DKM
ECONOMIC
CONSULTANTS

Galway Harbour Extension
Business Case & Cost Benefit Analysis

Final Report
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This document was prepared by:
DKM Economic Consultants Ltd., Office 6 Grand Canal Wharf, South Dock Road, Ringsend, Dublin 4, Ireland. Telephone: 00 353 1 6670372. Email: info@dkm.ie. Website: www.dkm.ie

EXECUTIVE SUMMARY

Introduction

Galway Harbour Company (GHC) is currently preparing a planning permission application to An Bord Pleanála (ABP) regarding a major extension of the port. This is designed to enable the relocation of commercial activities out of the Inner Dock area and essentially free the port from the tidal and capacity limitations imposed by the latter.

The project has been designated as a Strategic Infrastructure Project (SIP), which means the planning application goes directly to ABP. The Natura Impact Statement (NIS) prepared for the proposed harbour extension has concluded that adverse impact on the Natura 2000 site cannot be ruled out. For this reason among others, the application for the harbour extension must assess, among other things, alternative solutions with a view to establishing whether there is an alternative that would involve less damage to a Natura 2000 site.

A Business Case and a Cost Benefit Analysis (CBA) are required as part of the process, not only as back-up of the socio-economic case, but because they are a requirement of the Department of Transport in order for the Minister to grant permission for the project to proceed.

The Business Case for Phase One of the project has been prepared by Raymond Burke Consulting (RBC). GHC has requested DKM Economic Consultants to undertake both a review of this Business Case and a CBA. The financial business case for a project in effect represents the first stage of a socio-economic CBA. This report presents DKM's findings.

Options & Alternatives

In carrying out a CBA of a capital project, it is important to consider alternative means of delivering the sought-after benefits. The *Public Spending Code* requires that all realistic alternative ways of achieving the stated objectives are examined critically, and that in particular the "Do Nothing"/"Do Minimum" option be considered.

Following discussion with the GHC and other members of their advisory/design team, we initially considered the following options for the purposes of the socioeconomic CBA:

1. Do Minimum/Without Development – continue with the current configuration in the existing port.
2. Do Project/With Development, Phase One as per the Business Case;
3. Do Alternative – i.e. to the degree possible cater for the expected additional port traffic elsewhere in Ireland, taking into account additional road transport and landside investment where appropriate. This is considered in more detail below.

With respect to the current project, the key question is, could the proposed additional business be handled at a different port, and if so, at what cost,

including the implications for Galway and the surrounding region? A more detailed analysis of the alternatives has been compiled by McCarthy Keville O'Sullivan Ltd., Planning & Environmental Consultants, as part of the planning process for the project.

Having reviewed the various strands of business for the port, there are a number of categories of projected additional business proposed that would appear to be problematic from the point of view of identifying alternatives ports that could handle the business. In addition:

- Galway Port itself would suffer from the transfer of business to other ports, and there might be question marks over its longer term viability,
- There would be negative implications for economic activity in the region, as costs would be higher and enterprises might relocate to be closer to the alternative ports. Some elements of additional business might not be viable. This would conflict with Government regional development policy.
- The proximity principle would be contravened as the nearest alternative major port (Shannon-Foynes) is approximately 130km from Galway city.

This should be seen as a high level initial analysis, however, and one could only be confident of the conclusion if one had access to the internal management plans of the port customers in question, which is not possible. Furthermore, given the timeframe under consideration, the scope for business, market and technical change in the sectors in question is substantial.

On this basis, **we do not construct a separate 'Do Alternative' option**.

Business Case

The Business Case for this project was compiled initially by RBC, and validated by DKM. DKM's Base Case results can be summarised as follows:

Upfront Capex (€ million)	51.6		
Proceeds of Land Sales	24.6		
Net Cost	27.1		
Business Case	**With Project**	**Without Project**	**Net Impact**
NPV (€'000)	34,470	21,483	12,986
IRR	12.9%	n/d	7.8%

The analysis carried out by DKM has confirmed that for the Base Case scenario there is a Business Case for the proposed Harbour Extension. This is reflected in the fact that the Extension generates a positive €13 million over the period of analysis, on a Net Present Value (NPV) basis, with an Internal Rate of Return (IRR) of 7.8%.

Furthermore, we understand that the port company is having discussions with a number of potential new customers who have indicated that they would consider

using Galway Port if the development goes ahead (business volumes in the first 8 months of 2013 are up 13% on the same period of 2012). The inclusion of this potential new business, for which, we understand, Galway would be the port of choice, would attract additional volumes which would further strengthen the business case.

Our model projects port tonnage stabilising at just under two million tonnes per annum (Base Case), compared to just over 0.5 million tonnes per annum if the project does not proceed.

Uncertainty and the requirement to use long-term forecasts in many cases have forced us to make a number of assumptions. Realistic assumptions will reduce the level of uncertainty but will not eliminate it. As such, the results of the analysis are potentially associated with a wide margin of error.

Scenario/sensitivity analysis can address this. The following sets out the variations that we have tested on the Base Case:

1. Discount/interest rate +50%
2. Upfront capital expenditure +50%
3. Valuation of benefits -50%
4. Cruise & Marina business fails to grow
5. Grant aid/contributions received of €10 million.

We have also tested scenarios whereby expected future cargo business growth fails to materialise.

The Base Case is vulnerable to scenarios 2 and 3, and to some instances whereby future business fails to materialise. However, it is important to note that Galway Harbour Company overall remains highly profitable under all these scenarios. Grant aid/contributions from customers, reflective of the project's wider economic benefits (discussed below), would further insulate the project from these risks.

Economic Appraisal

The socioeconomic CBA takes the net cash flows from the financial appraisal, adjusts them to shadow prices (i.e. true economic prices) including a 50% premium for the shadow price of public funds (where appropriate), and adds the wider economic benefits and the external costs to the calculation. It then applies a social discount rate of 4% real.

A number of wider economic benefits flow from the project. These add to the overall GDP of the economy, in addition to the increased profitability of the port itself. Existing and/or new port customers can reduce their costs, either because:

(i) The extended Galway harbour can handle larger and more economical ships, leading to cheaper cargo, and/or

(ii) Galway harbour is nearer than the next best port and thus land transport costs are reduced.

Likewise, the projected increase in marina and cruise business can generate additional economic activity and employment in the local and regional tourism sector.

Other positive impacts of the project are that,

(i) with the movement of petroleum-related activities out of the Inner Dock, the Seveso-restricted area of the port will be moved away from the city centre (while the storage facilities will not be moved, the ship discharging fuel is a Seveso site while discharging). This may have a positive impact on future planning applications in the city centre.
(ii) By minimising land transport requirements the carbon footprints of the port's customers are reduced (internalised via the carbon tax).
(iii) During the construction phase of three years some 190 Full Time Equivalent (FTE) jobs will be generated, while in the tourism industry some 73 additional FTE permanent jobs will be generated; the project will also underpin employment in the port, its suppliers and customers.

The major negative impact of the proposed project is that it encroaches upon a Natura 2000 Special Area of Conservation (SAC) in Galway Bay. It is beyond the scope of this report to measure this impact, but other studies are being undertaken for this purpose, which we understand will indicate that adverse impacts cannot be ruled out.

Socio-Economic Cost Benefit Analysis Results

Having made the above adjustments, we can present the results of the socio-economic analysis of the project as follows, in the Base Case:

Base Case	Direct Return With Development	Net Wider Economic Costs	Net Wider Economic Benefits	CBA With Project	CBA Without Development	Net Socio-economic Impact of Project
NPV (€'000)	38,940	0	131,162	**170,102**	**22,693**	**147,409**
IRR	12.9%			**31.3%**	**n/d**	**26.8%**

n/d .. not defined.

As can be seen, while the business case Base Case indicates that the project is profitable for the port, when wider economic impacts are taken into account the benefit of the project to society is substantially greater. The High Case generates yet higher societal returns.

The net wider economic impacts of the project to society are very substantial, and dwarf those for GHC itself.

We would reiterate that future port traffic growth estimates are based on correspondence and meetings with the relevant business managements regarding their plans if the port extension Phase One proceeds. We did not carry out due diligence on the respective business plans.

As with any project such as this, there are a number of significant uncertainties, and they are considered via **scenario and sensitivity** analysis. We have tested the CBA Base Case results using essentially the same list of scenarios as for the business case above.

The socio-economic NPV of the project remains highly positive for all these scenarios. This gives comfort around the robustness of our results.

It is also worth keeping in mind that some significant positive impacts have only been qualitatively assessed, notably –

- The potential to service the oil and gas exploration business off the west coast;
- Elimination of Seveso issues around discharging oil products in the Inner Dock;
- Security of supply benefits related to storage of petroleum at Galway.

Conclusions

Our analysis has demonstrated that this project – in the Base Case – is profitable. There is also some further positive up-side which is captured in a High Case. The Base Case is vulnerable to some less positive scenarios, however the port remains highly profitable under all of these.

Furthermore, the project generates very substantial wider economic benefits (mostly for the port's commercial customers and the tourism sector), which are robust to less positive scenarios. Therefore the project is highly worthwhile from a socio-economic viewpoint.

Benefits include substantial employment during the construction phase (190 FTE jobs for three years) and in the tourism industry as a result of the increased cruise and marina business (73 additional FTE permanent jobs), as well as underpinning employment in the port, its suppliers and customers.

It must also be borne in mind that there are a number of benefits that have not been quantitatively evaluated in the Base Case (including the moving of a Seveso site out of the city centre), so it represents a somewhat conservative estimate of the total benefits.

Given the Business Case's vulnerability to some less positive scenarios in the Base Case, this would appear to justify a sharing of risk and reward between GHC, its main customers and the local business community, through for instance capital contributions or guarantees from customers and Fáilte Ireland or local or central Government.

1. INTRODUCTION

1.1 BACKGROUND

Galway Harbour Company (GHC) is currently preparing a planning permission application to An Bord Pleanála (ABP) regarding a major extension of the port. This is designed to enable the relocation of commercial activities out of the Inner Dock area and essentially freeing the port from the tidal and capacity limitations imposed by the latter.

Phase one of this project comprises:

- Reclamation of 19.86 ha of quay areas and back-up land;
- Formation of one 400m x 30m quay and one 200m x 20m quay;
- Dredging of channels to -3.5m and -8m depth;
- Dredging of a 400m diameter turning circle to –8m depth;
- Dredging of a -12m Berth pocket immediately adjacent to the proposed Quays;
- New oil and bitumen handling facility on a new 20m pier;
- Harbour related sites for general warehousing and fishing related activities, storage yards, passenger terminal and other quayside facilities;
- Refocusing of Inner Dock to concentrate on leisure-related activities.

The project has been designated as a Strategic Infrastructure Project (SIP), which means the planning application goes directly to ABP. The Natura Impact Statement (NIS) prepared for the proposed harbour extension has concluded that adverse impact on the Natura 2000 site cannot be ruled out. For this reason among others, the application for the harbour extension must assess, among other things, alternative solutions with a view to establishing whether there is an alternative that would involve less damage to a Natura 2000 site.

