <p>Would require assessment following intrusive site investigation.</p> <p>Remediation of the ground – this option may have a significant remediation requirement and within an operational industrial site. However, remediation would improve the area as a whole.</p>	<p>This option is at a location that may be impacted by significant contamination through industrial use.</p> <p>This option will require the least quantity of waste disposal, but the waste is more likely to be classified as hazardous.</p>	<p>Actual ground conditions and contaminant levels obtained from Site Investigation.</p> <p>Detailed structure design.</p>
Option 4	<p>Contaminants in sediments from harbour wide industrial use.</p> <p>Low to medium potential for contaminants in soils at southern end – through historical industrial activities.</p> <p>Made Ground at each end.</p> <p>Waste disposal requirement is highest of all of the options.</p>	<p>Use of specialist piling techniques.</p> <p>Minimise ground and sediment disturbance.</p> <p>Assessment based on intrusive site investigation.</p> <p>Remediation of the ground.</p>	<p>Options 4 and 7 are away from areas most likely to have been impacted by contamination.</p> <p>This option is longer in length than Option 7 and therefore will require more disturbance of the ground/sediments and the greatest waste disposal.</p>	As above

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
Option 7	<p>Contaminants in sediments from harbour wide industrial use.</p> <p>Low to medium potential for contaminants in soils at southern end – through historical industrial activities.</p> <p>Made Ground at each end.</p> <p>Waste disposal requirement is medium to high compared to other options.</p>	As Option 4 above.	<p>Options 4 and 7 are away from areas most likely to have been impacted by contamination.</p> <p>This option is shorter in length than Option 4 and therefore will require less disturbance of the ground/sediments.</p>	As above
Option 8	<p>Contaminants in sediments from harbour wide industrial use.</p> <p>Contaminants in soils at western end – through historical industrial activities including ship building yard, former gas works, former salt works.</p> <p>Made Ground at each end.</p> <p>Waste disposal requirement is the lowest of all of the options.</p>	<p>Use of specialist piling techniques.</p> <p>Minimise ground and sediment disturbance</p> <p>Assessment based on intrusive site investigation.</p> <p>Remediation of the ground – this option may have the greatest remediation requirement and within an operational industrial site. However, remediation would improve the area as a whole</p>	This option is at ground which is most likely to have been impacted by significant contamination through industrial use.	As above
Option 10	Contaminants in sediments from harbour wide industrial use.	Use of specialist piling techniques.	Options 4, 7 & 10 are away from areas most likely to have been impacted by contamination.	As above

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>Low to medium potential for contaminants in soils at southern end – through historical industrial activities.</p> <p>Made Ground at each end.</p> <p>Waste disposal requirement is medium compared to other options.</p>	<p>Minimise ground and sediment disturbance.</p> <p>Assessment based on intrusive site investigation.</p> <p>Remediation of the ground.</p>	<p>This option is shorter in length than Option 4 and therefore will require less disturbance of the ground/sediments.</p> <p>The use of a sheet pile wall will also minimise ground/sediment disturbance and waste arisings.</p>	

Summary statement:

Geotechnical – Although the geology across the four options is similar it is also likely to be locally variable. The impact of the geology on the structure to be built can only be meaningfully assessed based on the findings of an intrusive site investigation, and during and following the design of the proposed foundations. At this stage, there is no reason to differentiate the options based on geotechnical considerations.

Geo-environmental – The two main factors for comparison are - potential for significant concentrations of contaminants to be present, waste disposal and sediment/ground disturbance (i.e. potential for the contaminants to be released). Options 1 and 8 have the greatest potential for significant contamination but will produce the least waste and sediment/ground disturbance. Options 4, 7 and 10 are in a similar location and have a lower potential for contamination to be present but will necessitate greater sediment/ground disturbance and waste. The final preferred option will depend on the findings of the site investigation and confirmation of the actual contaminant concentrations.

The effects of dredging and land reclamation within the Inner Harbour has not been considered within this option assessment as this will occur for all options

