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EX 6498

Gravesend Town Pier
Revised Ferry Pontoon Development

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Summary

Gravesend Town Pier

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HR Wallingford was commissioned by Gravesham Borough Council to provide flow information in the vicinity of a proposed revised pontoon development at Gravesend Town Pier, the original pontoon development having been previously reported by HR Wallingford (HR Wallingford 2009). The study provides flow data that will be used to inform other investigations being carried out and / or the need and extent of further hydrodynamic studies to support the planning applications.

The proposed pontoon, which will be approximately 40 m in length, and about 40 m northeast from Town Pier jetty. Access to the pontoon will be by means of a link-span that can adjust throughout the tide so that continuous access is possible to the floating pontoon. The pontoon will float at all stages of the tide, its draft being 0.5 m. An arrangement of piles will be deployed to support and / or to hold the floating pontoon in place.

The principal findings of this study suggest that the proposed works will only have a minimal impact upon the hydrodynamic and sediment transport regime of the river at this locations or upon nearby riparian activity.

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1. Introduction

HR Wallingford was commissioned by Gravesham Borough Council to provide flow information in the vicinity of a proposed revised pontoon development at Gravesend Town Pier, the original pontoon development having been previously reported by HR Wallingford (HR Wallingford 2009). The study provides flow data that will be used to inform other investigations being carried out and / or the need and extent of further hydrodynamic studies to support the planning applications.

The proposed pontoon, which will be approximately 40 m in length, and about 40 m northeast from Town Pier jetty. Access to the pontoon will be by means of a link-span that can adjust throughout the tide so that continuous access is possible to the floating pontoon. The pontoon will float at all stages of the tide, its draft being 0.5 m. An arrangement of piles will be deployed to support and / or to hold the floating pontoon in place.

This report is laid out as follows: Section 2 discusses the site information, the details of information provided by the client and the modelling approach. Section 3 presents the results and the main findings. Finally, Section 4 draws the conclusions and recommendations are made.

2. 2D Hydrodynamic Modelling

2.1 SITE INFORMATION

Town Pier lies on the south side of Gravesend Reach approximately 100 m to the east of West Street Pier and 350 m to the west of Royal Terrace Pier (Figure 1). The proposed pontoon development will be linked to the eastern side of the pier-head. Gravesend Reach experiences strong tidal flows on almost all tides. In the vicinity of the proposed works the flows can be particularly strong and dynamic especially on the ebb tide.

2.2 DATA ACQUIRED

Information for the modelling process was derived from four main sources:

- Details of the proposed structure were provided by Gifford by means of drawings 13814-OPT3-PA-004 (Figure 2) which were received via email on 08/02/11,
- Details of the existing structures (West Street, Town and Royal Terrace Piers) especially the piling and pontoon arrangements, were obtained from the Port of London Authority (PLA)
- Photographs provided by the PLA and from the HR Wallingford archives.
- Bathymetric and coastline data was obtained from PLA Chart 336. The chart shows three pontoons that were moored at Royal Terrace Pier which were included in the model. These pontoons have now been replaced with a single smaller pontoon.

2.3 MODELLING APPROACH

The existing through-tide flow environment was studied using the 2D numerical flow model of the Thames Estuary (set-up by HR Wallingford on behalf of the EA and PLA

to assist them with their regulatory responsibilities). The model was used with permission from the Environment Agency (EA) and the Port of London Authority (PLA). The model has been successfully calibrated to a wide variety of tide and fluvial flow conditions (HR Wallingford 2004) so a bespoke site flow measurement exercise for this project was not necessary.

The mesh of this estuary wide model is not sufficiently fine in all areas to be able to carry out detailed studies at any location. To asses the proposed development, the local flow structure and the potential changes to it the numerical model cell mesh size was reduced in the vicinity of the proposed woks so that structures, including those that float could be adequately represented. The influence of the support piles on the flow was included in the simulations by adding an appropriate drag coefficient (based up on the size, shape and density of the piles) within each piled area.

The mesh size was refined to a 5 m grid in the area of the development and can be seen in Figure 3.

3. Model results and discussion

Information presented in this report provides flow data for the existing present day condition and following the construction of the proposed works. The information presented comprises:

- Flow speed vectors and contoured current speed at hourly intervals in the vicinity of the proposed pontoon to assess changes in flow magnitude and alignment with the flow;
- Contoured current speed difference at hourly intervals

3.1 FLOW SPEED AND DIRECTION AT HOURLY INTERVALS IN THE VICINITY OF THE PROPOSED PONTOON

Figures 4 to 10 show the through-tide depth-averaged flow for both the existing and proposed scenarios. Although aligned with Town Pier, the pontoon structure is not particularly well aligned to the flow. A 4-5° anticlockwise rotation of the main pontoon would bring the pontoon more in line with the simulated 2D flow. It is suggested that this issue be addressed by site inspection and possibly measurements.

Depth-averaged peak speeds at the new pontoon are expected to vary slightly from the existing state, rising by 0.03 m/s at peak flood and ebb with the area of the change being larger at peak ebb.

3.2 CONTOURED CURRENT SPEED DIFFERENCE AT HOURLY INTERVALS

Figures 4 to 10 also show the depth-averaged, tidal flow speed differences. A general pattern of a slight slowing of the flow both upstream and downstream of the pontoon is noted. The magnitude of change is typically of the order of 0.01 m/s, with occasional very localised values of up to 0.03 m/s in peak flood and peak ebb. Superimposed on the general slowing predicted localised speed increases are present in the pontoon area and landward from it. These increases are largely of the order of 0.01 m/s with localised values of up to 0.03 m/s.

