

time of Colles' Map (1769) (Plate 14-7) it is evident that a second entrance into the quays had been opened by removing a section of City Wall just to the north of the original harbour entrance. This is also indicated in Sauthier's map of 1786 (Plate 14-8). New Bridge had been constructed at the bottom what is now Bridge Street and new Quays have been constructed on either side of the Abbey River. George' is named on Colles' Map and the construction of this Quay and New Bridge can be seen to have led to the removal of the City Wall along the south side of the Island. It has been shown from previous excavations associated with the Limerick Main Drainage Project that the foundations of the City Wall are still extant under the road along Georges Quay.



Plate 14-7. Extract from Christopher Colles' map, 1769 (British Library, Irish Historic Towns Atlas 21 Limerick, 18 Map)



Plate 14-8. Extract from C.J. Sauthier's map, 1786 (Irish Historic Towns Atlas 21, Map19)

By the early 19th Century and Ordnance Survey Ireland's first survey (Plate 14-9), the quays associated with the harbour have been filled in and we now have Merchant's Quay and the Potato Market looking much as they do today. The northern quay area is now home to the Court House which was designed by two local architects, Nicholas and William Hannan, and was completed in 1810. The City Gaol has also been constructed to the north of the Court House and the Mills and Breweries are still extant between the Gaol and King John's Castle.

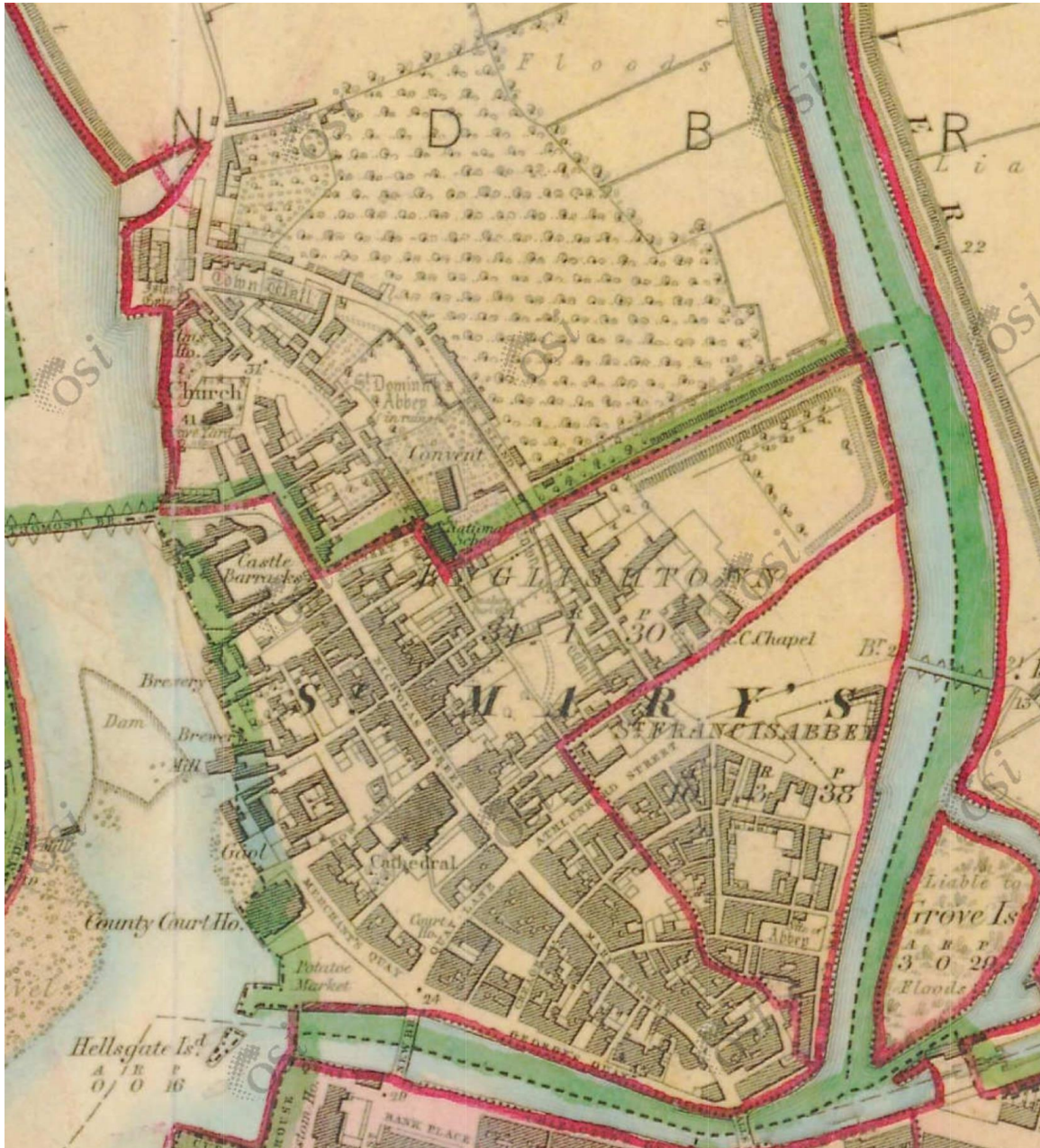


Plate 14-9. OSI First Edition Survey c. 1830.

By the time of OSI 25 Inch Survey, c. 1900 (Plate 14-10), the mills that were on either side of the Shannon for hundreds of years are gone. Nolan's Cottages have been constructed on the foundations of one of the breweries that was situated to the east of the mills on the eastern side of the River. The Gaol is now listed as the Female Prison and there are two court houses, one for the City and one for the County. A large area of buildings between Merchant's Quay and St. Mary's Cathedral has been removed, opening up the grounds of the Cathedral.

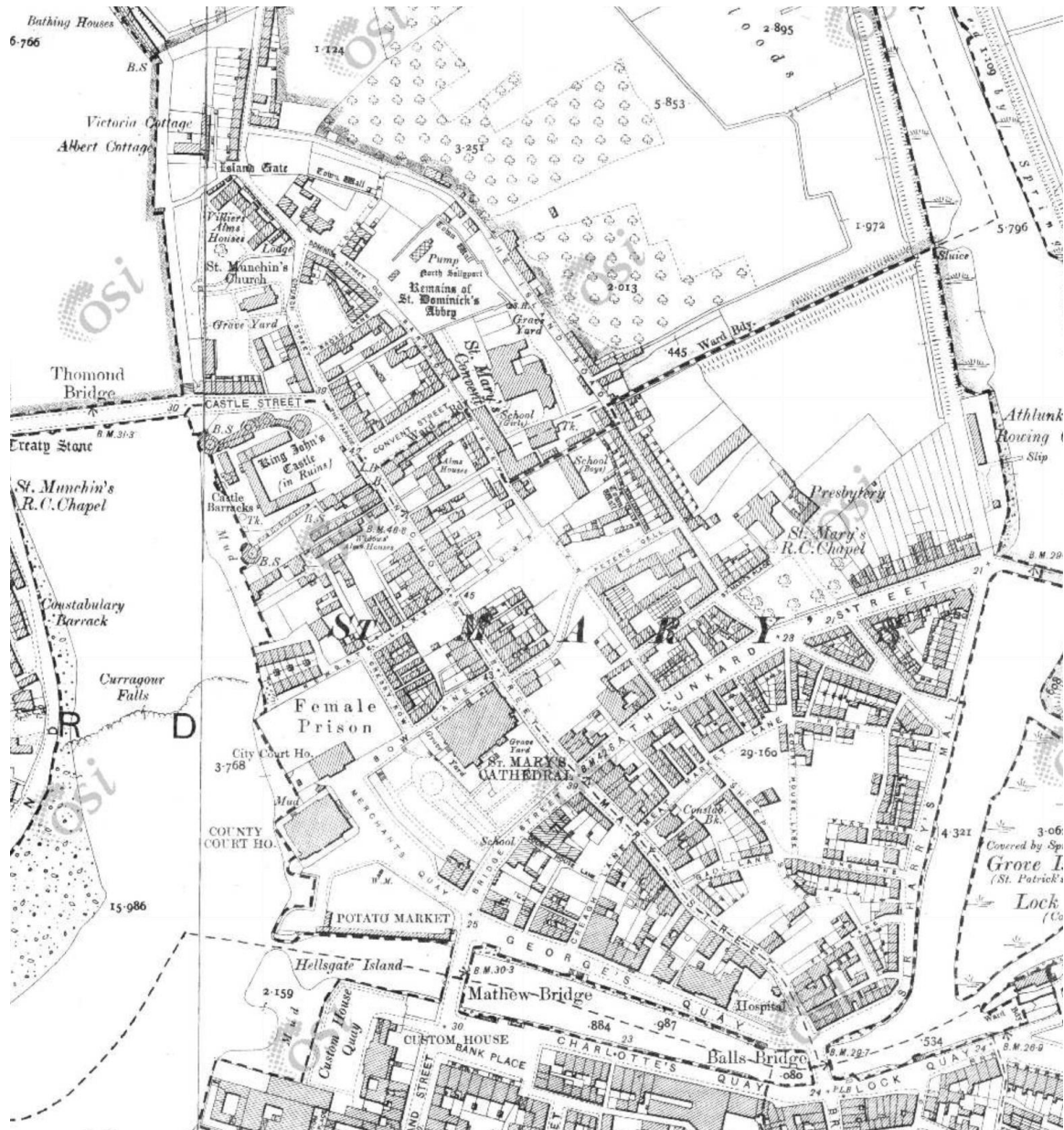


Plate 14-10. OSI 25 Inch Survey c. 1900.

14.3.5 Aerial Photography

The usefulness of aerial photography is that it allows for a different perspective - 'the distant view'. Archaeological sites may show up on the ground surface, depending on their state of preservation, by light and shadow contrasts (shadow marks), tonal differences in the soil (soil marks) or differences in height and colour of the cultivated cereal (crop marks). It is also a useful aid in pinpointing existing features and can assist in ascertaining their extent and degree of preservation.

A review of available aerial photographs dating from 1995 to the present showed no evidence of anomalies indicative of sub-surface features. It is interesting to note on recent aerial photography from Google, taken during a low tide, that evidence of the race that directed water to the two mills on either side of the Shannon River is still visible. The most significant changes in the recent past relate to the area to the south of King John's Castle where the breweries and mill buildings that were a feature of this area for so long

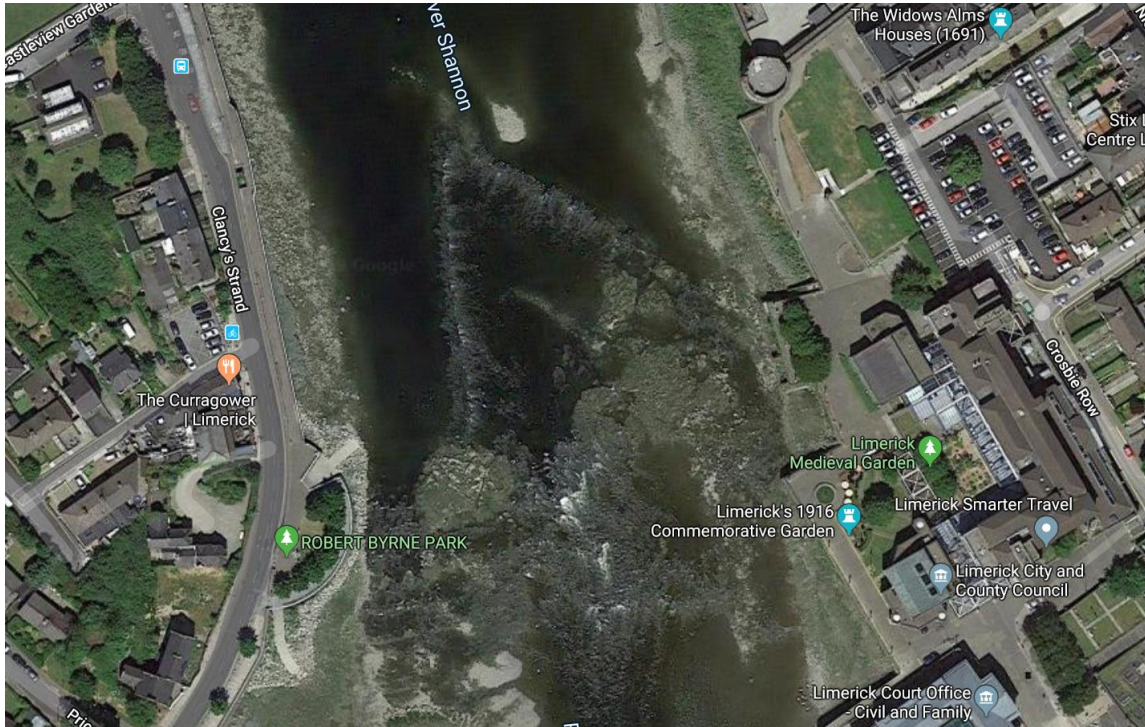


Plate 14-11. Recent Google aerial photography with inverted v-shaped race evident point upstream.

14.3.6 Underwater Archaeology

The region in which the proposed FRS is taking place is on the margins of King's Island at the mouth of the Shannon River. The Island is limned to the west by the Shannon and to the east and south by the Abbey River. The archaeological importance of the area is evidenced by the quantity of archaeological finds recorded during excavation of the Abbey and part of the Shannon River associated with the regrading of the River as part of the Limerick Main Drainage Project. In an information brochure¹⁶⁹ produced following the completion of the project Edmond O'Donovan (2001) noted that there were in excess of 11,000 artefacts discovered during works associated with the Limerick Main Drainage and Shannon Lower Navigation Projects. The extent of the in-stream works is evident from OSI aerial photography (Plate 14-12) and a photograph which shows the mouth of the Abbey River, just to the south of the Potato Market during the works (Plate 14-13).

¹⁶⁹ Limerick Navigation 1999-2001 (July 2001). Published by Limerick Corporation.



Plate 14-12. OSI aerial photography from 2000 showing works in the Abbey River associated with the Limerick Main Drainage Project.

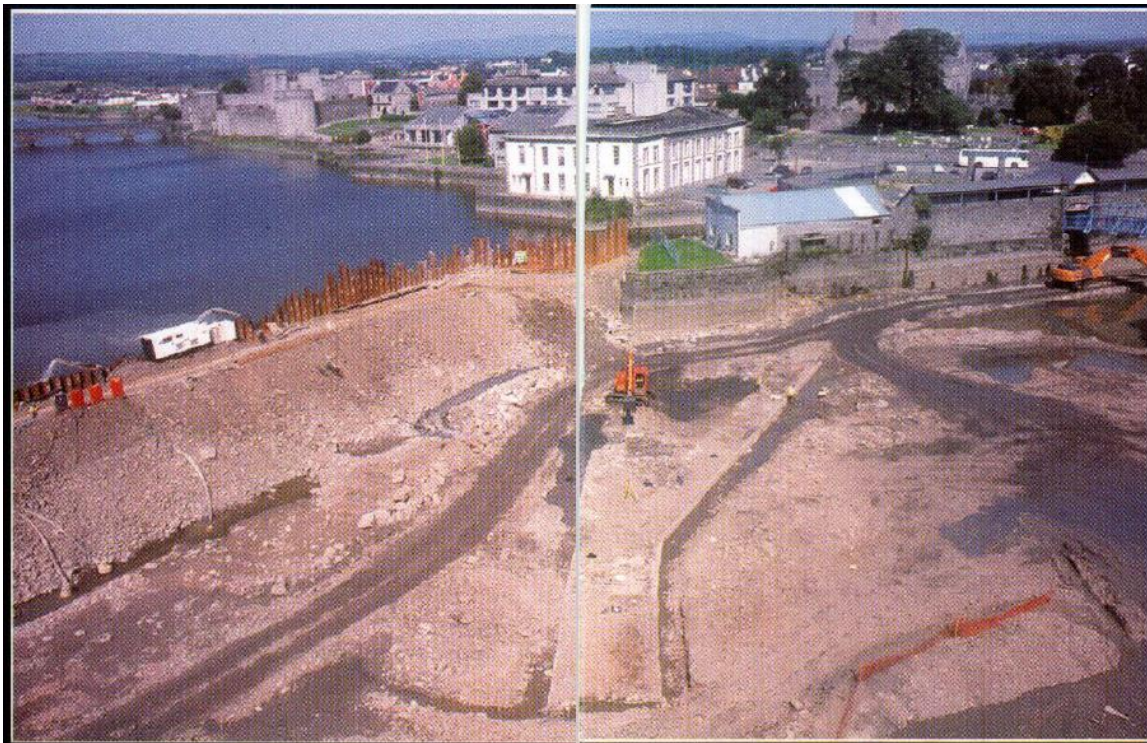


Plate 14-13. Photograph of works at the Mouth of the Abbey River associated with the Limerick Main Drainage and Shannon Lower Navigation Projects.

14.3.7 Archaeological Field inspection

The Project Area was inspected by William Anderson (Moore Group) on 27 May 2019, by Billy Quinn (Moore Group) on the 6th September 2019 and by Nigel Malcolm (Moore Group) on the 2nd and 22nd of October 2019. Using the proposed FRS designs as a guide, the proposed works area was walked to visually assess the potential impacts of the project on recorded and unrecorded archaeology. The location of previously recorded sites in relation to the works was assessed using

maps generated with the GIS. Ground conditions were also assessed to consider areas of archaeological potential.

The inspection started at Verdant Place (Area A1), moving in a clockwise direction around King's Island. Detours were made at points to assess the location of previously recorded archaeological sites in relation to the proposed FRS designs. Notes were taken by marking up a map of the proposed FRS design and photographs were taken to record ground conditions and the location of previously recorded archaeological features.

Areas A1-A2

Verdant Place runs along the embankment of the Shannon River, between the river and the town defences (SMR No. LI005-017010-). The town defences along the Verdant Place stretch include two towers and stand at a height of up to 6.5m (Collins et al. 2008: 57-62). The wall here encloses part of St Munchin's graveyard (SMR No. LI005-017044-) and the Villiers Alms Houses further to the north. The closest point of the defences to the river wall is a D-shaped tower of medieval date (Collins et al. 2008: 59), which is approximately 15 m east of the river wall (Plate 14-14).

To the north, in Area A2, concrete steps lead down to the river and a series of walls jut out into the river (Plate 14-15). These walls may relate to what are marked as 'Bathing Houses' on the 25" map circa. 1900.

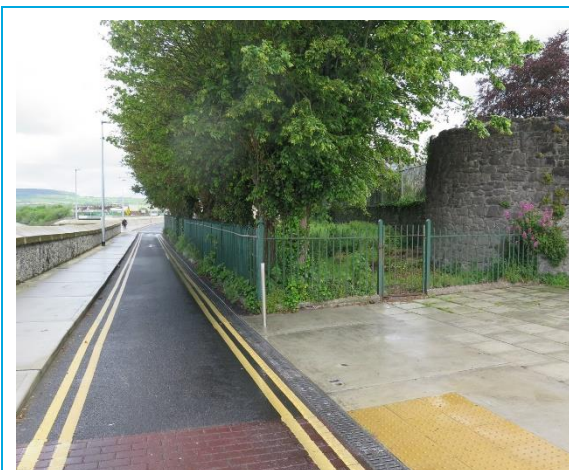


Plate 14-14. Verdant Place, facing north, with a tower of the town defences on the right and flood wall to the left



Plate 14-15. Verdant Place Steps, in Area A2, facing south

Area A3

Area A3 extends up the northwest side of King's Island and across approximately half of the northern extent of the island, this area is predominantly low-lying ground. The existing path that skirts the edge of the island is bordered on the outer, river side by an artificial bank and sandbags and to the inner, east side by a ditch. The Thomond Weir, built in 1938, does not connect to King's Island but a concrete block embedded in the ditch shows where it once did (Plate 14-16). The path is on ground which appears to be artificially raised, as the land it encloses, beyond the ditch to the east, is approximately 1m lower (Plate 14-17). To the east between the embankments associated with Areas A3 and A4 and somewhere beneath St. Mary's Park Estate is the site of Cromwell's Fort (SMR No. LI005-018----). The exact scale and location of the fort are unknown.