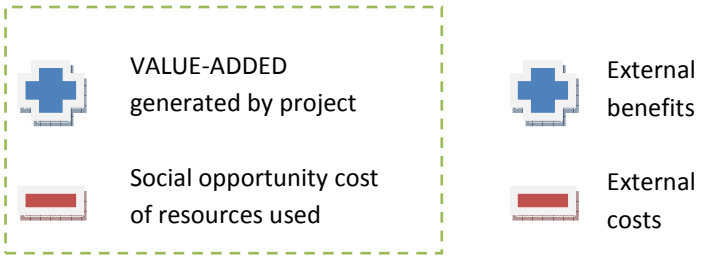
It is beyond the scope of this report to assess the trade-off between environmental and socio-economic public interests. However, a Business Case and a Cost Benefit Analysis (CBA) of Phase One, which assess alternatives, are required as part of the process, not only as back-up of the socio-economic case, but also because they are a requirement of the Department of Transport in order for the Minister to grant permission of the project to proceed.

The latest Business Case for Phase One of the project has been prepared by Raymond Burke Consulting (RBC), dated 4th June 2013. GHC has requested DKM Economic Consultants to undertake both a review of this Business Case and a CBA of the project. This report presents our findings. The financial business case for a project in effect represents the first stage of the socio-economic CBA.

1.2 PROJECT EVALUATION

1.2.1 Elements of CBA

In the discussion below we examine the elements of Cost Benefit Analysis (CBA) in more detail. The general approach to carrying out this CBA is prescribed in the *Public Spending Code*. CBA is an analysis tool used generally for projects seeking public funding, and attempts to identify the net socioeconomic benefit of a project. The net socioeconomic benefit consists of:



The **additional value-added** is made up of the additional income (profits + wages) generated by the project, and can be considered the private return to the resources (enterprise and labour) used in the project. It is generally classified into three "effects":

Direct effect – the additional income directly generated by the project itself. As a commercial concern, charging a commercial price for its services, the direct effect would comprise the additional profits plus payroll generated for the GHC by the project[1].

Indirect effect - the additional income generated in Irish-based firms supplying the project (and in Irish-based firms supplying those firms, and so on). In the current case, the indirect impact would include the additional income (profit and wages) of the firms that design and build the project, as well as firms that that supply equipment, consumables, services, etc., on an ongoing basis during the operational phase, to the extent that these firms are Irish-based.

Induced effect – the additional income generated in the economy through the spending of the incomes from the direct and indirect effects. For example, building workers and additional GHC staff spend their wages in the locale, generating income for local businesses.

The direct and some indirect impacts are generally ascertainable from the project promoter's cost estimates, while the CSO's Input-Output tables can be used to estimate the balance of the indirect and the induced impacts of expenditure on the project.

[1] Another way of measuring value added in a commercial context is sales minus non-payroll costs minus depreciation of fixed assets.

The **social opportunity cost of the resources used** represents the cost to society of using enterprise and labour resources on the project. It is effectively their value in the next best use, and is often referred to as the shadow price.

In a fully employed economy, it is generally taken that the shadow price of resources used is 100%, i.e. it equals the market price. The rationale is that, in the absence of the project, the resources could be put to an equally productive use elsewhere in the economy. However, where there is unemployment in the economy, then the price paid for labour by the project would likely be above the value of its next best use – it would be appropriate to use a shadow price of less than 100%.

A key case in point is construction, currently in a severe downturn which is unlikely to improve substantially in the short term[2]. The construction sector is currently not fully employed (i.e. has spare capacity) and can be expected to remain so for the coming number of years at least.

The Department of Finance CSF Evaluation Unit's *Proposed Working Rules for Cost Benefit Analysis* (1999) state that a minimum of 80% should be applied as the shadow price of construction labour, and defended based on market conditions. The rules also state that a sensitivity analysis of a shadow wage of 100% should also be considered. These parameters are in the process of being reviewed in the *Public Spending Code*[3], but at the time of writing no more up-to-date values have been proposed. In the current case, for convenience, we work on the basis that the construction sector will remain in recession during the construction phase, and therefore we will use a shadow price of construction labour of 80%. For convenience in the calculations, we will add a credit of 20% for the wages element of the construction stage.

Also, where Exchequer funds are used, a shadow price greater than 100% is applied to account for the distortionary effect of the taxes used to generate them. However, we understand that no direct Exchequer funding will be available (or required) for the project, so this does not arise.

External benefits are those that affect third parties who are not charged for these benefits or compensated for these costs. Most obviously, these include environmental benefits, such as reduced pollution as a result of trucks travelling a shorter distance to access port facilities, or to deliver products to their final destinations.

In the current context we expand this heading to include **wider economic benefits**, specifically the additional **Gross Value Added** or GVA (i.e. profits and wages, keeping in mind the above discussion of the treatment of wages) generated by customers of the extended port, because they can increase their

[2] Activity peaked in 2007, when the construction sector employed 276,400 people. By Q4 2012 employment in construction had fallen to 102,200. Having peaked at around 25% of economic activity in 2005, the construction industry's share of GNP had declined to 6.5% by 2012.
[3] http://publicspendingcode.per.gov.ie/technical-references/

profitability or reduce their costs as a result of the port extension. It is easier to include them under an external/wider economic benefits heading in the current context, as it enables the alignment of internal costs and benefits with financial appraisal/business case.

The most familiar **external costs** are pollution, disruption and congestion, e.g. emissions from the additional energy used to build and operate the extended port, as well as the increased traffic congestion and disruption during its construction and subsequent operations. The introduction of a carbon tax and carbon trading has effectively internalised a major element of the pollution costs. Additional congestion may arise during the construction phase and subsequent operations, although congestion around other ports may be reduced.

The costs and benefits of the proposed project must be measured *vis à vis* the costs and benefits of the **counterfactual**, i.e. what would happen if this project did not go ahead. The counterfactual is generally taken to be "Do Minimum", i.e. continue with the existing configuration of facilities and services.

At least one **alternative option** for achieving the same or similar goals as the proposed project must also be considered.

Another important requirement is **scenario/sensitivity analysis and risk analysis**, which assess the possibility of the outturn being more or less favourable than expected. In the current context focus is understandably on the latter. Key issues would be:

- Capital cost being greater than expected;
- Additional business being less than expected. The project might be vulnerable to this, given its dependence on a small number of customers.

The *Public Spending Code* also requires a **Business Case**, which presents the actual financial flows from the point of view of the Exchequer, effectively excluding externalities, consumer surplus, shadow price adjustments, etc. In the current context the **Business Case** performs this function.

The CBA will deliver Business Case and Socio-economic outcomes, in the form of Net Present Value (NPV) and Internal Rate of Return (IRR).

The Business Case outcome represents the net money cost/benefit of the project to GHC, while the socio-economic outcome represents the net benefit at a wider societal level. Effectively, the Business Case is the starting point, and externalities and shadow price adjustments are then added to complete the CBA.

1.2.2 Costs & Benefits to be Considered

We set out the actual costs and benefits we propose to include in the analysis in Table 1.1 overleaf.

1.2.3 Other Considerations

The project can be considered a long-lived public infrastructure, and hence investment therein should be evaluated over a long timeframe. The *Public Spending Code* requires a twenty year analysis period for commercial investments, and we use this in the current analysis. We also give credit for the residual value of the investment at the end of that period.

The treatment of **VAT** requires some discussion. The capital costs will attract VAT at 13.5% (23% for fees and equipment), but GHC can reclaim this VAT, and the same is true for VAT arising on operational costs. Because of this it is appropriate to only take into account costs net of VAT for CBA purposes.

The treatment of **inflation** must likewise be considered. In general, in CBA we measure all monetary flows in today's (2013) money, i.e. ignoring future inflation. These are often referred to as 'real' prices, as opposed to 'nominal' prices, which reflect increases due to inflation. The only exceptions are where we expect inflation for particular future cashflows to differ significantly from average inflation. Examples might include:

- Payroll, where average wages can be expected to grow ahead of inflation over the long run, although this is usually cancelled out by productivity improvements in the wider economy.
- Future construction costs, reflecting a recovery from today's exceptionally low tender prices back to more "normal" levels as the economy recovers. The relevance of this depends on the timeframe over which construction is being considered.
- Property rental, for similar reasons.

Future flows of costs and benefits need to be discounted back to today's values, by use of a **test discount rate**. For the Business Case, a rate equivalent to GHC's real borrowing cost (net of inflation) is used. Deducting inflation – which we assume to be 2% in the long run reflecting the European Central Bank's target inflation rate – gives a real average cost of capital of 4.6%.

For the socio-economic analysis the social discount rate (reflecting society's time preferences) is used. For this, the *Public Spending Code* currently recommends 4%, pending a re-estimation thereof, with testing for alternative rates.

Table 1.1: COSTS AND BENEFITS TO BE CONSIDERED

	Internal/Exchequer	External/Wider Economic
Costs	• Capital cost of construction. • Price of land purchased/ opportunity cost of land used. • Additional payroll & non-payroll running costs.	• Additional pollution & congestion costs from construction of new facilities. • Additional pollution & congestion costs from running new facilities. • Shadow price of public funds.
Benefits	• Additional Revenues from increased business at port. • Market value of property released. • Residual value of land and buildings at end of evaluation period. • Additional revenues from rentals.	• Additional profits/reduced costs for customers of the extended port. • Credit for reduced shadow price of construction and other labour. • Benefits to city centre of moving Seveso site.

In summary, in the case of a public infrastructure facility, a socioeconomic CBA is essentially concerned with measuring:

Business Case { The financial benefits minus financial costs of the project, from the point of view of GHC.

Socio-economic CBA {

plus
External and wider economic benefits.
Adjustments for the shadow price of construction labour and of public funds.

minus
External costs.

1.3 REPORT LAYOUT

This report applies these principles to the GHC extended port project. It is set out as follows[4]:

Chapter 2 defines the project rationale and scope, including project justification and objectives.
Chapter 3 sets out a feasibility study, including the counterfactual and alternative options, and the project constraints.
Chapter 4 presents the Business Case of the options.
Chapter 5 provides the economic appraisal of the options.
Chapter 6 presents our conclusions.

An Executive Summary is presented at the beginning of this document.

[4] In accordance with Chapter 7 of the *Guide to Economic Appraisal: Carrying out a Cost Benefit Analysis* http://publicspendingcode.per.gov.ie/wp-content/uploads/2012/08/D03-Guide-to-economic-appraisal-CBA-16-July.pdf

2. PROJECT SCOPE, RATIONALE & JUSTIFICATION, OBJECTIVES

2.1 PROJECT SCOPE

Galway Harbour Company (GHC) is currently preparing a planning permission application to An Bord Pleanála (ABP) regarding a major extension of the port. Phase one of this project, the subject of this report, comprises:

- Reclamation of 19.86 ha of quay areas and back-up land;
- Formation of one 400m x 30m quay and one 200m x 20m quay;
- Dredging of channels to -3.5m and -8m depth;
- Dredging of a 400m diameter turning circle to –8m depth;
- Dredging of a -12m Berth pocket immediately adjacent to the proposed Quays;
- New oil and bitumen handling facility on a new 20m pier;
- Harbour related sites for general warehousing and fishing related activities, storage yards, passenger terminal and other quayside facilities;
- Refocusing of Inner Dock to concentrate on leisure-related activities.