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
ECOLOGY				
<p>NOTE: The estimates of intertidal habitat loss (as stated below for each option) are based on rough maps of intertidal areas, the location of the retention gate for each option and the assumption that impounded areas would be limited to downstream of the weir. The estimates should be considered as indicative only at this stage. Effects will need to be fully quantified based on the results of the calibrated/verified hydrodynamic modelling, the flood study and masterplan layout.</p>				
Option 1	<p>Birds</p> <p>An estimated 75 – 80% of intertidal feeding areas, important for a variety of birds including redshank and other waders all year round but especially in winter, will be permanently lost. This is considered to represent a major permanent impact.</p> <p>In terms of disturbance during construction, although some disturbance is likely to arise from construction activity, it is unlikely that any of the options is dramatically better or worse than any other. Some birds may roost at high tide in the recesses in this area. Oystercatcher bred in the shingle adjacent to the existing</p>	<p>Mooragh Park Lake presently provides an alternative additional feeding area in the period when drained. With the loss of intertidal feeding areas this will become of increased importance and it will be beneficial if it continues to be available. However, since the lake is drained for short periods only (typically one or two set of tides in recent years) benefits will be slight. The potential changes in water quality and salinity within the Mooragh Park Lake will also need to be considered.</p> <p>Disturbance impacts from construction would be lower during summer months as there would be fewer birds using the site. However, oystercatcher bred</p>	<p>Mitigation may have some beneficial impact, but this will need to be fully assessed when all the data are available. During autumn, birds would have to find alternative feeding areas, so they may not be present to benefit from Mooragh Park Lake when drained later in the winter.</p>	<p>Final masterplan.</p> <p>Construction programme, methodologies etc.</p> <p>Final results of hydrodynamic modelling.</p> <p>Ongoing bird survey data results.</p> <p>Long term monitoring of birds in the estuary should be</p>

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>swing bridge in 2008. This may affect the construction programme (breeding season April to July).</p>	<p>in the shingle adjacent to this site in 2008. Since it would be illegal to disturb them while breeding (breeding season April to July) this might cause delays to construction.</p>		<p>undertaken.</p>
	<p>Fish</p> <p>Some risk of interference to migratory fish species, particularly those returning to rivers from sea, cannot be completely ruled out. Effects on salmonid smolts or adult eels migrating to sea are very unlikely. There is insufficient knowledge of adult fish migration patterns to completely rule out effects but significant effects seem unlikely. However, because of the high importance of salmonids in particular, and lack of documented knowledge of effects of half tidal barriers on salmonid migration, it is important to minimise this risk as far as possible.</p> <p>Impounded areas may in theory be mildly beneficial to fish such as mullet, flounder, common gobies and juvenile bass since it will give them additional habitat at low</p>	<p>Installation of suitable fish ladder. This will require consideration of different modes of migration (bottom migrators such as lamprey and possibly eel; midwater migrators such as adult sea trout and salmon). Research will need to be undertaken to design an appropriate fish pass that will allow passage of fish species within the limitations of the study area.</p> <p>For all options, construction activities will need to consider fish migration times in order to avoid undue siltation and possibly deoxygenation of the water during dredging. This will involve liaison with DAFF staff. This will also apply for any maintenance dredging.</p> <p>Water quality - this will need to consider the potential disturbance of contaminated material,</p>	<p>Likely to be minimal long term effects on migratory fish if a suitable fish pass can be designed and maintained. It is possible that feeding habitats for some fish may be affected but this is difficult to gauge as the relative importance of permanently impounded versus intertidal areas for feeding is unknown.</p> <p>It should be possible to carry out timing and nature of construction and maintenance work so as to minimise effects on fish.</p> <p>A full assessment of construction activities would need to be undertaken once details of construction techniques are known.</p>	<p>Knowledge of general fish populations and migratory fish movements within the whole estuary would improve ability to assess changes.</p>

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>water. However, it is possible that this will be of less overall feeding value than the present intertidal areas. Overall significance is unclear based on available data, but is likely to be a permanent detrimental effect.</p> <p>Changes in water quality, particularly during construction (disturbance of sediments), will need to be considered.</p>	<p>particularly within the Inner Harbour.</p>		
	<p>Saltmarsh</p> <p>Further botanical surveys and studies of upstream flooding and water quality are required before impacts on the saltmarsh and other upstream river habitats can be fully assessed.</p>	<p>To await full assessment.</p>		<p>Further botanical surveys.</p>
	<p>Other intertidal habitats</p> <p>An estimated 75 – 80% of intertidal habitat will be permanently lost. This includes relatively rich areas in the mid-estuary that are of importance as feeding areas for birds and fish. These will be replaced with what is likely to be a permanently submerged mud that is likely to</p>	<p>None anticipated possible based on the available information.</p>		<p>Ongoing inter-tidal habitat survey findings.</p> <p>Relative importance of different areas to fish during tidal states.</p>