Plate 14-16. Ditch with concrete block from Thomond Weir along path in Area A3-1, facing north, with St Mary's Park behind



Plate 14-17. View from path on the northeast side of King's Island, in Area A3-2, facing south

Areas A4-A5

Area A4 starts at a roughly central point along the northern extent of the island and, just to the east of the handball alley, curves to the south along the eastern side of St. Mary's Park. Just before the northern boundary of the Star Rover's pitches and to east of the Military Cemetery (founded 1856), Area 5 commences. It curves to the east, along the northern boundary of the pitches before turning to the south, following the pitch's eastern boundary and continuing to Athlunkard Boat Club. The land to the east of Area 4 and north of Area 5 is recorded on the Ordnance Survey First Edition map as 'Liable to flood' and is depicted as largely undeveloped land cut with drainage ditches enclosed by a flood defence embankment. The most significant monument in this area is a Cromwellian Era Star shaped fort (SMR No. LI005-018). This site, represented on William Webb's map of the siege as a 'New Irish Fort', was five sided regular with corner bastions surrounded by a fosse. The site continued to feature on subsequent maps until it was entirely effaced by the development of St. Mary's Park in 1934. The nearest groundworks associated with the proposed FRS to the Fort will relate to the proposed construction compound, which is located approximately 40 m to the west of RMP Zone of Notification for the site.

Field walking along the proposed new embankment did not identify any previously unrecorded features. There is a conspicuous grassy bund to the east of St. Senan's Street that relates to dumping in the mid 1990's. From a review of aerial images, much of the footprint for the embankment was previously topsoil stripped in the autumn of 2015 (Plate 14-21).

Note: The Church of Ireland Military Cemetery east of St. Ita's Street is not a recorded monument. The one-acre site, known originally as The Royal Military Cemetery, was consecrated in 1856 and contains plots for Officers, Other Ranks and children. The graveyard contains 39 burials of the 1914-1918 Great War.



Plate 14-18. View from east of cemetery looking north



Plate 14-19. Approximate location of the bastioned fort (LI005-018----) in the St Mary's Park estate; view facing west along St Colmcille Street



Plate 14-20. Looking towards rear wall of Military cemetery, note the linear course of the reeds to the right of the middle ground, these drains feature on the First edition map

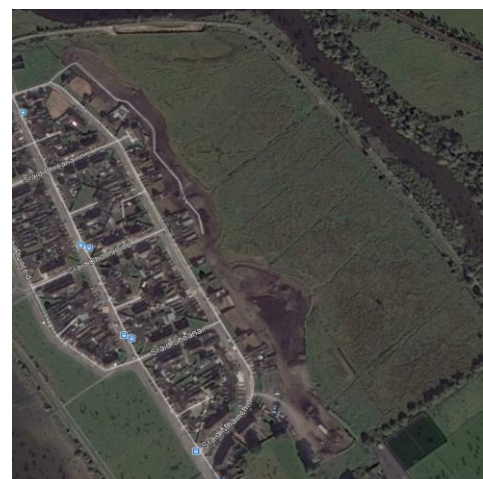


Plate 14-21. Google earth image from October 2010 showing topsoil stripped in proposed works area

Area A6

Between Area A5 and A6, east of the Lee Estate, the ground rises gradually to the point where the Athlunkard Boat Club is located (Plate 14-23). There has been some modification of the ground, through embankments and channels, which can be seen on historical maps. The clubhouse stands on the gently sloping river bank (Plate 14-22). Although the ground level seems to have been artificially raised in places, there is some potential for natural surfaces, to the north and west of the clubhouse.



Plate 14-22. Existing pathway in Area A5, facing south, showing land rising gradually to the south



Plate 14-23. Land north of the Athlunkard Boat Club, facing south, showing the river bank and gradually rising ground to the west

Area A7

The northern part of Sir Harry's Mall, south of O'Dwyer's Bridge and approximately halfway along the street, is a fairly narrow roadway where the river bank is wider (Plate 14-24). In the southern stretch, the road is wider and the steep riverbank is a thin strip (Plate 14-25).

The RMP Zone of Notification for the Historic Town of Limerick commences approximately 60 m to the south of O'Dwyer's Bridge. To the west are archaeological monuments associated with excavations – miscellaneous (SMR No.s LI005-017142- & LI005-017178-), a burial ground (SMR No. LI005-017145-), a kiln (SMR No. LI005-017141- and a religious house- Franciscan friars (SMR No. LI005-017079----).



Plate 14-24. Northern part of Sir Harry's Mall, facing south



Plate 14-25. Southern part of Sir Harry's Mall, facing north from the walkway

Areas A8, A9 and A10

Area A8 consists of a raised, cantilevered boardwalk which projects out over the Abbey River at the southern extend of Area 7 (Plate 14-26). There are no proposed changes to the boardwalk itself,

although the access ramps to it are to be raised to meet flood defence requirements. Area A9 is located between the boardwalk and Abbey Bridge. Previously Sir Harry's Mall had continued south from Area 7 around the south eastern corner of Kings Island, to intersect with Mary Street on the north side of Baal's Bridge. New development to the north west extended over Sir Harry's Mall and only the boardwalk and walkway above a river wall to the south of the boardwalk are now accessible. It would appear that there was significant impact on the ground on the landward side of the river walk in Area A9 associated with the new build and Abbey Bridge that was opened in 1999. Area A10, between Abbey Bridge and Baal's Bridge, is on solid ground. This may have been extended outwards slightly from the early town's boundaries, as the projected alignment of the town defences, which in this area date from the 14th century, runs just to the north of here, below the buildings that line the quay (Collins et al. 2008: 100-102). However, this area is archaeologically sensitive due to the presence of burial grounds (LI005-017154- and LI005-017177-) and the Fratres Cruciferi Priory (LI005-017115-) nearby. Baal's Bridge is a 19th-century structure that is at the same location as a medieval bridge crossing (LI005-017001-). Excavations in the area have uncovered medieval burials and numerous post-medieval structures¹⁷⁰, and it is possible that these extend out to the works area.



Plate 14-26. View looking north to Area 9 (left) which rises to access Area 8 (right), existing boardwalk. Southern extent of Area 7, Sir Harry's Mall in far right



Plate 14-27. View of Baal's Bridge, facing west from Lock Quay with Area 10 to right

Areas B1 and B2

Along George's Quay, the present alignment of the river wall runs parallel to the south of the medieval town defences¹⁷¹. West of Matthew Bridge is the Potato Market and behind it a carpark, which is the location of the medieval harbour (LI005-017072-). The harbour is well documented through numerous historical references in maps, pictures and written descriptions¹⁷¹. The town defences at this point likely run beneath the car park and close to the Potato Market roofed area, and there is evidence for medieval and post-medieval towers in the area, including the three illustrated in the *Pacata Hibernia* map (1633). At the tip of the quay is the Curraghgour Boat Club, which was the location of the south tower of the harbour entrance and a six-gun battery at the pierhead (LI005-017073-) (Plate 14-28). Despite being built up, this area is highly sensitive for archaeology, being at the heart of the medieval trading port and not far from its religious centre – St Mary's Cathedral (Plate 14-29). There are vernacular features visible, such as a stone and brick wall between the Potato Market and the Curraghgour Boat Club (Plate 14-30) and a limestone bollard, perhaps a survival from the former pier, in the northwest of the carpark (Plate 14-31).

¹⁷⁰ Hanley 1997. 'Fish Lane/Sir Harry's Mall, King's Island, Limerick', *Excavations Bulletin* 1997: 351.

¹⁷¹ Collins, T., N. Darmody, B. O'Mahony, L. G. Lynch, F. Coyne and D. Humphreys 2008. Limerick City Walls Conservation Management Plan. Report by Aegis Archaeology, Architectural Conservation Professions and Minogue & Associates for Limerick City Council and The Heritage Council.

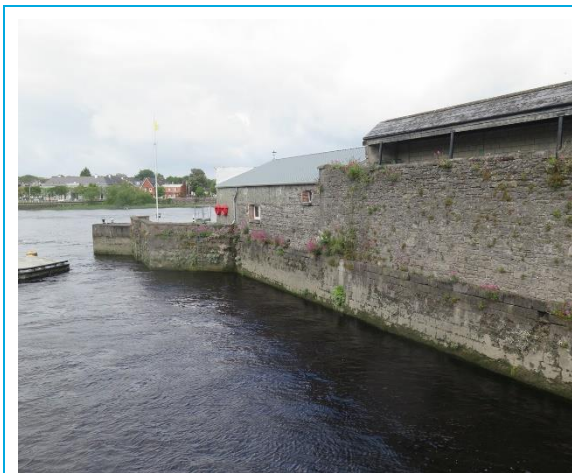


Plate 14-28. West end of the Potato Market and the pierhead, now the Curraghgour Boat Club, the location of a post-medieval artillery battery

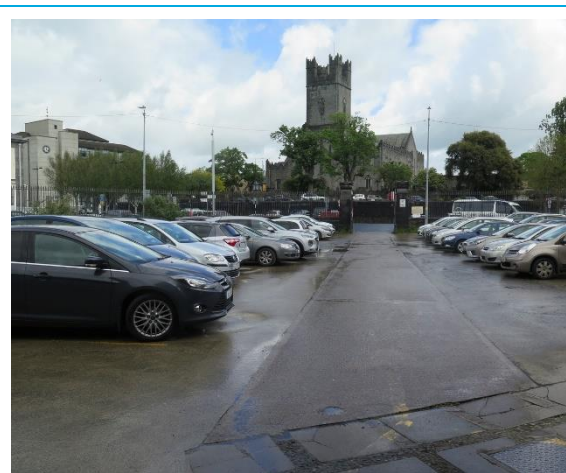


Plate 14-29. View of St Mary's Cathedral from the Potato Market carpark, facing northeast

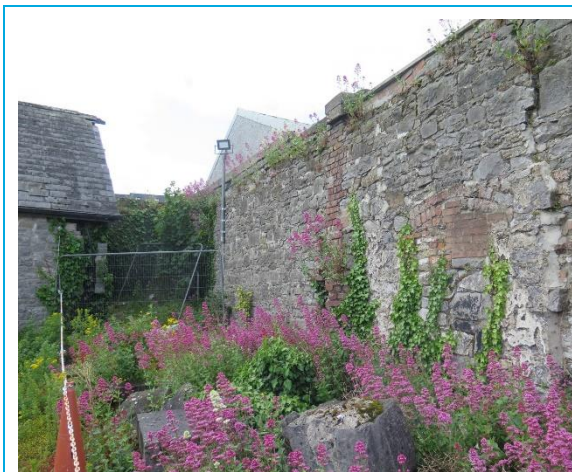


Plate 14-30. Stone and brick wall between the Potato Market and the Curraghgour Boat Club



Plate 14-31. Limestone bollard north of the Curraghgour Boat Club

Area B3

The walkway around the Court House north of the Potato Market projects out over the river before re-joining the riverbank west of the Limerick City and County Council buildings. The Council's buildings occupy the site of the former city jail, demolished in 1988 (Plate 14-32). While this block of land may have limited archaeological potential, to the direct north of here, and extending to King John's Castle, there are several recorded archaeological features along the riverside. These include the mill building, parts of which are incorporated into the river wall (Plate 14-33), including a flight of stairs leading to the water (Plate 14-34). Historic maps show that a small street, Newgate Lane, used to run between the jail and the mill, and two small rows of terraced housing post-date the mill. The open area to the south of King John's Castle has high archaeological sensitivity. It is where the town defences connect to the southwest tower of the castle, and also the location of three recorded

medieval houses (Plate 14-35). The First Edition OS Map shows that in the 1830's a brewery abutted the castle's southwest tower.



Plate 14-32. View of the Limerick City Council buildings, the location of the former city jail, facing north

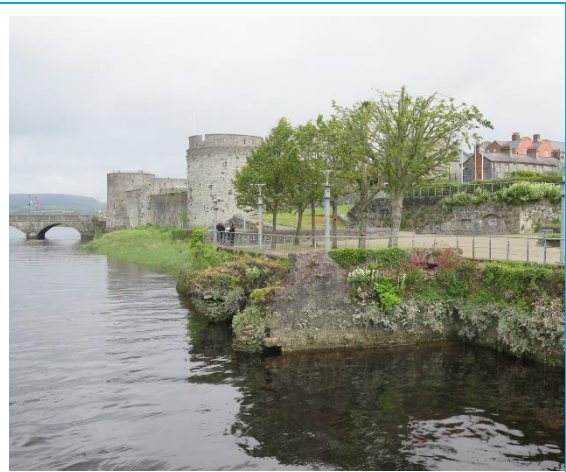


Plate 14-33. View of the former mill LI005-017074-, facing north, with King John's Castle and Thomond Bridge behind



Plate 14-34. Steps beside the location of the former mill LI005-017074-, view facing south



Plate 14-35. Open area south of King John's Castle; three medieval houses are recorded on the higher ground to the right with undercroft LI005-017140

Conclusions from the archaeological field inspection

The field inspection gained information on the condition of land within the Project Area and the spatial relationship of the planned works with recorded archaeological sites. This allows for an informed assessment of the predicted impacts of the proposed FRS on archaeology and cultural heritage.

The north and south halves of King's Island present contrasting environments and archaeological conditions; further, there are differences in the designs for the proposed FRS in the northern and

southern parts of the FRS. Therefore, an approach to cultural heritage must be tailored to the particular contexts and the nature of works being carried out, taking into account the level and extent of ground disturbance and the possible impact on both recorded and unrecorded archaeological sites.

In the northern half of King's Island (Area A2, A3, A4 and A5), the proposed FRS crosses mainly 'greenfield' land where there has not been a large amount of previous building, although ground modification has taken place, especially through previous drainage projects. The southern half, particularly Area A10, B1, B2 and B3, is within the historic town of Limerick, and crosses areas of high archaeological potential, including the recorded location of archaeological monuments and the town defences. The exact location and condition of archaeological deposits cannot be determined from a visual survey, but the archaeological sensitivity of particular locations was informed by the field inspection.

Boat/Pontoon Access Areas at O'Dwyer's Bridge and near Lock Quay

The green space to the immediate south of O'Dwyer's Bridge is proposed to be used as a slipway and temporary repairs maybe required. This area has been landscaped and is overgrown along the riverbank. The works area lies outside the one of Notification for the Historic Town.

The canalisation along Lock Quay dates to the mid 18th century and the area lies within the zone of notification for the historic town, it is proposed to use this area as a launch site for a Jack up Barge or Pontoon. The area is now paved, and the retaining wall is concrete.

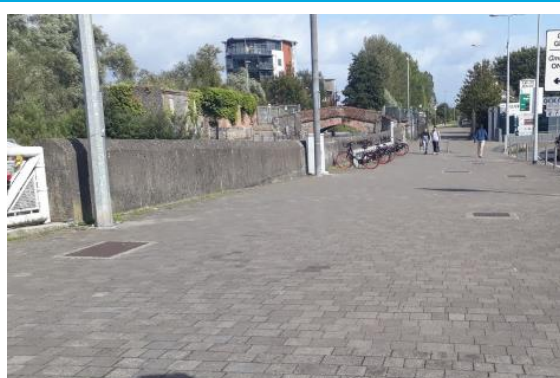


Plate 14-36. View to Lock Quay



Plate 14-37. Green space to south of O'Dwyer's Bridge

14.3.8 Results of Archaeological Monitoring of Site Investigations

Archaeological monitoring of Site Investigations was undertaken in two Phases during 2016¹⁷².

The first Phase took place at Verdant Place in January 2016 under Ministerial Consent C720 (E004645 & R000402). No archaeological remains were discovered during the archaeological monitoring.

Phase 2 of the Site Investigations was undertaken during May and June 2016 when a total of 34 trial pits were excavated around the perimeter of King's Island. Archaeological features were recorded in eight of the pits. The location of the pits in which archaeological features were encountered are presented in Plate 14-38 and stratigraphic details for these pits are presented in Table 14-5.

¹⁷² O'Donoghue, J. and A Hawkes 2016. Archaeological Monitoring Report, Site Investigation Phase 2 (2016), King's Island Flood Relief Scheme, Limerick. Report by Julianna O'Donoghue Archaeological Services for Priority Geotechnical.



Plate 14-38. Location of SI pits where archaeological features were encountered.

Table 14-5. Stratigraphic details for SI pits where archaeological features were encountered.

SI Ref	Location	Dimensions	Stratigraphic Details	Archaeological Significant
FIP-102	Sir Harry's Mall	2.57m NW-SE x 1.4m x 2.8m	0 – 0.06 Cobbled surface 0.06-0.18 Brown sandy gravel layer 0.18-0.33 Grey stony gravel 0.33-0.56 Reinforced concrete road surface 0.56-0.76 Mid-brown silty clay with rubble stone (small-large limestones) and red brick fragments 0.76-0.98 Grey/black silty clay with small-medium angular stones and brick throughout 0.98-1.6 Grey silty clay with few stone inclusions. Water-table reached at this depth.	F1 Quay Wall
FIP-104	Georges Quay	2.8m NE-SW x 0.95m x 2.89m	0 – 0.08 Cobbled surface, 0.08-0.18 Yellow sand 0.18-0.41 Grey gravel 0.41-0.47 Powdered mortar layer with red brick fragments 0.47-1.47 Brown silty clay (root penetrated) with rubble stone, frequent mortar fragments and some red brick. 19th and 20th century glass, red earthen ware, white china and glass. 1.47-2.89 Grey silty clay (wet) with some stone inclusions. Some bone and oyster shell within matrix.	F2 Quay Wall
FIP-105	Georges Quay	2.8m NE-SW x 1.18m x 3.9m	0 – 0.10 Cobbled surface, 0.10-0.15 Yellow sand 0.15-0.26 Concrete 0.26-0.36 Brown sandy silt	F3 Quay Wall

SI Ref	Location	Dimensions	Stratigraphic Details	Archaeological Significant
			<p>0.36-0.42 Grey/black gravel</p> <p>0.42-0.56 Mortared gravel surface</p> <p>0.56-2.36 Brown silty clay with frequent large sub- rounded and angular stones with mortar fragments and red brick. Finds include animal bone, 19th and 20th century white china and earthenware and oyster shell.</p> <p>2.36-3.9 Brown silty clay (wet). Fragments of bone and shell.</p>	
FIP-106	Georges Quay	3.2m NE-SW x 1.54m x 3.4m	<p>0 – 0.08 Cobbled surface,</p> <p>0.08-0.15 Grey sand</p> <p>0.15-0.25 Grey gravel concrete</p> <p>0.25-0.32 Black gravel</p> <p>0.32-0.42 Light Brown sand</p> <p>0.42-0.66 Grey silty soil with frequent medium angular stones, mortar and crushed and broken red brick.</p> <p>0.66-0.84 crushed mortared layer</p> <p>0.84-2.0 Brown silty clay with frequent stone, mortar and red brick fragments (infrequent)</p> <p>2.0-3.4 Grey silty clay with frequent small-medium angular stones, fragments of oyster shell and bone.</p>	F4 Quay Wall
FIP-108	Potato Market	2.7m NE-SW x 1.4m x 4.4m	<p>0 – 0.08 Cobbled surface,</p> <p>0.08-0.15 Light brown sand</p> <p>0.13-0.35 Grey/Black stony gravel layer</p> <p>0.35-1.05 grey/light brown silty clay with modern rubble backfill. Large stones, metal, plastic bottles and piping.</p> <p>1.05-1.55 Brown silty clay with rubble stone and some fragments of red brick. 19th and 20th century pottery fragments, glass and clay pipe.</p> <p>1.55-4.4 Grey silty clay with occasional oyster shell and bone. Frequent rounded water-rolled pebbles and stones.</p>	F5 Quay Wall
FIP-109	King Johns Castle	2.6m NW-SE x 1.15 x 3.0m	<p>0 – 0.08 Cobbled surface</p> <p>0.08-0.13 Brown sand and</p> <p>0.13-0.33 Black stony layer</p> <p>0.33-0.73 Brown silty soil layer with small-medium rubble limestone, powdered mortar and red brick fragments</p> <p>0.73-0.93 Crushed and broken red brick layer.</p> <p>0.93-1.93 Brown silty rubble layer with medium-large angular stones and crushed/powdered mortar.</p> <p>1.93-3.00 Grey silt sand layer with small stones, some broken shell and bone.</p> <p>Plastic pipe runs adjacent to quay wall.</p>	F6 Quay Wall
FIP-110	King Johns Castle	2.8m NW-SE x 1.85 x 3.0m	<p>0 – 0.03 Cobbled surface</p> <p>0.03-0.33 Brown sand and Black silty gravel</p> <p>0.33-0.55 Brown silty clay with small angular and sub- angular limestone and frequent red brick fragments.</p> <p>0.55-?? Brown silty soil layer with 10% powdered mortar and 60% rubble stone. Small- medium angular limestone and 10% red brick and 20% gravel sand. Plastic pipe runs adjacent to quay wall.</p>	F7 Quay wall and F8 Wall

SI Ref	Location	Dimensions	Stratigraphic Details	Archaeological Significant
FIP-111	King Johns Castle	2.36m NE-SW x 1.07m x 3.28m	0 – 0.09 Tar, 0.09-0.48 Road fill 0.48-.6 Brown silty gravel, 0.6 to 1.2 Brown silty clay with slate inclusions. Truncated by three pipes.	F9 Quay Wall

14.3.9 Architectural/Built Heritage

Protected Structures

Under the Local Government Planning and Development Act, 2000, structures that are in the opinion of the planning authority of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest shall be included in the Record of Protected Structures, which will form part of every development plan. The Record of Protected Structures for Limerick City includes the following 15 Protected Structures, shown in Table 14-6, which are either in or in the immediate vicinity of the proposed works area in King's Island. Mapping showing the location of Protected Structure and structure which are included in the National Inventory of Architectural Heritage in relation to the site boundary are presented in Volume 3, Figures 14-6, 14-7 and 14-8.