2.2 RATIONALE & JUSTIFICATION

The project is designed to enable the relocation of commercial activities out of the Inner Dock area of Galway Harbour and essentially free the port from the tidal and capacity limitations imposed by the latter, whereby the port is only operational 4 hours out of every 24, and is limited to ships of 5,000-7,000 tonnes.

2.3 PROJECT OBJECTIVES

The project, by removing operational limitations on the port, seeks to facilitate a significant increase in the volume and types of business handled by the port, and to enable it to fulfil its role as a major infrastructure asset for Galway and the West region and beyond. These include servicing the growing offshore energy sector off the west coast of Ireland.

3. FEASIBILITY STUDY

3.1 FEASIBILITY

Various studies and reports by Tobin's Consulting Engineers and others, as part of the planning application and EIS for the GHE project, deal with the technical feasibility of the project. Section 4 of this report addresses the financial feasibility of the project (essentially a summary of the separate Business Case report), while Section 5 assesses its economic feasibility.

3.2 OPTIONS & ALTERNATIVES

3.2.1 Options

In carrying out a CBA of a capital project, it is important to consider alternative means of delivering the sought-after benefits. The *Public Spending Code* requires that all realistic alternative ways of achieving the stated objectives are examined critically, and that in particular the "Do Nothing"/"Do Minimum" option be considered.

In view of this, and following discussion with the GHC and other members of their advisory/design team, we initially consider the following options for the purposes of the socioeconomic CBA:

1. Do Minimum/Without Development – continue with the current configuration in the existing port.
2. Do Project/With Development, Phase One as per the Business Case;
3. Do Alternative – i.e. to the degree possible cater for the expected additional port traffic elsewhere in Ireland, taking into account additional road transport and landside investment, and environmental impacts, where appropriate. This option is considered in more detail below.

3.2.2 Feasible Alternatives

With respect to the current project, the key question is, could the proposed additional business be handled at different ports, and if so, at what cost, including the implications for the environment, for Galway and the surrounding region, and for Government policy? This is explored for each of the main business types at the port in the following discussion. Note that a more detailed analysis of feasible alternatives has been compiled by McCarthy Keville O'Sullivan Ltd., Planning & Environmental Consultants, as part of the planning process for the project.

As a starting point, we can consider the commercial ports dealing in bulk cargoes along the west coast, which would be the "natural" potential alternatives for Galway. The following table lists them and their bulk business in 2012.

Table 3.1: COMMERCIAL PORTS ON WEST COAST OF IRELAND & 2012 BULK TRAFFIC

Port	Designation under National Ports Policy	Distance from Galway (km)	Cargo 2012 ('000 Tonnes)				
			Direction of Traffic	Liquid Bulk	Dry Bulk	Break Bulk & Other Goods	Total Bulk & Other Goods
Shannon-Foynes	Tier 1 National	130	In	1,094	7,099	15	**8,208**
			Out	3	1,839	44	**1,886**
Galway	Regional Significance	-	In	415	0	13	**428**
			Out	0	47	25	**25**
Killybegs	Regional Significance	309	In	0	0	10	**10**
			Out	0	0	117	**117**
Sligo	Regional Significance	139	In	0	19	0	**19**
			Out	0	8	6	**14**

Source: Department of Transport, CSO

West coast trade is dominated by Shannon-Foynes, so this would appear to be the primary alternative port within a reasonable distance of Galway and its hinterland. That said, there is still a significant distance to Foynes port from Galway (130km)[5]. We do not in general consider ports further afield, except in specific cases, as this would contravene the proximity principle, and the consideration that each port should cater for its own hinterland, be it regional or national[6].

A key consideration also is that, if extensions to these alternative ports were required to cater for the traffic in question, it could we understand involve extension into SACs in some cases, which would be equally problematic. That is not a primary focus of our analysis here. However, while we understand that there is significant capacity in Shannon-Foynes, it would appear likely that any significant movement of trade to Sligo or Killybegs would involve extension of port facilities, and thus could be problematic.

Bitumen

Cold Chon has a significant storage and (local) processing operation in Galway, and planning permission to increase storage further. Shannon-Foynes does undertake transhipment activities, but for it to fulfil the function being proposed, Cold Chon would have to replicate its bitumen terminal and processing and storage facilities at Shannon-Foynes, at considerable extra cost, and we understand this does not fit with their business plans.

[5] Limerick Docks are closer, as are some of the dedicated facilities that make up Shannon-Foynes, but we understand (i) the spare capacity is concentrated in Foynes, and (ii) the dedicated facilities such as Moneypoint would not be available to cater for Galway's traffic.

[6] Other ports that could be considered alternatives are Dublin for the eastern segment of the catchment, and Derry for the northern segment. However, Dublin is considerably further away from Galway than say Shannon-Foynes (220km Vs. 130km). Derry is 275km from Galway, and there is a relatively small proportion of the port business being considered in this report that would be within the northern segment of the catchment.

Petroleum

Petroleum is imported and transhipped into and between numerous ports in Ireland. Indeed much of the fuel currently imported into Galway comes via other Irish ports. Furthermore, national fuel import volumes have fallen in recent years with the economic downturn.

The additional petroleum imported into Galway would displace fuel imported into other ports in Ireland (or possibly Northern Ireland). On the face of it, there appear to be a number of alternatives, therefore, which would not require investment. Additional costs would arise in terms of the longer land transport of this fuel into Galway and its hinterland, which would be at least partly passed on to customers. We note also that Galway is seen as having a strategic role in fuel storage for Ireland, and it holds some of the National Oil Reserve Agency's (NORA) reserves.

Limestone

The location of McGrath's Limestone Works in Cong, Co. Mayo, and the nature and relative cost of the product, makes Galway the natural port to cater for this product. Given the product's weight-to-value ratio, it might not be feasible to cater for volumes through a more distant port. There may not be a feasible alternative therefore with respect to this cargo.

Cruise Business & Marina Business

The projected additional cruise business is driven by the particular attractions of Galway city and its hinterland from a tourism viewpoint. It is difficult therefore to see how there could be a feasible alternative to the additional business being envisaged under this heading.

It may be feasible to build another sizeable marina on the west coast of Ireland, including elsewhere in Galway Bay, but on the face of it Galway is an ideal location, given its relative position on the west coast, the location of the Inner Dock, the facilities already in place and the attractions of Galway city for boaters.

Other Business

Much of the other business proposed is not dependent on the current project proceeding, and thus is not relevant here. Most of the other business is local to Galway or its immediate hinterland, so Galway is the natural port to cater for it, and to send it elsewhere would contravene the proximity principle and the role the National Ports Policy sees for Galway.

Servicing of gas and oil exploration rigs could be catered for at other ports in Ireland, although Galway is very well placed vis à vis the current and prospective exploration sectors off the west coast, and there is also a danger that the business could be lost to Ireland.

3.2.3 Government Policy

Government policy with respect to Galway's expansion plans, is relevant on many levels:

- The recently published *National Ports Policy 2013*[7] indicates that Galway is a port of regional (as opposed to national) significance, which "function(s) as important facilitators of trade for their regional and local hinterland", notably for petroleum products.
- The Irish Marine Development Agency (IMDO) also identifies Galway as an important port for servicing the offshore energy sector.
- Galway is seen as having a strategic role in fuel storage for Ireland, and it holds some of the National Oil Reserve Agency's (NORA) reserves.
- The National Spatial Strategy sees Galway as a national Gateway (as is Limerick/Shannon), and the only Gateway in the West NUTS III region. Gateways are seen as drivers of economic activity, and centres of key economic infrastructure, such as ports.
- Galway (unlike Limerick/Shannon) is also situated in the BMW NUTS II region, which includes the least economically developed parts of the country, and is a particular focus for Government efforts at economic development.
- Development policy is articulated for example through IDA Ireland's Horizon 2020 Strategy[8], which specifically has a target of 50% jobs generation outside Dublin and Cork and to support regional economic development: "*IDA has identified key areas of infrastructure improvement that are essential if we are to be successful in winning new investments into the regions outside Dublin and Cork. Transport and energy are vital. The importance of delivering next-generation networks is arguably the most important of all.*" Galway Harbour is thus a key element of transport infrastructure.
- Government and EU policy is also aimed at energy efficiency, reducing Ireland's carbon footprint and encouraging sea in preference to road transport. All these would argue against the leakage of traffic from Galway harbour to other more distant ports around the country.

In this context, it is clear that national policy would be in favour of the development of Galway port. Later in this report, we estimate that the project would generate significant temporary local employment during construction and permanent local employment once operational, which would be foregone if the project did not proceed.

3.2.4 Summary

In summary, there are a number of categories of business proposed at Galway that would appear to be problematic from the point of view of identifying alternative ports that could handle the business, either commercially or environmentally. In addition:

[7] http://www.transport.ie/uploads/documents/news/National%20Ports%20Policy%202013%20-%20Web.pdf
[8] http://www.idaireland.com/news-media/publications/library-publications/ida-ireland-publications/IDA-Ireland-Strategy-2020.pdf

- Galway Port itself would suffer from the transfer of business to other ports, and there might be question marks over its longer term viability,
- There would be negative implications for economic activity in the region, as costs would be higher and enterprises might relocate to be closer to the alternative ports. Some elements of additional business might not viable. This would conflict with Government national and regional development policy.
- The proximity principle would be contravened in terms of the nearest alternatively major port (Shannon-Foynes), which is approximately 130km from Galway city. This would be in contravention of Government policy with respect to transport and the environment.

On the basis of the above, **we do not construct a separate Do Alternative option**.

This has to be seen as a high level initial analysis, however, and one could only be confident of the conclusion if one had access to the internal plans of the port's customers, which is not possible. Furthermore, given the timeframe under consideration, the scope for business, market and technical change is substantial.

3.3 CONSTRAINTS

We have compiled the constraints that may apply to the various options, as set out in the next table.

Table 3.2: CONSTRAINTS APPLYING TO EACH OPTION

	Options	
Constraint	**1. Do Minimum**	**2. Do Project**
Financial		x
Continued operations and growth of the port	X	
Dependence on business plans of a limited number of customers	x	X
Traffic during construction		x
Seveso issues with Inner Dock	X	x
Lack of integration of Inner Dock with City	X	

Note: Large 'X' represents a more significant constraint; small 'x' represents a less significant constraint.

This highlights the range of constraints that apply to the port in its current configuration, and to the proposed extension. Clearly, proceeding with the project imposes some financial constraint in the short term at least, in that GHC must partially finance the project with borrowing. The longer term capacity of the port to serve its catchment is in question if the project does not proceed, and the viability of the project is dependent on a relatively small number of port customers. There will be some increased traffic during the construction phase, while the project will have a significant positive impact on the Seveso site at the port. Finally, the port as currently configured, while close to the city centre, is not well-integrated with it.

4. BUSINESS CASE

4.1 DEFINITION

In the Business Case/financial appraisal we consider the financial costs and benefits of the project. Referring back to Table 1.1, these can be considered as the internal costs and benefits[9], i.e.:

Table 4.1: COSTS AND BENEFITS TO BE CONSIDERED

Costs	• Capital cost of construction. • Price of land purchased/ opportunity cost of land used. • Additional payroll & non-payroll running costs.
Benefits	• Additional Revenues from increased business at port. • Market value of property released. • Residual value of land and buildings at end of evaluation period. • Additional revenues from rentals.

Each of these must be assessed over the lifetime of the project, and for each alternative option.

