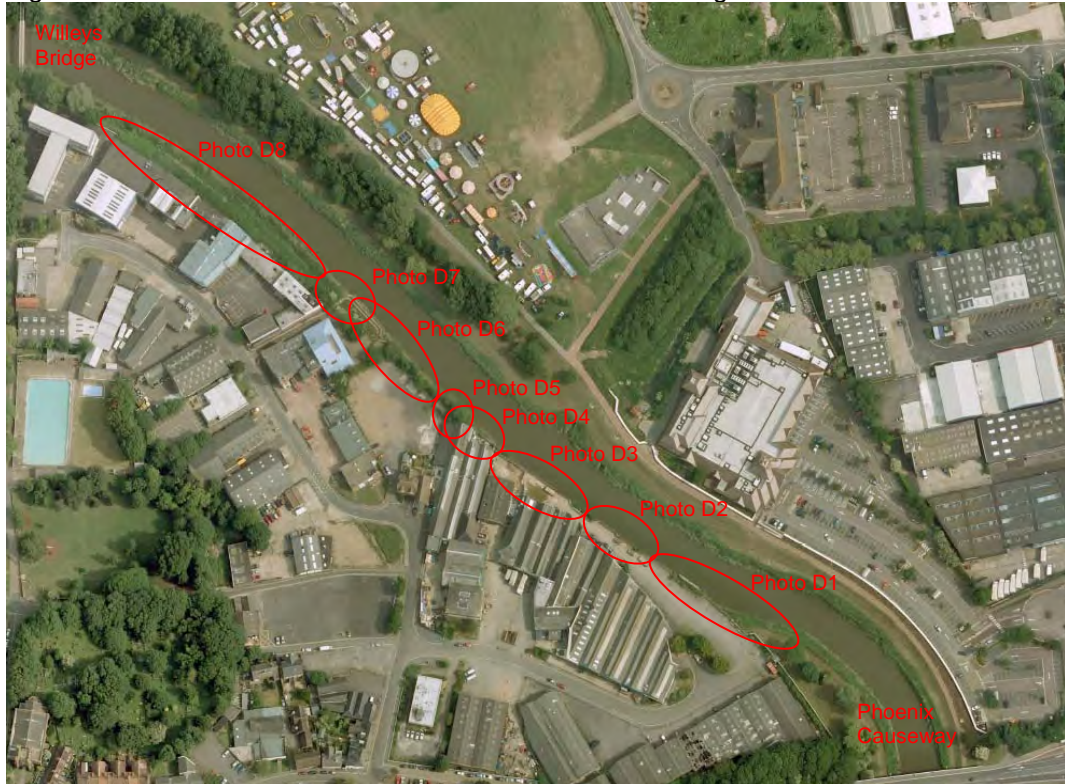


Appendix D: Assessment of Lewes Flood Cell 4 and Newhaven Flood Compartment 4

LEWES FLOOD CELL 4 (North Street)

- D.1.1. The potential for redevelopment of the North Street area in Lewes is currently being considered. In order to ensure that flood risk is fully considered as part of these proposals, Lewes District Council instructed a more detailed assessment of this flood cell as part of the Level 2 SFRA.
- D.1.2. A site visit to the area was carried out to gain a better understanding of the existing flood defences in the area. An overview of our assessment is provided below.

Figure D 1: Aerial View of Lewes Flood Cell 4 - River Frontage



Photograph D 1



Photograph D 2



Photograph D 3



Photograph D 4



Photograph D 5



Photograph D 6



Photograph D 7



Photograph D 8



- D.1.3. Flood defences along this stretch of the Ouse are deemed to provide a standard of protection of 1 in 50 years (NFCDD). This would, however, appear to be a rather misleading simplification of the state and level of protection provided by the defences.
- D.1.4. A combination of hard and soft flood defences is found along this part of the Ouse with crest levels varying between the different styles of construction of the defences, as shown throughout the above photographs.
- D.1.5. As part of the analysis of this flood cell, the following scenarios were investigated:
- Defended
 - undefended
 - Raised Defences

Defended Scenario

- D.1.6. This scenario looked at the existing situation by taking into consideration the current standard of safety provided by the flood defences protecting this flood cell. The results of the runs made for this scenario are included in the maps section.

Undefended Scenario

- D.1.7. This scenario looked at the possible consequences of not having flood defences protecting the flood cell (worst case scenario). The results of the runs made for this scenario are included in the maps section.

Raised Defences

- D.1.8. This scenario looked at the consequences on the system of upgrading the existing river defences along flood cell 4 and providing transverse defences to protect the whole cell as detailed in Appendix E.

Flooding Mechanism

- D.1.9. In order to have a better understanding of the flooding process, the following table presents the flooding mechanisms in Lewes flood cell 4 (North Street) for the various scenarios analysed.

Table D. 1 Summary of Flooding Mechanism for Lewes Flood Cell 4

Fluvial Return Period	Tidal Boundary	Existing	Undefended	Raised Defences
20	MHWS (2007)	Flow Confined to Channel	-	No flooding
100	MHWS (2007)	Defences overtopped	Defences overtopped	No flooding
100 + 20%	MHWS (2115)	Defences overtopped	-	No flooding
1000	MHWS (2007)	Defences overtopped	-	No flooding

KEY

Flow Confined to Channel – no overtopping.

