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Department of Communications,
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Geoscience Research
GSI
Suirbhéireacht Gheolaíochta Éireann
Geological Survey of Ireland

Geological Survey of Ireland Research Programme
- Short Call 2015, Final Report -

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Organisation name	RealSim Games Ltd		
Organisation type:	☐HEI	☐Public Sector (other)	X☐Private Sector
Department/section			

Project Title	3D Simulation of Ireland's 'Ancient East' Marine Environment
Contract No.	2015-sc-070

INFOMAR
Integrated Mapping for the Sustainable Development of Ireland's Marine Resource

Tellus
Understanding Underground

Marine Institute
Foras na Mara

1. **Project information**:

Title of project	3D Simulation of Ireland's 'Ancient East' Marine Environment
Did you make any formal amendment to the project workplan / budget?	X☐ yes ☐ no If yes, please specify: We decided to include the modelling of the Leinster in it's current wreck state in June following a change of mind from Ulster University to allow us to use their ultra high resolution bathymetry data over the wreck. They had initially declined to give us this data during discussions in November 2015 when we were exploring this option as part of our Infomar project proposal. To accommodate this, we had to divert time and resources from the Hook Head part of the project, where we were unable to carry out a drone survey due to flying restrictions and poor weather. There was no net effect on the overall budget.

Project Report (*max 1500 words, excluding figures and headings*):

(i) Objectives and scientific/engineering targets beyond the state of the art.

The final output of this project is a seabed data and marine heritage content template which can be used as a basis to deploy an engaging interactive public display and as a platform to be populated further with new information on Irelands seabed and the natural and manmade features within it. The work will also help the scientific analysis of other workers. The 3d model of the Leinster will be given to Ulster University marine scientists Ruth Pletts and Rory Quinn to aid their analysis of the detail bathymetry data taken over the wreck during surveying last year.

The 10km terrain and seabed tiles produced will be given to the GIS manager in the Marine Institute. At present all the data is stored in terms of survey legs rather than in geographic tiles. The interactive scene is comprised of a Unity Player File executable which can be navigated by simple mouse and key board controls. It has not however been prepared to be a publicly accessible simulation which would involve the coding of simpler controls using joystick or a touch screen. This has not been done on purpose as any such public use simulation would have to be constructed in collaboration with the host museum, fitting in with their hardware budget and desired style and visitor experience. We are currently in consultation in the maritime museum in DunLaoghaire and the Dunbrody Famine Ship interpretative centre location 3d model.

With the exception of the high resolution landscape model around Hook Head, all the objectives that aimed to go beyond any previous work carried out by RealSim or any other party have been achieved;