4.2 VALIDATION OF THE RBC BUSINESS CASE

We have been provided with the GHC Business Case report, prepared by Raymond Burke Consulting (RBC). This foresees the project being completed and ready to commence as of the start of 2018 ("Year 1"), having been constructed in 2015, 2016 and 2017 (Years -3, -2 and -1), and it looks forward 18 years (to 2035).

Our task was to:

1. Read through and validate the mechanics of the RBC model;
2. Review implications of DTZ property valuation report;
3. Identify port's catchment, with a view to indicating potential business;
4. Validate elements of: Future Core Business, Non-core Business, and other potential new business identified in client model, as well as identifying other potential business currently using other ports.

The report produces a Base, High and Low case. The Base Case results presented in the RBC report are summarised as follows:

[9] The Exchequer is also likely to benefit from some reduction in social welfare payments, as a proportion of the construction workers employed on the project would otherwise have been unemployed. This can be considered to be captured in the adjustment of construction wages to shadow prices, which is generally treated as a wider socio-economic impact rather than a direct financial impact (see Section 5).

Table 4.3: Financial Projections – Base Case at Current Prices for Galway Harbour Company

€'000	2018	2023	2028	2033	2035
Cargo Turnover (Tonnage & Cargo)	2,503	5,645	6,387	7,227	7,593
Cruise Income	102	230	378	501	558
Marina Income	396	768	869	983	1,033
Other related Income	287	425	481	544	572
New Development Income	113	256	290	328	344
Car Parking	558	631	714	808	849
Total Income	**3,958**	**7,956**	**9,119**	**10,391**	**10,948**
Operating/Maintenance Costs	1,911	2,008	2,111	2,218	2,263
EBITDA	**2,047**	**5,948**	**7,008**	**8,173**	**8,685**
Depreciation	2,292	2,321	2,349	2,378	2,389
Profit before Tax	-929	3,351	5,359	7,800	8,929
Tax & Pension	0	419	670	975	1,116
Profit	**-929**	**2,932**	**4,689**	**6,825**	**7,813**
Cash Flow	243	3,872	5,395	7,163	9,981

4.2.1 Validation of Model Mechanics

We have reviewed the RBC model and found that it was valid and based on reasonable assumptions. We would note that the table above:

- presents the profitability of the entire GHC operations, not just of the net additional impact of the project;
- It excludes any proceeds of sale of property, although the RBC report indicates that the project would be expected to be part-funded by the sale of assets;
- The values are in current money values (i.e. including inflation).

As part of DKM's review, RBC provided a number of back-up spreadsheets, which enabled us to isolate the net impact of the project, and express all values in constant (2012) money, i.e. stripping out future inflation. This facilitates direct comparison with the socio-economic CBA described later in the current report.

4.2.2 Implications of DTZ Property Valuation Report

Under the project, it is planned that the Inner Docks will be cleared and sold (excluding the area of water in the Inner Docks), while the on-street car parking and the enterprise park (with their rent rolls) will be retained by GHC.

A valuation of GHC's property was undertaken by DTZ, dated 27th June 2013. It indicates that the proceeds of the above sale (at mid-2013 values) should be €24.5 million, leaving a borrowing requirement of €27.1 million (€51.6 million – €24.5 million).

The Inner Docks could only be cleared once the new harbour is in place, so the proceeds of sale would only be realised in 2018. It is possible that property sales

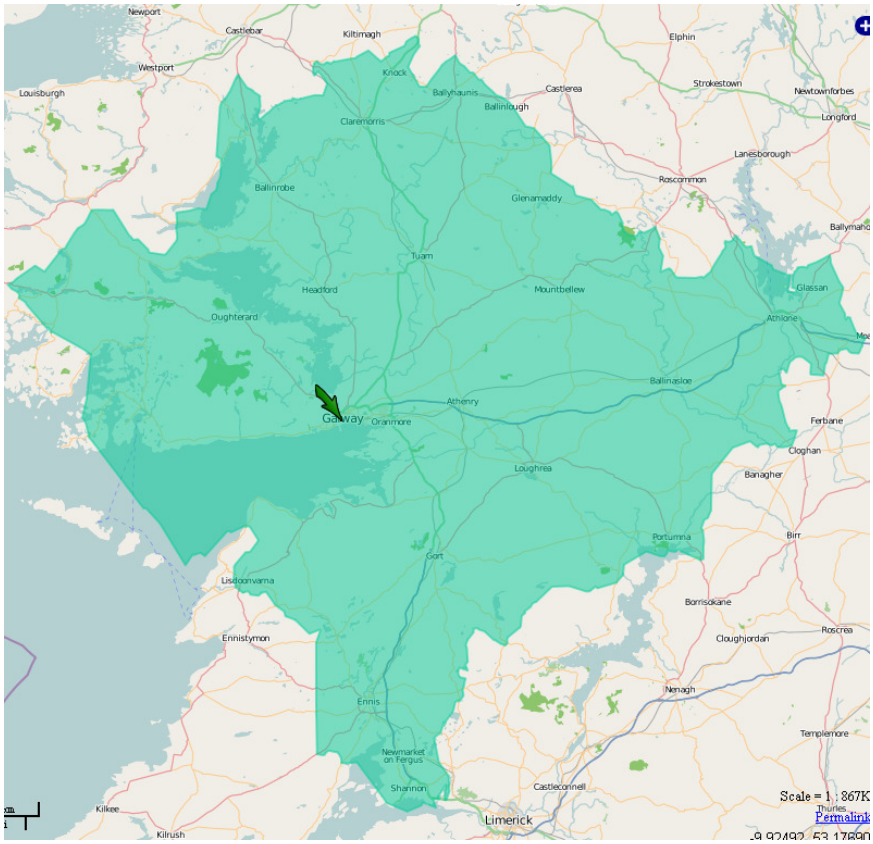
some years' hence would achieve better prices than per the valuation report, but as our base case we use the values per DTZ, to be conservative.

4.2.3 GHC's Catchment

The recently published *National Ports Policy 2013*[10] indicates that Galway is a port of regional (as opposed to national) significance, which "function(s) as important facilitators of trade for their regional and local hinterland", notably for petroleum products. The Irish Marine Development Agency (IMDO) also identifies Galway as an important port for servicing the offshore energy sector.

IMDO generally defines regional port hinterlands in terms of one hour driving time (see figure).

Figure 4.1: ONE-HOUR "HEAT MAP" OF GHC



Source: IMDO

However, it appears to us that this is not fully appropriate for Galway, for two reasons:

(i) The one-hour drivetime stretches down almost to Limerick, and overlaps with Shannon-Foynes port, identified as one of the tier 1 ports of national significance.

(ii) Galway is by far the largest port on the west coast north of Shannon Foynes as far as Derry.

[10] http://www.transport.ie/uploads/documents/news/National%20Ports%20Policy%202013%20-%20Web.pdf

Therefore, it appears to us that the operational hinterland of Galway extends only a relatively short distance south, but significantly further northwards and eastwards. This is also reflected in Chapter 2 of the EIS, where it states: "Accordingly, a port's natural catchment area is its hinterland and, for Galway Harbour Company, it is, primarily, the western and north-western counties." (Section 2.2.1.2).

4.2.4 Validation of Business Elements

Existing Freight Business

We have reviewed the forecast volumes for these cargoes, in the With and Without Development options, via consultation (verbal and written) with customer representatives, and they appear reasonable. A key overriding issue is that there are severe limitations on the size of ships that Galway can cater for, as well as time limitations as the harbour at the moment can only operate for four hours per day. The size of ships in question mean that economies of scale cannot be exploited, and indeed it appears that ships are not being built to this size anymore, meaning that they are becoming less abundant. This places restrictions on the flexibility of customers of the port.

New Freight Business

A number of additional potential sources of business are available now and in the future, whether new or within the hinterland and currently using other ports. These include:

- Refuse-derived fuel (RDF).
- Timber product imports & exports
- Servicing oil and gas exploration.
- Turbines for various planned wind farms in the West and Midland regions.
- Windmills for off-shore wind farms.
- Servicing other offshore renewables, e.g. tidal and wave energy.

Servicing oil and gas exploration

The Department of Communications, Energy & Natural Resources (DCENR) indicates that Ireland's Atlantic offshore margin is estimated to hold substantial 'potential, yet-to-find' hydrocarbon reserves of some 10 billion barrels of oil equivalent[11].

However, one needs to be mindful of the difference between 'potential, yet-to-find' and 'proven' reserves. The Irish Offshore Operators' Association points out that offshore exploration has been taking place in Ireland for nearly half a century and that only two gas fields (plus two ancillary fields) have been successfully commercialised and that no commercial oil field has yet been discovered[12].

While the difficult operating conditions off the west coast of Ireland and the poor success rate have discouraged exploration in the past, new technologies are

[11] http://www.ouroceanwealth.ie/SiteCollectionDocuments/Harnessing%20Our%20Ocean%20Wealth%20Report.pdf

[12] http://www.iooa.ie/facts-and-figures-page.html

easing the exploration process in the region, and high oil prices are making fields more viable. Recent industry announcements with respect to exploration offshore west of Ireland[13] are an indicator of the industry's renewed interest in the region, although announcements with regard to other sectors of Irish waters are less so[14].

Servicing offshore exploration potentially could have a very significant impact on GHC's business in the medium term, but from the current standpoint it is difficult to include specific projections in our analysis.

On-shore Wind Turbines

The development of Galway Harbour would enhance its capability to service the on-shore wind industry due to the ability to accommodate larger vessels, increased quay length and greater availability of hinterland.

A good indicator of the potential business in this sector is the number of grid connection offers issued under "Gate 3" by the Commission for Energy Regulation (CER). In the next 5 – 8 years, the planned wind farms in the west of Ireland that will be in receipt of grid connection are as follows:

- Galway: 350mw (154 turbines)
- Mayo: 732mw (322 turbines)
- Clare: 121mw (53 turbines)
- Roscommon: 96mw (42 turbines)

The wind farms must be constructed and operational before the end of 2017 if developers are to avail of maximum subsidy payments under the Renewable Energy Feed-In Tariff (REFIT)[15]. As a result, these wind farms are likely to be constructed before the development of Galway Harbour is complete. This may not be an issue as Galway Harbour has accommodated such projects in the past.

Off-shore Wind Turbines

The west coast of Ireland possesses some of the highest wind speeds in Europe and has an average wind speed of 10.2m per second[16]. At present there are no offshore wind energy developments taking advantage of these wind speeds off Ireland's Atlantic coast.

The European Wind Energy Association (EWEA) report *Wind in our Sails - The coming of Europe's offshore wind energy industry*[17] identifies two types of ports that are needed for offshore wind projects. These are manufacturing ports and mobilisation ports. As servicing the offshore wind industry would be a non-core activity for Galway Port, it is more likely to be used as a mobilisation port, i.e. turbine components would be imported to Galway Harbour where they would be

[13] http://www.reuters.com/article/2013/05/07/idUSnHUGd4CZ+73+ONE20130507
[14] http://www.irishtimes.com/business/sectors/energy-and-resources/providence-to-abandon-dunquin-well-1.1471398
[15] http://www.dcenr.gov.ie/Energy/Sustainable+and+Renewable+Energy+Division/REFIT.htm
[16] http://www.aoea.ie/offshore-wind-energy/
[17] http://www.ewea.org/fileadmin/ewea_documents/documents/publications/reports/23420_Offshore_report_web.pdf

partially assembled and transported to the offshore wind farm where construction would be completed.

