Illus 1 Site location plan.
Archaeological excavation and recording at 16–18 and 22 Exchange Street, Dundee
Bruce Glendinning and David Perry

Introduction and background

This report describes the results of archaeological works carried out by SUAT Ltd on the site formerly occupied by 16–18 and 22 Exchange Street, Dundee (Illus 1) during late 2000 and early 2001. The work was commissioned by AIM Design on behalf of their client Robertson Residential, in response to an archaeological condition imposed by Dundee City Council Planning and Transport Department.

Initially the works were to include an evaluation of the open ground to the rear of the site and a watching brief on the grubbing out of foundations. However during demolition work hitherto unknown vaults were discovered running east–west underneath the surface of the site. This prompted a different approach.

Historical Background

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In the late 18th century most of the application area formed part of the ‘Great Yard called the Craig Yard’, which in 1778 was acquired by John Wemyss, merchant in Dundee, who had a threadworks and dye-works elsewhere in Dundee, trading under the name of John Wemyss & Sons. Between 1776 (Illus 2) and 1793, land that had been reclaimed from the estuary of the Tay was incorporated into the site. In 1796 this extended shore line was occupied by the ‘Embankment & Wharf at Messrs John Wemyss & Sons’, with a building on the east part of the development site extending down to the new shore line. The Wemyss business seems to have gone bankrupt and their trustees sold the property in 1798 to Alexander Riddoch, Provost of Dundee.

Riddoch had already acquired the adjoining property to the west in 1794. This adjoining property occupied a large area extending from behind the Seagate frontage, southwards as far as the sea shore and included the top of the Castle Hill with a statue of Apollo and two gardens, probably on the south side of the hill, as well as the semicircular wood yard by the sea shore. This property passed to the town council and the eastern side became the site of Castle Street and the properties fronting the east side of that street. The semicircular wood yard is described in property deeds as ‘formerly the sea flood mark now the waste ground ..., intended for a bowling green’ and ‘the piece of waste ground inclosed [sic] by ... Sir George Stewart [of Grandtully] disposed to him by the Town Council of Dundee lying within the flood mark’. The yard had formerly been part of the estuary, reclaimed by the Town Council with the intention of creating a level bowling green, presumably in the first half of the 18th century, then sold to Stewart before 1739, when he disposed of the yard and the rest of his property on Castle Hill.

Ireland’s plan in 1796 of the shore line of Dundee indicates the areas that had been embanked, ie reclaimed from the Tay. The semicircular wood yard, the area immediately to the north of it up to the edge of Castle Hill, and the shore of John Wemyss & Sons (partly within the development area) are all included in the embanked areas. The area immediately to the north of the Wemyss land, that is most of the area within the present development, is not described as embanked, although presumably it had been reclaimed from the Tay at some unknown date before 1776.

A plan by Jardine of the harbour improvements in 1829 bears the annotation ‘Ground made up’ in reference to the area between Dock Street and an irregular line from approximately half way up Castle Street to Burnhead (now Commercial Street).

In the late 18th century, before 1776, there is a reference to vaults being found on Castle Hill as follows: ‘Masons, when building some of these houses that now stand upon the Castlehill, when founding them, came upon the top of vaults, and drove in some of the stones ere they were aware, but these were immediately filled up’ (Millar 1923, 145). The unexpected discovery of vaults in the 18th century indicates that their presence was then unknown. Their location on Castle Hill is not identified and their relation to the vaults on the development site cannot, therefore, be determined, but presumably they were on the northern part of the hill. The annotation on the 1829 plan that the site was on ‘Ground made up’ suggests that the presence of the Exchange Street vaults was known then.

Cartographic evidence

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The site seems to have been unoccupied by buildings until the early 19th century, except for the eastern side where a range of buildings is shown behind 22 Exchange Street on Crawford’s plans of 1776 (Illus 2) and 1793. The 1793 plan also shows that land has been reclaimed from the Firth of Tay since 1776: the extension of the shore appears to encompass Exchange Street itself and the ground as far as Dock Street, the area now occupied by the former Exchange Coffee House. The building on the east side of the site has been extended.
Ireland’s plan of 1796 notes that the newly reclaimed land, with the adjoining ground to the east was part of the ‘Embankment & Wharf at Messrs John Wemyss & Sons’, with the building on the east part of the site extended down to the shore line.