4. Conclusions

1. The alignment of the proposed pontoon to the flow could be improved. As reported in the previous study (HR Wallingford, 2009) a 4 to 5° anticlockwise rotation of the main pontoon would bring the structure more in line with the 2D flow. As suggested in the previous work this issue may be addressed by site measurements and possibly measurements
2. Changes in flow speed in the area following the installation of the pontoon extension and the new piles will be small.
3. Changes to the flow regime adjacent to the river wall are expected to be minimal. It is therefore considered that the foreshore fronting the river wall will not be subject to any erosion. The integrity of the river wall will therefore be unaffected by the proposed works.
4. Flow changes in the vicinity of other riparian activities in the area will be small and localised. It is anticipated that the proposed works will not impact upon their operation.
5. The new layout will not affect tidal propagation in the Estuary. The volume changes due to the floating structures will only have a nominal effect on the tidal volume.

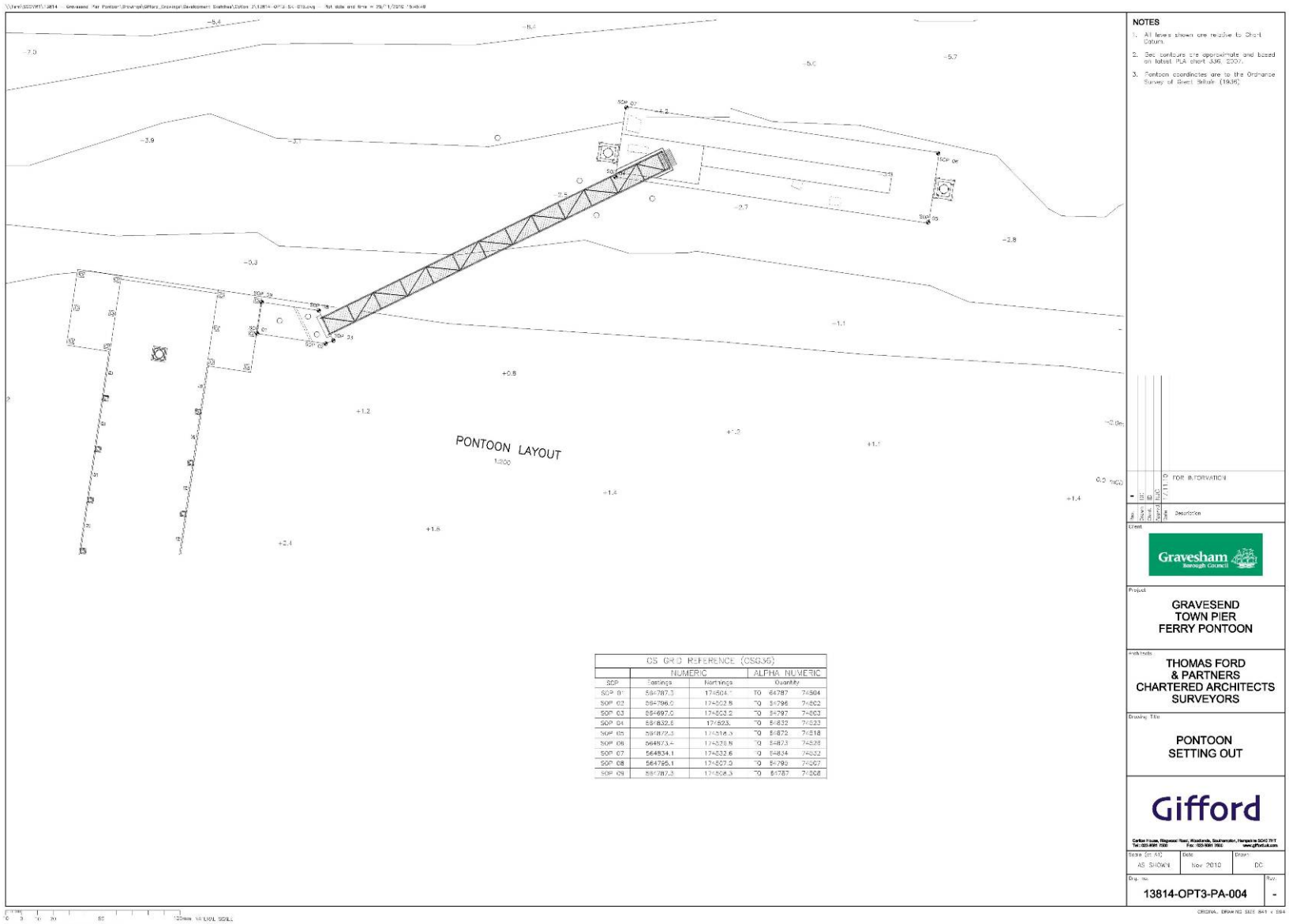
5. References

HR Wallingford (2004). Thames Estuary 2D Base Model. HR Wallingford Report EX 4912, April 2004

HR Wallingford (2009). Gravesend Town Pier, Construction of a Ferry Pontoon: Provision of flow information arising from pontoon extension to Town Pier, Gravesend Reach, Thames Estuary. HR Wallingford Report EX 6152, October 2009.