The only port on the island of Ireland identified in the EWEA report as suitable for manufacturing or mobilisation is Belfast, which has recently developed a £50 million offshore wind terminal[18]. The planned development of Galway Harbour would leave it better placed to take advantage of opportunities in this area as it would be able to accommodate larger vessels and have a larger hinterland available for storage and assembly work.

Other Off-shore Renewables

Wave Energy

A report published by the Ocean Energy Development Unit (OEDU) at the Sustainable Energy Authority of Ireland (SEAI) states that the geographic location of Galway Harbour in close proximity to wave energy resources means it will be attractive to potential developers of ocean renewable energy[19]. Off the west coast of Ireland, the annual average wave height is 2.5m – 3m, however winter events are substantially greater. In December 2007, 14m waves were measured[20].

In December 2012, the European Commission awarded €19.8 million in funding to the WestWave energy project off the west coast of Ireland. This project, which is being led by the ESB, involves the installation of six wave energy converters capable of generating up to 5MW of electricity by 2015. The aim of the project is to demonstrate Ireland's ability to construct, deploy and operate wave energy converters. On top of this, it will help pave the way for commercial projects in terms of consenting procedures, such as foreshore licensing, permitting electrical grid access and local infrastructure[21]. If this project is successful it could lead to more large scale development of wave energy farms off Ireland's west coast.

Tidal Energy

Ireland's tidal resource is concentrated off the east coast. The tidal flow is relatively strong entering the Irish Sea at St. Georges Channel and the North Channel whereas the tidal currents are generally low along the west and south coasts[22]. For this reason we do not consider tidal energy a potential non-core business area for Galway Port.

Other Potential New Business

With regard to other potential business for Galway Port, we consider businesses that (i) import or export bulk cargo, and (ii) are situated within the port's catchment, effectively the West region and the western part of the Border region, potentially extending into parts of the Midlands.

[18] https://www.belfast-harbour.co.uk/news/article68/50m-offshore-wind-terminal-completed
[19] http://www.oceanrenewable.com/wp-content/uploads/2011/05/200906_SEI_Review-of-Engineering-and-Specialist-Support-Requirements-For-the-Ocean-Energy-Sector.pdf
[20] http://www.marine.ie/home/services/operational/oceanenergy/Wave+Energy.htm
[21] http://www.westwave.ie/
[22] http://www.marine.ie/home/services/operational/oceanenergy/Tidal+Energy.htm

The CSO's *Statistics of Port Traffic 2012* indicate where bulk trade is catered for in ports along the west coast, see the table below. With regard to Liquid Bulk, Shannon-Foynes dominates, importing 1.1 million tonnes compared to 415,000 tonnes in Galway, with no other west coast port handling liquid bulk. Galway's liquid bulk trade is quite specific to particular customers in situ, as indeed is Shannon-Foynes', so on the face of it there is limited scope for Galway to attract significant volumes of this trade.

With respect to Dry Bulk, Shannon-Foynes is even more dominant, with almost 9 million tonnes compared to 47,000 tonnes in Galway. The majority of the dry bulk at Shannon-Foynes is imported, again for particular customers (e.g. Moneypoint), so there may be limited scope to compete away this business.

In addition, since Shannon-Foynes is designated a major port of national significance, it may be problematic to seek to compete with it for business it currently holds.

Table 4.2: COMMERCIAL PORTS ON WEST COAST OF IRELAND & 2012 BULK TRAFFIC

Port	Designation under National Ports Policy	Distance from Galway (km)	Cargo 2012 ('000 Tonnes)				
			Direction Of Trade	Liquid Bulk	Dry Bulk	Break Bulk & Other Goods	Total Bulk & Other Goods
Shannon-Foynes	Tier 1 National	130	In	1,094	7,099	15	**8,208**
			Out	3	1,839	44	**1,886**
Galway	Regional Significance	-	In	415	0	13	**428**
			Out	0	47	25	**25**
Killybegs	Regional Significance	309	In	0	0	10	**10**
			Out	0	0	117	**117**
Sligo	Regional Significance	139	In	0	19	0	**19**
			Out	0	8	6	**14**

Source: Department of Transport, CSO

Sligo handled a modest 33,000 tonnes while Killybegs handled a more substantial 127,000 tonnes. However, we understand that the majority of the latter is fish exports, with only 10,000 tonnes of dry bulk imported via Killybegs in 2012.

We contacted the CSO, IDA Ireland and Enterprise Ireland in terms of identifying businesses that import or export bulk cargoes from the West, South-West, western part of the Border or Midlands region. The CSO was not able to provide information additional to its published data. Our enquiries of IDA Ireland and Enterprise Ireland were necessarily incomplete as they are only concerned with exporters. IDA indicated that it was unlikely that any of the firms under their auspices in the relevant regions would export in bulk. Enterprise Ireland were able to identify a small number of firms, and indicated that some other are currently based at Killybegs and export through that port. However, there does not appear to be substantial potential among this list either.

More generally, with regard to **agriculture**, the reform of the Common Agriculture Policy and trade liberalisation may generate opportunities for the ports sector, as exports would be expected to increase. For instance, it is expected that the removal of milk quotas in 2015 will allow Irish dairy production to increase substantially[23]. While most agriculture exports would not be handled in bulk, there might be increased demand for feed and agriculture imports in response to the increased output, which do tend to be transported in bulk. This would represent an opportunity for Galway, but it would face strong competition from those ports already handling these cargoes.

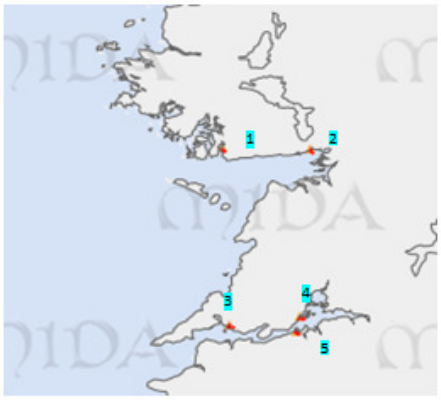
Marina and Cruise Business

Under the project, the number of **marina berths** is to increase from the current 40 to 240. This will make it the largest such facility in the West (assuming no other marina developments take place in the region)[24]. The chart overleaf shows the situation prevailing in 2013.

There are an estimated 50 "proper" marinas in Ireland (as opposed to moorings, tie ups against piers in harbours or along fishing boats), providing 5,200 berths[25]. The majority of berths are located on the South West/South East coasts, with only 12% of total berths located on the West Coast.

A survey undertaken in early 2013 by the British Marine Federation found that that **19.5%** of berths in the marinas which responded were vacant[26]. Galway City Marina seems not to have suffered from a reduction in business following the demise of the Celtic Tiger. The existing 40 berth marina in Galway reportedly is well utilised and often operates at full capacity, so that visiting boats are advised to reserve a berth in advance[27].

Figure 4.2: MARINAS IN PROXIMITY TO GALWAY CITY MARINA



Marina	Capacity
1 Rossaveal Harbour	28
2 Galway City Marina	40
3 Carrigaholt Moorings	8
4 Kilrush Marina	120
5 Foynes Yacht Club Pontoon	8

Source: http://mida.ucc.ie/contents.htm

[23] http://www.teagasc.ie/research/journalarchives/vol51no1/ijafr_108_10.pdf
[24] The planned development of Killybegs Harbour will include visiting berths. http://afloat.ie/port-news/irish-marinas/item/21893-killybegs-to-develop-small-craft-harbour-for-leisure-craft
[25] Sources: Marine Institute, Marine Irish Digital Atlas, websites of marina facilities
[26] http://www.britishmarine.co.uk/news__press/news_article.aspx?ArticleId=3963
[27] http://afloat.ie/port-news/irish-marinas/galway-city-marina

Given the under-provision of marina facilities on the West coast of Ireland, it seems likely that the expanded marina in Galway will be able to achieve high occupancy rates, while causing little displacement in other marinas in the locality.

The **Cruise Business** is expected to grow from the current six visits per annum to 15 by 2018, growing thereafter eventually to 36 if the project goes ahead. If the project does not go ahead, the number of cruises is expected to gradually fall back to three over time, as difficulties with having to tender passengers to shore impact on the attraction of Galway as a cruise destination.

This pattern appears reasonable. The European Cruise Council[28] reported that the demand for cruises has grown steadily between 2002 and 2011, with average annual growth of 7.6% in passenger numbers worldwide.

This growth is set to continue as the industry has been investing heavily in new vessels. European shipyards, which build most of the world's state-of-the-art cruise liners, are scheduled to deliver 24 cruise vessels over the five year period 2012 to 2016 with a combined capacity of over 67,000 passengers and representing a total investment by the cruise industry in Europe of over €12 billion[29].

Many Irish ports want to increase the number of cruise liners to their facilities, and harbour companies' trips abroad to woo cruise companies are a regular occurrence. While there is clearly a competitive element at play, taken together, these visits are ensuring that Ireland is becoming firmly implanted in cruise companies' itineraries.

To reflect (i) the continued international growth of the cruise industry and (ii) the increased popularity of the West of Ireland and in particular Galway city, we increase the number of cruise vessel visits to reach 36 by 2035. We also assume that the average passengers per cruise will increase from 600 to 1,000. Both of these changes will increase the wider economic impacts, although they will have limited impact on the port's finances.

4.2.5 Adjusted Results of Business Case Model (Base Case)

The results of the Business Case, isolating the net impact of the project, including the expected impact of land sales and with inflation stripped out, can be summarised as follows[30]. The Net Present Value (NPV) of the Port's business with and without the project is calculated using a discount rate of 4.6% (real).

Table 4.3: SUMMARY OF BUSINESS CASE RESULTS PER DKM – BASE CASE

[28] European Cruise Council (2012), THE CRUISE INDUSTRY Contribution of Cruise Tourism to the Economies of Europe, page 12

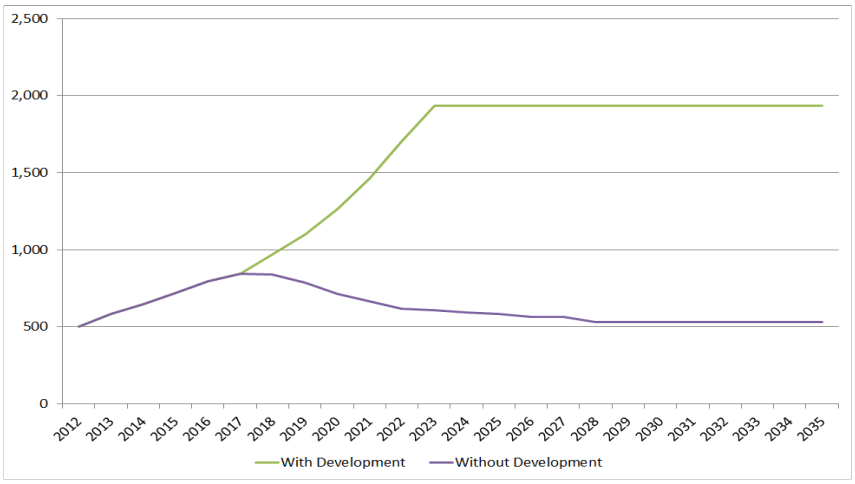
[29] http://www.europeancruisecouncil.com/content/Facts%20at%20a%20Glance.pdf

[30] Comparing the net change in GHC's profit before interest, depreciation, amortisation and tax as a result of the project (i.e. EBITDA), with the capital cost of the project.