Neave’s plan of 1813 shows that the western end of this reclaimed land was occupied by a wood yard. Castle Street had been cut through Castle Hill.

In 1814 the reclaimed land was occupied by ‘Public Property’ and a graving dock. North of these was an E–W entry, about 100ft long, from Castle Street, providing access to the graving dock. On the north side of this entry was a N/S entry, flanked at its opening by two small buildings, leading to open ground on the south side of Castle Hill. No other buildings occupied the development site except for the range of buildings behind 22 Exchange Street already mentioned.

In 1818 the site of the ‘Public Property’ and graving dock was under construction as a wet dock (King William IV Dock). Only the small building on the east side of the entry is shown.

Wood’s plan of 1821 shows the site has been built on. The southern part of the site, with the entry from Castle Street, was similar to the 1814 plan. The north side of the entry from Castle Street was occupied by buildings, of which the easternmost appears to have formed one side of an open courtyard. The northern side of this courtyard was occupied by a new building, while the eastern side was occupied by a building on the site of or the same as that on the earlier plans. This courtyard, lined on three sides by buildings, is probably that depicted in Lamb’s vignette (1895, XLIII) of the ‘Back of Castle Hill and Burnhead’ (Illus 3). These buildings were probably ‘stables and other buildings’ mentioned in title deeds.
The copy in West Register House of Jardine’s plan of the harbour in 1829 has been annotated. An irregular line about halfway up Castle Street is marked across the building block between Castle Street and Burnhead (approximately Commercial Street), on the north side of Dock Street. This area is labelled ‘Ground made up’.

By Leslie’s plan of 1836 Exchange Street was laid out and the frontage of the development site was occupied by a building with two wings extending backwards and enclosing a courtyard. The northern part of the development site was occupied by the same building as in 1821.

Edward’s plan of 1846 (Illus 4) shows that the site was unchanged from 1836.

**Trial excavation**
Bruce Glendinning

*Numbers in parenthesis are context numbers.*

**Trench 1** (Illus 5)

This trench was excavated along the length of the western side of Vaults 4–9. It was positioned to identify the presence of any buried entrance to the vaults from that side. It was also expected to reveal how deep the vaults were.

The trench was excavated to a depth of about 1.7 m but no evidence of any entrance into the vaults was identified. A sondage 3 m long and 2.25 m deep was cut, and it was hoped to extend this to identify the depth of the vaults. However the excavation had to be stopped at 2.25 m due to the ingress of ground water. Another sondage was cut which reached 3.20 m before it became so unstable that it had to be immediately backfilled.

The deposits that were removed comprised a mix of clay, brick, cobbled setts, boulders, crushed rock and ash. This material had obviously been dumped to level up the ground to the height of the vaults. It is presumed at this point, that the vaults were always supposed to be subterranean and that this fill material was introduced shortly after their construction.

A solidly constructed mortar-bonded sandstone wall (002) was identified running east–west across the trench. It was 0.75 m wide x 0.70 m high (six courses); no construction trench was visible in section. It was not part of the vaults and must have related to one of the buildings that formerly occupied the site.

To the north of this, another rudely constructed wall (003) was identified, as forming part of a drainage culvert, 0.57 m in height and 0.47 m in width internally, that ran from the buildings to the west into the vault. The side walls of the culvert comprised up to 8 courses of stones, with single slabs forming the base and roof. A hole had been broken through the western wall of the
vaults to allow the insertion of the drain.

At the southern end of the trench another culvert (001), 0.60 m wide and 0.64 m high internally, was identified, which was more intact than the one identified to the north (003). It comprised two walls, of up to seven courses of stone, with a base formed from sandstone slabs and it was capped with similar slabs. This culvert also ran from the buildings to the west into the vault. Like (003), a hole had also been broken through the western wall of the vaults to allow the insertion of the drain.

Trench 2 (Illus 5)

This trench was excavated along part of the length of the eastern side of Vaults 10 and 11. It was positioned to identify the presence of any buried entrance to the vaults from that side. It was also placed to see if there was any evidence of phasing as it was thought that Vaults 10 and 11 were a different phase of construction to the rest.