Table 14-6. Protected Structures on or close to the subject site.

RPS	Description	NIAH/RMP	Location
001	Villiers Alms House	21508009	Area A1
004	King John's Castle	LI005-017014	Area B3
005	Widow's Alms House	21508012	Area B3
012	County Court House	211513060	Area B3
038	Thomond Bridge Toll House	21508002	Area A1
047	St. Munchin's Church of Ireland	21508007	Area A1
050	Undercroft cellars	N/A	Area B3
059	Limerick City Walls	LI005-017013	Area A1
106	Barringtons' Hospital	21513053	Area B1 & B2
314	Athlunckard Boat Club	21508017	Area A6
320	The Potato Market	21513061	Area B3
428	Thomond Bridge	21508001	Area A1
429	O'Dwyer's Bridge	21508018	Area A7
432	Mathew Bridge	21513015	Area B1 & B2
433	Baal's Bridge	21513031	Area A10

Other buildings of architectural/historical interest

Table 14-7. Other buildings of architectural/historical interest in or close to the subject site.

RPS	Description	NIAH/RMP	Location
--	City Hall	21508013	Area B3
--	Limerick IT School of Art	21513070	Area B1 & B2
--	Quay Walls	--	Area B1, B2 and B3

14.3.10 Results of Architectural/Built Heritage Field Inspection

The Project Area was inspected by Anne Carey (Historic Buildings Consultant) on 1st July and 2nd October 2019, using the proposed FRS designs. Areas A1, A2, A5-A10 and B1, B2 and B3 were walked to visually assess the potential impacts of the project on the built heritage. The inspection started at Verdant Place Steps and Creche (Area A2), moving in an anti-clockwise direction around the perimeter of King's Island.

Area A2

Located to the north of Area A1, Area A2 has a section of concrete steps leading down to the Shannon River and a series of walls jut out into the river. The modern Community Creche adjoins the pathway to the north-east.

Area A1

Area A1 runs from Verdant Place Steps and Creche, southward along Verdant Place, adjacent to the embankment of the Shannon River. To the east of the pathway, by the river, is an extant section of the medieval City Wall, (SMR No. LI005-017010-; Protected Structure RPS 059) comprising two towers (Plate 14-39) and a stretch of masonry walling (Plate 14-40) that disappears into the grounds of Villiers Alms House, protected structure (RPS 001), behind a tall nineteenth century boundary wall at the north-western end of the almshouse (Plate 14-41). The City Wall may continue to the south, incorporated into the terrace of cottages 1-4 Verdant Place. The medieval tower to the north of the cottages along Verdant Place is located approximately 15m east of the river wall (Plate 15.21). The walls run to the west of the graveyard of St. Munchin’s Church of Ireland, protected structure (RPS 074), a Board of First Fruits church that was built in 1827 to a design of James Pain, architect.





Plate 14-41. Possible nineteenth century boundary wall adjoining medieval tower at north-western end of Villiers Almshouse, protected structure (RPS 001)

To the south in Area A1 is the small but delightfully exuberant square-plan Thomond Bridge Toll House, protected structure (RPS 038) (Plate 14-42). Dating to c. 1840, it was the work of James and George Pain, architects, who were also responsible for the adjacent Thomond Bridge. It is in the Gothic Revival style and it was constructed to replace an earlier toll house.

Located between Area A1 and Area B3 is Thomond Bridge, protected structure (SMR No. LI005-017002 and RPS 428) (Plate 14-43). It was constructed between 1836-38, to a design produced in 1814 by the Pain brothers. The bridge is an impressive seven-arch bridge spanning the broad Shannon River adjacent to King John's Castle. The bridge, which is said to incorporate fabric from an earlier bridge in its pier foundations, is constructed of relatively plain rock-faced limestone.



Plate 14-42. Thomond Bridge Toll House, RPS 038



Plate 14-43. Thomond Bridge, RPS 428; RMP LI005-01700

Area B3

Area B3 runs southward from Thomond Bridge, towards the site of the former port, now Merchant's Quay. The area immediately to the south of Thomond Bridge is dominated by King John's Castle, (National Monument No. 288, SMR No. LI005-017014 & RPS 004) (Plate 14-44). Established in the first decade of the thirteenth century on an existing Anglo-Norman ringwork, the castle was extended to include the north-west tower by the mid-to-late thirteenth century, with the south-west tower and great hall added by the end of the thirteenth century. To the south-east of the castle are a terrace of five almshouses, protected structure (RPS 005), which date to the late-seventeenth century. They are associated with King John's Castle, having been provided for the widows of soldiers in the castle.



Plate 14-44. King John's Castle, from north-west

To the south of King John's Castle along Merchant's Quay, is Limerick Civic Offices which were constructed on the site of the City Gaol. The gaol was constructed between 1811-13 and it was largely demolished in 1988 but the northern façade of the civic building retains a five-bay, two-storey façade of the nineteenth century building (RPS No. 058). Masonry walls are evident along part of the quay, with a flight of steps leading down to the water near the site of a former mill, to the west of the remains of undercroft cellars (RPS 050), now located in the civic space to the north of City Hall (Plate 14-45). Beyond the Civic Offices is the fine early-nineteenth century Court House, protected structure (RPS 012) located on the water's edge with a fine portico, dating to 1817, to the north-eastern façade (Plate 14-46). This north-eastern façade faces St. Mary's Cathedral (SMR No. LI005-017015-, RPS 009), which is set back in its own grounds away from the river. The quay wall is visible along the river's edge at the front of the Civic Offices but its line at the Court House is obscured by a modern boardwalk that wraps around its northern and western sides. There are replacement metal railings which sit on a cut stone plinth around the building.



Plate 14-45. View to the north to King John's Castle, with steps to foreground, undercroft cellars to the right



Plate 14-46. Front façade of County Court House, protected structure (RPS 012)



Plate 14-47. County Court House, from north, showing board walk and railings, along northern and western sides

Located at the most favourable point of entry to King's Island from the river, Merchant's Quay has been the site of the port of Limerick since Viking times. The port was central to the economy of the city and buildings and industries associated with it grew up around it. A customhouse operated from adjacent to the port from the thirteenth century and mills and fisheries were also established in the vicinity. The site is now occupied by Curraghgour Boat Club (Plate 14-48), which was established in 1877, and the quay walls appear to date from that time.



Plate 14-48. Curraghgour Boat Club, south of Court House

Immediately to the east of the boat club is the Potato Market, protected structure (RPS 320), which dates to the early-1840s. Plans were drawn up for the market in the mid-nineteenth century by William Henshaw Owen. The market, which was substantially restored in the 1980s, occupies an attractive location, backing onto the water and accessible from the south by the Sylvester O'Halloran Bridge. This pedestrian bridge was erected in 1987 and it was named after the eminent eighteenth-century Limerick surgeon. The Potato Market is situated adjacent to Mathew Bridge, protected structure, (RPS 432), (Plate 14-49). Mathew Bridge was also constructed to the design of William Henshaw Owen and it was erected in the years 1844-46. It replaced the New Bridge, an earlier eighteenth century bridge.



Plate 14-49. View of the south wall of the Potato Market, overlooking the river, and Mathew Bridge



Plate 14-50. View of George's Quay from Mathew Bridge

Areas B1 and B2

Located between Mathew Bridge to the north-west and Baal's Bridge to the south-east is George's Quay, construction of which was completed by 1763. The quay wall along George's Quay is of concrete construction on masonry footings. Mills and industries were sited in this area as well as a guard house and a constabulary barracks. The guard house was demolished in the early-nineteenth century and replaced by one of the finest nineteenth century buildings on the island, Barringtons' Hospital, protected structure (RPS 106), (Plate 14-51) in 1829. The hospital was founded by Joseph Barrington and it was constructed to a design by Frederick Darley, architect. The architecturally interesting School of Art, originally built as St. Ann's Vocational School in 1938 (Plate 14-52), is sited to the north-west of Barringtons' Hospital. It was designed by Patrick Joseph Sheahan, architect, from Limerick.

Baal's Bridge, protected structure (SMR No. LI005-017001-, RPS 433), is a single arched hump back road bridge of early-nineteenth century date (Plate 14-53). It occupies the most ancient and significant route onto King's Island. This was the location of the first bridge constructed by the Anglo-Normans in the late-twelfth century and it was the site of the medieval bridge which was built between 1360 and 1400. The medieval bridge supported dwellings on one side but it was widened in the eighteenth century. It was replaced between 1830-31 to the design of James and George Pain.



Plate 14-51. Front façade of Barringtons' Hospital,
George's Quay



Plate 14-52. Former St. Ann's Vocational School, now LIT College of
Art



Plate 14-53. Baal's Bridge, from St. Harry's Mall, to the north-east

Area A10, A9, A8 and A7.

St. Harry's Mall stretches along modern, featureless developments under the new Abbey Bridge and on towards O'Dwyer's Bridge, protected structure (RPS 429). Areas A8 and A9 are located on raised boardwalks which project out above the river

Area A6

O'Dwyer's Bridge, protected structure (RPS 429) is a concrete bridge built in 1931. It was dedicated to Rev. Dr. E.T. O'Dwyer, Bishop of Limerick. Immediately to the north-west of O'Dwyer's Bridge is Athlunkard Boat House, protected structure, (RPS 314), which dates to 1923-24. The club house was designed by Patrick Joseph Sheahan.



Plate 14-54. O'Dwyer's Bridge, protected structure, RPS 429, and gates leading to Athlunkard Boat Club



Plate 14-55. Athlunkard Boat Club, protected structure (RPS 314), from O'Dwyer's Bridge to south-east

Area A5, A4 and A3

There were no features of architectural interest noted in Areas A5, A4 or A3.

Conclusions from the architectural/built heritage field inspection

There is a rich and varied architectural heritage bordering the river along the southern perimeter of King's Island. This has been a port city since Viking era, flourishing at different times during its long history, with the built heritage attesting to its position as one of Ireland's leading cities. The remaining sections of the town defences at Verdant Place and King John's Castle, both of national significance, are the earliest visible monuments from the medieval heritage of the city, as is the medieval mill to the south of King John's Castle.

There is good preservation of the quay walls along Merchant's Quay and of the quay footings on George's Quay and but little evidence of the infrastructure of the early port. The Widow's Alm House and Villiers Almshouse, dating to the seventeenth century and the nineteenth century respectively, are tangible reminders of the tradition of charitable endeavour in the city. The bridges that span the Shannon River and the Abbey River are largely of nineteenth century date but are located on the sites of earlier constructions, the fabric of some may be retained within the newer constructions. The nineteenth century County Court House was built in the heart of the historic city at a time when the greater part of the development in Limerick was happening to the south-west on the mainland. Buildings like Barringtons' Hospital also brought a classical elegance to the water side.

14.4 Predicted Impacts

14.4.1 Construction and Operation Phase Impacts

Construction phase impacts usually consist of direct, physical impacts which may occur where sites of archaeological, architectural and cultural heritage significance are located within the footprint of the proposed FRS, and could potentially be impacted upon by ground disturbances or works to site structures or feature of archaeological or architectural heritage interest.

In relation to the proposed FRS, direct, physical impacts on the archaeological, architectural and cultural heritage can manifest themselves in the following ways:

- Where an archaeological, architectural or cultural heritage site, structure, monument or feature is located within an area where works takes place and the works either intentionally or unintentionally entail the alteration or removal of all or part of the site, structure, monument or feature;
- In gaining access to the site - where archaeological, architectural or cultural heritage sites, structures, monuments or features are intentionally or unintentionally removed or altered when transporting and/or facilitating access for machinery, equipment and/or materials to or from site; and
- The same impacts in the above two points can occur where previously unrecorded archaeological and architectural sites, structures, monuments or features are affected.

If these impacts cannot be remediated, for example if archaeological deposits are destroyed during excavations, then the impacts will be permanent.

Operation Phase Impacts associated with the proposed FRS will predominantly consist of impacts of the setting of archaeological and architectural features as a result of the proposed flood defences. These impacts will be predominantly visual.

14.4.1.1 Archaeological Impacts

Direct Physical Impacts on the Archaeological Heritage

The following table (Table 14-8) provides an assessment of the potential direct physical impacts that may result from the proposed FRS – using a three-level rating of low, moderate and high and taking into account the archaeological potential of each area.

Table 14-8. Potential direct physical impacts on archaeological heritage.

Area	Summary of Proposed works	Archaeological potential of works area	Archaeological Impact of works
A1	New copings to be added to existing flood defence wall and wall to be painted.	High Located to the north of Thomond Bridge (SMR No. LI005-017002-) and just to the east of the City Wall, both National Monuments. Most of Area 1 is located within the Zone of Notification for the Historic Town (SMR No. LI005-017----).	None Works are proposed to existing flood defence there are no predicted archaeological impacts.
A2	Flood defence wall from Area A1 to be extended approximately 85 m to the north, at which point it will join into proposed embankment in Area A3. Dig-out for piled foundation approx. 3 m wide by 1.5 m deep.	Moderate Approx. 90 m to the north of Zone of Notification for the Historic Town (SMR No. LI005-017----). Nearest archaeological site, a medieval house, is approximately 170 m to the south (SMR No. LI005-017166-). Riverbank location increases archaeological potential.	Moderate/High Dig-out associated with the construction of the foundations for the new flood defence wall could impact on previously unrecorded archaeological deposits along the river margin.
A3	Construction of embankment and associated drainage and walk ways along western and northern margins of the Island. Construction compound situated to the north west of St. Mary's Park estate. All areas where the embankment is proposed to be topsoil stripped. Dig-out required for construction of drainage. Construction compound to be topsoil stripped prior to surfacing with crushed stone.	Moderate Although there are no known archaeological monuments in the area, except for Cromwell's Fort (SMR No. LI005-018----), Kings Island was of strategic importance for centuries and saw many forces encamped during this time. Nearest works approx. 40 m from Zone of Notification associated with Cromwell's	High Extensive topsoil stripping and dig-out associated with the construction of the embankment, drainage and construction compound could impact on previously unrecorded archaeological deposits.
A4	Construction of embankment and associated drainage and walk ways to the east of St. Mary's Park estate. All areas where the embankment is proposed to be topsoil stripped. Dig-out required for construction of drainage. Open drains to east to be	Moderate/Low Situated to the east of Cromwell's Fort (SMR No. LI005-018----), just at the edge of its Zone of Notification, and continuing to the south away from Fort. Aerials indicate that	High Extensive topsoil stripping and dig-out associated with the construction of the embankment, and drainage could

Area	Summary of Proposed works	Archaeological potential of works area	Archaeological Impact of works
	extended to connect with new drainage headwalls.	some of this area has seen disturbance in the past. No areas of features of archaeological interest noted to the south. Land to the east are subject to flooding.	impact on previously unrecorded archaeological deposits.
A5	Move existing AstroTurf pitch to the south and construct embankment and associated drainage around perimeter of playing pitches and to the south, to Athlunkard Boat Club. New inter-tidal storage tank to be constructed to the north west of Athlunkard Boat Club. All areas where the embankment is proposed to be topsoil stripped. Dig-out required for construction of drainage.	Low No known archaeological monuments in the area, nothing of archaeological potential noted during fieldwork. Separated from Abbey River by existing embankment.	Moderate/High Extensive topsoil stripping and dig-out associated with the construction of the embankment, intertidal storage tank, and drainage could impact on previously unrecorded archaeological deposits.
A6	New access to Athlunkard Boat Club. New piled flood defence wall to the west of Athlunkard Boat Club and wall to support ramp from embankment to Boat Club.	Moderate There are no archaeological monuments in the immediate environs of the works in Area A6 and the works are not located within any Zone of notification. Ramp is over the historic location of the bank of the Abbey River.	Moderate Dig-out associated with the foundation of the new flood defences and access ramp could impact on previously unrecorded archaeological deposits.
A7	The existing flood defence wall on Sir Harry's Mall is to be raised and reinforced ((drawing nr KIFRS-C-107). Reinforcing will require dig-out for foundations which will be approx. 2 to 3 m deep by 2 m wide.	High Approximately two thirds of the work in Area A6 is located within the Zone of Notification for the Historic Town (SMR No. LI005-017----) and the works are located along the edge of the river bank of the Abbey River.	High Extensive dig-out associated with the construction of foundations to reinforce the existing flood defences on the margins of the Abbey River could impact on previously unrecorded archaeological deposits.
A8	There are no works proposed to the Boardwalk in Area A8 although the approach landings are to be raised to required flood defence level.	Low (on boardwalk) The Boardwalk is a new structure attached to a new build.	None
A9	The existing parapet wall is to be demolished and replaced (drawing nr KIFRS-C-109). To construct the new flood defence wall, dig-out for foundations will be required to a depth of approx. 1.5 m by 3m wide.	High The works are located within the Zone of Notification for the Historic Town (SMR No. LI005-017----) and are immediately adjacent to the Abbey River.	High Extensive dig-out associated with the construction of foundations to construct a new flood defence wall on the margins of the Abbey River could impact on previously unrecorded archaeological deposits.
A10	Flood Defences The existing parapet wall is to be demolished and replaced. To construct the new flood defence wall, dig-out for foundations will be required to a depth of approx. 4 to 5 m by 3 m wide (drawing nr KIFRS-C-109). Drainage New storm water drainage is proposed along the roadway at George's Quay	High The works are located within the Zone of Notification for the Historic Town (SMR No. LI005-017----) and are immediately adjacent to the Abbey River. Immediately to the west is Baal's Bridge and excavations associated with Limerick Main Drainage found the remains of a tower/gate associated with the	High Dig-out associated with the construction of the flood defences and drainage could impact on previous quays, the City Wall and/or associated features.