Figures

Figure 1 Study Area



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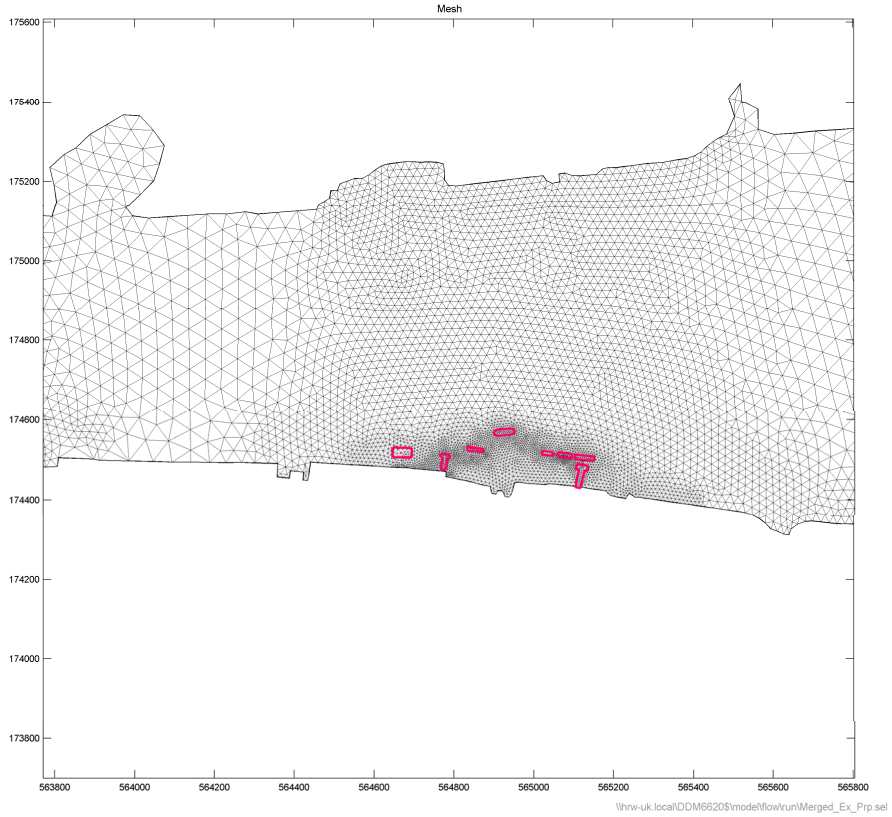
SOP 06	564873.4	174528.8	TO	64873	74528
SOP 07	564834.1	174532.6	TO	64834	74532
SOP 08	564795.1	174527.0	TO	64795	74527
SOP 09	564787.3	174508.3	TO	64787	74508

Figure 2 Proposed Configuration: Drawing 13814-OPT3-PA-004 (provided by Gifford)