Defences overtopped – flood occurs from defences being inundated.

No flooding – river and transverse defences ensure flooding does not occur

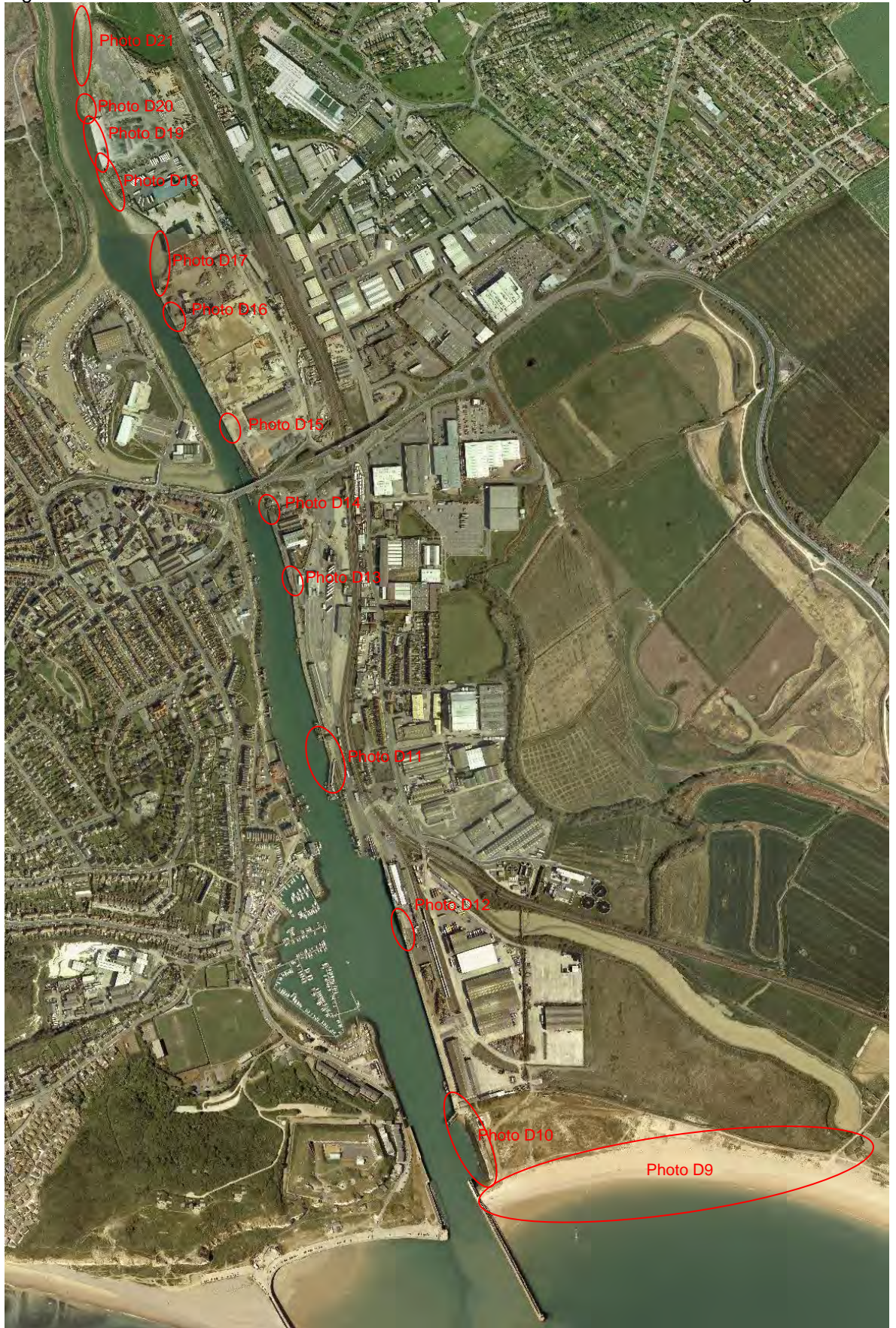
Under current circumstances flood cell 4 would not flood under the 1 in 20year return period event but it would under the 1 in 100 year event. To prevent this not only river defences would need to be raised but transverse defences would need to be put in place as a significant amount of overland flooding occurs in the area.

The results of the raised defences scenario show that raising river and transverse defences at Lewes flood cell 4 would increase peak water levels upstream but would reduce them slightly at the site and have a small reduction downstream. By raising defences the flow is confined to the channel and limits potential overtopping.

NEWHAVEN FLOOD COMPARTMENT 4

- D.1.10. Potential large scale developments are currently being considered for Eastside and Newhaven Port, both areas within Newhaven Flood Compartment 4. In order to ensure that flood risk is fully considered as part of these proposals, Lewes District Council instructed a more detailed assessment of this flood compartment as part of the Level 2 SFRA.
- D.1.11. A site visit to the area was carried out to gain a better understanding of the existing flood defences in the area. An overview of our assessment is provided below.