1. Largest bathymetric and terrestrial dataset compiled in to one navigable scene.

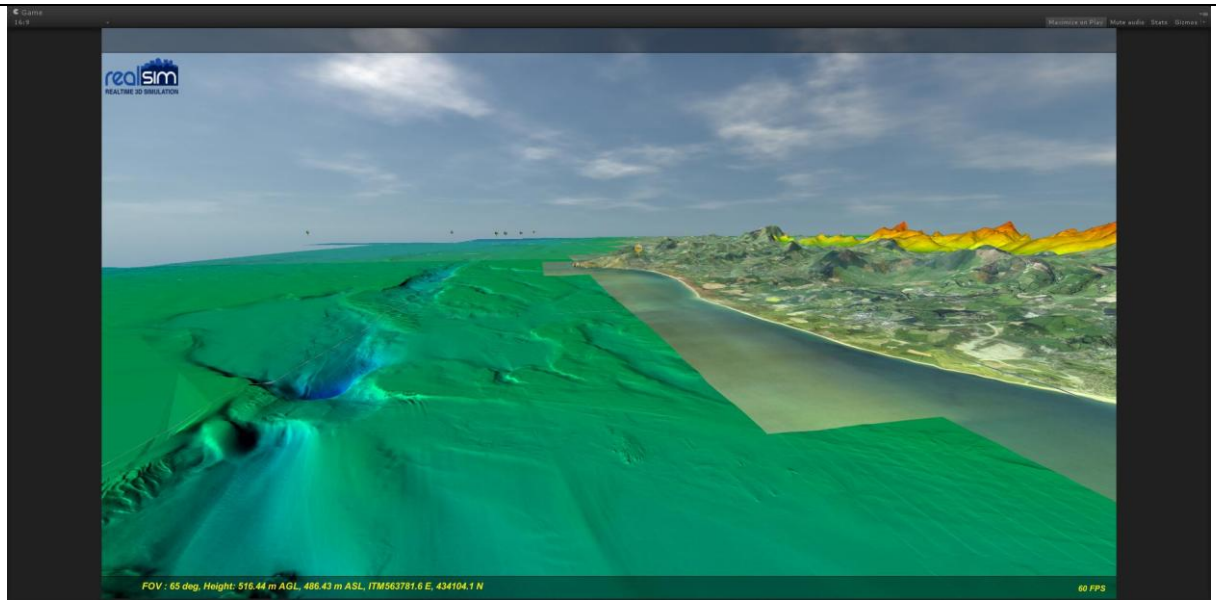

Figure 1: Screenshot from RealSim's 3d scene of entire East coast bathymetric and terrestrial dataset

Simulation represents roughly 17,000 square kilometres seabed and terrestrial data with a height point every 5m. This is larger than the seabed simulation currently on display in Titanic Belfast, and has been constructed in the such a way that the scene is capable of being extended to the entire island.

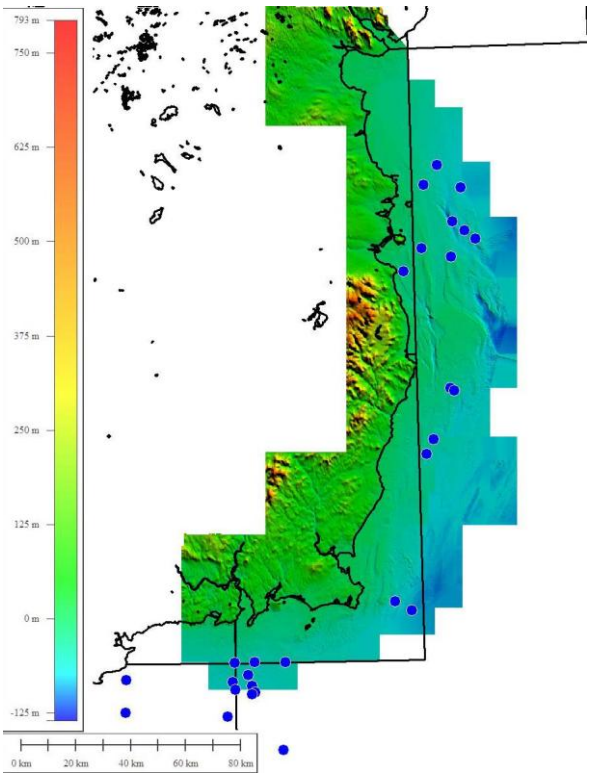

Figure 2: Extent of merged terrestrial and bathymetric data for Marine Ancient East project. Dots represent location of verified WWI shipwrecks.