Area	Summary of Proposed works	Archaeological potential of works area	Archaeological Impact of works
	(drawing nr KIFRS-C-209).	City Wall, just to the west of the Bridge.	
B1	<p>Flood Defences</p> <p>The existing parapet wall is to be demolished and a new gravity wall with ground anchors constructed (drawing nr KIFRS-C-110). This construction technique is being used to preserve the adjacent trees. Hand dig-out will take place to a depth of approx. 1 to 1.5 m to install ground anchors.</p> <p>Drainage</p> <p>New storm water drainage is proposed along the roadway at George Quay (drawing nr KIFRS-C-209).</p>	<p>High</p> <p>The works are located within the Zone of Notification for the Historic Town (SMR No. LI005-017----) and the flood defences are immediately adjacent to the Abbey River. Excavations associated with Limerick Main Drainage found the remains of the City Wall in the vicinity of Baal's Bridge and it is known that the alignment of the City Wall is roughly the same as that of the road along George's Quay.</p>	<p>High</p> <p>Dig-out associated with the construction of the flood defences and drainage could impact on, previous quays, the City Wall and/or associated features.</p>
B2	<p>Flood Defences</p> <p>Existing concrete parapet wall to be demolished down to the level of the original cut stone quay wall. This will require dig-out of approx. 600mm.</p> <p>Two flood defence types are proposed along George's Quay. The first type is the same as that in Area B1 which is to consist of a gravity wall with ground anchors. This will require dig-out by hand to a depth of approx. 1 to 1.5 m. The second type will consist of glass panelling anchored to a mass concrete backing wall, to be constructed to the rear of the existing quay walls. The second type will require dig-out to a depth of approx. 4 – 5m (to the foundation of the historic quay wall) and approx. 3 m wide. See drawing nr KIFRS-C-110 & 111</p> <p>Drainage</p> <p>New storm water drainage is proposed along the roadway at George Quay (drawing nr KIFRS-C-209).</p> <p>Further storm water drainage is proposed at the intersection of Bridge Street and George's Quay (drawing nr KIFRS-C-210).</p> <p>Gravity Sewer</p> <p>At the western end of George's Quay a proposed gravity sewer crosses Bridge street and proceeds along George's Quay in an easterly direction for approx. 33 m before connecting into the existing Limerick Main Drainage sewer (drawing nr KIFRS-C-210).</p>	<p>High</p> <p>The works are located within the Zone of Notification for the Historic Town (SMR No. LI005-017----) and the flood defence works are immediately adjacent to the Abbey River. A review of previous excavations, historic maps and SI works indicates that the area to the rear of the quay walls predominantly consists of 18th Century fill. However, it is noted that there was a mill located just to the south of Barrington Hospital and to the south of the City Wall (SMR No. LI005-017069-).</p> <p>Drainage works, located along the alignment the road, on George's Quay, are located in the vicinity of the alignment of the City Wall.</p> <p>The gravity sewer crosses Bridge Street in the vicinity of the alignment of the City Wall and a gated entrance into the quays which were associated with the historic harbour.</p>	<p>High</p> <p>The majority of dig-out associated with the construction of flood defences is unlikely to encounter archaeological deposits, however it could encounter the remains of the Mill (SMR No. LI005-017069-).</p> <p>Dig-out- associated with the construction of drainage could impact on the City Wall and associated features, or the remains of the Mill (SMR No. LI005-017069-) or previously unrecorded archaeological deposits.</p> <p>Dig-out associated with the construction of the gravity sewer could impact on the City Wall and/or associated features, or previously unrecorded archaeological deposits.</p>
dB3	Archaeologically Area B3 is an area of some diversity and complexity and it is therefore dealt with under a number of sub-headings below.	High	High
B3a	<p>The Potato Market</p> <p>Flood Defences</p> <p>Glass panelling is proposed for the opening in the Potato Market wall, just the west of Matthew Bridge (drawing nr KIFRS-C-113). The glass panelling is to be anchored to a mass concrete</p>	<p>High</p> <p>The works are located within the Zone of Notification for the Historic Town (SMR No. LI005-017----).</p> <p>The Potato Market was constructed partially over 18th</p>	<p>High</p> <p>Dig-out associated with the flood defences, drainage and ramp could impact on the historic remains of the quay (SMR No. LI005-017072-). There is</p>

Area	Summary of Proposed works	Archaeological potential of works area	Archaeological Impact of works
	<p>backing wall, to be constructed to the rear of the existing quay walls. This will require dig-out to a depth of approx. 4 – 5m (to the foundation of the historic quay wall) and approx. 3 m wide.</p> <p>A new flood defence wall is required to the west of the Potato Market, between it and Curragower Boat Club (Volume 3, Figure KIFRS-C-115). Dig out to facilitate the wall will be approximately 4 to 5 m deep by 3 m wide.</p> <p>Drainage New storm water drainage is proposed throughout the Potato Market which is to direct surface water to an inter-tidal storage tank in merchant's quay (drawing nr KIFRS-C-210). Dig-out for the drainage will be to an approx. depth of 1.5 to 2 m.</p> <p>Ramp A flood defence wall with associated ramp and steps is proposed to facilitate access to Sylvester O'Halloran pedestrian bridge (Volume 3, Figure KIFRS-C-114). Dig-out to facilitate the ramp and associated flood defences will be to a depth of approximately 1.5 m over an area approximately 24 m by 6 m.</p>	<p>Century quays and over what would have been the waters of the harbour. Historic maps show that there has been a harbour and associated quays since at least the 16th Century (SMR No. LI005-017072-). Historic mapping further indicates that the alignment of the city wall, where it was associated with the southern side of the entrance into the harbour, was located rough along an east west alignment just to the north of the Potato Market buildings.</p>	<p>also the potential that there may be remnants of the City Wall that could be impacted on.</p>
B3b	<p>Merchants Quay</p> <p>Gravity Sewer A gravity sewer is proposed between a pumping station location on the north side of the Council's Offices and a connection to the Limerick Main Drainage on George's Quay (drawing nr KIFRS-C-210). The alignment of the sewer is roughly north west to south east across the plaza at the front of the Council's Offices and the Court House. Dig-out to facilitate the sewer will be from approx. 2m depth to 3 m depth.</p> <p>Inter-tidal storage tank An inter-tidal storage tank is proposed to store surface water during high tides and flooding events (drawing nr KIFRS-C-210). The tank is roughly 26 m by 17 m at its maximum extents and dig out of approximately 3m depth will be required to facilitate its construction. A new outfall with oil interception is to be constructed to the south west, which will require similar dig out.</p> <p>Drainage A network of surface water drainage pipes will direct water from Merchant's Quay and the Potato Market to the inter-tidal storage tank (drawing nr KIFRS-C-210). Dig-out for the surface water drainage will be approx. 1.5 to 2 m.</p>	<p>High The works are located within the Zone of Notification for the Historic Town (SMR No. LI005-017----).</p> <p>This area has been home to a harbour since Viking times. Historic mapping indicates that the harbour and its associated quays have changed several times. The extent of historic fabric that still remains in the area is largely unknown, as there are no recorded archaeological excavations in the area. It is highly likely that the area will contain the remains of historic quays and the foundations of buildings associated with the operation of the harbour.</p>	<p>High Dig-out associated with the construction of the gravity sewer could impact on the historic quays (SMR No. LI005-017072-), associated buildings on the quays, the City Wall and/or associated features, included the gated entrance into the quays from the east.</p> <p>Dig-out associated with the construction of the intertidal storage tank and associated drainage and outfall could impact on the historic quays (SMR No. LI005-017072-), associated buildings on the quays, and previously unrecorded archaeological features.</p>

Area	Summary of Proposed works	Archaeological potential of works area	Archaeological Impact of works
B3c	<p>Entrance to Curragower Boat Club</p> <p>An automatic flood barrier is to be constructed at the entrance into Curragower Boat Club. To the west on the entrance a concrete flood defence wall will be constructed (drawing nr KIFRS-C-115). Dig-out to facilitate the construction of the flood defences will be approximately 1.5 m deep.</p>	<p>Low</p> <p>The works are located within the Zone of Notification for the Historic Town (SMR No. LI005-017----).</p> <p>Historic mapping indicates that as late as 1870 this was the entrance into New Quay and the following this date the quay was filled to the point which now forms the west facing quay at the entrance to the Boat Club.</p>	<p>Low</p> <p>The works in this area are in fill and are unlikely to impact on any known or previously unrecorded archaeological deposits.</p>
B3d	<p>Court House / Quay</p> <p>From the entrance to Curragower Boat Club (approx. Chainage 3465) heading west and around the end of the quay (to approx. Chainage 3496) glass panel flood defences are proposed (drawing nr KIFRS-C-115 & 116). The glass panelling is to be anchored to a mass concrete backing wall, to be constructed to the rear of the existing quay walls. This will require dig-out to a depth of approx. 4 – 5m (to the foundation of the historic quay wall) and approx. 3 m wide.</p> <p>Court House / Boardwalk</p> <p>The existing cantilevered boardwalk which surrounds the Court House to the west and north is to be removed. A new cantilevered boardwalk is to be constructed with glass panel flood defences. The new boardwalk is to be anchored using piled foundations. (drawing nr KIFRS-C-116)</p>	<p>The works are located within the Zone of Notification for the Historic Town (SMR No. LI005-017----).</p> <p>Court House Quay - Moderate</p> <p>The flood defence works on the area of quays to the south of the Court House are in an area that changed substantially during the rearrangement of the harbour and quays during the late 18th Century. There is the potential that older quay or City Wall fabric could be contained within the quay, however this seems unlikely given the extent of works that took place during the late 18th Century.</p> <p>Court House Boardwalk - Low</p> <p>As part of the works to the harbour during the late 18th Century a new harbour entrance was opened to the north of the previous harbour entrance. This involved the removal of a section of City Wall and dredging would have been required to facilitate access for boats to the revise quays layout. The south western and north western facing quay walls associated with the Court House Boardwalk were constructed in the dredged harbour associated with the new 18th Century layout. There is little chance of archaeological deposits still remaining in this area.</p>	<p>Quays - Moderate</p> <p>The flood defence works on the area of quays to the south of the Court House could impact on the remains of the northern wall associated with the historic entrance into the harbour. These remains could be associated with the City Wall. However, this seems unlikely given the level of disturbance that took place in the area in the late 18th Century.</p> <p>Boardwalk - Low</p> <p>Given the level of disturbance that took place during the late 18th Century, including the dredging of a new harbour, the potential impact of the proposed works associated with piled foundations for a new cantilevered boardwalk is low.</p>
B3e	<p>West of the Council's Office – previously the City Gaol.</p> <p>Flood defences</p> <p>Heading north from the Court House and to the west of the Council's Offices it is proposed to construct glass panel flood defences. The glass panelling is to be anchored to a mass concrete backing wall, to be constructed to the rear of the existing quay walls. This will require dig-out to a depth of approx. 4 – 5m (to the foundation of the historic quay wall) and approx. 3 m wide. (drawing nr KIFRS-C-116 CROSS-SECTION B3-10)</p>	<p>Low/Moderate</p> <p>The works are located within the Zone of Notification for the Historic Town (SMR No. LI005-017----).</p> <p>The Council's Offices were constructed on the site of the City Gaol which was itself constructed on land that was reclaimed during the late 18th Century. The Gaol was demolished in 1988 to facilitate the construction of the new City Council's Offices. Excavations over seen by Celie O'Rahilly</p>	<p>Moderate</p> <p>Dig-out associated with the construction of the flood defences is likely to encounter late 18th Century fill and the foundations of the City Gaol. These remains have no statutory protection.</p> <p>Dig-out associated with the construction of the gravity sewer</p>

Area	Summary of Proposed works	Archaeological potential of works area	Archaeological Impact of works
	<p>Gravity Sewer A gravity sewer is proposed between a pumping station location on the north side of the Council's Offices and a connection to the Limerick Main Drainage on George's Quay. The proposed sewer passes from the north to the west of the offices and then between the offices and the Court House. A second pumping station to the north of the Court House is also to be decommissioned and connected to the new gravity sewer. The sewers from the Council's Offices and The Court House join in the plaza to the south of the Council's office and proceed to the south east across Merchant's Quay (see above B3 Merchant's Quay). Dig-out to facilitate the sewer will be from approx. 1 to 2m depth. (drawing nr KIFRS-C-211)</p> <p>Inter-tidal Storage Tank An inter-tidal storage tank in proposed to store surface water during high tides and flooding events. The tank is roughly 28.5 m by 22.5 m at its maximum extents and dig out of approximately 2.5 m depth will be required to facilitate its construction. A new outfall with oil interception is to be constructed to the south west, which will require similar dig out. Outfall is to be via an existing outlet in the quay wall to the north of the tank which is to be upsized (drawing nr KIFRS-C-211).</p> <p>Drainage Drainage, including ACO mono drain channel is proposed to direct surface water to the inter-tidal storage tank (drawing nr KIFRS-C-211).</p>	<p>following the demolition of the City Gaol noted the presence of the remains of the City Wall to the north west of the proposed inter-tidal storage tank. The flood defences surrounding the tank and extending south to the Court House, and the tank itself and associated drainage are all situated on reclaimed land.</p> <p>There is the potential that there could be remnants of the City Wall along the route of the proposed gravity sewer where it passes between the Council's Offices and the Court House. Celie O'Rahilly excavated a test trench in this area and did not locate it but her trench was small (approx. 5 m long) and it may have been too far east.</p>	<p>is likely to encounter late 18th Century fill and the foundations of the City Goal. Between the Council's Offices and the Court House there is the potential that a section of the City Wall could still be extant. It is noted that the dig-out for the sewer is relatively shallow and that it may pass over the foundations of the wall if still extant.</p> <p>Dig-out associated with the construction of the intertidal storage tank and associated drainage is likely to encounter late 18th Century fill and the foundations of the City Goal. These remains have no statutory protection.</p>
B3f	<p>Mill Area– north west of Council's Offices</p> <p>Flood Defences The proposed FRS in this area is sensitive to know archaeological features located in the area. Heading north from the Inter-tidal storage tank, which is located to the west of the Council's Offices (Chainage 3630), it is proposed to construct a concrete flood defence wall. In the area of the bridge, mill and tunnel (see archaeological potential of works area) this wall is to be supported on a raft which is to be constructed over the bridge and tunnel. The raft will preserve the tunnel and bridge in situ. The raft will be anchored on piles which will ensure that there are no loads on these known archaeological features. The concrete flood defence will continue north to a point past the mill building (approx. Chainage 3656) which is evidenced by the remnants of walls extending to the west from the quay wall, into the Shannon River. Once past the mill the</p>	<p>High During excavations associated with the construction of the Council's Offices, Celie O'Rahilly recorded the presence of the City Wall in an area that had been home to Nolan's Cottages. A surface on the City Wall was associated with a bridge that was connected to the outer (western) face of the City Wall and extended to the west. It was concluded that the surface related to a gate in the City Wall which gave access to the bridge which lead to a mill located in the River Shannon. The mill and bridge are indicated on several maps dating from the late 16th to the 18th Century a mill is indicated on OSI first survey c. 1830. O'Rahilly also noted the presence of a tunnel which was aligned north south and connected to the outer (western) arch of the bridge. This tunnel appears to be indicated on William Eyres' map of 1752.</p>	<p>High</p> <p>Works associated with the construction of the flood defences in this area could impact on known archaeological features associated with the City Wall.</p> <p>Works associated with the construction of the proposed surface water drainage will consist of shallow dig-out to facilitate the installation of ACO channel drains that will above the level of archaeological deposits.</p>

Area	Summary of Proposed works	Archaeological potential of works area	Archaeological Impact of works
	<p>wall will turn west to join the quay wall.</p> <p>Turning north (approx. Chainage 3662) the flood defence will be glass panelling anchored to a mass concrete backing wall, to be constructed to the rear of the existing quay walls. This will require dig-out to a depth of approx. 4 – 5m (to the foundation of the historic quay wall) and approx. 3 m wide.</p> <p>Turning east (approx. chainage 3675) the wall will once again be concrete. In this area it is proposed to remove an existing stone wall that shows signs of subsidence and cracking and replace it with a concrete wall to be clad in stone with coping and facing to match existing. Where this section of wall crosses the tunnel it will again be supported on a piled raft.</p> <p>Drainage Surface water drainage in the area is comprised of ACO channel drains.</p>		
B3g	<p>Mill to King John's Castle Moving north from the Mill area (approx. Chainage 3691) it is proposed to include glass panel flood defences (drawing nr KIFRS-A-011). The glass panelling is to be anchored to a mass concrete backing wall, to be constructed to the rear of the existing quay walls. This will require dig-out to a depth of approx. 4 – 5m (to the foundation of the historic quay wall) and approx. 3 m wide. The flood defences are aligned north south and turn to the east just before King John's Castle. Just to the south of King John's Castle the flood defences interface with an existing stone wall that supports a ramp beside the Castle. The flood defences will not interface with the Castle.</p>	<p>High The works are located within the Zone of Notification for the Historic Town (SMR No. LI005-017----).</p> <p>The area is located immediately to the south of King John's Castle (National Monument No. 288).</p> <p>An area of land to the west of the city wall was reclaimed sometime between the Sauthier's Map of 1786 and OSI's first survey c. 1830. By 1830 the area is home to several buildings and OSI's 1870 survey indicates buildings in the area that appear to be associated with Newgate Brewery. Although this area was recently reclaimed it is in a very archaeologically sensitive area given its location, on the coast immediately to the south of the Castle</p>	<p>High Given the high archaeological potential of the area, immediately to the south of King John's Castle, on the riverbank there is a high potential that dig-out associated with the construction of the flood defences could encounter previously unrecorded archaeological deposits.</p>

Operation Phase - Archaeological Impacts on Setting

Area A1

Works in this area are to consist of replacing a railing at the southern end of Verdant Place and integrating it with a new coping that is to improve the overall cohesiveness and associated visual aesthetic with the new flood defence wall to the north which was constructed in 2017. It is also proposed to paint the new coping and the existing coping on the 2017 wall to reduce their visual intrusiveness. The overall effect of the proposed works will be to slightly improve the impact on the setting of the archaeological heritage of the area, including Thomond Bridge (SMR No. LI005-017002-) to the south and the City Wall (SMR No. LI005-017010-) and its associated towers to the east.

Areas A2, A3, A4, A5, A6

There are no archaeological monuments in the vicinity of the proposed works in Areas A2, A3, A4, A5, and A6 that will have their settings effected by the proposed project. The only site in the northern half of King's Island is Cromwell's Fort (SMR No. LI005-017018-), the remains of which are situated beneath St. Mary's Park.

Areas A7, A8, A9

Although there are a number of archaeological monuments located to the west of the works proposed in Areas A7, A8 and A9 these sites are related to archaeological excavations or features noted on historic maps. There are no archaeological sites or features that will have their setting affected by the proposed works in these Areas.

Area A10/B1

There are works proposed to the river and quay walls located immediately to the east and west of Baal's Bridge (SMR No. LI005-017001-). It is noted that this structure is also a Protected Structure (RPS 433) and that although this is the site of early bridge connecting King's Island to the mainland, the current bridge was constructed between 1830 and 1831. Given this the importance of the archaeological setting of the bridge would be open to debate. Evidence of an earlier bridge was found during excavations to the north and south of the current bridge associated with the Limerick Main Drainage Project. The work to the east of the Bridge is to consist of replacing the existing wall with a new flood defence wall. The existing wall in this area can be seen to have been constructed in two distinct phases, evidenced by the different techniques used in their stonework. The proposed new flood defence wall is to be clad in stone which is to reflect this. Work to the west of the Bridge is to consist of the construction of a new wall to a higher level than the existing. The wall is to be constructed of concrete but clad in stone to match the existing, with a stone coping. The overall effect of the proposed works on the archaeological setting will be imperceptible. A photomontage of the view of Area A10 in presented in Volume 4 (VP8)

Area B2

Archaeological monuments in the vicinity of Area B2 relate to sites and features that were either associate with archaeological excavations or features identified from historic maps. There are no archaeological sites or features that will have their setting affected by the proposed works in these Areas.

Area B3

Similar to other Areas the majority of archaeological monuments in this Area relate to sites and features that were either associate with archaeological excavations or features identified from historic maps.

There are a few of notable exceptions:

St. Mary's Cathedral (SMR No. LI005-017015-)

St. Mary's Cathedral given its scale and elevated location is visible from much of the surrounding area to the south and west, across the Shannon and Abbey Rivers. Views from the Cathedral will remain predominantly unchanged. The main features in views to the south and west, consisting of the Potato Market, the Court House and Council's Offices will remain. There will be slight insertion into the views between some of these structures; new flood defences between the Potato Market and the Court House and the same between the Court House and the Council's Offices. From the south there is going to be little change in views towards the Cathedral with the Potato Market being largely unchanged except for a glass panel which will be constructed in an opening in the southern wall of the Market. A photomontage is presented in Volume 4 (VP11) which shows the proposed FRS when viewed from the west bank of the Shannon looking to the east, towards King's Island and St. Mary's Cathedral. The overall impact of the proposed FRS on the setting of St. Mary's Cathedral is slight, although it is noted that for most areas the effects will be imperceptible.

House medieval (SMR No. LI005-0170140-).

During works associated with the construction of the Council's Offices in the late 1980's undercroft cellars were found to the north of the new offices. These features are associated with the City Wall and were preserved in situ and incorporated into the landscaping design for the area. Landscaping included paving of a plaza, a circular feature at the front of the undercroft, public walkways and the installation of new railings and lighting. The effect of the proposed flood defences on the setting of the undercroft in this already modernised area will be slight.

King John’s Castle (National Monument 288, SMR No. LI005-017014-).