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>quickly become anoxic just below the surface and thus to be less rich in animals. Seaweed dominated communities on vertical walls will be considerably reduced in extent. These habitats are all of very limited extent within the Isle of Man, especially since the impoundments at Douglas and Peel. This is considered to represent a permanent impact of major significance.</p>			
Option 4	<p>Birds</p> <p>An estimated 55 - 60% of intertidal feeding areas important for a variety of birds including redshank and other waders, all year round but especially in winter will be permanently lost. This is considered to represent a major permanent impact.</p> <p>In terms of disturbance during construction, although some disturbance is likely to arise from construction activity, it is unlikely that any of the options is dramatically better or worse than any other. Oystercatcher bred in the shingle adjacent to this site in 2008. This may affect the</p>	As Option 1 above.	As Option 1 above	As Option 1 above

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	construction programme (breeding season April to July).			
	<p>Fish</p> <p>Migratory fish and water quality - as Option 1 above.</p> <p>Impounded areas may in theory be mildly beneficial to fish such as mullet, flounder, common gobies and juvenile bass since it will give them additional habitat at low water. However, it is possible that this will be of less overall feeding value than the present intertidal areas. Overall significance is unclear based on available data, but is likely to be a permanent detrimental effect (less than Option 1).</p>	As Option 1	As Option 1 above	As Option 1 above
	<p>Saltmarsh</p> <p>As Option 1 above.</p>	As Option 1 above		As Option 1 above
	<p>Other intertidal habitats.</p> <p>An estimated 55 - 60% of intertidal habitat will be permanently lost. This includes relatively rich areas in the mid-estuary that are of importance as</p>	As Option 1 above		As Option 1 above

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>feeding areas for birds and fish. These will be replaced with what is likely to be a permanently submerged mud that is likely to quickly become anoxic just below the surface and thus to be less rich in animals. Seaweed dominated communities on vertical walls will be reduced in extent in places. These habitats are all of very limited extent within the Isle of Man, especially since the impoundments at Douglas and Peel. This is considered to represent a permanent impact of major significance.</p>			
Option 7	<p>Birds</p> <p>An estimated 45 - 50% of intertidal feeding areas important for a variety of birds including redshank and other waders, all year round but especially in winter will be permanently lost. This is considered to represent a major permanent impact.</p> <p>Construction disturbance as Option 4.</p>	As Option 1 above.	As Option 1 above.	As Option 1 above.

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>Fish</p> <p>Migratory fish and water quality - as Option 1</p> <p>Impounded areas may in theory be mildly beneficial to fish such as mullet, flounder, common gobies and juvenile bass since it will give them additional habitat at low water. However, it is possible that this will be of less overall feeding value than the present intertidal areas. Overall significance is unclear based on available data, but is likely to be a permanent detrimental effect (less than Option 1, 4, and 10).</p>	As Option 1 above	As Option 1 above	As Option 1 above
	<p>Saltmarsh</p> <p>As Option 1.</p>	As Option 1 above		As Option 1 above
	<p>Other intertidal habitats</p> <p>An estimated 45 - 50% of intertidal habitat will be permanently lost. This includes relatively rich areas in the mid-estuary that are of importance as feeding areas for birds and fish. These will be replaced with what is likely to be a permanently</p>	As Option 1 above		As Option 1 above

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>submerged mud that is likely to quickly become anoxic just below the surface and thus to be less rich in animals. Seaweed dominated communities on vertical walls will be reduced in extent in places. These habitats are all of very limited extent within the Isle of Man, especially since the impoundments at Douglas and Peel. This is considered to represent a permanent impact of major significance.</p>			
Option 8	<p>Birds</p> <p>An estimated 20 - 25% of intertidal feeding areas important for a variety of birds including redshank and other waders, all year round but especially in winter will be permanently lost. This is a much lower percentage than other options but the area seems to represent more favoured feeding ground than many other areas. This is considered to represent a moderate to major permanent impact, but this option is the only one to retain reasonable amounts of areas suitable for those species encountered in the estuary.</p>	As Option 1 above	As Option 1 above	As Option 1 above

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	Construction disturbance as Option 4.			
	<p>Fish</p> <p>Minimal effects on migratory fish species.</p> <p>Unlikely to be major effects on other species. Intertidal losses relatively low and unlikely to have major impact on other fish species such as mullet, bass, flounder, and gobies. It is possible that the additional sub-tidal habitat available within the impounded area when the tide is out elsewhere in the harbour, may be beneficial.</p> <p>Changes in water quality, particularly during construction (disturbance of sediments), will need to be considered.</p>	<p>Fish ladder not required.</p> <p>Construction activities (timing and methods) will have to take careful account of fish migration times in order to avoid undue siltation, and possibly also deoxygenation of the water during dredging. This will involve liaison with DAFF staff. This will also apply to any maintenance dredging. More opportunities to minimise adverse effects than for options 1, 4 and 7.</p>	As Option 1 above.	<p>As Option 1 above</p> <p>Some knowledge of fish populations in the old harbour area would be desirable but much less so than for options 1, 4, 7 and 10.</p>
	<p>Saltmarsh</p> <p>Very unlikely to be affected, assuming that there is no major change to the hydrographic regime / water quality.</p> <p>Assessment to be confirmed</p>	As Option 1 above		As Option 1 above