Upfront Capex (€ million)	51.6		
Proceed of Land Sales	24.6		
Net Cost (Borrowings)	27.1		
Business Case	**With project**	**Without project**	**Net Impact**
NPV (€'000)	34,470	21,483	12,986
IRR	12.9%	n/d	7.8%

Having reflected the adjustments discussed above, the business case results indicate that the project is profit-making, generating a positive €13 million over the period of analysis, on a net present value basis, with an Internal Rate of Return (IRR) of 7.8%. The following chart compares the projected tonnage with and without the development.

Figure 4.3: PROJECTED TONNAGES, BASE CASE WITH & WITHOUT DEVELOPMENT



It is noteworthy that under the Without Development option, tonnages grow in the short term but then fall back to a little over their current level. This is reflective of the constraints on the existing infrastructure in terms of the size of ship than can be accommodated. Over time, ship sizes are increasing, and this is expected to have a gradual negative impact on the port in its current configuration as the range of ships that can be accommodated narrows. Lack of space in the harbour for loading/off-loading is expected to be a negative factor going forward also.

4.3 SCENARIO/SENSITIVITY ANALYSIS

In the context of project appraisal, scenario/sensitivity analysis is an important element in testing for alternatives outcomes. Here we investigate a High Case and a range of less positive outcomes.

4.3.1 High Case

GHC has received communication from its main customers indicating their intentions to increase business volumes through the port, if the project proceeds. In the Base Case, RBC deducted some elements of volumes from this, to adjust for what might be described as "optimism bias". In our High case, we present the results if in fact the projections from customers were to materialise. The resultant Business Case results are as follows:

Table 4.4: SUMMARY OF BUSINESS CASE RESULTS PER DKM – HIGH CASE

Upfront Capex (€ million)	51.6		
Proceed of Land Sales	24.6		
Net Cost (Borrowings)	27.1		
Business Case	**With project**	**Without project**	**Net Impact**
NPV (€'000)	39,199	21,483	17,716
IRR	13.7%	n/d	8.8%

This has a sizeable positive impact on the Business Case. The payback period is reduced to 13 years.

4.3.2 Less Positive Scenarios

We have to be mindful that the Base Case is built on relatively few pillars in that it is dependent on a small number of key customers. The project could be vulnerable were any of these to be lost to the port or if the expected business growth fails to occur. Likewise, the costs of infrastructure project such as this are difficult to predict, and regularly cost significantly more than estimated *ex ante*[31]. In appraisals of projects such as this, it is common to test a case where the capital cost is 50% higher than expected.

On the other hand, as will be seen in the socio-economics chapter, the project confers significant benefits on certain customers and on the tourism sector, above and beyond the benefits to GHC itself. In this context, it is possible that contributions from customers and/or grants from e.g. Fáilte Ireland might be forthcoming. The potential impact on the business case can be considered.

We test the following scenarios:

[31] See for instance Flyvbjerg, B, Bruzelius, N, & Rothengatter, W., (2003), *Megaprojects and risk: an anatomy of ambition*. Cambridge University Press.

Table 4.5: SCENARIO ANALYSIS – BUSINESS CASE

Factor		Base Case	Scenario Analysis Value
1.	Discount/interest rate	4.6% real	Base + 50% (6.9% real)
2.	Upfront capital expenditure	€51.6 million	Base + 50%
3.	Valuation of benefits	As per above	Base – 50%
4.	Cruise & Marina business fails to grow	As per above	Same as Without Development
5.	Business contributions/grants	As per above	€10 million received

We have also tested scenarios whereby expected future business growth fails to materialise. The results for each of these tests are set out below.

4.3.3 Higher Discount/Interest Rate

A real discount/interest rate of 6.9% gives the following results:

Table 4.6: BUSINESS CASE RESULTS, REAL DISCOUNT/INTEREST RATE = 6.9%

Upfront Capex (€ million)	51.6		
Proceed of Land Sales	24.6		
Net Cost (Borrowings)	27.1		
Business Case	**With project**	**Without project**	**Net Impact**
NPV (€'000)	20,630	17,688	2,942
IRR	12.9%	n/d	7.8%

A higher discount/interest rate results in a much reduced but still positive NPV. The Internal Rate of Return value effectively gives how high the discount rate/cost of capital would have to be (7.8% real) for the project to just break even.

4.3.4 Higher Capital Expenditure

If the upfront capital expenditure turns out to be 50% higher than expected, the results would be as follows:

Table 4.7: BUSINESS CASE RESULTS, UPFRONT CAPITAL EXPENDITURE 50% HIGHER

Upfront Capex (€ million)	77.4		
Proceed of Land Sales	24.6		
Net Cost (Borrowings)	52.9		
Business Case	**With project**	**Without project**	**Net Impact**
NPV (€'000)	9,787	21,483	-11,696
IRR	6.2%	n/d	2.6%

This test indicates that the project is vulnerable to escalation in upfront capital costs, though it is worth keeping in mind that the port as a whole remains profitable. Our calculations indicate that the Base Case can bear a capital cost escalation of as much as 26% and still break even.

4.3.5 Lower Benefits

If benefits turn out to be 50% of the expected levels, the results would be as follows:

Table 4.8: Business Case Results – Benefits 50% Lower

Upfront Capex (€ million)	51.6		
Proceed of Land Sales	24.6		
Net Cost (Borrowings)	27.1		
Business Case	**With project**	**Without project**	**Net Impact**
NPV (€'000)	20,223	21,483	-1,261
IRR	10.0%	n/d	4.3%

As can be seen, the Base Case is also vulnerable to significant reductions in expected benefits. As long as benefits are more than 55% of the expected level, the project generates a positive NPV.

4.3.6 Cruise & Marina Business Fails To Grow

If the cruise and marina business fails to grow beyond its level in the Without Development option, the result would be as follows:

Table 4.9: Business Case Results – Cruise & Marina Business Fails to Grow

Upfront Capex (€ million)	51.6		
Proceed of Land Sales	24.6		
Net Cost (Borrowings)	27.1		
Business Case	**With project**	**Without project**	**Net Impact**
NPV (€'000)	27,237	21,483	5,754
IRR	11.4%	n/d	6.1%

This makes a relatively modest difference to the project NPV, and it remains highly positive.

4.3.7 Grant/Contribution Received

Given the wider economic benefits of the project (discussed in the next chapter), it is possible that capital contributions/grants would be forthcoming, either from the port's customers or the State, via for instance Fáilte Ireland, the local authorities or central Government. This would in effect reduce the capital cost

and thus the borrowing requirement of the project to GHC. If grants/contributions amounting to €10 million, then the business case results would be as follows:

Table 4.10: BUSINESS CASE RESULTS – €10 MILLION GRANTS/CONTRIBUTIONS RECEIVED

Upfront Capex (€ million)	51.6		
Proceed of Land Sales & Grants/Contributions	34.6		
Net Cost (Borrowings)	17.1		
Business Case	**With project**	**Without project**	**Net Impact**
NPV (€'000)	42,293	21,483	20,809
IRR	17.7%	n/d	11.1%

This makes a large positive impact on the project, and would effectively insulate it against most of the individual negative impacts assessed above.

4.3.8 Summary

In summary, the Base Case is vulnerable to:

- significant increases in capital costs,
- significant reductions in overall benefits, and
- failure of some expected future volume growth to materialise.

However, grant aid/contributions from customers would insulate the project from most of this downside. It is worth keeping in mind also that the port remains highly profitable even under these negative scenarios.

Further scenario analysis is undertaken in the CBA, reflecting wider economic impacts as well as commercial impacts, the results of which are summarised in the next chapter.

5. ECONOMIC APPRAISAL

5.1 DEFINITION

In the Business Case/Financial Appraisal we considered the financial costs and benefits of the project. It indicated that the project Base Case is profitable. High Cases, based on information from the port's customers and prospective customers, indicate more positive outturns. While the project is vulnerable to more negative outturns, the port itself remains highly profitable even under these negative scenarios.

The economic appraisal takes the business Base Case and includes the external/wider economic costs and benefits of the project, evaluated from the perspective of society as a whole.

Referring back to Table 1.1, these additional items include external costs and benefits, and additional profits/cost savings generated among the port's customers, i.e.:

Table 5.1: COSTS AND BENEFITS TO BE CONSIDERED IN ECONOMIC CBA

Costs	• Additional pollution & congestion costs from construction of new facilities. • Additional pollution & congestion costs from running new facilities. • Shadow price of public funds.
Benefits	• Additional profits/cost savings for port customers/reduced costs passed onto their customers. • Credit for reduced shadow price of construction labour. • Benefits to city centre of moving Seveso site.

Each of these categories is assessed in the following sections over the lifetime of the project, compared to the Without Development option. We must also adjust for any of Galway's new business that represents a dislocation from another port in Ireland. Only the difference in transport costs for these is a net benefit from the viewpoint of "Ireland Inc.".

5.2 ADDITIONAL POLLUTION & CONGESTION

The two main potential environmental costs are emissions from energy usage and traffic congestion. Some additional noise and disruption could be expected during the construction phase, but we assume that project management would act to minimise these impacts.

5.2.1 Air Pollution

In recent years a number of steps have been taken which have effectively internalised the energy usage-related environmental costs of construction, namely:

- the introduction of the carbon tax,
- the evolving EU Emissions Trading System (ETS) for larger emitters such as power stations and cement producers, and
- a range of regulations aimed at reducing the level of localised air pollution from the transport, energy and industrial sectors (e.g. EURO VI standards for transport).

On this basis we disregard costs from emissions from energy usage, as these are effectively included in the cost savings to customers of the port, as evaluated later in this chapter.

5.2.2 Traffic Congestion

Construction Phase

Some additional traffic congestion could be expected during construction. Construction would be due to begin in 2015 and continue over a period of three years. Given the nature of this project, however, whereby dredged material will be used to reclaim the land required for the port extension, we work on the basis that no excessive congestion arises on the public road network, and hence do no place a value on this cost.

Post-Construction

Some increase in port traffic can be expected as a result of this project, although a number of key cargoes, notably petroleum and bitumen, will be moved by underground pipeline and hence will generate no additional land-based traffic, and other customers have facilities or plan to move facilities to port lands. By the same token, the transfer of activities out of the current docks, in the city centre, to the port extension will probably lead to a reduction in traffic congestion.

Some of the potential new business volumes will entail additional traffic volumes, however, this can be mitigated to some degree at least by moving vehicles outside of peak times, and utilising storage at the port or on port lands. Moving to a 24-hour operational timeframe will facilitate this.

On balance, we assume that any increased traffic congestion caused is offset by reduced volumes either in Galway city centre or elsewhere in Ireland.

5.3 Increased Profits/Reduced costs for Port Customers

A number of wider economic benefits can flow from the project. These in sum add to the overall GDP of the economy, in addition to the increased profitability of the port itself.