King John’s Castle is a prominent and imposing feature visible from quays to the south, Thomond Bridge to the west and the west side of the Shannon River. These are the predominant views from the surrounding area of the Castle. The proposed FRS flood defences will consist of a new insertion into these views that will be more visually intrusive than the existing railings along the water front in the area. However, the setting of the Castle also includes its interior and other surrounding which it interacts with to the north and east. It is also evident that the setting of the Castle has changed significantly throughout its life, most recently with the construction of the new Council Offices to the south. The overall impact of the proposed proposed FRS on the archaeological setting of King John’s Castle is deemed to be slight,

14.4.1.2 Architectural Impacts

The predicted impacts of proposed FRS on architectural heritage include the possible visual impact of elements of the scheme on the character and setting of the protected structures.

The following table (Table 14-9) provides an assessment – using a four-level rating of imperceptible, slight, moderate and significant – of the architectural heritage impact on built heritage in each of the areas inspected. A detailed discussion of the impacts and mitigation measures regarding architectural heritage is presented below Table 14-9. It is noted that the detailed discussion of impact below includes both construction phase impacts and operation phase impacts.

Table 14-9. Potential Impacts on architectural heritage

RPS	Description	NIAH/RMP	Location	Distance from works	Potential Impact
059	Limerick City Walls	LI005-017010	Area A1	c.16m	Imperceptible
001	Villiers Alms House	21508009	Area A1	c. 35m	Imperceptible
047	St. Munchin’s Church of Ireland	21508007	Area A1	c. 43m	Imperceptible
038	Thomond Bridge Toll House	21508002	Area A1	c. 10m	Moderate visual impact due to proposed changes.
428	Thomond Bridge	21508001	Area A1	River’s edge	Slight physical and visual impact due to proposed changes.
004	King John’s Castle	LI005-017014	Area B3	River’s edge	No physical impact with castle. Moderate visual impact due to proposed changes
005	Widow’s Alms House	21508012	Area B3	c. 39m	Imperceptible
050	Undercroft cellars	N/A	Area B3	c. 8m	Slight visual impact.
012	County Court House	211513060	Area B3	River’s edge	Moderate physical impact in moving railings (not original) and uprights (original) and original plinth. Moderate visual impact due to proposed changes.
320	The Potato Market	21513061	Area B3	River’s edge	Slight to moderate physical impact from ramped access. Slight to moderate visual impact from proposed glass panel in opening in south wall overlooking river. Moderate visual impact from proposed flood defence wall between potato market and Curraghbour Boat Club.

RPS	Description	NIAH/RMP	Location	Distance from works	Potential Impact
432	Mathew Bridge	21513015	Area B1 & B2	River's edge	Slight visual impact due to proposed changes.
106	Barrington's Hospital	21513053	Area B1 & B2	c. 13m	Imperceptible
433	Baal's Bridge	21513031	Area A10	River's edge	Significant physical impact and moderate visual impact due to proposed changes.
429	O'Dwyer's Bridge	21508018	Area A7	River's edge	Imperceptible
314	Athluncard Boat Club	21508017	Area A6	3m	Positive impact in removal of existing concrete wall and replacement with new flood defence wall.
--	City Hall	21508013	Area B3	c. 40m	Imperceptible
--	Limerick IT School of Art	21513070	Area B1 & B2	c. 17m	Imperceptible
--	Quay Walls	--	Area B1, B2 and B3	River's edge	<p>Slight to moderate physical impact due to proposed changes and moderate visual impact.</p> <p>Significant impact to south wall of existing stone steps to west of civic space. Replacement of stone wall to south with stone-clad concrete wall with replacement stone coping.</p>

1. Location	Thomond Bridge Toll House
Physical Impact	No direct physical impact.
Visual Impact	Moderate. It is proposed to remove existing modern safety railings from the low riverside wall adjacent to the Toll House and to add a new concrete coping of similar style though less substantial size to that on the existing wall, which was upgraded in 2017. A wall-top railing will also be added. This proposal will constitute a moderate change in the setting of the protected structure.
Mitigation	The size of the coping has been reduced to address visual impact concerns.



Plate 14-56. View of the existing railings adjacent to the Toll House, RPS 038 and Thomond Bridge, RPS 428

2. Location	Thomond Bridge
Physical Impact	Slight. The installation of new coping will abut the north-eastern wall of the bridge.
Visual Impact	Slight. It is proposed to remove existing modern safety railings from the low riverside wall adjacent to Thomond Bridge and to add a new concrete coping of similar style though less substantial size to that on the existing wall, which was upgraded in 2017. It will constitute a slight change in the setting of the protected structure.
Mitigation	Monitoring.
3. Location	King John's Castle
Physical Impact	No physical impact.
Visual Impact	Moderate. It is proposed to install glass panels along the quay edge and the panels will tie into the wall to the south of the castle.
Mitigation	Monitoring.



Plate 14-57. King John’s Castle, National Monument, RPS 004, showing existing railings, to be replaced with glass panels, with tie into the later wall to the right

4. Location	Undercroft cellars, Medieval Mill and Bridge
Physical Impact	None.
Visual Impact	Slight to Moderate. It is proposed to install glass panels along the original quay edge.
Mitigation	Monitoring.
5. Location	County Court House
Physical Impact	Significant. The existing modern railings and original stone plinth will be moved to within 1.3 m along north-western and to within 1 m along the south-western sections of the court house. Removal of the boardwalk is positive as it will expose the original quay wall. The railings will be replaced by new glass panels.
Visual Impact	Moderate. It is proposed to install glass panels along the original quay edge.
Mitigation	Monitoring.



Plate 14-58. View of the north-eastern side of the County Court House, with replacement railings on original stone plinth and with modern boardwalk over the original quay wall

6. Location	Potato Market
Physical Impact	Slight to Moderate. Proposed ramped and stepped access to opening at Sylvester O'Halloran Bridge. Slight. It is proposed to install glass panels along the original quay edge.
Visual Impact	Overall Slight to Moderate. Proposed ramp will have a visual impact on the interior of the south section of the Potato Market. Slight to moderate visual impact from the proposed glass panels in opening in the south wall overlooking the river. Moderate visual impact from the proposed flood defence wall between the Potato Market and Curraghgour Boat Club. The existing wall between the Potato Market and Curraghgour Boat Club will be retained in situ.
Mitigation	Monitoring.



Plate 14-59. Opening in south wall



Plate 14-60. Interior of south wall in area of proposed ramp

7. Location	Quay Walls: George's Quay
Physical Impact	Slight to Moderate. The quay wall will be raised by removing the existing concrete walling and coping down to original masonry. A significant length of the flood defence opposite Barringtons' Hospital, protected structure, will be raised and retained as masonry walling to maintain the setting of the protected structure and glass panels will not be utilised in this area. The existing tubular railings will be removed, which will have a positive impact on the historic setting. Two sets of steps in this area will be retained and fitted with glass panels.
Visual Impact	Moderate. It is proposed to raise the height of the quay wall along sections of its length.
Mitigation	Moderate. It is proposed to install glass panels along the original quay edge. Details of how the glass panels will interface with the historic fabric of the quay wall have been issued and are appropriate in the historic setting.



Plate 14-61. Stone wall, George's Quay, looking toward Mathew Bridge

8. Location	Quay Walls: Merchants Quay
Physical Impact	Slight to Moderate. Existing railings along the quay edge will be replaced by glass panels. Slight to Moderate. Existing walls will be raised to achieve the required height. The walls will be raised by removing the coping and by the introduction of new masonry walling to match existing. The coping will be replaced on the raised section. Significant. Removal of existing poorly preserved wall to south of steps adjacent to civic space. This wall will be replaced with a concrete wall clad in stone with stone coping. The stone wall currently blocking the steps will be replaced with a glass panel.
Visual Impact	Moderate. It is proposed to raise the height of the quay wall along sections of its length. Moderate. It is proposed to install glass panels along the original quay edge.
Mitigation	Monitoring.



Plate 14-62. Steps along Merchant’s Quay, to west of civic space. Proposed removal of southern wall (left in photograph) and eastern wall (foreground)

9. Location	Bridges: Baal’s Bridge
Physical Impact	Significant. Existing wall along the northern side of the Abbey River between Abbey Bridge and Baal’s Bridge will be rebuilt to achieve the required height.
Visual Impact	Moderate. It is proposed to replace the wall between both bridges with a masonry wall to match the best preserved section of walling in that location.
Mitigation	The existing walls to be recorded prior to commencement of works.



Plate 14-63. Wall at north between Baal's Bridge and Abbey Bridge, which will be rebuilt as part of the flood defences

14.4.1.3 Underwater Archaeological Heritage Impacts

There will be no in-water excavations associated with the proposed works. The only in-water impact will be the proposed use of a jack-up barge to facilitate works on the parapet walls and quay walls. The jack-up barge has 4 supporting legs, each with a 1.5m x 1.5m base plate, which is placed on the riverbed in order to provide support to the barge. A netting apron will be suspended off the side of the barge, to catch any debris, in order to prevent debris falling into the river. The barge does not require any anchoring. As the works progress the rig will be moved along the defence walls, requiring the legs to be repositioned. It is proposed that the jack-up barge will be used to facilitate works in Areas A9, A10, B1, B2 and B3.

It has been noted that there were extensive in-stream works associated with the Limerick Main Drainage and Shannon Lower Navigation Projects completed from 1999 to 2001, including the regrading of the riverbed of the Abbey River and part of the Shannon River. This work included the Abbey River from upstream of Abbey Bridge downstream to where it joins the Shannon River and a section along the south eastern side of the Shannon River to Sarsfield Bridge.

Given the extensive in-stream works that have taken place previously in the Abbey River, there are no predicted impacts on the underwater archaeological heritage that would result from the use of a jack-up barge in the Abbey River. There is the potential that the use of a jack-up barge in the Shannon River in Area B3, from the Court House to the Mill area which is located at the north West of the Council's Offices, could negatively impact on archaeological artefacts and/or deposits. Given the lack of previous archaeological work in the area, the long history of the area and the number of artefacts that were found during the Limerick Main Drainage and Lower River Shannon Navigation Projects, the underwater archaeological potential of the area is high and the potential impact is deemed to be high.

14.4.2 Do Nothing Scenario

Many of the archaeological sites in the study area are subterranean and unlikely to be significantly affected by sporadic flood events. It is also noted that many of the features in the coastal margins relate to the remains of mills, and quays and other features associated with the aquatic environment of the river margins. However, if, as is expected, flood events become more frequent and more extreme this could lead to erosion and the abandonment of coastal areas that could lead to the further dilapidation of coastal margins and negative effects on archaeological sites, structures, features or deposits. In the south of the Island the proposed works not only include the erection of flood defences but also conservation and consolidation works to quay walls and other coastal structures, which will have a positive long term effect on the archaeological heritage of the area.

Similarly, low-lying Protected Structures, such as the Court House, are particularly susceptible to extreme flood events. If there is an increase in the frequency and intensity of these flood events, as

predicted, it could lead to a situation where it is no viable to maintain such structures. The flood defences will aid in the long-term preservation of these structures.

It is concluded, that although there will be negative effects as a result of the proposed flood defences, in the long term, doing nothing would likely have a greater negative effect on the archaeological and architectural heritage of the region.

14.4.3 'Worst Case Scenario'

A worst case scenario could arise if the proposed work were undertaken in the absence of archaeological and architectural mitigation. If this were to happen construction work could potentially negatively impact recorded and previously unknown sites, structures, features, artefacts or deposits resulting in the loss or damage of the cultural heritage resource.

14.5 Mitigation Measures

The best form of mitigation, preservation in situ, is achieved by designing to avoid direct physical impacts upon archaeological, architectural and cultural heritage site, structures, monuments and features. All designated archaeological, architectural and cultural heritage sites, structures, monuments or features have been avoided by the design team as far as was practicably possible, taking into account all the environmental constraints and requirement of the project brief.

14.5.1 Construction Phase

Archaeological Heritage Mitigation

The National Monuments Act, as amended requires that, in the event of the discovery of archaeological finds or remains that the relevant authorities, the National Monuments Service of the DoCHG and the National Museum of Ireland, should be notified immediately. Allowance will be made for full archaeological excavation, in consultation with the National Monuments Service of the DoCHG, in the event that archaeological remains are found during the construction phase.

In areas where there is the potential that archaeological, architectural or cultural heritage site, structures, monuments or features could be impacted on during the construction phase, one or both of the following mitigations measures have been recommended:

Archaeological monitoring — in areas of archaeological potential, excavations associated with construction works will be monitored by a suitably qualified archaeologist. In the event that archaeological deposits are discovered, work in the area will cease immediately and the archaeologist will liaise with the National Monuments Service of the DoCHG and the National Museum of Ireland.

Archaeological testing – best practice in areas of high archaeological potential demands caution, to ensure that archaeological deposits are identified as early as possible, thereby ensuring that any loss from the archaeological record is minimised. Under a monitoring remit, an archaeologist will observe normal construction works, usually undertaken with a toothed excavator bucket. During archaeological testing a licensed eligible archaeologist supervises excavations undertaken with a toothless grading bucket, under licence to the National Monuments Service of the DoCHG, thereby ensuring the early identification of archaeological deposits and minimal loss to the archaeological record. Undertaking this confirmatory surveying will ensure that sufficient time can be allowed within the construction schedule for the excavation of any archaeological deposits discovered.

Dive/Wade Survey – in areas of archaeological potential associated marine/aquatic environments archaeological surveys are overseen by the Underwater Archaeological Unit of the National Monuments Service. The only area this relates to for the proposed proposed FRS is tidal and exposed during low tides and low river flow. Best practice requires that such area be subject of a visual dive/wade survey with metal detection under licence to the Underwater Archaeological Unit of the National Monuments Service and the National Museum of Ireland. Such work should be conducted well in advance of potential impacts to allow for sufficient time for resolution of any archaeology that may be found.

It is recommended that a suitably qualified cultural heritage consultancy / consultant be appointed to oversee the effective implementation of the archaeological mitigation measures recommended in this chapter for the construction phase of the proposed FRS. The consultancy / consultant should maintain continuing liaison with the National Monuments Service of the DoCHG and Limerick City

and County Council's Executive Archaeologist throughout the construction phase of the development.

It is recommended that a Project Archaeologist be appointed to oversee the effective implementation of the archaeological mitigation.

All archaeological mitigation is to be undertaken under licence to the National Monuments Service of the DoCHG and the National Museum of Ireland. It is noted that the majority of the works in the southern half of King's Island are located within the RMP Zone of Notification for the Historic Town of Limerick (SMR No. LI005-017----) and as such the relevant Minister (the Minister for Cultural, Heritage and the Gaeltacht) will need to be notified a least two months in advance of any proposed works. It is also noted that intrusive works in Areas B2 and B3 are located in the vicinity of the City Wall and King John's Castle, both of which are National Monuments, and as such Ministerial Consent will be required.

There are seven areas where archaeological testing has been recommended. A detailed report outlining the proposed mitigation strategy 'Archaeological Testing Regime' is contained in Appendix G2. It is noted that the testing regime is proposed to confirm the nature and extent of archaeological features associated with the City Wall and therefore the testing will require Ministerial Consent.

Area A1

No archaeological mitigation.

Area A2

Archaeological monitoring of dig-out for foundations of new flood defence wall.

Areas A3, A4, A5, A6

Archaeological monitoring of topsoil stripping of areas where it is proposed to construction the embankment;

Archaeological monitoring of topsoil stripping of proposed construction site compound;

Archaeological Monitoring of dig-out associated with the construction of proposed drainage, including the inter-tidal storage tank in Area A6; and

Archaeological monitoring of topsoil stripping and dig-out associated with the construction of the new access ramp and flood defence wall at Athlunkard Boat Club.

Area A7

Archaeological monitoring of dig-out for foundations to reinforce the existing flood defence defences.

Area A8

No archaeological mitigation.

Area A9

Archaeological monitoring of demolition of existing river wall and dig out for foundations for new flood defence defences.

Area A10

Archaeological monitoring of demolition of existing river wall and dig out for foundations for new flood defence wall; and

Archaeological monitoring of dig-out associated with proposed new surface water drainage.

Area B1

Archaeological monitoring of hand dig-out for foundations for new concrete flood defence wall;

Archaeological monitoring of dig-out for mass concrete backing wall to support glass panel flood defences; and

Archaeological monitoring of dig-out associated with proposed new surface water drainage.

Area B2

Archaeological monitoring of dig-out for foundations for new concrete flood defence walls;

Archaeological monitoring of dig-out for mass concrete backing wall to support glass panel flood defences;

Archaeological monitoring of dig-out associated with proposed new surface water drainage;

Archaeological testing of alignment of proposed gravity sewer (Appendix G2 – Testing Regime Area 7);

Area B3

Archaeological testing of all dig-out for foundations for proposed flood defence walls;

Archaeological monitoring of all dig-out for mass concrete backing wall to support glass panel flood defences;

Archaeological monitoring of all dig-out for proposed surface water drainage, including two inter-tidal storage tanks and associated outfalls;

Archaeological monitoring of all dig-out associated with the decommissioning of the existing pumping stations to the north of the Council's Offices and to the north of the Court House;

Archaeological monitoring of all dig-out associated with the construction of the proposed gravity sewer from north of the Council's Offices to its point of connection to the Limerick Main Drainage on George's Quay;

Archaeological testing of Archaeological Testing Areas 1 to 6 as outlined in the Archaeological Testing Regime in Appendix G2

Architectural Heritage

Detail of the proposed mitigation measures in relation to individual architectural heritage sites and areas of architectural sensitivity are discussed in the Architectural Heritage impacts section of this chapter (Section 14.4.1.2) and area summarised below. The proposed mitigation measures include monitoring by a suitably qualified architectural heritage specialist.

It is recommended that a suitably qualified architectural specialist be appointed to oversee the effective implementation of the architectural mitigation measures recommended for the construction phase of the proposed FRS. The specialist should maintain continuing liaison with Limerick City and County Council's Conservation Architect throughout the construction phase of the development.

Thomond Bridge (RPS 428)

The installation of new coping will abut the north-eastern wall of the bridge. Monitoring of works by a suitably qualified architectural heritage specialist.

King John's Castle (RPS 004)

No physical impact. Although there are no predicted impacts, given the proximity of the Castle which is of National importance, monitoring of works by a suitably qualified architectural heritage specialist.

Undercroft cellars, Medieval Mill and Bridge (RPS 050)

No physical impact. The proposed FRS has been designed to prevent impacts on structures associated with this Protected Structure. However, given the extensive nature of the works in and around the bridge and mill care is required.

Mitigation: monitoring of works by a suitably qualified architectural heritage specialist.

County Court House (RPS 012)

Potential significant impacts. The existing modern railings and original stone plinth will be moved to within 1m along north-western and south-western sections of the courthouse. Removal of the boardwalk is positive as it will expose the original quay wall. The railings will be replaced by new glass panels.

Mitigation: monitoring of works by a suitably qualified architectural heritage specialist.

Potato Market (RPS 320)

Potential slight to moderate impacts. Proposed ramped and stepped access to opening at Sylvester O'Halloran Bridge and it is proposed to install glass panels along the original quay edge.

Mitigation: Detailed design of glass panel in open and flood walls associated with the ramp and how they interface with the historic fabric of the Potato Market to be agreed architectural heritage specialist and Limerick City and County Council Conservation Architect prior to construction.

Monitoring of works by a suitably qualified architectural heritage specialist.

Quay Walls: George's Quay

Potential slight to moderate impacts. The quay wall will be raised by removing the existing concrete walling and coping down to original masonry. A significant length of the flood defence opposite Barringtons' Hospital, protected structure, will be raised and retained as masonry walling to maintain the setting of the protected structure and glass panels will not be utilised in this area. The existing tubular railings will be removed, which will have a positive impact on the historic setting. Two sets of steps in this area will be retained and fitted with glass panels.

Details of how the glass panels will interface with the historic fabric of the quay wall have been issued and are appropriate in the historic setting.

Mitigation: No further mitigation required.

Quay Walls: Merchants Quay

Potential slight to significant impacts. 1) Existing railings along the quay edge will be replaced by glass panels. 2) Existing walls will be raised to achieve the required height. The walls will be raised by removing the coping and by the introduction of new masonry walling to match existing. The coping will be replaced on the raised section. 3) Removal of existing poorly preserved wall to south of steps adjacent to civic space. This wall will be replaced with a concrete wall clad in stone with stone coping. The stone wall currently blocking the steps will be replaced with a glass panel.

Mitigation: Monitoring of works by a suitably qualified architectural heritage specialist.

Baal's Bridge (RPS 433)

Potential significant impact. Existing wall along the northern side of the Abbey River between Abbey Bridge and Baal's Bridge will be rebuilt to achieve the required height.