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	following hydrodynamic model calibration/verification.			
	<p>Other intertidal habitats.</p> <p>Around 20 - 25% of intertidal habitat will be permanently lost. These areas will be replaced with what is likely to be a permanently submerged mud that is likely to quickly become anoxic just below the surface and thus to be less rich in animals. Seaweed dominated communities on vertical walls will be slightly reduced in extent. These habitats are all of very limited extent within the Isle of Man, especially since the impoundments at Douglas and Peel. This is considered to represent a permanent impact of moderate to major significance.</p>	As Option 1 above		As Option 1 above
Option 10	<p>Birds</p> <p>An estimated 50 - 55% of intertidal feeding areas important for a variety of birds including redshank and other waders, all year round but especially in winter will be permanently lost. This is considered to represent a major</p>	As Option 1 above	As Option 1 above	As Option 1 above

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>permanent impact.</p> <p>Construction disturbance as Option 4.</p>			
	<p>Fish</p> <p>Migratory fish and water quality - as Option 1 above.</p> <p>Impounded areas may in theory be mildly beneficial to fish such as mullet, flounder, common gobies and juvenile bass since it will give them additional habitat at low water. However, it is possible that this will be of less overall feeding value than the present intertidal areas. Overall significance is unclear based on available data, but is likely to be a permanent detrimental effect (less than Options 1 and 4).</p>	As Option 1 above	As Option 1 above	As Option 1 above
	<p>Saltmarsh</p> <p>As Option 1 above.</p>	As Option 1 above		As Option 1 above
	<p>Other intertidal habitats.</p> <p>An estimated 50 - 55% of</p>	As Option 1 above		As Option 1 above

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>intertidal habitat will be permanently lost. This includes relatively rich areas in the mid-estuary that are of importance as feeding areas for birds and fish. These will be replaced with what is likely to be a permanently submerged mud that is likely to quickly become anoxic just below the surface and thus to be less rich in animals. Seaweed dominated communities on vertical walls will be reduced in extent in places. These habitats are all of very limited extent within the Isle of Man, especially since the impoundments at Douglas and Peel. This is considered to represent a permanent impact of major significance.</p>			
<p>Summary statement: It is considered that Option 8 would be the preferred Option in terms of ecology. As the River Sulby would not be completely impounded, there would be less habitat loss, limited upstream impacts and effects on fish migration.</p>				

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
CULTURAL HERITAGE				
Option 1	<p>In terms of the possible marina facilities, the boat park, access road, car park and leisure berths would all potentially impact the area of the Old Harbour, including the BKW shipyard and ground thereof.</p> <p>Harbour entrance and primary exit for River Sulby since 1880's. Option 1 will involve localised structural disturbance to the North and South Pier(s) due to construction works.</p> <p>Potential for disturbance to foundations of 18th century lighthouse and coastal battery.</p> <p>Limited potential for damage to archaeological deposits, although flint remains (probably pre-historic) have been recorded within the locality.</p> <p>Crossing should not physically impact Ramsey Conservation Area and buildings listed under the Isle of Man Protected</p>	<p>Archaeological monitoring and investigation during construction work, largely via an archaeological watching brief. The watching brief will record features and deposits in outline and make provision for the detailed recording of any important archaeology.</p> <p>Desk-based study to resolve issues relating to the visual impact of the scheme upon protected buildings.</p> <p>Archaeological assessment of borehole data in order to provide palaeo-environmental evidence for the sediments within the impact area.</p>	<p>Archaeological watching brief and recording will preserve by means of record any archaeological information lost due to impact.</p> <p>Desk-based study will seek to resolve visual impact issues.</p> <p>Borehole data / assessment will provide compensatory information to offset impact to archaeology.</p>	<p>Current data gaps are lack of data concerning sediments – to be addressed via borehole survey, and lack of seabed survey data – to be addressed through analysis of geophysical data.</p>

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>Buildings Register (IMPBR).</p> <p>Impacts on possible archaeological deposits associated with the Old River / Harbour. Viking artefacts are recorded within the locality and potential for disturbance to deposits and maritime remains dating back to at least the Viking Age.</p> <p>Inner Harbour may require commercial 'tanking' (lining) as eastern edge is a loose shingle bank = disturbance.</p> <p>Impact to potential archaeological material due to engineering and construction work.</p>			
Option 4	<p>In terms of the possible marina facilities, the boat park, access road, car park and leisure berths would all potentially impact the area of the Old Harbour, including the BKW shipyard and ground thereof.</p> <p>Complex due to size and scale of area impacted both for location of retention gate effects on Inner</p>	As above	As above	As above