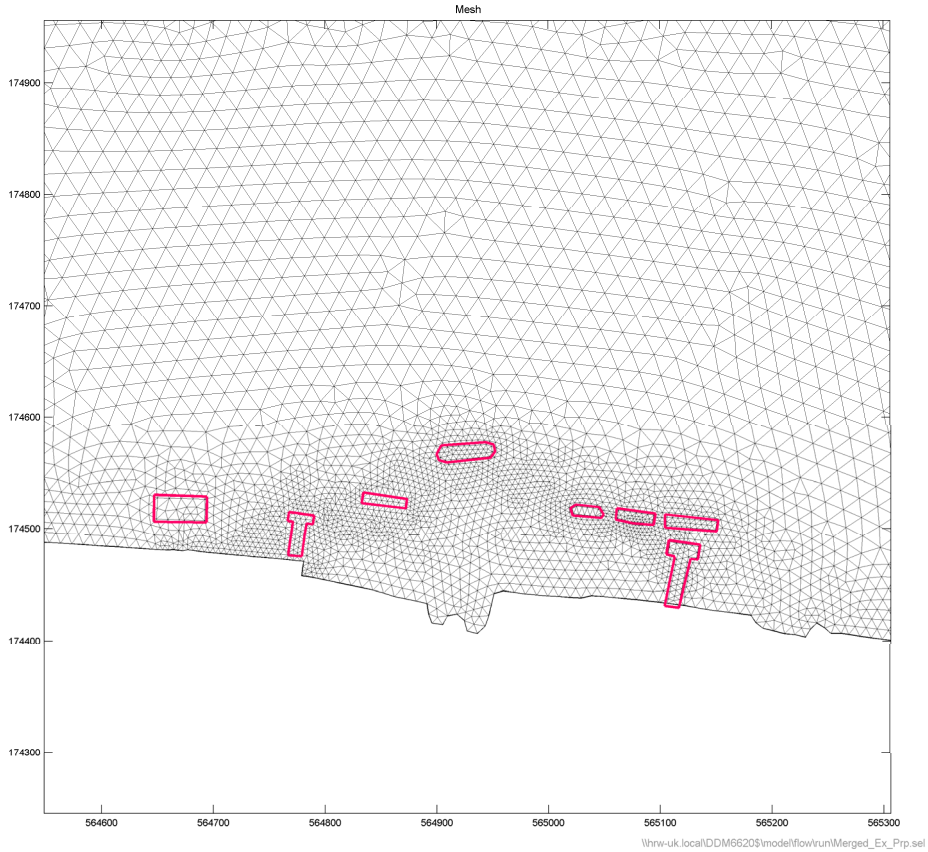


Figure 3 Model Mesh

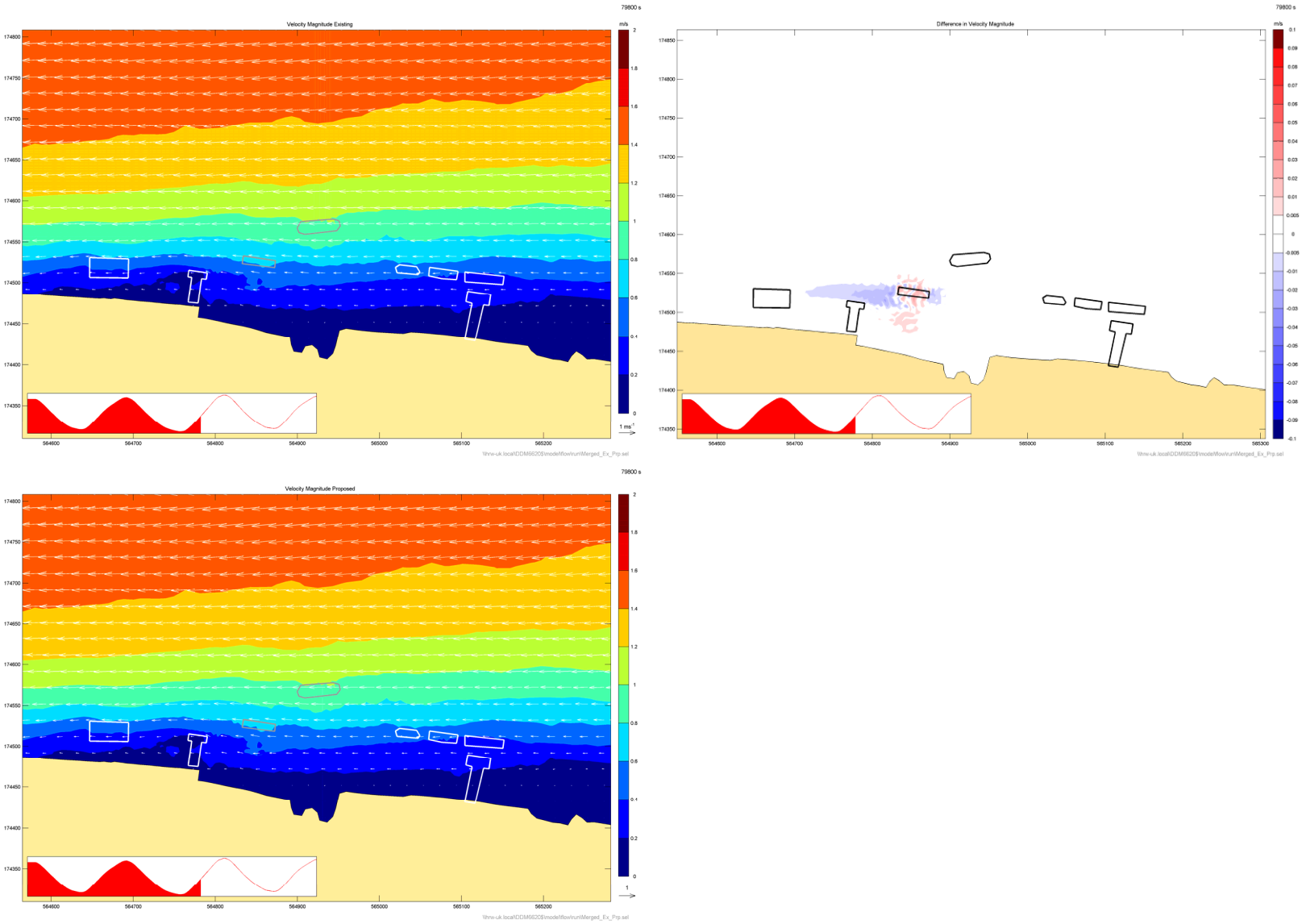


Figure 4 Existing and proposed velocity magnitude (left top and bottom respectively) and difference plot of Velocity magnitude (right) at High Water – 3 hr