Mitigation: The existing walls to be recorded prior to commencement of works. Method of recording to be agreed with LCCC's Conservation Architect.

Underwater Archaeological Area B3

There is the potential that the feet of the proposed jack-up barge could impact on previously unrecorded archaeological artefacts and/or along the coastal region in Area B3 from Curragower Boat Club to King John's Castle. This area is exposed during low tides.

Mitigation: Well in advance of the use of the jack-up barge in this area, a dive/wade visual and metal detection survey will be undertaken of the area by a suitably qualified underwater archaeological specialist under licence to the Underwater Archaeological Unit of the National Monuments Service and the National Museum of Ireland.

NOTE: The above recommendations relating to architectural heritage are subject to the approval of the National Monuments Section at the Department of Culture, Heritage and the Gaeltacht.

14.5.2 Operation Phase

Potential impacts on archaeological, architectural or cultural heritage sites, monuments, structures or features during maintenance or upgrade works that may be required during the operational phase

of the proposed FRS are best mitigated through ongoing liaison with the National Monuments Service and the Architectural Heritage Advisory Unit at the DoCHG and LCCC's Executive Archaeologist and Conservation Officer.

14.6 Residual Impact

14.6.1 Construction Phase

Archaeological Heritage

It has been noted that there is the potential that construction works associated with the proposed FRS could impact on known and previously unrecorded archaeological sites, structures, features, artefacts or deposits. The recommended archaeological mitigation will ensure that where these impacts may occur, they will be dealt with in accordance with best practice and in full consultation with the National Monuments Service of the DoCHG, the National Museum of Ireland and LCCC's Executive Archaeologist.

Architectural Heritage

It has been noted that there is the potential that construction works associated with the proposed FRS could impact on known architectural heritage sites, structures or features. The recommended architectural mitigation will ensure that where these impacts may occur, they will be dealt with in accordance with best practice and in full consultation with the LCCC's Conservation Architect.

14.6.2 Operation Phase

Archaeological Heritage

Throughout the operational phase of the proposed FRS there will be ongoing impacts on the setting of archaeological monuments as outlined in Section 14.4.1.1.

Architectural Heritage

Throughout the operational phase of the proposed FRS there will be ongoing impacts on the setting of architectural sites, structures or features as outlined in Section 14.4.1.2.

14.7 Interactions with other Environmental Effects

This chapter should be read in conjunction with Chapter 13 - Landscape and Visual.

14.8 Cumulative Impacts

With regards to Cultural Heritage, there are no likely significant cumulative impacts expected in relation to the listed developments.

14.9 Difficulties Encountered in Compiling this Information

None.

15 Interaction between environmental aspects

15.1 General

The new EIA Directive (2014/52/EU) requires a description of:

‘the interaction between any of the foregoing aspects’

Interactions can occur when a predicted impact causes interaction or dependency with other environmental aspects. This section discusses the interactions between aspects and assesses them as positive, negative or neutral (as having no interaction or interdependency).

The interactions of environmental effects were considered throughout the design development for the proposed flood relief scheme and adjustment were made to the design of the layout to mitigate impacts arising from these interactions. In Table 15-1, interactions between certain environmental aspects are marked with a 'Y' and discussed in the text below.

Table 15-1. Interactions between environmental aspects

	Population and Human Health	Material Assets: Traffic, Utilities and waste	Biodiversity	Surface and Groundwater	Soil, and Geology	Noise and Vibration	Air and Climate	Landscape and Visual	Cultural Heritage
Population and Human Health									
Material Assets: Traffic, Utilities and Waste	Y								
Biodiversity									
Surface and Groundwater			Y						
Soil and Geology				Y					
Noise and Vibration	Y	Y							
Air and Climate	Y	Y		Y					
Landscape and Visual	Y		Y				Y		
Cultural Heritage								Y	

15.2 Population/Human Health and Traffic

The impact on the traffic network will be highest closest to the proposed site compound at the north east of St Mary's Park. Residents in this area will be affected for the 18 months of construction and temporary traffic measures will be implemented to ensure access to their property.

The temporary diversions and raising of manholes and utility covers will be carried out at advanced works and will be detailed in the preliminary design report. The impact on residents and workers in the study area will be short term and not significant.

15.3 Population/Human Health and Noise/Vibration

There will be increases in noise from construction plant, particularly close to the construction compound and to the embankments and walls. Residents in these areas will experience an increase in noise levels. Mitigation during construction will comprise be in the form of a screen/hoarding of 2.4m high adjacent to Areas A2, A6, A7, A9, A10, B1 & B2, B3).

15.4 Population/Human Health and Air Quality/Dust

Increase in dust and emissions during the construction phase have the potential to influence human health. During the construction phase of the project, fill material will be imported into the site for the construction of the embankment in the northern part of the scheme. To mitigate dust impacts on the local residential community the contractor will develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the Local Authority. The DMP may include monitoring of dust deposition, dust flux, real-time PM10 continuous monitoring and/or visual inspections. To address the impacts on air quality and dust to human beings, site management will involve recording all dust and air quality complaints, taking appropriate measures to reduce emissions in a timely manner, and recording the measures taken. The complaints log will be made available to the local authority when asked, and any exceptional incidents that cause dust and/or air emissions will be recorded alongside the action taken to resolve the situation. Regular liaison meetings will be held with other high risk construction sites within 500 m of the site boundary, to ensure plans are co-ordinated and dust and particulate matter emissions are minimised.

15.5 Population/Human Health and Landscape/Visual

There will likely be some impact on visual amenity for residents living close to the scheme particularly those in St. Mary's Park with views towards the embankment and close to the site compound in Area A3 close to Oliver Plunkett Street, and in Area A4 for residents backing onto St. Munchin's Street. In the operation phase street lighting has been directed away from the residential properties and tree planting has been included to the rear of St Munchin's street to filter views in to rear garden.

15.6 Surface/Groundwater and Biodiversity

The waterbodies surrounding King's Island are part of the Lower Shannon SAC, which is valuable habitat for a number of significant and protected species. Impacts on the waterbodies will have associated impacts with fish, mammals, and vegetation within the rivers. Mitigation measures have been recommended to reduce these impacts.

15.7 Surface/Groundwater and Soils/Geology

Groundwater and aquifer characteristics and activity are largely dictated by geology and overlying soils. Impacts such as soil compaction, water infiltration into soil, and groundwater flow are directly related to both soil and geology, and surface and groundwater.

15.8 Surface/Groundwater and Climate Change

Surface water bodies around King's Island will be directly affected by climate change through sea level rise and changes to precipitation patterns, which is projected to cause increased water levels, and higher frequency of intense storms. Sea level rise as a result of climate change has the potential to affect the scheme through frequent wetting of the defences. This was considered at the design stage.

15.9 Traffic/Transport and Noise/Vibration

It was considered whether movement of HGVs along the construction delivery route to the site compound at St. Mary's Park would cause noise and vibration impacts to nearby buildings. An assessment of the impacts from the construction and operational phase of the proposed FRS shows that the increases in traffic during both phases will not give rise to significant impacts. To ensure that these impacts do not arise, monitoring will be implemented during the construction phase.

15.10 Air Quality/Dust and Biodiversity

A portion of Kings Island is designated within the Lower River Shannon Special Area of Conservation (SAC). The proposed construction works will take place within the SAC in Area A4. Therefore, the sensitivity of the Area to Ecological Impacts is High. Appropriate construction phase mitigation measures have been outlined to ensure that the potential impacts of dust on the SAC will be negligible.

15.11 Biodiversity and Landscape/Visual

Interaction with the fauna and flora was required due to the presence of the SAC protected fauna (bats, badgers and nesting birds) adjacent to the embankment on the western and eastern side it was necessary to ensure that the 6m high lighting columns were directional.

15.12 Cultural Heritage and Landscape/Visual

In the preparation of the chapter on Cultural Heritage there was interaction with Landscape and Visual. Changes to cultural heritage sites are assessed against the potential change to the landscape setting which contributes to the quality and integrity of the environment. Additionally, the style and finishes of the flood walls affects the character of the historic setting of Kings Island. Proposed treatment of the flood walls as reported in the Landscape Strategy document for the proposed scheme, was developed in consultation with heritage officers and visual impact specialist to ensure the finish blended with the historic landscape setting.

15.13 Climate Change and Landscape/Visual

The approach to climate change taken in the options appraisal phase of this development included consideration of a precautionary approach which assessed building defences that were high enough to account for the most extreme events in climate change scenarios. However, the visual and landscape impact of the precautionary approach of building to the MRFS level was considered significant, and so the managed adaptive approach was taken instead to allow for defences to be raised at some point in the future when it is deemed appropriate and acceptable.

16 Cumulative Impacts and Major Accidents and/or Disasters

16.1 Infrastructure projects

Cumulative Impacts are effects that result from incremental changes caused by other past, present or reasonably foreseeable developments together with the proposed flood relief development. Cumulative impacts were assessed by looking at all current developments for which planning has been approved within 10km of the proposed site location, ten sites/ projects are shown in Figure 17-1, Volume 3. A consideration of development objectives in the current development plans in the area was also carried out. This cumulative assessment has considered cumulative impacts that are:

- (a) Likely;
- (b) Significant; and
- (c) Relating to an event which has either occurred or is reasonably foreseeable together with the impacts from this development.

A search in relation to plans and projects that may have the potential to result in cumulative impacts was carried out. Data sources included the following:

16.1.1 Killaloe Bypass / Shannon Bridge Crossing and R494 Improvement Scheme

The proposed Killaloe Bypass, Shannon Bridge Crossing and R494 Improvement Scheme, Co. Clare will provide a western bypass of Killaloe, a new bridge crossing of the River Shannon and an upgrade of the existing R494 regional road from Ballina to the N7 at Birdhill. The proposed site is located approximately 16.5km north-east of the King's Island FRS site. The proposed bypass, bridge and road improvements have been subject to NIS and EIS which was approved by An Bord Pleanála. Construction of this project has yet to commence, with the most recent statement from Clare County Council (March 2019) stating that the designs were still be finalised and land acquisition for the project was still on-going.

When construction does proceed, the scheme will seek to minimise traffic disruption, but there will be some impact for the local community, especially for those who use minor local roads that cross the scheme, at junction tie-ins and along the R494 during improvement works. However, given the distance between the developments; the quantities of traffic involved; the measures proposed to protect the environment from both schemes; and the localised footprint of Killaloe scheme, **no likely significant cumulative impact is expected**.

16.1.2 Limerick Northern Distributor Road

The scheme will comprise of the design and construction of approximately 10km of a northern distributor road that will include a crossing of the Ardnacrusha Tailrace and the River Shannon, with possible crossings of the Blackwater and Mulkear Rivers. The proposed scheme will provide a northern distributor road around Limerick City, improving accessibility to the city from County Clare and relieving pressure on the existing river crossings in the City Centre. The proposed FRS is located approximately 450m north-west of the King's Island FRS site at its closest proximity (Phase 1 area), while the majority of the road scheme is located beyond 2km (west, north and east) of King's Island. After being subjected to the environmental and planning process Phase 1 (Coonagh - Knockalisheen) the scheme has commenced construction and is expected to be completed before Kings Island is constructed (commencement expected Autumn 2020).

No likely significant cumulative impact is expected from Phase 1 given that cumulative impacts would have been considered during the environmental and planning process.

Phase 2 will be subject to in depth environmental assessment by means of an EIAR, which will presumably consider any cumulative impacts from this development if approved. Since it is not possible to state in known detail whether Phase 2 will present cumulative impacts in combination with the King's Island FRS at this stage, no detailed assessment of likely cumulative impacts can be assessed as part of the EIAR in this project.

16.1.3 Limerick City and Environs Flood Relief Scheme (FRS)

The Catchment Flood Risk Assessment and Management (CFRAM) recommends progressing the project-level development and assessment of a Flood Relief Scheme for Limerick City & Environs.

Included within this is the proposed upgrade to the Castletroy Flood Relief Scheme. The upgrade of existing flood defences to consist of the following; extension to an existing flood defence berm along the Shannon and Mulkear river banks; the upgrade and rerouting of the existing surface water drainage system; provision of attenuation ponds; and improvements to the existing storm water sewer system. The proposed Castletroy FRS upgrade site is located approximately 4.5km east of the King's Island FRS site.

The proposed FRS upgrade is currently at the 'Further Information' stage of its planning application. The Castletroy FRS upgrade will be subject to in depth environmental assessment, which will presumably consider any cumulative impacts from the Kings Island FRS if approved. However, since it is not possible to state in known detail whether the Castletroy FRS upgrade will present cumulative impacts in combination with the King's Island FRS at this stage, no detailed assessment of likely cumulative impacts can be assessed as part of the EIAR in this project.

16.1.4 Castleconnell Flood Relief Scheme (FRS)

The proposed Castleconnell Flood Relief Scheme, Co. Limerick is located approximately 8.1km north-east of the King's Island FRS site. This project is at Preplanning (Constraints and Options stage) with construction estimated at earliest 2022. Construction for Kings Island FRS is scheduled between 2020 and 2022 therefore Kings Island construction will be completed prior to Castleconnell commencement.

The Flood Risk Management Plan for the Shannon Upper and Lower River Basin¹⁷³ includes a set of proposed measures for the cost effective and sustainable, long term management of flood risk in the River Basin including the areas where the flood risk has been determined as being potentially significant. The plan includes feasible measures developed through a range of programmes and policy initiative including flood risk prevention and preparedness measures developed by OPW to implement Government policy and flood protection measures identified through the National Catchment Flood Risk Assessment and Management (CFRAM) Programme.

Both Kings Island (Fluvial/Coastal flood risk) and Castleconnell (Fluvial flood risk) FRS's are described in the Flood Risk Management Plan for the Shannon Upper and Lower River Basin. The Plan has been subject to Strategic Environmental Assessment (SEA) to determine benefits and impacts on the environment and to identify mitigation and monitoring measures necessary to avoid or minimise such impacts.

No cumulative impacts are expected from Castleconnell FRS. The appointed contractor for the Kings Island FRS will implement a specific CEMP to develop and monitor the measures outlined in the EIAR (as summarised in Chapter 18), these will be considered in the Castleconnell FRS EIAR.

16.1.5 Springfield Flood Relief Scheme (FRS)

The Springfield area is located approximately 5km north-east of the proposed King's Island FRS. The initial plans for the Springfield Flood Relief Scheme, Co. Clare was withdrawn by Clare County Council on 9th of August 2018. However, in the March 2019 Clare County Council Chief Executive Report, it was stated that the council had met with the Office of Public Works and Consultants to discuss the issues raised in new draft feasibility study report. The executive report further outlined that a programme of work was agreed upon by the above to progress the project.

Should the Springfield FRS progress further into the planning process, it will be subject to in depth environmental assessment, which will presumably consider any cumulative impacts from this development if approved. However, since it is not possible to state in known detail whether the Springfield FRS will present cumulative impacts in combination with the King's Island FRS at this stage, no detailed assessment of likely cumulative impacts can be assessed as part of the EIAR in this project.

16.1.6 Opera Site, Limerick City

The proposed regeneration of the Opera Site as part of the Limerick Twenty Thirty includes a mixed-use development, comprising of offices, retail, culture, licenced premises and other ancillary uses. The Opera site is located approximately 50m south of the King's Island site boundary. Should the Opera Site development receive permission, construction access will occur from R445 and Michael Street minimising the impact on more sensitive roads around the site (EIAR Chapter 13: Traffic & Transport). Construction is expected to take place over 4.5 to 6 years, beginning in 2019 or 2020,

173 OPW, (2018) *Flood Risk Management Plan for the Shannon Upper and Lower River Basin*

subject to planning approval. The assessment concludes that there will be a negligible effect on local traffic, pedestrian and cycle delay and public transport. Noise and vibration-based impacts were also assessed by the developments EIAR, with the respective chapter stating that there would be no significant impacts. Chapter 9 of the development's EIAR, Air Quality and Climate Assessment, has also outlined that during construction a series of best practice measures will be adopted to limit the generation of dust to protect residential properties in the vicinity of the site.

Chapter 16 Biodiversity highlights only a small number of residual impacts of local significance post-mitigation, these include disturbance to and loss of nesting sites (house sparrow, lesser black-backed gull, starling, swift; and herring gull); disturbance to and loss of roost site – Bats (non-breeding Common Pipistrelle); and the permanent loss of foraging habitat in unlit site interior - Bats (Foraging Leisler's bat, Common Pipistrelle bat, Soprano Pipistrelle bat). Limerick City and County Council lodged the planning application for the development to An Bord Pleanála on the 22nd of March 2019.

If the Opera Site development receives permission from An Bord Pleanála to proceed with construction, the competent authority would have reviewed the above information provided by the EIAR, along with the measures proposed to protect the environment and potential cumulative impacts of both the Opera Site and the King's Island FRS. Given the above, **no likely significant cumulative impact** is expected.

16.1.7 Limerick Urban Centre Revitalisation - O'Connell Street

The Limerick Urban Centre Revitalisation - O'Connell Street, otherwise known as the LUCROC project, is a commitment to the revitalisation of O'Connell Street, which will result in quantifiable improvements to urban mobility and the urban environment. The project is will located between the junctions of Denmark Street and Barrington Street, approximately 786 metres in length. This proposed revitalisation projected is located approximately 330m south-west of the King's Island FRS site.

Phase I of this project has recently been granted planning permission under the Part 8 planning process. An EIAR Screening Report was completed by Arup (2019), which recommended that significant environmental effects are unlikely to arise. A Construction Stage Temporary Traffic Management Plan has been recommended to manage traffic impacts associated with this development.

The Traffic Modelling Report prepared as part of the preliminary design process indicates that traffic volumes on O'Connell Street will not reduce significantly but there will be an increase in queues and delays on the surrounding street network. It is anticipated that, should the LUCROC project be granted planning permission, it would be constructed over the following two years, i.e. the construction period may overlap with the King's Island Flood Relief Scheme. The cumulative assessment of these two projects therefore concerns traffic associated with the construction stages only. The LUCROC project lies further south than the Opera Site, and it is anticipated that any construction traffic from the west would approach the site via Shannon Bridge rather than Thomond Bridge. Similar to the Opera site, it has not received planning permission and is therefore not a committed scheme. However, given the above factors, **no likely significant cumulative impact is expected should it be granted planning permission.**

16.1.8 Mungret Local Infrastructure Housing

The Mungret Local Infrastructure Housing, one of aspects of the Limerick Twenty Thirty plan, includes the upgrading of roads to allow for the development of 450 homes by 2021, with a potential estimate of 2,700 homes to be provided on the lands. The infrastructure will also ensure the delivery of a post primary school in the area within the next 3 years. The 200-unit first phase of the development is expected to be completed by end of 2021. The Mungret development is located approximately 5.5km south-west of the King's Island FRS site.

The development is currently in the Master-planning stage, with a planning permission to follow. Should it progress through the planning process, it will be subject to in depth environmental assessment, which will presumably consider any cumulative impacts from this development if approved. However, since it is not possible to state in known detail whether the Mungret Local Infrastructure Housing will present cumulative impacts in combination with the King's Island FRS at this stage, **no detailed assessment of likely cumulative impacts can be assessed** as part of the EIAR in this project.

16.1.9 International Rugby Experience Building, O'Connell Street

The International Rugby Experience Building (extension) on O'Connell Street will comprise of the demolition of the ground floor at No. 42 O'Connell St & the basement area at No. 42 O'Connell St/No.1 Cecil Street comprising of retail premises (Fines Jewellers), and the construction of an extension to the 'International Rugby Experience' to incorporate the existing retail floorspace at ground level and provide additional exhibition floorspace at basement level; all associated revisions to the O'Connell Street (west) elevation and Cecil Street (south) elevation of the 'International Rugby Experience'; minor revisions to fenestration at first floor level and second floor level. The site is located approximately 670m south-west of the proposed King's Island FRS site. The International Rugby Experience Building (extension) received Conditional Permission on 2nd of April 2019.

No likely significant cumulative impact is expected from International Rugby Experience Building (extension) given that cumulative impacts with neighbouring proposed sites would have been considered during the environmental and planning process.

16.1.10 Corbally Housing Development, Corbally Road

The housing development proposed within the Corbally area is located adjacent to Corbally Road to the east and the railway lines to the north and north east. This housing development will comprise of 27 housing units, along with vehicle and pedestrian access and other ancillary features. This proposed FRS is located approximately 215m east of the proposed King's Island FRS site.