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>Harbour.</p> <p>Impacts on possible archaeological deposits associated with the Old River / Harbour. Viking artefacts are recorded within the locality and potential for disturbance to deposits and maritime remains dating back to at least the Viking Age.</p> <p>Based on available data, option 4 would have a significant impact both physically and visually, on the Ramsey Conservation Area. May visually impact Ramsey Swing Bridge, a proposed Protected Building.</p> <p>Inner Harbour may require commercial 'tanking' (lining) as eastern edge is a loose shingle bank = disturbance.</p> <p>Impact to potential archaeological material due to engineering and construction work.</p>			
Option 7	As Option 4, but from available data, there would be no physical impact on Ramsey Conservation Area, but there would be a visual	As above	As above	As above

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	impact. May visually impact Ramsey Swing Bridge proposed protected building.			
Option 8	<p>As Option 4, but from available data there would be a limited impact on Ramsey Conservation Area and buildings protected under the IMPBR.</p> <p>Construction effects would be limited to a smaller area than for Options 1, 4, 7 and 10.</p>	As above	As above	As above
Option 10	As Option 4, but based on available data there would be a visual and physical impact to Ramsey Swing Bridge, a proposed Protected Building, and to Ramsey Conservation Area.	As above	As above	As above
<p>Summary Statement: Options 1 and 8 have been assessed as having the lowest direct and visual archaeological impacts based on the location of the retention gate. Works within the Inner Harbour have been considered for all options and it has been identified that all options will disturb potential archaeology within the Inner Harbour area, the extent depending on the final layout.</p>				

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
SOCIO-ECONOMICS				
Option 1	<p>One of the main impacts would be that of the shorter discharge period for commercial vessels due to time allowance for the gate. At present the largest vessels can access up to 2.5 hours before high tide and leave up to 2.5 hours after.</p> <p>Concern of river debris backing up behind retention gate.</p> <p>Would mean loss of drying out / maintenance space within the harbour area.</p> <p>Impound both current slipways, limiting access to launching of craft.</p> <p>Loss of use of the grid located on West Quay, north of the Swing Bridge.</p> <p>Restricted access for sailing club vessels, especially safety boats that may require quick egress.</p> <p>Greater difficulty in maintaining 'rail' lifting dock if inner harbour</p>	<p>Provision of a third slipway which allows access to the seaward side of any water retention gate and access to the open sea. (Possibility next to existing trailer park on North Shore, although exposed to north westerly winds).</p> <p>Increased build of affordable homes within Ramsey.</p>	<p>Many of the impacts remain and are not easily mitigated against. Provision of storage / drying out space is likely to prove costly and therefore potentially financially unviable.</p> <p>If vessels are unable to dry out it may also mean they begin to dock elsewhere reducing the commercial element of the harbour which the Ramsey Local Plan looks to retain.</p> <p>Where negative impacts are felt locally due to increased property prices, the construction of affordable housing should neutralise impacts.</p>	<p>Masterplan layout.</p> <p>Information relating to planned highway marking changes particularly around Mooragh Promenade and Old River Road.</p>

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>flooded.</p> <p>Ecological impact on Poyll Dooey nature reserve.</p> <p>Loss of space on Commercial Berth 1 due to construction of Water retention gate.</p> <p>Mooragh Park is salt water filled. Retention gates may impact on this.</p> <p>Marina design – ramps to mooring pontoons are opposite boat / trailer park and planned double yellow lines on Old River Road / Mooragh Promenade will restrict drop off possibility.</p> <p>Additional retained area of water bringing increased berthing opportunities for pleasure craft.</p> <p>Increased spend within the locality from berth owners and visiting craft.</p> <p>Increased property prices due to retained water frontage benefit for local and could attract incomers.</p> <p>Increased property prices could make area unaffordable for local people.</p> <p>Critical mass among leisure craft will enable high quality events</p>			