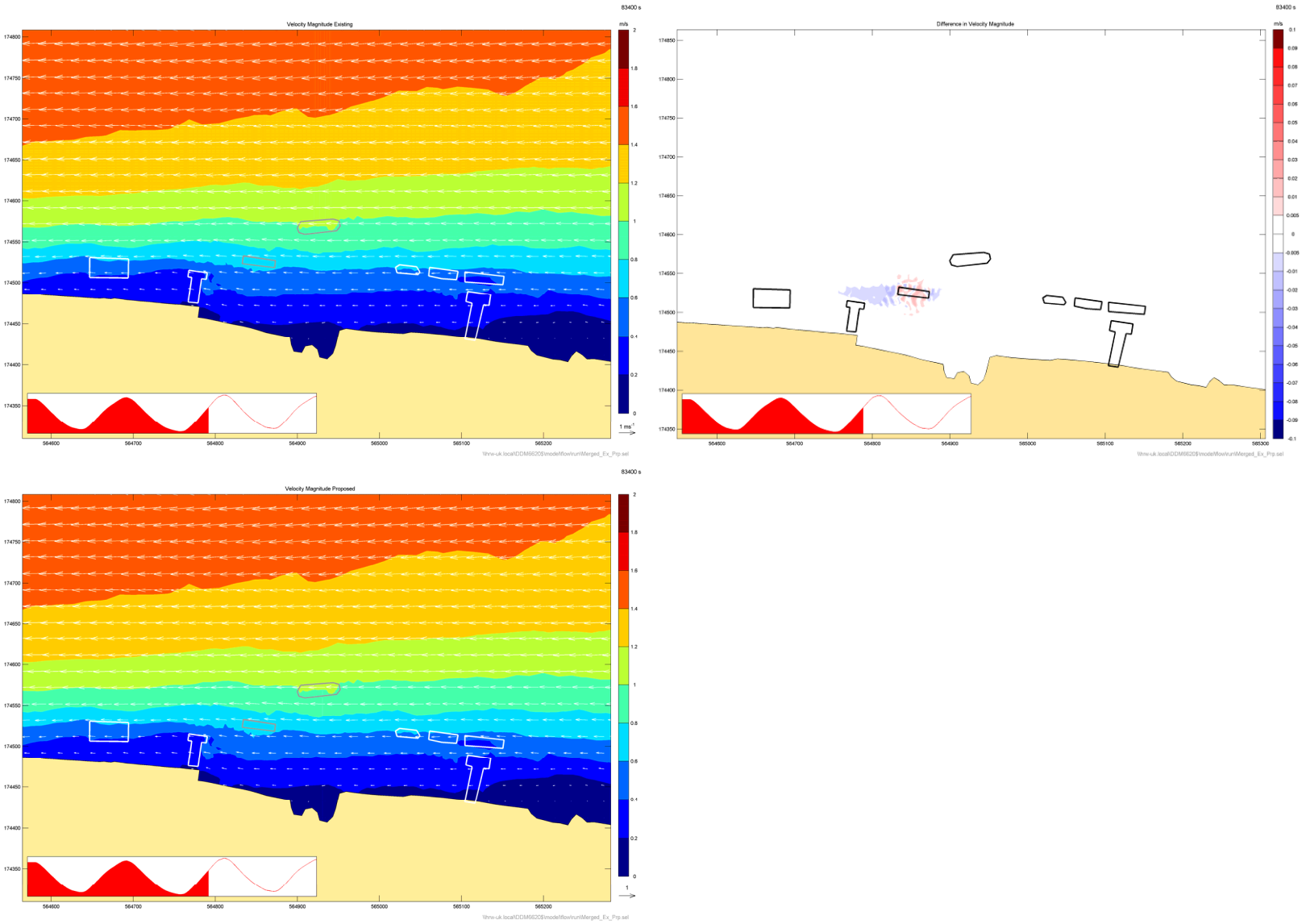


Figure 5 Existing and proposed velocity magnitude (left top and bottom respectively) and difference plot of Velocity magnitude (right) at High Water – 2 hr

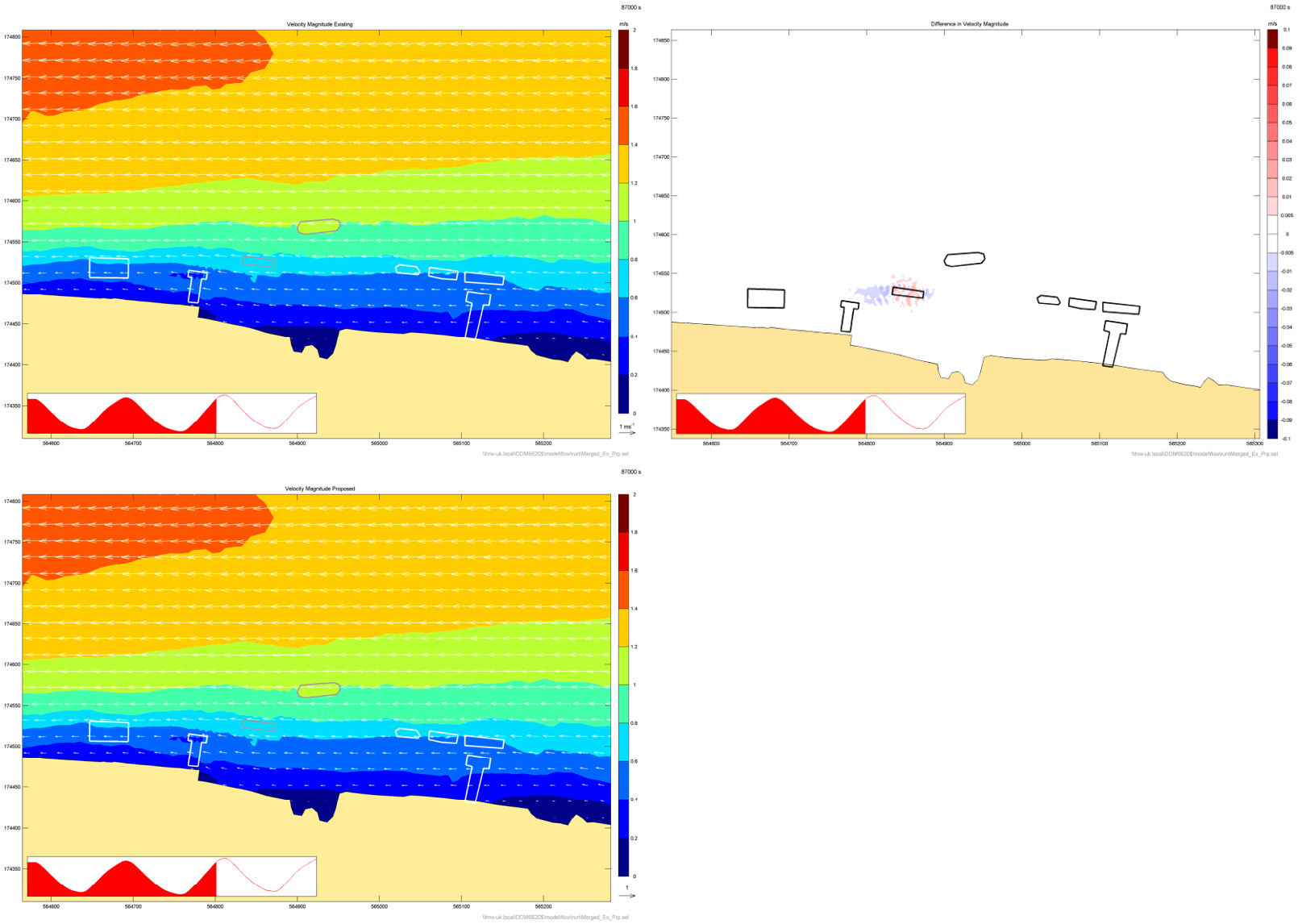


Figure 6 Existing and proposed velocity magnitude (left top and bottom respectively) and difference plot of Velocity magnitude (right) at High Water – 1 hr