The development is currently in the planning stage, with only a provision plan for site in place that has yet to be finalised. Should this development progress further through the planning process, it will be subject to in depth environmental assessment, which will presumably consider any cumulative impacts from this development if approved. However, since it is not possible to state in known detail whether the Corbally Housing Development Housing will present cumulative impacts in combination with the King's Island FRS at this stage, **no detailed assessment of likely cumulative impacts can be assessed** as part of the EIAR in this project.

16.1.11 Orchard Housing Development, King's Island

A housing complex for elderly persons is proposed on King's Island, and has been submitted as a Part 8 application to LCCC. The site is divided into two plots, known as the Orchard Site and the Garden Site, on either side of Old Dominick Street, comprising 27 residential units. The Orchard Site is at the location of the existing temporary car park for King John's Castle. The proposed FRS will be approximately 0.6ha and will also incorporate a pedestrian walkway and green space, and parking spaces to serve the housing units. The development will also involve the reduction of Old Dominick Street from a two-way street to a one-way street and widening of pedestrian pavement.

The Orchard development is still at the planning approval stage. The proposed FRS plans do not proposing to use Old Dominick Street or the section of Island Road bordering this site for haul routes or site access.

16.2 Major Accidents and/or Disasters

As required in the Directive 2014/52/EU, this EIAR has looked at the effects on the environment in the event of major accidents and/or disasters relevant to the project, including those caused by climate change. It is considered that the three main areas of potential for major accidents and/or disasters relevant to the project are:

16.2.1 Proximity to Seveso Sites

In Limerick, there are two Upper Tier Seveso Sites and two Lower Tier Seveso Sites:

Upper Tier

- Atlantic Fuels Supply Company, Foynes Port, Foynes, Co. Limerick. (35km from Kings Island)
- Gouldings Fertiliser, Morgan's South, Askeaton, Co. Limerick (27km from Kings Island).

Lower Tier

- Irish Liquid Bulk Storage, Foynes Port, Foynes, Co. Limerick. (35km from Kings Island)
- Grasslands Fertiliser, Dock Road, Limerick City. (3.5km from Kings Island).

There are no Seveso (COMAH) sites near the proposed FRS, with the nearest Seveso site being Grasslands Fertiliser in Dock Road, located approximately 3.5km southwest of the site. Therefore, there is no likely significant impact on Population and Human Health as a result.

16.2.2 Risk of Flooding

It is intended the proposed flood relief scheme will enhance and strengthen the existing flood measures in place and be able to withstand the likely increased frequency and severity of future flooding events. The works have been designed and developed with a primary focus to protect the affected areas against fluvial and tidal flooding. The scheme proposed herein is designed to provide protection to properties in the study area from the 1 in 200 year tidal flood event.

16.2.3 Risk of an accident leading to spillage

The risk of an accident resulting during construction leading to a spillage and pollution of sensitive land and waterbodies is considered in the Chapter 10 Surface and Groundwater and Chapter 11 Soils and Geology. During construction of the proposed FRS, there is a risk of localised accidental pollution incidences from the following sources:

- Spillage or leakage of temporary oils and fuels stored on site;
- Spillage or leakage of oils and fuels from construction machinery or site vehicles;
- Spillage of oil or fuel from refuelling machinery on site;
- Run-off from concrete and cement during pad foundation construction;
- Site preparation including the construction of the Contractors compound, temporary fencing and hoarding. The erection of signage and traffic diversion signs throughout the island;
- Health Risks: As the work progresses, any remaining contaminated material in the old landfill has the potential to come in contact with the construction workers;
- The presence of an old invasive species dump site has the potential to release legumes or pieces of Japanese Knotweed into the surface water or onto human clothing, thus potentially spreading this material;
- The construction of the Contractors compound;
- Import and placement of approximately 143,600m³ of earth fill for construction of the embankments around the north side of the island;
- Demolition of old, and construction of new flood walls on the banks of the Shannon and Abbey Rivers;
- Excavations of hardstanding and topsoil during the construction of walls and embankments beside the River Shannon and along the rear of the houses on St. Munchin's Street;
- Use of jack-up rigs on the bed of the River Shannon and Abbey River to be used as a work platform for machinery operating at Merchant's Quay and the Absolute Hotel;
- Construction of access roads and foot paths;
- Groundwater pumping as a result of excavation works; and
- The removal of some existing drainage infrastructure and the installation of the upgraded drainage network to depths of 1.5m bgl.

The Main Contractor and sub-contractors will be responsible for ensuring the following measures are implemented if surface or groundwater ingress is encountered during excavations and infilling:

- If surface water or groundwater ingress into excavations is encountered, then the Main Contractor should ensure that the groundwater is not exposed to hazardous materials. If removal of the groundwater is required then this should be stored, treated if necessary and disposed of appropriately. If disposal of groundwater to the public sewer is required, then the necessary approval and license should be sought from Irish Water;
- Contractors will ensure that spill kits will be accessible to construction personnel at all times and all spills will be reported to the Main Contractor;
- All works undertaken near the banks will be fully consolidated to prevent scour and run-off of silt. Consolidation may include use of protective and biodegradable matting or geotextiles on the banks and the sowing of grass seed on bare soil;
- Stockpiles of soil will be remotely located from waterbodies; and
- All concrete works will be carried out in dry conditions;

- All earthworks will aim to be carried out in periods of dry weather (from April to September inclusive) to avoid potential for suspended sediment runoff;
- A site-specific Construction Environmental Management Plan (CEMP) will be prepared by the contractor prior to the commencement of any works in order to ensure all works are carried out in a manner designed to avoid and minimise any adverse impacts on the receiving environment.

With regards to accidental spills and leaks, the Main Contractor and sub-contractors will be responsible for ensuring the following measures are implemented:

- The Project Manager will take full ownership of the CEMP and will be responsible for storing all site records, including but not limited to, training records, incidents and emergencies, environmental quality monitoring records and updates to Method Statements. Sub-contractors will be made aware of the site-specific Construction and Environmental Management Plan for the work;
- Construction methods adopted by the contractors will be to minimise the requirement to disturb habitat in foreshore areas;
- An Emergency Plan for the site will be established by the Main Contractor prior to work commencing at the site. As a minimum the Emergency Plan should contain contact details for statutory bodies such as the NPWS and IFI. All site workers should be made aware of the plan and its location in the site offices;
- There will be no refuelling of machinery within or near the river channel. Refuelling will take place at designated locations at distances of greater than 30 metres from the watercourse;
- No vehicles will be left unattended when refuelling and a spill kit including an oil containment boom and absorbent pads will be on site at all times;
- Any fuel that is stored on the site will be stored appropriately and at a location that is set back from the river. All other construction materials will be stored in this compound. The compound will also house the site offices and portable toilets. This compound will either be located on ground that is not prone to flooding or will be surrounded by a protective earth bund to prevent inundation;
- All vehicles will be regularly maintained and checked for fuel and oil leaks;
- All liquids, solids and powder containers will be clearly labelled and stored appropriately in sealable containers. Storage of fuels and oils will be in the main contractor's compound only;
- If a spillage does occur, it will be contained with adsorbent pig bags. These will be placed in a hazardous waste bin for ultimate disposal. The contractor will replenish the adsorbent pig bags immediately;
- Where a contractor is responsible for materials stored in a bunded area, that contractor shall implement measures for the regular inspection of bunds and emptying of rainwater (when uncontaminated). Bunding must have a minimum capacity of 110% of the volume of the largest tank or 25% of the total storage capacity, whichever is the greater. Bunding shall be impermeable to the substance that is being stored in the tank;
- The use of settling lagoons, settling tanks, or equivalent, with outflow control measures may be used for the interception of surface water or groundwater pumped from an active working area;
- Concrete and mortar washout will take place in an impermeable bunded/lined area. The concrete will be allowed to go off and broken up and used as blinding for site roads/haul roads etc;
- If a spillage of a hazardous material to groundwater does occur, the groundwater will be contained and pumped to a tank or holding vessel prior to shipment off site for disposal. The contractor will maintain disposal records. The contractor will identify the cause of the spillage and mitigation measures and controls will be put in place to prevent a repeat. The CEMP for the site will be updated and contractors and sub-contractors will be made aware of the amendments;
- Where possible, excavated soils should be re-used on site. Stockpiles of material should be located away from waterbodies;
- In the event of contaminated ground or hazardous waste been uncovered e.g. asbestos, work will stop and an investigation into the extent and characteristics of the material will be

undertaken. The waste material will be removed by a licenced haulier and disposed of at a licenced/permitted facility. Waste disposal records will be kept by the Project Manager. Sandbags/ silt fences should be placed on the surface water drainages channels in this event;

- A water quality monitoring regime will be established and agreed with the NPWS and IFI in advance of works commencing; and
- All wastes generated within the canteen will be segregated and handled separately (further addressed in Chapter 7 - Material Assets including Waste).

With regards to instream works and the use of the moveable working platforms/jack up rigs, the following mitigation is proposed:

- The platform will be impermeable with raised sides to ensure that any spillages or debris caught by the barge is trapped before entering the surface water;
- Netting or similar should be used in the space between the jack up rig and the walls to trap any falling debris which would otherwise fall into the River Shannon or Abbey Rivers;
- Construction should be phased appropriately to avoid multiple movements of the jack-up rig, therefore limiting disturbance to the riverbed; and
- Reference Chapter 8 Biodiversity to mitigate impacts to any fauna or flora which may be impacted as a result of instream works.

16.3 Conclusion Cumulative Impacts

The proposed flood relief scheme has been assessed, taking full consideration of the cumulative and in-combination effects acting together with effects from past, present or reasonably foreseeable projects/ actions. No likely significant cumulative impacts are expected.

There are no “Seveso” sites (establishments within the meaning of the Chemicals Act (Control of Major Accident Hazards Involving Dangerous Substances) Regulations 2015) in the vicinity of the proposed FRS. The closest establishment is Grasslands Fertiliser, Dock Road, Limerick City at least 3.5 km south west of the nearest part of the proposed scheme.

In relation to flooding, the works have been designed and developed with a primary focus to protect the affected areas against fluvial and tidal flooding. Flood Relief Schemes are typically designed and built to a standard that protects against the 1 in 100 year flood event, and for coastal areas the 1 in 200 year flood event. As King’s Island is highly susceptible to tidal flooding it will be built to the 1 in 200 year standard which is considered appropriate for the location and level of flooding previously experienced.

In relation to accidents resulting in a spillage of polluting material, the risk of these occurring will be reduced to Short-term, Slight effects if mitigation measures specified during construction are implemented, the long-term effect would be slight with a neutral impact on water quality.

17 Summary and Conclusion

Table 17-1 provides a summary of the significant effects, mitigation measures and residual effects identified in each of the chapters of the EIAR. For the purpose of this summary table, some significance scores have been adapted to reflect the standardised approach to significance scoring as detailed in Chapter 1.

It is recommended that the proposed mitigation measures be incorporated into a site-specific Construction Environmental Management Plan by the proposed contractor and developed prior to construction.

Table 17-1. Summary of significant effects, mitigation measures and residual effects

Environmental Topic	Potential Likely Significant Effect	Significance Score	Proposed Mitigation to be included in a site-specific CEMP developed by the proposed contractor	Residual Effect Significance Score
6. Population and Human Health				
Construction Phase	Reduced foot traffic and vehicle traffic causing negative impacts to residential amenity, businesses, recreation and tourism. Impacts to human health through traffic, noise, and air quality. Reduced access to recreation and open space when footpath is closed. Disruption to FC pitches. Reduced capacity for tourism. Potential impacts to health and safety for construction personnel. Positive impact due to increased employment and population during construction phase.	Moderate negative, temporary impacts	A site-specific CEMP will mitigate most impacts during construction. Impacts to traffic, water quality, noise, air, landscape/ visual during the construction phase addressed in Chapters 8, 11, 12, 13, respectively. A Health and Safety Programme will be put in place on the site prior to commencement of construction. Construction on the sports pitches will take place during the off-season for the club (July-August).	Slight/ Temporary
Operation Phase	Positive impacts to population, economic activity, residential amenity, and recreation/ tourism. Potential for safety issue around flood defences due to proximity to water.	Positive, Long Term effects.	Maintenance and monitoring schedule to ensure defences are operating safely Provision of guarding heights at an appropriate level (1.1m). Provision of access and egress points in design to allow boat users to continue using the island as before.	No significant impacts predicted.
7. Material Assets incl. Traffic, Utilities, and Waste Management				
Traffic Construction Phase	Traffic: Slight increases in traffic volumes on the surrounding road network in absolute terms during construction phase, due to construction staff traffic and material haulage.	Not significant to moderate; temporary negative impacts	Best practice measures, including a CEMP and a Construction Traffic Management Plan, a Traffic Management Coordinator, Site Induction, Signage, Staff Mobility Management.	No Residual Effects
Traffic Operation Phase	No impacts predicted	No impacts predicted	No mitigation necessary during operation.	No impacts predicted
Utilities and Waste Construction Phase	Area A6: Minor diversion of telecom, power, and sewers A7: Relocation of road gullies A10: Diversion of street lighting ducts B1/B2: Slight disruption to water main, power lines, and sewer B3: Disruption to existing manholes, chambers and chamber lids relating to water, sewer, storm,	Slight, temporary impacts predicted	Service disruptions will take place only where absolutely necessary. A site-specific CEMP will mitigate impacts during construction.	Slight, temporary impacts predicted

Environmental Topic	Potential Likely Significant Effect	Significance Score	Proposed Mitigation to be included in a site-specific CEMP developed by the proposed contractor	Residual Effect Significance Score
	telecoms and electrical services.			
Utilities and Waste Operation Phase	No impacts predicted	No impacts predicted	No mitigation measures necessary	No impacts predicted
8. Biodiversity				
Construction impacts	Alluvial forest habitat Damage to riparian/alluvial woodland during construction of north west outfall pipe, and upgrading of flood defence walls	International	The footprint of the construction works will not encroach within the boundaries of the Annex 1 Alluvial forest habitat Fencing/signage will be used to demarcate SAC boundary. Bankside trees on Shannon and Abbey Rivers will not be disturbed	Not significant
	Marsh habitat Physical damage to marsh habitat due to machinery and fill materials Material from construction works altering soil levels and raising flood plain level thereby interfering with flooding regime Surface runoff from bare soil/fill material bringing additional particulate matter into marsh habitat and contributing to change of species composition	International	The footprint of the embankment construction works will be limited to that agreed with NPWS. Fencing will be used to demarcate marsh habitat and SAC boundary. Cutting of sheet piling will take place from embankment and will not take place inside the marsh habitat. Surface water flow from works will be prevented from reaching marsh habitat. Allow natural revegetation of marsh habitat upon completion of works.	
	Ditch Construction of western embankment will result in direct loss of a ditch and wet grassland habitat	National (due to presence of protected species Opposite-leaved pondweed)	Relocation of ditch and reinstate with similar hydrology and sediment features to original; adequate sloping of ground to allow revegetation and succession of wet grassland	Not significant
	Construction of embankments will result in direct loss of ditch to east of Star Rovers pitch and adjacent treeline/scrub habitats	Moderate at local level	Compensatory planting of treeline and allow succession of scrub vegetation. Adequate area of flood plain for flood water containment	Not significant
	Opposite-leaved pondweed Infilling of ditch will result in loss of population of Opposite-leaved pondweed	National	Removal of pondweed plants from ditch habitat to a holding area and then translocation into a newly excavated channel. Mitigation will follow the Methods statement in the Section 21 Licence Application (Floral Protection Order) for <i>Groenlandia densa</i> (Denyer, 2019)	Not significant
	Otter Additional lighting required for construction phase will inhibit Otter activity	National	No additional lighting systems set up during construction. Night-time working will not be permitted.	Not significant

Environmental Topic	Potential Likely Significant Effect	Significance Score	Proposed Mitigation to be included in a site-specific CEMP developed by the proposed contractor	Residual Effect Significance Score
	Badger Disturbance / destruction of Badger sett south of marsh during embankment construction.	Local	Derogation licence for temporary exclusion of Badger, confirmation of suitable alternative sett or habitat for building of setts During exclusion the sett will be fenced off to prevent construction material blocking the entrance holes. Trees in the vicinity of the sett will be cut and not uprooted so there is no disturbance to underground passageways. Night-time working will not be permitted Revegetation with native hedgerow /tree species. Allow natural succession to scrub	
	Bats Additional lighting required for construction phase will inhibit bat activity	Local	No additional lighting systems set up. Night-time working will not be permitted.	
	Wintering birds Machinery operation and workforce movement will cause disturbance to wintering birds in the flood plain area	International	Avoidance of works on the eastern embankment and cutting of sheet piles during wintering bird season (October to March) Should works extend through the winter period (i.e. October - February) the following measures should be undertaken, although they may be adopted as best practice: a) Daily monitoring of average daytime temperatures will be undertaken. When average daytime temperatures fall below 0°C for five consecutive days, works will temporarily cease. Works can proceed again when temperatures become milder. b) Night-time working will not be permitted. c) All machinery used on the eastern embankment will be fitted with noise reduction measures.	Not significant
	Breeding Birds The construction of the new western embankment will require the removal of the treeline and scrub adjacent to the path along the north of Kind's Island with potential discrete loss of available nesting habitat	Local	All vegetation clearance works and site preparatory works will be conducted outside of the bird nesting season (31 March to 31 August inclusive). Compensatory planting of native trees, with some unmanaged areas where scrub and natural succession are allowed.	Positive Revegetation with trees, scrub and unmanaged areas of vegetation will increase nesting and pollinator habitat and overall biodiversity
	Bees Movement of sandbags on walls surrounding embankment will disturb nests of bees	Local	Removal of sandbags to take place once bee larvae have hatched (Spring) and before new nests have been excavated (6-8 weeks later)	Not significant

Environmental Topic	Potential Likely Significant Effect	Significance Score	Proposed Mitigation to be included in a site-specific CEMP developed by the proposed contractor	Residual Effect Significance Score
			Provision of replacement bee nesting habitat	
	<p>Juvenile Lamprey- Whilst the launch site and jack-up rigs will be temporary, they will result in compaction and physical damage to substrate and the loss/damage of juvenile Lamprey living in the sediment</p>	International	Electro-fishing and translocation of juvenile Lampreys in pre-construction phase- Electro fishing to take place during summer months Ideally August-October.	Not significant
	Surface water runoff and pollution will impact on the water quality of the Lower Shannon SAC, Shannon and Abbey Rivers, impacting on estuarine habitats, fish, invertebrates and their predators,	International, national and local	Follow Management measures for surface water (see 0) and pollution prevention measures (see 0)	Not significant
Operational Impacts	<p>Opposite-leaved pondweed A new channel with translocated population of Opposite-leaved pondweed may not lead to successful reestablishment of this species.</p>	National	Management of channel vegetation, Monitoring of Opposite-leaved Pondweed according to Section 21 Licence application for <i>Groenlandia densa</i> (Denyer, 2019)	Not significant
	<p>Otter and Bats The pathway on the embankment around King's Island was not previously lit at night. A new lighting plan is designed to improve use and security of people using the path. Unless correctly designed this will interfere with Otter and bats using the river for commuting and foraging.</p>	<i>National and local</i>	Lighting plan will abide by specifications for Otter and Bats in Section 0	Not significant
	<p>Badger Excessive management of vegetation (grass cutting, cutting of scrub) could disturb Badger population and limit habitat suitable for location of Badger setts</p>	Local	Landscape plans and long-term management will involve planting of native trees and plants, including some unmanaged areas which will provide undisturbed habitat for Badger setts	Neutral - Positive
	<p>Waterbirds The proposed works will result in the flood plain being completely enclosed by embankments, with public paths on top and easier public access to the marsh area, resulting in greater disturbance to wintering waterbirds during flood events</p>	International	Planting a natural barrier using low-growing native species such as Hawthorn at base of eastern embankment to discourage access. Allow minimal meadow grassland management (e.g. one cut / year), with some unmanaged areas where scrub and natural succession are allowed.	Neutral - Positive Encourages biodiversity and pollinators
	<p>Reduction in water quality Periodic maintenance works such as clearing</p>	International, national	Regular maintenance and regular review of maintenance requirements	Not significant