Existing and/or new port customers can reduce their costs, because:

a. The extended Galway harbour can handle larger and more economical ships, leading to cheaper cargo, and/or
b. Galway harbour is nearer than the next best port and thus land transport costs are reduced.

These savings can be retained, leading to higher profits, or partly passed onto staff (increased employment, wages), or to customers, leading to higher profits and/or lower prices along the supply chain[32]. In a more dynamic sense, they can also enable port customers to expand their business, leading to greater economic activity and greater profits and/or employment and wages. Profits and wages combined make up the Gross Value Added (GVA) of a company and add to Ireland's GDP.

From our current perspective, we are not in a position to conclude which of the above would occur or to what degree. What we have done in this analysis is to assume that the benefits are captured by the port's direct customers, except where circumstances indicate otherwise.

The additional marina and cruise business will also have a significant wider impact in the tourism sector, in Galway and further afield.

5.4 Marina & Cruise Business

The marina and cruise businesses, while generating only modest income for the port company, have a potentially substantial positive impact on the local and regional tourism sector[33].

5.4.1 Cruise Liners

Passengers and crew disembarking bring extra spending to a location and its hinterland, either directly or through tours that they book. In addition, the cruise liners themselves take on supplies, which generates further local business. Given their nature, the economic activity generated is highly additional, and it is likely that alternative Irish ports complement rather than compete with each other for this business, for the most part[34].

The construction of new cruise facilities in Galway could be expected to generate a slow and steady increase in cruise vessel calls, which we assume will reach 36 calls by 2035. This is equivalent to annual average growth of 5.3%. Average vessel size would grow to 35,000 gross tonnes (GT), compared to just under 30,000GT projected for 2013, and more than double the average 2012 actual figure.

[32] In theory they could also be partly passed back to GHC, but for convenience we do not consider this option.
[33] For example http://www.scribd.com/doc/140569091/The-Potential-for-Growing-Marine-Leisure-pdf, http://www.ashcroftandassociates.com/images/ECC-Report%5B3-LR%5D.pdf, and https://webgate.ec.europa.eu/maritimeforum/system/files/BMF%20Coastal%20marinas%20UK_Channel_Fullreport_2005-06.pdf
[34] Dublin and Dún Laoghaire being an exception.

It is assumed that the average number of passengers per vessel will grow from approximately 600 to 1,000, which is reflective of number being achieved in other ports in Ireland[35]. The European Cruise Council[36] reported that the demand for cruises has grown steadily between 2002 and 2011, with average annual growth of 7.6% in passenger numbers worldwide.

In 2012, vessels visiting Galway had a passenger/crew ratio of 51%. This is in line with international experience[37] and is assumed to stay constant over the duration of this assessment.

In order to derive the economic impact of the new facility, a number of assumptions need to be made. They are listed below.

Table 5.2: CRUISE PASSENGER AND CREW EXPENDITURE IN GALWAY - KEY ASSUMPTIONS

	Passengers	Crew
% Disembarked in port	75%	50%
Average expenditure while in port	€71	€48
Advance payments made by % of disembarked passengers	27%	
Average amount of advance payment	€119	
Proportion of advance payments repatriated to Ireland	50%	

Source: Fáilte Ireland (2011), Cruise Tourism Report, averages for all Irish ports.

To calculate the economic impact of these expenditures over time, a number of steps are required, making use of the CSO's Input-Output Tables[38].

1. By stripping out the import content from each sector of spending, we get the total net impact of the spending on the Irish economy (direct and indirect).
2. The value added component (i.e. payroll plus profits) for each sector of spending constitutes the *direct* impact on the Irish economy.
3. Taking payroll and profits of Irish companies out of the total net impact leaves us with the *indirect* impact, (i.e. spending on other inputs by Irish companies in receipt of cruise passenger spending).
4. Finally, the *induced* impacts are calculated (61% of the combined direct and indirect impacts). These arise as the wages and Irish profit elements of the direct and indirect impacts combined are spent throughout the economy (i.e. households and firms spending their wage and profits earned from the increased economic activity due to spending by cruise passengers and crew).

[35] Passenger numbers are related not only to the size of the vessel but also the market sector – budget, premium, luxury, etc. The more up-market the sector, the lower the number of passengers.
[36] European Cruise Council (2012), THE CRUISE INDUSTRY Contribution of Cruise Tourism to the Economies of Europe, page 12
[37] European Cruise Council (2012) cites 52%. The more up-market the cruise, the higher the crew/passenger ratio.
[38] http://www.cso.ie/en/media/csoie/releasespublications/documents/economy/2005/inputoutput_2005.pdf

The next table summarises these elements for With and Without Development, and also includes the expenditure by cruise companies while in port, as vessels typically buy in miscellaneous items such as fresh flowers, fuel, food, newspapers and various chandleries (estimated at €5,000 per vessel)[39].

Table 5.3: ECONOMIC IMPACTS OF CRUISE LINERS IN GALWAY (€'000)

	With Development	Without Development	Net Impact
Spend			
Expenditure by passengers	1,110	222	888
Expenditure by crew	193	39	154
Cruise operator misc. spend	75	25	50
Total Spend	**1,378**	**286**	**1,093**
Economic Impact			
Direct	836	173	663
Indirect	316	66	251
Induced	703	146	557
Total Economic Impact	**1,855**	**384**	**1,470**

Source: CSO Input-Output Tables 2005, Leontief Inverse; DKM estimates.

Further qualitative benefits could be expected as follows:

- The positive externalities of cruise ships berthing in the centre of an attractive harbour, situated in a significant marine and tourist destination, which is well connected with its city centre.
- The impact of cruise passengers and crews returning to Ireland for subsequent holidays.

5.4.2 Marina Business

Much the same points can be made for the marina business as for the cruise business. Users of marinas generate significant additional business where they dock. The Irish Marine Sector Market Survey (2007)[40] found that sailors typically spend an average of between €7,787 and €11,011 per berth on maintenance, chandlery, fuel, personal protective equipment (PPE), clothing, insurance, marina berthing fees and training. This spend will benefit the local business community and will help to attract retail outlets catering for the sailing community to the waterfront, thus contributing to a vibrant, attractive environment for non-sailing tourists to visit. Most of the expenditure by people on visiting boats is done locally and would thus benefit Galway city itself, even after allowing for import content. The 2007 study referred to above found that 80% of spend by visiting boat was spent in the locality.

[39] For convenience we assume that the same multipliers as for passenger expenditure apply.
[40] Irish Marine Sector Marketing and Business Development (2007), The Potential for Growing Marine Leisure http://www.scribd.com/doc/140569091/The-Potential-for-Growing-Marine-Leisure-pdf

5.5 Other Positive & Negative Impacts

5.5.1 Environmental & Planning

Another positive impact of the project is that, with the movement of petroleum-related activities out of the Inner Dock, the Seveso-restricted area of the port will be moved away from the city centre (while the storage facilities will not be moved, the ship discharging fuel is a Seveso site while discharging).

This may have a positive impact on future planning applications in the city centre. However, from the current standpoint it is not possible to place a value on this potential benefit and it must remain a qualitative impact.

The major negative impact of the proposed project is that it encroaches upon a Natura 2000 Special Area of Conservation (SAC) in Galway Bay. It is beyond the scope of this report to measure this impact, but other studies are being undertaken for this purpose.

5.5.2 Employment

Significant employment will be generated directly or facilitated elsewhere in the economy by the project. Direct employment changes in GHC will be modest, but its employment and employment in its suppliers and customers will be sustained by the project.

We would see additional employment arising in two main areas:
(i) the construction of the project, and
(ii) the tourism industry as a result of the increased cruise and marina business.

Construction Phase

Phase One is projected to cost €51.6 million. DKM estimates that every €1 million spent on civil engineering infrastructure projects in Ireland generates approximately eight "man years" of employment in the construction firm and its suppliers, with a further 3.2 "man years" of induced employment in the wider economy[41]. On this basis, the project would generate in total some 580 "man years" of employment in the economy. Over a three-year construction phase that equates to just over 190 Full Time Equivalent (FTE) jobs. This will be particularly welcome in the construction and related sectors which have been decimated by the current recession.

Cruise & Marina Business

The tourism sector is particularly job-intensive, and significant additional economic activity will be generated as a result of the increased cruise and marina business at the port.

Our model indicates that the additional spend by cruise ships, their passengers and crews will generate some 55 permanent FTE jobs (outside GHC itself) over the time period under consideration, compared to 3 if the development does not

[41] http://www.dkm.ie/uploads/pdf/reports/CIC%20Submission%20to%20Government.pdf

proceed. Likewise, the additional expenditure by users of the marina facilities is expected to generate 26 permanent FTE jobs (outside GHC itself) over the time period under consideration, compared to 5 if the development does not proceed.

Thus the net increase in employment as a result of the development would be in the region of 73 (55 – 3 + 26 – 5).

5.6 Shadow Price of Public Funds

With a publicly funded project the Government must withdraw money from other sectors of the economy to fund it, in the form of taxes[42]. There is an additional cost imposed by these taxes, as they distort the economy away from its private optimum[43].

The *Proposed Working Rules for Cost-Benefit Analysis* (1999) by the CSF Evaluation Unit of the Department of Finance suggests a shadow price for public funds of 150%. Thus, for current purposes, we use a shadow price of 150%.

This significantly increases the burden on the Exchequer. However, it does not arise in our base case as the project is intended to be fully funded/financed by GHC and its banks. Should State grants or contributions arise shadow price effects would need to be taken into account.

5.7 Credit for Reduced Shadow Price of Construction Labour

As discussed in Chapter 1, in a fully employed economy, it is generally taken that the shadow price of resources used is 100%, i.e. equal to the market price. The rationale is that, in the absence of the project, the resources could be put to an equally productive use elsewhere in the economy. However, if there is unemployment in the economy, then the price paid for labour for instance would likely be above the value of its next best use, and it would be appropriate to use a shadow price of less than 100%.

Construction activity in Ireland has been in severe decline for a number of years[44]. The construction sector is currently not fully employed (i.e. has spare capacity) and will not be for the period of construction of the project. The difference

[42] Even if the Government borrows to fund the investment, that borrowing must be repaid with interest, and these repayments eventually come from tax revenue or alternative expenditure foregone.

[43] In some cases the private optimum does not coincide with the socioeconomic optimum, and some taxes are at least partly designed to bridge the gap, e.g. taxes on cigarettes, alcohol and transport. In these cases taxes may reduce distortions in the economy and are beneficial. However most taxes, particularly direct taxes, distort the economy away from both the private and socioeconomic optimum.

[44] Construction activity peaked in 2006-07, when, after 14 years of unbroken growth, the construction sector employed 272,600 people directly (Q2 2007, seasonally adjusted). By the second quarter of 2012, employment in construction had fallen to 100,800 (seasonally adjusted) and was unchanged in the third quarter. Having peaked at around 25% of economic activity in 2005, the construction industry's share of GNP declined to 7.4% in 2011, with a further fall to approximately 6.4% expected in 2012.

between the market price and the shadow price can at one level be considered to be equivalent to the social welfare payments avoided, and thus to accrue to the Exchequer.

The Department of Finance CSF Evaluation Unit's *Proposed Working Rules for Cost Benefit Analysis* (1999) state that a minimum of 80% should be applied as the shadow price of construction labour, and defended based on market conditions. These parameters are in the process of being reviewed in the *Public Spending Code*[45], but at the time of writing no more up-to-date values have been proposed.