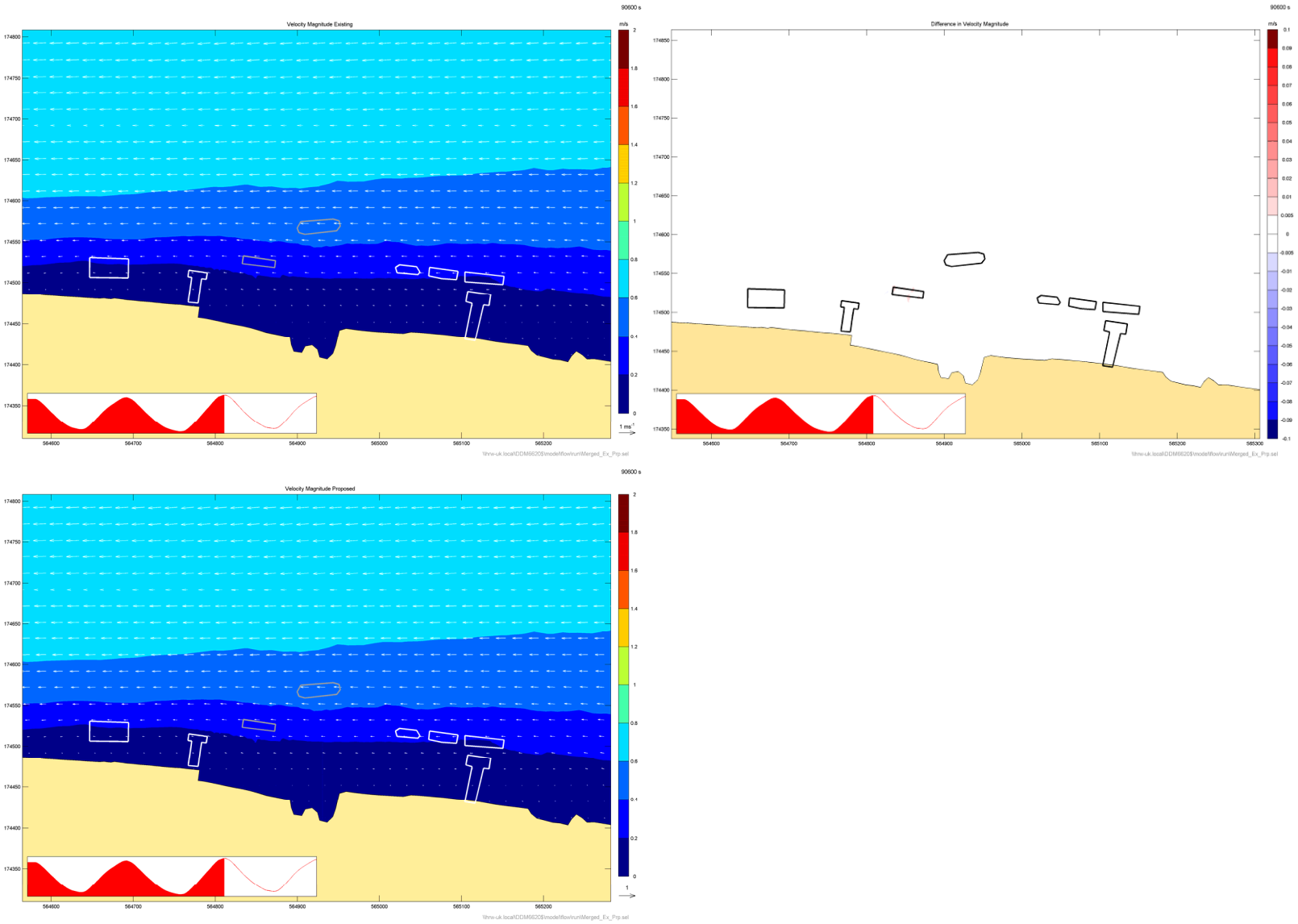


Figure 7 Existing and proposed velocity magnitude (left top and bottom respectively) and difference plot of Velocity magnitude (right) at High Water