Figure D 2: Aerial View of Newhaven Flood Compartment 4 - River and Sea Frontage



Photograph D 9



Photograph D 10



Photograph D 11



Photograph D 12



Photograph D 13



Photograph D 14



Photograph D 15



Photograph D 16



Photograph D 17



Photograph D 18



Photograph D 19



Photograph D 20



Photograph D 21



- D.1.12. Flood defences along this stretch of the Ouse provide a varying standard of protection. The northern edge of the flood compartment (area north of the North Quay site – Photographs D20 and D21) is deemed to provide a standard of protection of 1 in 30 years whereas the rest of the compartment is reported to have a standard of protection of 1 in 100 years (NFCDD).
- D.1.13. The vast majority of the area is protected by hard defences with crest levels varying between the different styles of construction, as shown throughout the above photographs.
- D.1.14. This would, however, appear to be a rather misleading simplification of the state and level of protection provided by the river defences. Furthermore, during the production of the hydraulic model for this area, it was noted that the levels of the flood defences at Newhaven were inaccurate and needed to be revised. The EA subsequently carried out a review of these levels and provided the necessary updated information for inclusion in the hydraulic modelling work.
- D.1.15. Coastal defences along the Newhaven sea frontage are deemed to provide a standard of protection of 1 in 100 years (NFCDD). These natural defences (Photograph D9) are a result of the accretion process brought about by the construction of the breakwater arm at the entrance of Newhaven Port and are bound to be recharged/upgraded continuously through natural processes.
- D.1.16. In general terms, the sea frontage in this flood compartment is quite well protected and unlikely to create any serious problems for the land behind it.
- D.1.17. As part of the analysis of this flood compartment, the following scenarios were investigated:
- Defended
 - undefended
 - Raised Defences
- Defended Scenario**
- D.1.18. This scenario looked at the existing situation by taking into consideration the current standard of safety provided by the flood defences protecting this flood compartment. The results of the runs made for this scenario are included in the maps section.

Undefended Scenario

- D.1.19. This scenario looked at the possible consequences of not having river flood defences protecting the flood compartment (worst case scenario). No changes to the existing coastal defences were made as they are deemed to be created by natural processes. The results of the runs made for this scenario are included in the maps section.

Raised Defences

- D.1.20. This scenario looked at the consequences on the system of raising river and transverse flood defences along flood compartment 4. A more detailed explanation of the analysis of raised defences is included in the Hydraulic modelling section (Appendix E).

Flooding Mechanism

- D.1.21. In order to have a better understanding of the flooding process, the following table presents the flooding mechanisms in Newhaven flood compartment 4 for the various scenarios analysed.

Table D. 2 Summary of Flooding Mechanism for Newhaven Flood Compartment 4

Fluvial Return Period	Tidal Boundary	Existing	Undefended	Raised Defences
20	20yr (2007)	Defences overtopped		No flooding
2	200yr (2007)	Defences overtopped	Defences overtopped	Defences overtopped
2	200yr (2115)	Defences overtopped		No flooding
2	1000yr (2007)	Defences overtopped		No flooding

KEY

Defences overtopped – flood occurs from defences being inundated.

No flooding – river and transverse defences ensure flooding does not occur

CONCLUSIONS AND RECOMMENDATIONS

- D.1.22. The analysis of Lewes flood cell 4 and Newhaven flood compartment 4 shows that the existing river defences along the River Ouse provide inadequate protection for these areas during times of extreme flooding.
- D.1.23. Along flood cell 4 in Lewes, the estimated standard of protection of the existing defences is 1 in 50 years return period (NFCDD) which would appear to be confirmed by the modelling carried out as part of the SFRA. However, events with higher return periods will cause overtopping of defences upstream of the flood cell and overland flooding to occur in the North Street area. Therefore, raising defences locally will not prevent flooding as overtopping of defences will occur further upstream within the catchment bringing about overland flooding of the North Street area.
- D.1.24. Along Flood compartment 4 (Newhaven), the standard of existing river flood defences vary between 1 in 30 and 1 in 100years return period (NFCDD) which is somewhat misleading as defence levels had to be reviewed as part of this study. The modelling of the current scenario analysis suggests that river flood defences are overtopped upstream of the compartment bringing about overland flooding to the study area. The modelling suggests that raising river flood defences and including transverse defences for this flood compartment would bring about an increase in peak water levels when compared to the existing scenarios. This is due to the loss of floodplain storage in flood compartment 4 as a result of the raising of defences.
- D.1.25. The coastal defences protecting flood compartment 4 are deemed to be adequate in general terms as they are naturally recharged (upgraded) as a result of the accretion brought about by the breakwater protecting Newhaven Harbour.

- D.1.26. The division of the catchment into flood cells would appear to be satisfactory for low return periods but at the more extreme events, particularly taking climate change into account, the existing flood cells are not really appropriate.
- D.1.27. It is recommended that a more detailed investigation of the river flood defences along the Ouse is carried to ensure that improving flood defences in one area does not have any detrimental effect on other parts of the catchment as a result of overland flooding.