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	and festivals, bringing benefits of associated spend and visitors.			
Option 4	<p>Loss of space of commercial berth 4 due to retention gate being seaward of existing Swing Bridge.</p> <p>Loss of use of the grid located along West Quay.</p> <p>Greater difficulty in maintaining rail lifting dock.</p> <p>For taller vessels there would be two obstacles in close succession – the swing bridge & the water retention gate.</p> <p>Impound both current slipways, limiting access to launching of craft.</p> <p>Water retention may impact on Poyll Dooley nature reserve.</p> <p>Restricted access for sailing club vessels, particularly safety boats.</p> <p>Concern of river debris backing up in the harbour area.</p> <p>Limited drying out / maintenance space for leisure craft currently moored along the West Quay.</p> <p>Mooragh Park is salt water filled. Retention gates may impact on</p>	<p>Provision of a third slipway on the seaward side of any retention gate to allow access to the open sea.</p> <p>Provision of alternative drying out / maintenance space for leisure craft.</p> <p>Increased build of affordable homes within Ramsey.</p>	<p>Many of the impacts are not easily mitigated against and mitigation for some may prove costly.</p> <p>To ensure the continued commercial use of the harbour it is essential that maintenance / drying out is possible. This is also key for some of the larger leisure vessels who require maintenance / drying out.</p> <p>Allowing launch access on the seaward side of any water retention gate would reduce the number of vessels wishing to pass through the harbour at high tide. However, this requires associated vehicle and trailer storage close to the slip.</p> <p>Where negative impacts are felt locally due to increased property prices, the construction of affordable housing should neutralise impacts.</p>	As above

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>this.</p> <p>Marina design – ramps to mooring pontoons are opposite boat / trailer park and planned double yellow lines on Old River Road / Mooragh Promenade will restrict drop off possibility.</p> <p>Operation / use of the swing bridge by vehicles and pedestrians may be impacted due to increased use of Swing Bridge to allow access / egress to and from berths. Therefore restricting access (particularly pedestrian) to North Key and facilities such as the leisure centre.</p> <p>Additional retained area of water bringing increased berthing opportunities for pleasure craft.</p> <p>Increased spend within the locality from berth owners and visiting craft.</p> <p>Increased property prices due to retained water frontage benefit for local and could attract incomers.</p> <p>Increased property prices could make area unaffordable for local people.</p> <p>Critical mass among leisure craft will enable high quality events</p>			

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	and festivals, bringing benefits of associated spend and visitors.			
Option 7	<p>Option presents two obstacles between berths and the open sea (swing bridge & water retention gate).</p> <p>Slight loss of mooring space along West Quay for leisure craft.</p> <p>Option impounds the current slipways used for the launching of vessels.</p> <p>Concern of tidal range reaching that required to allow gates to open / operate effectively (height of 2.6m discussed).</p> <p>Water retention may impact on Poyll Dooley nature reserve.</p> <p>Loss of rail lifting dock if inner harbour flooded.</p> <p>Limits drying out period currently experienced along West Quay.</p> <p>Loss of use of the grid located along West Quay.</p> <p>Mooragh Park is salt water filled. Retention gates may impact on this.</p> <p>Marina design – ramps to mooring pontoons are opposite</p>	<p>Provision of a third slipway on the seaward side of any retention gate to allow access to the open sea.</p> <p>Provide maintenance / drying out space elsewhere for those currently using the Grid along West Quay.</p> <p>Increased build of affordable homes within Ramsey.</p>	<p>Where negative impacts are felt locally due to increased property prices, the construction of affordable housing should neutralise impacts.</p>	<p>As above</p>

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>boat / trailer park and planned double yellow lines on Old River Road / Mooragh Promenade will restrict drop off possibility.</p> <p>Operation / use of the swing bridge by vehicles and pedestrians may be impacted due to increased use of Swing Bridge to allow access / egress to and from berths. Therefore restricting access (particularly pedestrian) to North Key and facilities such as the leisure centre.</p> <p>Additional retained area of water bringing increased berthing opportunities for pleasure craft.</p> <p>Increased spend within the locality from berth owners and visiting craft.</p> <p>Increased property prices due to retained water frontage benefit for local and could attract incomers.</p> <p>Increased property prices could make area unaffordable for local people.</p> <p>Critical mass among leisure craft will enable high quality events and festivals, bringing benefits of associated spend and visitors.</p>			

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
Option 8	<p>Mooragh Park is salt water filled. Retention gates may impact on this.</p> <p>Tidal range would need to be quite high in order to open gates – concern that period of opening would be limited. (dependant on engineering works and size of vessel).</p> <p>Pedestrian access may be an issue if link provided over retention gate. There is currently no link through the Shipyard.</p> <p>Marina design – ramps to mooring pontoons are opposite boat / trailer park and planned double yellow lines on Old River Road / Mooragh Promenade will restrict drop off possibility.</p> <p>Additional retained area of water bringing increased berthing opportunities for pleasure craft.</p> <p>Increased spend within the locality from berth owners and visiting craft.</p> <p>Increased property prices due to retained water frontage benefit for local and could attract incomers.</p> <p>Increased property prices could</p>	<p>Increased build of affordable homes within Ramsey.</p>	<p>Where negative impacts are felt locally due to increased property prices, the construction of affordable housing should neutralise impacts.</p>	<p>Socio-economic assessment to be undertaken on Options 8 and 10.</p>