With regard to the employment impact of construction, the CSO's Input-Output Tables 2005 (the latest available) indicate that 42.2% of the total cost of a construction contract goes to compensation of employees[46]. Thus for a project with a capital cost of €51.6 million, some €21.8 million could be expected to be related to wages and salaries. A credit for 20% of this would amount to €4.4 million).

5.8 SOCIOECONOMIC COST BENEFIT ANALYSIS RESULTS

In accordance with the Government's *Public Spending Code*, the socioeconomic CBA takes the net cashflows from the financial appraisal, and:

- adjusts them to shadow prices (i.e. true economic prices) including a 50% premium for the shadow price of public funds,
- adds the wider economic benefits and the external costs to the calculation,
- adjusts the cost of capital from the estimated commercial rate facing GHC (4.6% real) to a social discount rate facing the overall economy of 4% real.

The results are summarised in the tables below. The Base and High cases are as per the Business Case Analysis in Chapter 4.

Table 5.4: SOCIO-ECONOMIC COST BENEFIT ANALYSIS RESULTS – BASE CASE

	Direct Return With Development*	Net Wider Economic Costs	Net Wider Economic Benefits	CBA With Project	CBA Without Development*†	Net Socio-economic Impact of Project
NPV (€'000)	38,940	0	131,162	**170,102**	**22,693**	**147,409**
IRR	12.9%			**31.3%**	**n/d**	**26.8%**

*Using the social discount rate of 4% as opposed to the Business Case rate of 4.6%. †Same as Direct Return Without Development. n/d .. not defined.

[45] http://publicspendingcode.per.gov.ie/technical-references/

[46] Excel Tables, Leontief Inverse, NACE code 45 Construction, http://www.cso.ie/en/releasesandpublications/nationalaccounts/2005supplyanduseandinput-outputtables/

Table 5.5: SOCIO-ECONOMIC COST BENEFIT ANALYSIS RESULTS – HIGH CASE

	Direct Return With Development*	Net Wider Economic Costs	Net Wider Economic Benefits	CBA With Project	CBA Without Development*†	Net Socio-economic Impact of Project
NPV (€'000)	44,007	0	140,195	**184,201**	**22,693**	**161,508**
IRR	13.7%			**32.4%**	**n/d**	**27.9%**

*Using the social discount rate of 4% as opposed to the Business Case rate of 4.6%.
†Same as Direct Return Without Development. n/d .. not defined.

As can be seen, while in the Base Case the business case indicates that the project is profitable for the port, the wider economic impacts greatly increase the project's worthwhileness from a societal viewpoint, generating an NPV of €147 million and an IRR of 27% over the period under consideration. The High Case further reinforces this.

The net wider economic impacts of the project are very substantial (€131 million in the Base Case), and dwarf those for GHC itself.

We would reiterate that the sectoral impact estimates are based on correspondence and meetings with the relevant business managements regarding their plans if the port extension Phase One proceeds. We did not carry out due diligence on the respective business plans.

As with any project such as this, there are a number of significant uncertainties, and they are considered in the scenario/sensitivity analysis below.

5.9 SCENARIO/SENSITIVITY ANALYSIS

5.9.1 Scenarios

We now employ a range of scenario and sensitivity analysis tests, to evaluate the impact of varying our assumptions regarding each of the main costs and benefits discussed so far in this report. Uncertainty and the requirement to use long-term forecasts in many cases have forced us to make a number of assumptions. Realistic assumptions will reduce the level of uncertainty but will not eliminate it. As such, the results of the analysis are potentially associated with a wide margin of error. The following tests will assist us in identifying the sensitivity of our results to changes in the major assumptions.

The sensitivity analysis should highlight critical factors and the areas that may require further analysis in order to quantify their impact more accurately. Sensitivity analysis strictly speaking should assess both positive and negative variations, but in project appraisal, the focus is understandably on negative variation. We can also assess how negative some impacts would have to become before the project did not generate a positive return, i.e. the 'switching values'. This helps us to understand what is driving the results and makes them more robust.

It is also worth keeping in mind that some significant positive impacts have only been qualitatively assessed, notably –

- The potential to service the oil and gas exploration business off the west coast;
- Elimination of Seveso issues around discharging oil products in the Inner Dock;
- Security of supply benefits related to storage of petroleum at Galway.

These go some way to counterbalancing to any vulnerabilities identified.

The table below sets out what we consider to be the key assumptions made in this CBA Base Case, and the variations we propose to test. For the most part they mirror the scenarios tested for the Business Case.

Table 5.6: SUMMARY OF SCENARIO ANALYSIS TESTS

Factor		Base Value (used in CBA)	Scenario Analysis Value
1.	Discount rate	4% real	Base + 50% (6% real)
2.	Upfront capital expenditure	€51.6 million	Base + 50%
3.	Valuation of benefits	As per Chapters 4 & 5	Base – 50%
4.	Cruise & Marina business fails to grow	As per Chapters 4 & 5	Same as Without Development
5.	Shadow price of construction labour	80%	100%

We have also tested scenarios whereby expected future business growth fails to materialise.

5.9.2 Higher Discount Rate

A social discount rate of 6% real gives the following results:

Table 5.7: CBA RESULTS, DISCOUNT RATE = 6%

	Direct Return With Development	Net Wider Economic Costs	Net Wider Economic Benefits	CBA With Project	CBA Without Development†	Net Socio-economic Impact of Project
NPV (€'000)	25,493	0	106,246	**131,739**	**19,031**	**112,708**
IRR	12.9%			**31.3%**	**n/d**	**26.8%**

†Same as Direct Return Without Development. n/d .. not defined.

A higher social discount rate results in a reduced but still highly positive NPV. The Internal Rate of Return value effectively gives how high the discount rate/cost of capital would have to be (27%) for the project to just break even from a socio-economic viewpoint.

5.9.3 Higher Capital Expenditure

If the upfront capital expenditure turns out to be 50% higher than expected, the results would be as follows:

Table 5.8: CBA RESULTS, UPFRONT CAPITAL EXPENDITURE 50% HIGHER

	Direct Return With Development*	Net Wider Economic Costs	Net Wider Economic Benefits‡	CBA With Project	CBA Without Development*†	Net Socio-economic Impact of Project
NPV (€'000)	14,119	0	133,258	**147,378**	**22,693**	**124,684**
IRR	6.2%			**21.0%**	**n/d**	**18.1%**

*Using the social discount rate of 4% as opposed to the Business Case rate of 4.6%. †Same as Direct Return Without Development. ‡ Net wider economic benefits rise slightly because of the credit for the shadow price of construction labour. n/d .. not defined.

Once again, the project NPV is reduced but still highly positive.

5.9.4 Lower Benefits

If benefits turn out to be 50% of the expected levels, the results would be as follows:

Table 5.9: CBA RESULTS – BENEFITS & SAVINGS 50% LOWER

	Direct Return With Development*	Net Wider Economic Costs	Net Wider Economic Benefits	CBA With Project	CBA Without Development*†	Net Socio-economic Impact of Project
NPV (€'000)	23,644	0	67,677	**91,321**	**22,693**	**68,628**
IRR	10.0%			**22.8%**	**n/d**	**17.8%**

*Using the social discount rate of 4% as opposed to the Business Case rate of 4.6%. †Same as Direct Return Without Development. n/d .. not defined.

As can be seen, reducing benefits to 50% of their expected level reduces the NPV significantly, but it remains positive.

5.9.5 Cruise & Marina business fails to grow

If the cruise and marina business fails to grow beyond its level in the Without Development option, the result would be as follows:

Table 5.10: CBA Results – Cruise & Marina Business Fails to Grow

	Direct Return With Development*	Net Wider Economic Costs	Net Wider Economic Benefits	CBA With Project	CBA Without Development*†	Net Socio-economic Impact of Project
NPV (€'000)	31,213	0	79,329	**110,542**	**22,693**	**87,849**
IRR	11.4%			**24.8%**	**n/d**	**20.1%**

*Using the social discount rate of 4% as opposed to the Business Case rate of 4.6%. †Same as Direct Return Without Development. n/d .. not defined.

This reduces the socio-economic NPV of the project, but it remains highly positive.

5.9.6 Shadow Price of Construction Labour = 100%

On the basis of a 100% shadow price of construction labour, the results would be as follows:

Table 5.11: CBA Results – 100% Shadow Price of Construction Labour

	Direct Return With Development*	Net Wider Economic Costs	Net Wider Economic Benefits	CBA With Project	CBA Without Development*†	Net Socio-economic Impact of Project
NPV (€'000)	38,940	0	126,971	**165,910**	**22,693**	**143,217**
IRR	12.9%			**28.7%**	**n/d**	**24.7%**

*Using the social discount rate of 4% as opposed to the Business Case rate of 4.6%. †Same as Direct Return Without Development. n/d .. not defined.

This makes almost no difference to the socio-economic NPV of the project.

5.9.7 Conclusions

We have tested the robustness of our results to significantly more negative outcomes. The socio-economic NPV of the project remains positive under all these scenarios.

This gives comfort around the robustness of our results. It must also be borne in mind that a number of benefits have not been quantitatively evaluated in the base case, so it represents a somewhat conservative estimate of the total benefits.

6. CONCLUSIONS

Chapter 4 of this report demonstrated that in the Base Case the proposed project is profitable. A High Case demonstrates the up-side and reinforces the profitability of the project.

However, this is based on projected substantial additional business at the port for a relatively small number of port customers. It is important therefore to test our results against a range of negative scenarios, including ones whereby this additional business does not materialise. We therefore tested the Base Case against a number of more negative outcomes, namely:

1. Discount/interest rate +50%
2. Upfront capital expenditure +50%
3. Valuation of benefits -50%
4. Cruise & Marina business fails to grow.

We have also tested scenarios whereby expected future business growth fails to materialise.

The project's commerciality (in the Base Case) is vulnerable to scenarios 2 and 3, and to some instances whereby future business fails to materialise. However, the port itself remains highly profitable even under these negative scenarios.

The project does in addition generate very substantial wider benefits, as demonstrated in Chapter 5, which in fact are much larger than the benefits to the port itself. These include substantial employment during the construction phase and permanently in the tourism industry as a result of the increased cruise and marina business, as well as underpinning employment in the port, its suppliers and customers.

Chapter 5 indicates that the project is highly worthwhile from a socio-economic viewpoint in the Base Case, even when testing for the same more negative outcomes as listed above. This gives comfort around the robustness of our results. It must also be borne in mind that there are a number of benefits that have not been quantitatively evaluated in the base case, so it represents a somewhat conservative estimate of the total benefits.

Most of these wider economic benefits are captured either by the port's customers or by the tourism sector. Given the project's vulnerability to some less positive scenarios, this would appear to justify a sharing of risk and reward between GHC, its main customers and the local business community, through for instance capital contributions or guarantees from customers and Fáilte Ireland or local or central Government.

DKM
ECONOMIC
CONSULTANTS

CONTACT DETAILS

DKM ECONOMIC CONSULTANTS
Office 6 Grand Canal Wharf
South Dock Road
Ringsend, Dublin 4.
Telephone: 01 6670372
Fax: 01 6144499
Email:info@dkm.ie

www.dkm.ie