Environmental Topic	Potential Likely Significant Effect	Significance Score	Proposed Mitigation to be included in a site-specific CEMP developed by the proposed contractor	Residual Effect Significance Score
	filter drains and outfalls will contribute silt or pollutants to water courses			
9. Surface and Ground water				
Construction the phase	<p>Possible surface and groundwater contamination due to increased suspended solids from runoff.</p> <p>Temporary disruption to the riverbeds as a result of instream works / works near water.</p> <p>Risk of contamination from excavation and infilling, accidental spills and leaks, surface water runoff from the construction site.</p> <p>Risk of contamination as a result of flood event occurring during the construction phase.</p>	Short-term, Significant Negative impact.	<p>A site-specific CEMP and Emergency Plan will be prepared prior to starting works.</p> <p>Mitigation measures have been proposed which recommend best practices for earthworks and concrete works in and around water.</p> <p>Suspended solids in runoff will be managed through consolidating earth works near banks, and through use of settlement ponds or tanks, and by conducting the large part of earthworks during periods of dry weather.</p> <p>Accidents will be prevented through use of spill kits on all machinery, appropriate storage of hazardous materials.</p> <p>Jack up rigs/ in-river works will be carefully managed through minimisation of barge movements, and through the use of netting to catch any debris falling from quay walls.</p> <p>The risk of contamination as a result of a flood occurring during the construction phase will be managed through close monitoring of tide levels. Existing flood defences will be left in place until the new defences are built.</p>	Short-term, Slight effects.
Operation Phase	<p>Reduced localised infiltration and groundwater recharge as a result of increased hardstanding/ compacted surfaces.</p> <p>Increased surface water runoff as a result of improved drainage design.</p> <p>Reduced flow of groundwater through flood wall foundations.</p> <p>Leaching of contaminants from stone and concrete.</p> <p>Long-term changes to hydromorphology as a result of raised bank levels.</p>	Long term, Not Significant impact	<p>Filter drains have been provided in the design to allow settlement of contaminants prior to discharging surface water runoff into the Abbey and Shannon Rivers.</p> <p>Erosion mitigation measures are proposed in area A4 around sheetpiling works to prevent further erosion of the bank.</p> <p>Further design adaptations include setting back embankments from the river's edge to limit erosion and long-term impacts on hydromorphology.</p>	Long-term and Slight effect.
10. Soil and Geology,				
Construction Phase	<p>Potential for contamination as a result of accidental spills and leaks.</p> <p>Bedrock exposure as a result of excavation and drilling.</p>	Long term, Slight negative impact	<p>Use of best practices and appropriate guidelines for proper management of the soil and geological environment.</p> <p>Contractor will be required to prepare a Soil Management Programme, ensure imported soils are sourced from a</p>	Short term, Slight negative impact

Environmental Topic	Potential Likely Significant Effect	Significance Score	Proposed Mitigation to be included in a site-specific CEMP developed by the proposed contractor	Residual Effect Significance Score
	Compaction as a result of the import of soil, introduction of clay materials, and truck movements in St. Mary's Park. Generation of waste as a result of soil recovery if contaminated soils are encountered.		reputable facility, and ensure contaminated soils are sent to a waste licensed soil facility.	
Operation Phase	Increase in hardstanding surfaces. Introduction of a protective topsoil layer. Export of contaminated material and import of clean fill,	Slight, but Positive Permanent impact	No mitigation required	Slight, but Positive Permanent impact
11. Noise and Vibration				
Construction Phase	Increases in noise levels at nearby receptors due to the construction works associated with the flood defence, retaining walls, flood defence embankment and access paths. Increases in noise levels from construction traffic on local roads	Not significant to moderate, temporary negative impacts	Best practice measures outlined in BS5228-1 in addition to specific measures outlined in Section 13.5.1 including the following; Selection of modern equipment complying with relevant guidelines; Regular maintenance of plant and vehicles; Shutdown of equipment not in use; c2.4m hoarding around works for concrete walls, barriers; Max speed limit of 30km/hr; Noise monitoring will take place at the nearest sensitive receptors to the works.	No significant impacts predicted
Operation Phase	No operational noise sources, therefore no potential likely significant effects	No impact	No mitigation required	No impact
12. Air and Climate				
Air Quality-Construction Phase	No significant impact from the construction phase.	Not Significant impact.	Construction mitigation measures have been outlined including provision of a Dust Management Plan and CEMP.	Not Significant impact.
Air Quality-Operation Phase	There will be no air quality and dust impact from the operation phase.	No impact	No mitigation is necessary.	No impact.
Climate Emissions - Construction Phase	Contribution to GHG emissions during the construction phase include emissions from transport of materials to the site, embodied CO2 in construction materials (such as cement, steel, etc.), emissions from plant machinery and other ancillary areas such as contractor compounds, waste management, etc. GV movements and	Slight, Short-term impact.	Ensure all vehicles switch off engines when stationary - no idling vehicles; Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable; Impose and signpost a maximum-speed-limit of 15 mph on	Slight, short-term impact.

Environmental Topic	Potential Likely Significant Effect	Significance Score	Proposed Mitigation to be included in a site-specific CEMP developed by the proposed contractor	Residual Effect Significance Score
	machinery operating on site will contribute the majority of GHG emissions.		surfaced and 10 mph on unsurfaced haul roads and work areas; and Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials.	
Climate emissions - Operation Phase	There will be no emissions during the operation phase.	No impact.	No mitigation required.	No impact.
Climate change vulnerability and adaptability	<p>The King's Island FRS is vulnerable to the effects of climate change, in particular sea level rise and frequent intense storms.</p> <p>Both the embankments and the RC flood walls are at a high vulnerability to the effects of climate change. However, there are in-built capacity measures that have been taken at the design stage to account for the sensitivity and adaptability of the flood defence features.</p>	<p>Vulnerability: Neutral under the Mid-Range Future Scenario (MRFS), in the Long Term (appraisal period of 50 years).</p> <p>Adaptability: Adaptable in the Long Term under the MRFS but not the HEFS, therefore Slightly Adaptable. Beyond the Long Term and the MRFS, the defences are considered Not Adaptable and future risk will need to be managed as required.</p>	The scheme has been designed to be adaptive to climate change through the provision of foundations which are strong enough to raise the scheme defences by up to 0.5m (the MRFS) in all areas but one (Area A8, the Absolute Hotel Boardwalk).	Not significantly vulnerable in the Long Term (i.e., the appraisal period of approx. 50 years), and Adaptable to climate change. Beyond the Long Term (past the appraisal period of 50 years), the scheme is considered to be Moderately Vulnerable, and Slightly Adaptable to the effects of climate change if mitigation measures and monitoring are implemented.
13. Landscape and Visual				
Landscape and Visual Construction Phase	<p>During construction the tranquil character of the river edge landscape will change due to the construction activity, local walkers on the embankment will be affected. Access to the western side of the river edge will be closed during construction and access will be via the footpath at Oliver Plunkett Street.</p> <p>The site compound is proposed in the northwest corner of St. Mary's Park. Which will cause a change to the character of the open space and will cause visual intrusion.</p> <p>Disruption to the Star Rovers sports pitches will occur.</p>	The overall impact of the proposed flood relief works on the landscape character and visual amenity of the detailed study area during the construction phase is arrived at by a combined measurement of the sensitivity of the landscape character (High) and the magnitude (Medium) of the development. As such the impact before mitigation on the landscape character and	<p>During the construction phase impacts to the landscape character of the open space in the north of Kings Island will be mitigated by minimising disruption to the existing river edge walkway. Access around the western side of the open space and adjacent to the River Shannon will be disrupted as people are diverted to the footpath on Oliver Plunkett Street during construction and walkers will be directed to the track on the eastern side of the island.</p> <p>Within the southern part of Kings Island pedestrian access will be disrupted but not prevented as the work to construct the raised wall proceeds.</p> <p>Construction techniques have been development to minimise damage to and removal of the mature trees on</p>	The residual impact on the landscape character and visual amenity of the Detailed Study will be Short term, Slight, Negative Impact.

Environmental Topic	Potential Likely Significant Effect	Significance Score	Proposed Mitigation to be included in a site-specific CEMP developed by the proposed contractor	Residual Effect Significance Score
	<p>Removal of vegetation at Athlunkard boat club will cause temporary changes in character. Views towards the Jack-up rig in the river (2 locations) during the reinforcement and cleaning of the river wall adjacent to the Absolute hotel and the Court House will cause visual intrusion. Disruption to footpaths along Sir Harry's Mall, Georges Quay, the Potato Market, the Court House and Limerick City and Council offices will occur affecting the streetscape character</p>	<p>visual amenity of the Detailed Study area is Temporary to Short Term, Moderate, Negative Impact.</p>	<p>George's Quay to provide protection during the adjacent wall repairs. Tree surgery to the existing mature trees including raising of the tree crown and removal of lower branches and basal shoots will prevent damage by construction work. Additionally, prevention of machinery and storage of building supplies within the tree root protection areas will minimise any damage to these valuable resources and maintain the sylvan charm of George's Quay during construction.</p>	
<p>Landscape character Operation Phase</p>	<p>In the operational phase landscape character areas A3, A4, A5 and A6 will be worst affected by the proposed earth embankment approximately 2.0-2.5m in height (5.5m AOD) and lighting along the footpath will bring activity in the form of pedestrians, lighting and noise into a quiet low-lying area and contribute to an overall change in character.</p> <p>Areas B1/B2 the existing flood wall will be raised along this section by approximately 0.5m to maintain a wall height of 1.2m above ground level. Significant drainage works will be implemented in areas B1 and B2</p> <p>Area B3 the work to the water's edge from the Potato Market to the St John's Castle will involve a reduction in the width of the boardwalk around the courthouse, mass concrete backing and new plinth to strengthen the existing flood wall, increased footpath height and increased flood defence height. Significant drainage works will be implemented in area B3; two tidal storage tanks are proposed for the Potato Market car park and the river edge walk way north of the LCCC offices and proposed foul and storm sewers to enable decommissioning of the three existing foul pumping stations</p>	<p>In the operational phase landscape character areas A3, A4, A5, A6, B1/B2 and B3 will be worst affected and will experience Permanent, Moderate, Negative Impacts.</p>	<p>Semi mature trees will be planted at the base of the embankment parallel to St. Munchin's street to filter visibility into the rear of properties. The trees will have a clear stem of 2m to provide low level views through the planting for security purposes;</p> <p>Profiling of the embankment to grade the slope out in a gentle slope to remove the engineered appearance and give a more natural landform.</p> <p>Directional lighting (Areas A3-A6) will be implemented along the top of the embankment with the lighting columns on the outside of the footpath to direct the light away from the adjacent SAC (in the River Shannon and between St. Munchin's Street and the Abbey River);</p> <p>A scrub hedge at the foot of the embankment will be incorporated into the design to act as barrier planting to prevent access to the sensitive SAC.</p> <p>Connecting access paths at approximately 150m intervals from residential areas onto the embankment and one enhances access to the River Shannon for fishermen.</p> <p>A range of Stone finishes and copings to the raised flood walls</p> <p>In Areas B2-B3 sections of stone wall or railings will be replaced with transparent panels to allow connectivity with the Abbey River and River Shannon for pedestrian and vehicular users.</p>	<p>Permanent, Slight, Negative Impact.</p>

Environmental Topic	Potential Likely Significant Effect	Significance Score	Proposed Mitigation to be included in a site-specific CEMP developed by the proposed contractor	Residual Effect Significance Score
Visual amenity	Worst affected will be a total of 107No. residential properties who will experience Moderate Adverse visual impacts as a result of the proposed embankment, footpath and night-time lighting. These are located in west and north facing properties in Oliver Plunkett Street, west facing properties on St Munchin's Street and north and east facing properties on Assumpta Park.	A total of 107No. residential properties will experience Permanent, Moderate Adverse Impacts	<p>Directional lighting will be implemented along the top of the embankment with the lighting columns on the outside of the footpath to direct the light away from the adjacent SAC (in the River Shannon and between St. Munchin's Street and the Abbey River);</p> <p>Semi mature trees will be planted at the base of the embankment parallel to St. Munchin's street to filter visibility into the rear of properties. The trees will have a clear stem of 2m to provide low level views trough the planting for security purposes.</p> <p>After planting and mitigation measures have established within 10 years, the adverse moderate visual impacts will be gradually and increasingly mitigated. Monitoring of the growth of the tree planting around the site boundary will be carried out during the 18-month Defects Liability Period and the subsequent establishment period to ensure any planting which has failed to establish is replaced in the next planting season</p>	Permanent, Slight, Negative Impacts on maturity of the landscape proposals.
14. Cultural Heritage				
Construction Impacts	Potential for direct, physical impacts on the known and unknown archaeological, architectural and cultural heritage features	Moderate to High. Potential significant direct negative permanent impacts	Archaeological testing will take place before the construction phase. All ground disturbances will be subject to continuous archaeological monitoring. Monitoring will be carried out under licence to the DCHG in consultation with the National Museum and the LCCC's Archaeologist. Full provision will be made available for the resolution of any archaeological remains that may be discovered should this be deemed an appropriate manner in which to proceed. Archaeological monitoring of dig-outs will take places in Areas A2, A3-A7, A9-A10, and B1-B3.	Potentially significant. With regards to the archaeological resource, following the implementation of the mitigation measures, there will be no residual impact on the archaeological resource.
	Direct physical impact on previously unrecorded archaeological artefacts along coastal region in Area B3 as a result of the use of jack-up barge in proximity to Merchant's Quay and King John's Castle.	Moderate to High. Potential significant direct negative permanent impacts	Prior to construction commencing, dive/wade visual and metal detection survey will be undertaken of the area by a suitably qualified underwater archaeological specialist under license from the Underwater Archaeological Unit of the National Monuments Service DCHG and National Museum of Ireland.	Potentially significant. Following the implementation of the mitigation measures, residual impacts will be dealt with in accordance with best practice and in agreeance with

Environmental Topic	Potential Likely Significant Effect	Significance Score	Proposed Mitigation to be included in a site-specific CEMP developed by the proposed contractor	Residual Effect Significance Score
				National Monuments Service and National Museum of Ireland.
	Direct physical impact on Thomond Bridge. The installation of new coping will abut the north-eastern wall of the bridge.	Slight	This proposal will constitute a slight change in the setting of the protected structure. Works will be monitored by a suitably qualified architectural heritage specialist.	Slight
	The removal of the existing modern railings and original stone plinth along north-western and south-western sections of the county courthouse. The railings will be replaced by new glass panels.	Significant. Removal of the boardwalk is positive as it will expose the original quay wall.	Details of how the glass panels will interface with the historic fabric of the quay wall will be issued, with a recommendation that the interaction is non-intrusive. Works will be monitored by a suitably qualified architectural heritage specialist.	Significant.
	Potential direct physical impact at Potato Market. Proposed ramped and stepped access to opening at Sylvester O'Halloran Bridge. Proposed replacement of railings in south wall of Potato Market with new glass panels.	Slight to Moderate.	Details of how the proposed ramp and the glass panels will interface with the historic fabric of the Potato Market walls will be issued, with a recommendation that the interaction is non-intrusive. Works will be monitored by a suitably qualified architectural heritage specialist.	Slight to Moderate
	Direct physical impacts on the Quay Wall at Georges Quay. A significant length of the flood defence opposite Barrington's' Hospital, protected structure, will be raised and retained. The existing tubular railings will be removed.	Slight to Moderate. The removal of existing tubular railings will have a positive impact on the historic setting. Sections of glass panels are proposed along other areas of the quay wall. These will largely correspond with existing features.	Details of how the glass panels will interface with the historic fabric of the quay wall have been issued and are appropriate in the historic setting.	Slight to Moderate.
	Existing railings along Merchants quay edge will be replaced by glass panels.	Slight to Moderate.	Details of how the glass panels will interface with the historic fabric of the quay wall have been issued and are appropriate in the historic setting. Works will be monitored by a suitably qualified architectural heritage specialist	Slight to Moderate.
	Removal of existing poorly preserved wall to south of steps adjacent to civic space. This wall will be replaced with a concrete wall clad in stone with stone coping. The stone wall currently blocking the steps will be replaced with a glass panel.	Significant	Works will be monitored by a suitably qualified architectural heritage specialist.	Significant impact on wall
	Existing wall along the northern side of the Abbey River between Abbey Bridge and Baal's Bridge will be rebuilt to achieve the required height.	Significant.	The existing wall will be recorded, method to be agreed with LCCC's Conservation Architect.	Significant.

Environmental Topic	Potential Likely Significant Effect	Significance Score	Proposed Mitigation to be included in a site-specific CEMP developed by the proposed contractor	Residual Effect Significance Score
Operational Phase	It is proposed to remove existing modern safety railings from the low riverside wall adjacent to the Thomond Bridge Toll House and to add a new concrete coping of similar style though less substantial size to that on the existing wall	Moderate Adverse Impact on Setting	The size of the coping has been scaled down to address visual impact concerns.	Moderate Adverse Impact on Setting
	Installation of glass panels along the quay edge and the panels will tie into King Johns Castle edge in the location of an existing metal railing.	Moderate Adverse Impact on Setting	Details of how the glass panels will interface with the historic fabric will be issued, with a recommendation that the interaction is non-intrusive.	Moderate Adverse Impact on Setting
	Installation of glass panels along the original quay edge at the County Courthouse.	Moderate Adverse Impact on Setting	Details of how the glass panels will interface with the historic fabric will be issued, with a recommendation that the interaction is non-intrusive.	Moderate Adverse Impact on Setting
	Proposed ramp at potato Market will have a visual impact on the interior of the south section of the Potato Market. Installation of glass panels along the original quay edge.	Overall Slight to Moderate Adverse Impact on Setting	Details of how the proposed ramp and the glass panels will interface with the historic fabric of the Potato Market walls will be issued, with a recommendation that the interaction is non-intrusive.	Overall Slight to Moderate Adverse Impact on Setting
	Quay walls at Georges Quay - It is proposed to raise the height of the quay wall along sections of its length. It is proposed to install glass panels along the original quay edge.	Moderate Adverse Impact on Setting	Details of how the glass panels will interface with the historic fabric of the quay wall have been issued and are appropriate in the historic setting.	Moderate Adverse Impact on Setting
	Quay Walls Merchants Quay. It is proposed to raise the height of the quay wall along sections of its length. It is proposed to install glass panels along the original quay edge.	Moderate Adverse Impact on Setting	Details of how the glass panels will interface with the historic fabric of the quay wall have been issued and are appropriate in the historic setting.	Moderate Adverse Impact on Setting
	Baals Bridge. It is proposed to replace the wall between both bridges with a masonry wall.	Moderate Adverse Impact on Setting	The existing wall will be recorded.	Moderate Adverse Impact on Setting
	Raising the masonry wall adjacent to the bridge on George's Quay.	Slight Adverse Impact on Setting	The existing wall style will be replicated in the new courses and the existing capping will be retained and replaced.	Slight Adverse Impact on Setting
16. Cumulative Impacts, and Major Accidents/Disasters				
Cumulative Impacts - Construction Phase	<p>Potential for cumulative impacts on traffic, noise, landscape/ visual and population/human health as a result of the following:</p> <ul style="list-style-type: none"> -Opera Site, Limerick City -Limerick Urban Centre Revitalisation -O'Connell Street <p>Potential for cumulative impacts on surface water quality (if the construction phases are to overlap)</p>	No likely significant cumulative impacts.	Mitigation implemented as above.	No likely significant cumulative impacts

Environmental Topic	Potential Likely Significant Effect	Significance Score	Proposed Mitigation to be included in a site-specific CEMP developed by the proposed contractor	Residual Effect Significance Score
	as a result of: - Limerick City and Environs FRS - Castleconnell FRS			
Cumulative Impacts - Operation Phase	No cumulative impacts during operation.	No likely significant impacts.	No mitigation required.	No impacts.
Major Accidents and/or Disasters - Construction Phase	If a flood is to occur during construction, there is a possibility for surface water contamination and associated impacts on biodiversity, population and human health. No Seveso sites within 3.5km. Risk of accidental spills and leaks	Significant, Short-term effects	Monitoring of high tide levels during the construction phase Emergency plan in place including spill kits on all machinery, bunding around construction compounds, ensuring that refuelling takes place at an adequate distance from watercourses, etc. Full suite of mitigation measures is provided in Section 16.2 of the EIAR.	Moderate, short-term effects
Major Accidents and/or Disasters - Operation Phase	No impacts - The purpose of the scheme is to protect King's Island against the 1:200 year flood event.	No impact.	No mitigation necessary.	No impact.