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>make area unaffordable for local people.</p> <p>Critical mass among leisure craft will enable high quality events and festivals, bringing benefits of associated spend and visitors.</p>			
Option 10	<p>Impounds current slipway used for launching of smaller craft.</p> <p>Water retention may impact on Poyll Dooley nature reserve.</p> <p>Loss of rail lifting dock if inner harbour flooded.</p> <p>Limits drying out period along West Quay.</p> <p>Loss of use of grid along West Quay.</p> <p>Mooragh Park is salt water filled. Retention of water may impact on this.</p> <p>Operation / use of the swing bridge by vehicles and pedestrians may be impacted due to increased use of Swing Bridge to allow access / egress to and from berths. Therefore restricting access (particularly pedestrian) to North Key and facilities such as the leisure centre.</p>	<p>Provision of a third slipway on the seaward side of any retention gate to allow access to the sea.</p> <p>Provide maintenance / drying out space elsewhere for those currently using the Grid along West Quay.</p> <p>Increased build of affordable homes within Ramsey.</p>	<p>Where negative impacts are felt locally due to increased property prices, the construction of affordable housing should neutralise impacts.</p>	<p>Socio-economic assessment to be undertaken on Options 8 and 10.</p>

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>Marina design – ramps to mooring pontoons are opposite boat / trailer park and planned double yellow lines on Old River Road / Mooragh Promenade will restrict drop off possibility.</p> <p>Additional retained area of water bringing increased berthing opportunities for pleasure craft.</p> <p>Increased spend within the locality from berth owners and visiting craft.</p> <p>Increased property prices due to retained water frontage benefit for local and could attract incomers.</p> <p>Increased property prices could make area unaffordable for local people.</p> <p>Critical mass among leisure craft will enable high quality events and festivals, bringing benefits of associated spend and visitors.</p>			

Summary statement: All options bring a number of potentially beneficial impacts, including a) Additional retained area of water bringing increased berthing opportunities for pleasure craft; b) Increased spend within the locality from berth owners and visiting craft; c) Increased property prices due to retained water frontage benefit for local and could attract incomers; and d) Critical mass among leisure craft will enable high quality events and festivals, bringing benefits of associated spend and visitors.

Of the options assessed, Option 8 clearly presents the least number of negative impacts to existing harbour users and potentially the environment. All options which would result in the retention of water within the inner harbour area (1, 4, 7, and 10) present impacts in relation to loss of drying out and maintenance space within the

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
<p>harbour (currently undertaken during low water).</p> <p>Options 4 and 7 present impacts in terms of having two barriers in close proximity to one another, due to the location of the swing bridge and concerns were raised during discussions with regards to the swing bridge remaining open on high tide due to only a short period when the retention gates could be opened. This concern is also relevant to Option 10 which follows the line of the existing swing bridge.</p> <p>Option 1 presents impacts in terms of the discharge time of vessels looking to access, unload and egress on a tide due to the retention gate restricting movements.</p> <p>Option 8 presents the least impacts on the existing operations of the inner harbour. However, the proposed pedestrian bridge link would need to be completed to access the proposed boat park.</p> <p>All options would ultimately impound water within the proposed marina area which may impact on Mooragh Park, currently salt water filled on spring tides and drained annually.</p> <p>The masterplan layout has not yet been provided, but needs to consider access to mooring pontoons – available information shows that the access to the mooring pontoons is achieved via Old River Road, while the proposed boat park / car park is illustrated within the North Shore area. Proposals for double yellow lines around Mooragh Promenade and along Old River Road would further compound issues of access to mooring pontoons, restricting stopping within the area.</p> <p>Options 8 & 10 will now be subject to a detailed cost / benefit analysis which will utilise this constraints chapter as a baseline from which to undertake a detailed analysis of the socio-economic benefits and costs of the two options.</p>				