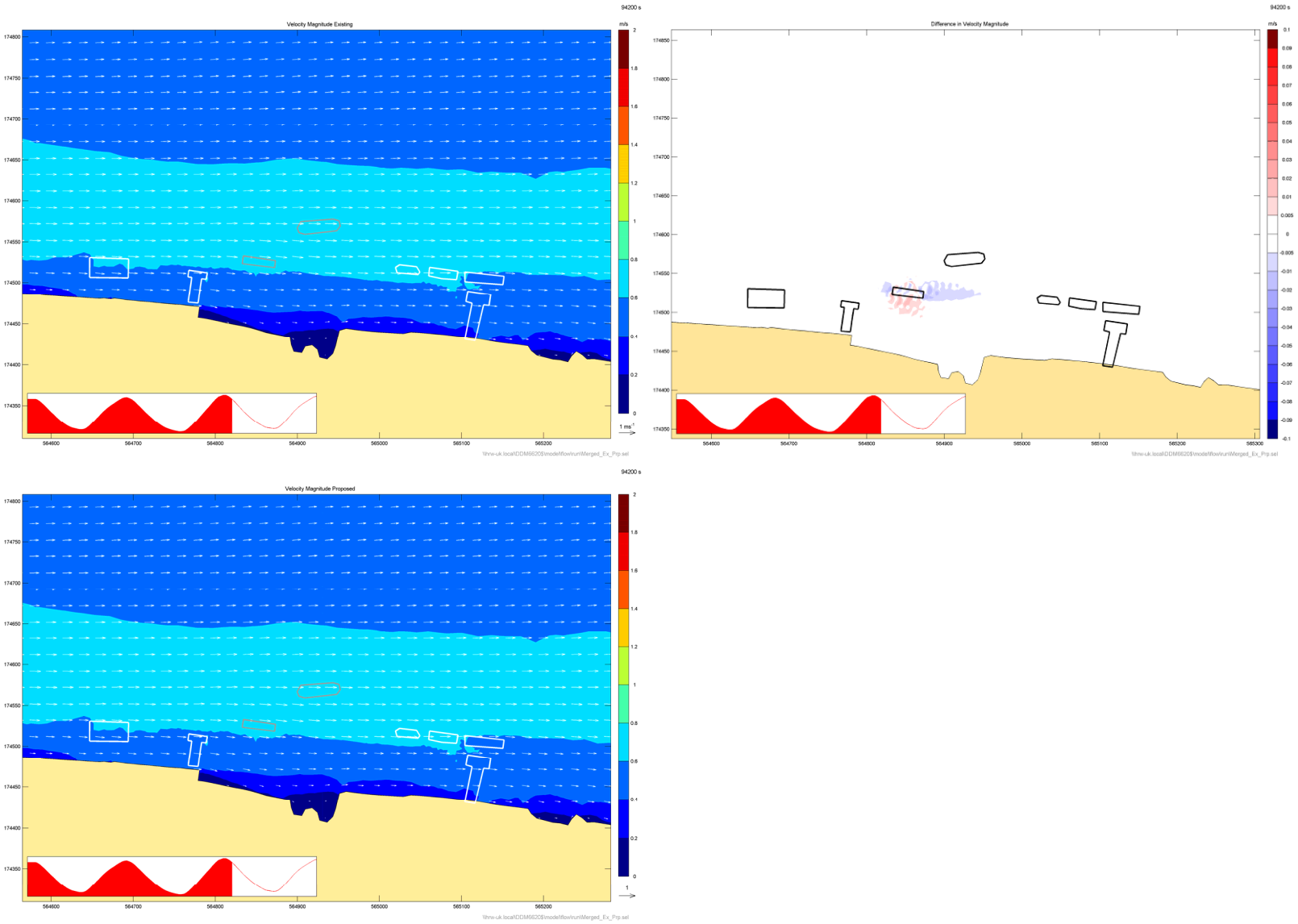


Figure 8 Existing and proposed velocity magnitude (left top and bottom respectively) and difference plot of Velocity magnitude (right) at High Water + 1 hr