2. New Ship and Shipwreck Reconstructions

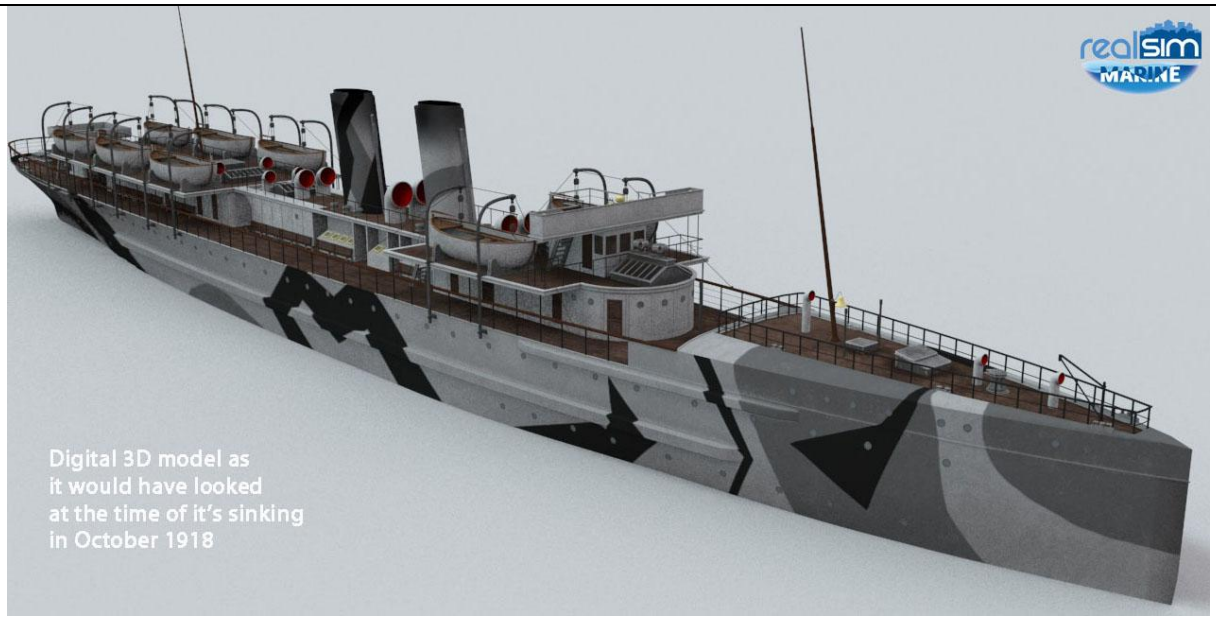

Figure 3: The digital model reconstructed from the ships engineering plans as shown in Philip Lecane's book on tthe R.M.S. Leinster, 'Torpedoed'.

Figure 4: A computer generated image of how the ship may have looked as she sailed.

Figure 5: An artistic interpretation of the moment of impact, when the torpedo hit the Leinster.

Figure 6: A computer generated image of Irish Lights vessel, the South Arklow or 'The Gullimot', which was sunk by a German U-boat in WWI. This has been reconstructed from engineering plans acquired from the naval library in the commissioner of Irish Lights.

Figure 7: A computer generated image of German U-boat U-65 responsible for sinking the Guillimot.

(ii) Implementation (including reference to timelines, milestones, management)

This project relied on the delivery of data from many different sources and this caused considerable delay at the outset of the project. However we are very grateful for the assistance from all who kindly gave us their data and free time to assist us where they could. The data required and received to facilitate this project includes;

- 10m terrestrial terrain data with 0.5m pixel resolution ortho photos for the entire east coast supplied by Ordnance Survey Ireland
- WWI shipwrecks database supplied by the Underwater Archaeology Unit
- Bathymetry survey legs for the entire east coast supplied by the Marine Institute
- ultra high resolution bathymetry of the RMS Leinster wreck supplied by MI but facilitated by Ulster University
- access to the physical model of the RMS Leinster in the National Maritime Museum in Dun Laoghaire

We were not however reliant on all the base mapping data to start on the project and were able to begin work on the ship modelling process in advance. Much of the work on the ships were completed in June before we started the process of processing and merging all the seabed and terrestrial data in to 10km tiles. We brought on board a 3rd party contractor to work on the Leinster because we realised there was too much work on other aspects of the project for Gary Dempsey to handle. This turned out very well as he did an excellent job. Gary was also assistant in the mapping data preparation process by colleague Eoghan Quigley who did the final processing procedure required to make the terrain tiles Unity ready.

With the additional workers on the project we have been able to complete the work slightly ahead of schedule which had been divided over a 12 month timeline, completing the work in 10 months.

(iii) Outputs (please use bullet points)

- A single navigable scene of a merged 3d land/sea dataset populated with shipwrecks, info icons and lighthouses.
- A template for expanding this content in to an all island model.
- 3D models of 2 ships and one German U-boat, the R.M.S. Leinster, the Irish Lights vessel, the

South Arklow, and U-boat U65.

- A 3D model of the Leinster shipwreck and a methodology developed for transforming a dense point cloud in to a detailed photo-textured mesh model
- Relationships developed with operators engaged in disseminating marine heritage to the public with a view to creating innovative visual and immersive marine themed experiences for the respective museum/information centres.

Impact/value of the project (M*ax 500 words*):

This project built upon expertise developed on earlier projects on how to assemble large areas of real world terrain in to gaming engines. The main purpose of the project was to advance the education outreach capabilities of the marine science sector which lags well behind other forms of science and IT outreach programmes in Ireland. The aim of this project was to present complex scientific data in a simple, easy to use and understand format for the public. Although the current output is not yet 'public ready', we are now in a position to discuss the presentation of this work and it's further development in to a form that will suit a specific museum or information centre.

The real impact will happen when this work is on public display with young and old interacting with Irelands seabed landscape, something which is hidden and largely a mystery to the vast majority of the populace. We hope to have an outline agreement with one or more potential hosting centres before the end of 2016 with a view to building out and deploying a public exhibit during the course of 2017.

Our work will also add to the scientific work of marine researchers specifically those interpreting the acoustic data around ships wrecks. Ulster University will have the digital 3d model of the RMS Leinster with which to further refine their analysis of the ultra detailed swath sonar survey they carried out over the shipwreck in 2015.