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
VESSEL MOVEMENTS				
Option 1	<p>Loss of drying-out facilities in inner harbour.</p> <p>Possible reduction in width of the harbour entrance.</p> <p>BWK shipyard would require significant alterations to facilities in order to continue.</p> <p>Impediment to free movement of commercial <u>and</u> leisure vessels within the harbour at lower states of tide.</p> <p>Improved mooring facilities for all leisure vessels in the Inner and Outer Harbours.</p>	<p>Ensure that the width and depth of channel are not reduced by structure.</p> <p>Liaise with BWK Shipyard regarding alterations to facility.</p>	<p>Unable to relocate drying-out facilities.</p> <p>Adverse impact on mooring areas and wave climate would be less severe than Options 4 and 7.</p> <p>Improved mooring facilities for leisure vessels and fishing fleet in inner and outer harbours.</p> <p>BWK shipyard would require significant alterations to facilities in order to continue.</p>	<p>Carry out a full cost-benefit analysis for each option, based on masterplan.</p>
Option 4	<p>Reduced navigational space in outer harbour.</p> <p>Loss of No.5 Berth.</p> <p>Increased swell within outer harbour.</p> <p>Loss of drying-out facilities in inner harbour.</p>	<p>Mooring facilities could be provided along the new crossing. However, they would be exposed to wave action through entrance.</p> <p>Incorporate a permeable / sloping revetment to increase wave energy absorption.</p> <p>Relocate drying-out grid to outer</p>	<p>May be difficult to find alternative location for drying-out grid. If a revetment can be designed so as to provide current wave climate then wave energy may not be an issue.</p> <p>Mooring areas will be reduced in outer harbour, but fishing and leisure vessels may be in favour if improved facilities are provided within the inner harbour. BWK</p>	<p>Carry out a full cost-benefit analysis for each option, based on masterplan.</p>

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
	<p>BWK shipyard would require significant alterations to facilities in order to continue.</p> <p>Impediment to free movement within the harbour at lower states of tide. Improved mooring facilities for all leisure vessels in the inner harbour.</p>	<p>harbour to provide replacement facilities.</p> <p>Provide improved mooring and access for fishing fleet.</p> <p>Provide improved mooring and access for fishing fleet to offset No. 5 Berth.</p> <p>Liaise with Shipyard regarding alterations to facility.</p>	<p>shipyard would require significant alterations to facilities in order to continue operation.</p>	
Option 7	<p>Loss of No.6 Berth.</p> <p>Reduced access to BWK shipyard.</p> <p>BWK shipyard would require significant alterations to facilities in order to continue operation.</p> <p>Loss of drying-out facilities in inner harbour.</p> <p>Impediment to free movement within harbour at lower states of tide.</p> <p>Improved mooring facilities for all leisure vessels within the Inner Harbour.</p>	<p>Relocate drying-out grid to outer harbour. Provide improved mooring and access for fishing fleet to offset No.6 Berth lost.</p> <p>Liaise with BWK Shipyard regarding alterations to facility.</p>	<p>Improved mooring facilities for leisure vessels and fishing fleet in inner harbour.</p> <p>BWK shipyard would require significant alterations to facilities in order to continue.</p>	<p>Carry out a full cost-benefit analysis for each option, based on masterplan.</p>

Option	Assessment of Impacts	Possible Mitigation	Assessment After Mitigation	Data Gaps
Option 8	<p>Neutral impact on commercial marine movements due to location of retention gate.</p> <p>Improved mooring facilities for only those leisure vessels in the Old Harbour.</p> <p>Recreational vessels would have to wait until half tide to exit impounded areas</p>		<p>Neutral impact on commercial marine movements due to location of retention gate.</p> <p>Improved mooring facilities for leisure vessels.</p>	<p>Carry out a full cost-benefit analysis for each option, based on masterplan</p>
Option 10	<p>Loss of drying-out facilities in inner harbour.</p> <p>Possible reduction in width of the harbour entrance.</p> <p>BWK shipyard would require significant alterations to facilities in order to continue.</p> <p>Impediment to free movement of commercial <u>and</u> leisure vessels within the harbour at lower states of tide.</p> <p>Improved mooring facilities for all leisure vessels in the Inner and Outer Harbours.</p>	<p>Ensure that the width and depth of channel are not reduced by structure.</p> <p>Liaise with BWK Shipyard regarding alterations to facility.</p>	<p>Unable to relocate drying-out facilities.</p> <p>Adverse impact on mooring areas and wave climate would be less severe than Options 4 and 7.</p> <p>Improved mooring facilities for leisure vessels and fishing fleet in inner and outer harbours.</p> <p>BWK shipyard would require significant alterations to facilities in order to continue.</p>	<p>Carry out a full cost-benefit analysis for each option, based on masterplan</p>

Summary Statement: All of the options have an impact on marine navigation, because they all include a mid-tide gate. Option 8 has the least significant impact of all the options as it does not impound the main harbour area. If any of the options to impound the main harbour are taken forward the impact on BWK Shipyard needs to be considered.