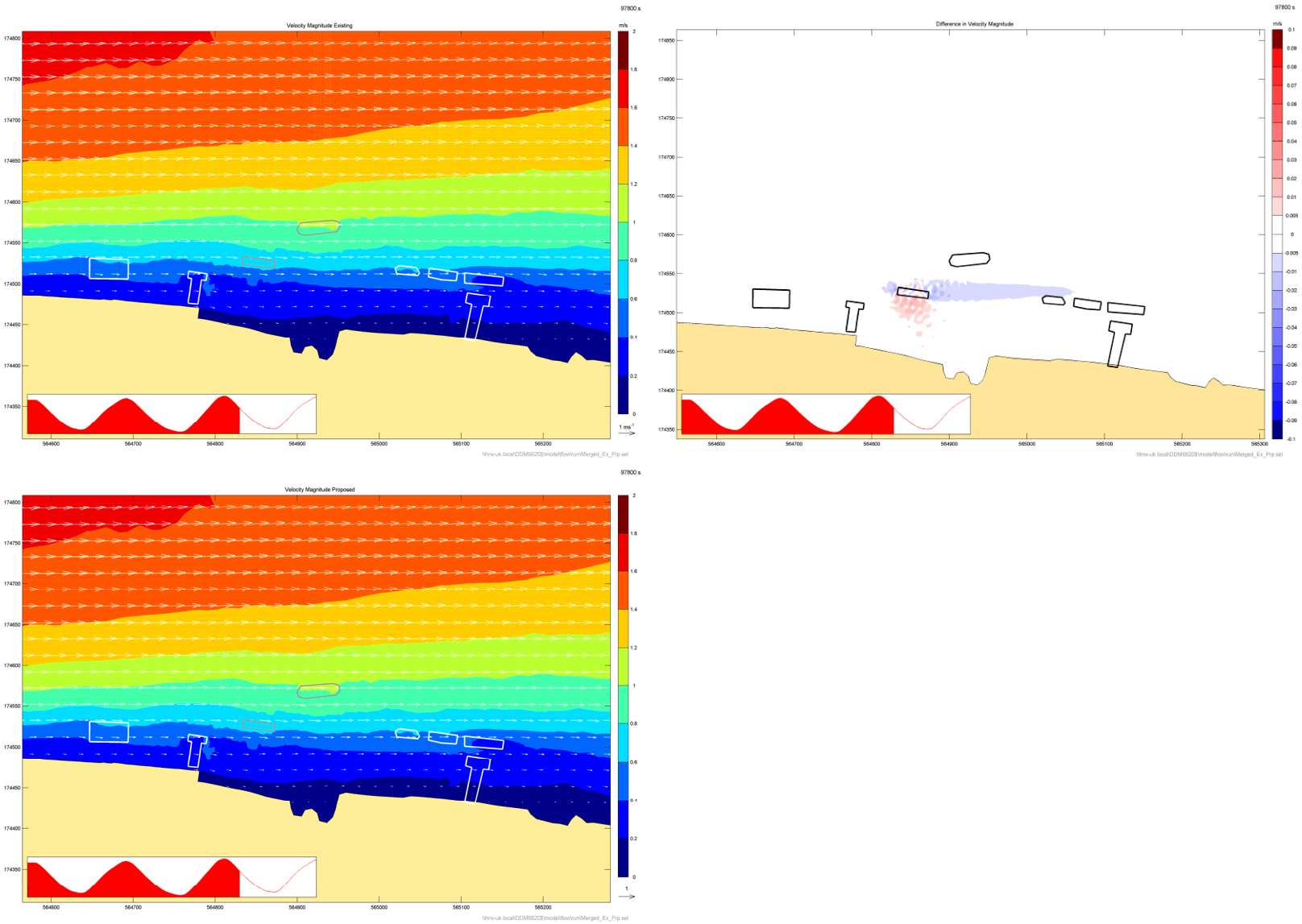


Figure 9 Existing and proposed velocity magnitude (left top and bottom respectively) and difference plot of Velocity magnitude (right) at High Water + 2 hr

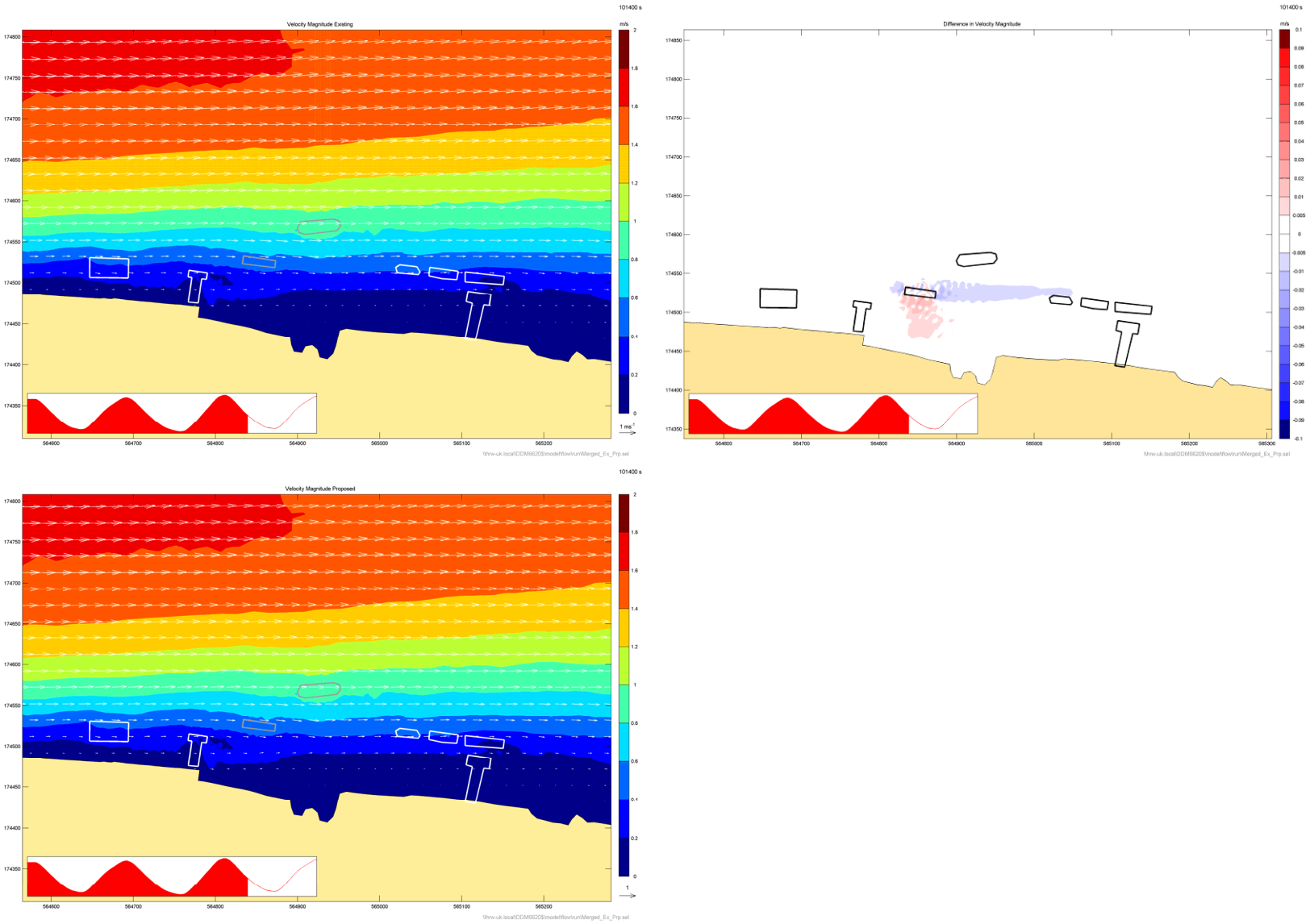


Figure 10 Existing and proposed velocity magnitude (left top and bottom respectively) and difference plot of Velocity magnitude (right) at High Water + 3 hr