No evidence of different phases of construction was identified, but the small area that it was possible to uncover had been disturbed by the later insertion of a cast iron drain into the vaults. This disturbance involved the
Illus 5 Site plan, showing the excavated trenches and vaults as located.
repair of the NE corner of the vault, where the E wall appeared to abut the N wall.

The excavated fill was similar to that from Trench 1. A large ceramic drain was uncovered, draining from the structures to the east into the vaults. The pipe was contained within a stone culvert, 0.76 m wide and 0.62 m high internally, that had been broken through the east wall of the vault to allow the pipe to be inserted.

**Trench 3 (Illus 6)**

This trench was excavated within the footprint of 16–18 Exchange Street to determine whether further vaults existed below this structure. It was excavated to a depth greater than the level of the top of the vaults to the north. No evidence of vaulted cellars was identified.

A few features relating to the recently demolished structure were uncovered, but these were of very limited interest.

**Recording of the vaults**

Measurement and recording was necessarily restricted by the great depth of polluted water, all observations being made from ground surface or from a machine platform temporarily lowered.

Eleven barrel vaults were known to exist on the site, aligned approximately east–west (Illus 5). The first three vaults (Vaults 1–3) and the last two vaults (Vaults 10–11) appeared to run the full width of the site, c 21 m, while the remaining eight were c 16 m long (including end walls), leaving an unvaulted strip c 5 m wide along the western boundary of the site. The vaults had a clear span of c 2.25 m, or 3 m between centres. The southernmost vault, 11, lay adjacent to the northern wall of the Exchange Street frontage buildings.

The very limited observations that were possible at the start led all parties to believe that Vaults 10–11 were better constructed and on a different alignment from Vaults 1–9. It was therefore proposed that they were of a different period, and were added on later.

Vaults 3 and 4 were partially opened up, allowing inspection of the internal structure of two adjacent vaults, one long, the other short. The southern wall of Vault 3 (Illus 7) was rather featureless, and, as it was not arched, it did not communicate with its neighbour to the south ( Vault 4) apart from the putlog holes. The northern wall was more interesting (Illus 6 and 10). Along the length of the northern wall were a series of large and very well-built round arches, c 2.75 m in diameter, leading through the dividing wall into Vault 2. Inspection from a machine platform lowered into Vault 3 showed that the arches were in fact part of an arcade.
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Illustration 7 Vault 3, north-facing elevation.

extending all the way along to the eastern end of the vault, and that this arcade was repeated in the north wall of Vault 2, uniting all three long vaults in the north of the site as a single space, all the way to the high retaining wall which formed the northern site boundary.

Both Vaults 3 and 4 were very solidly built of a dark red sandstone, perhaps Kingoodie, visibly different from the greyer stone which could be seen in the back of St Paul’s Cathedral to the north-west of the site. The dividing walls were built of coursed, roughly hewn rubble bonded with yellow-white lime mortar, and the barrel vaults were similar, but used even larger blocks, set on edge to form the voussoirs. Both vaults displayed a line of alternating putlog holes and large flat corbel slabs, just below the spring of the barrel vault (Illus 7). The putlog holes passed through the thickness of the dividing walls, from one vault to the next, and the corbel slabs probably did so as well. Both corbels and putlogs were very substantial, and could easily have supported a timber floor, although they probably served to support the centring for the vaults. The crest of the vaults was close to current Exchange Street ground level, while the vault interior was c 0.4 m down. Water level was c 1.6 m down, and the bottom of the vaults was c 4.3 m down, though in many places obstructed by fallen rubble, mainly from the opening up. An engineer’s investigation in the southern part of the site, closer to Exchange Street, found the bottom of a vault c 3.8 m down, perhaps suggesting that the rockhead rises to the south.

The west end wall of Vault 3 was partly formed by an outcrop of bedrock (Illus 6 and 11) which formed the north-west corner of the chamber, and from distant inspection seemed to be an impermeable, igneous rock, probably the dolerite whinstone which forms so much of the underlying geology of Dundee, including the rocky peninsula of Castle Hill. At the north-west corner of the chamber, the north wall stepped out in an irregular buttress, probably because of the irregular bedrock behind it. It was noted that the arcade in the north wall of the vault did not continue all the way to its western end; this may also be because solid bedrock lies almost directly behind the wall at this point.

The west end wall of Vault 4 in places looked as if it had once been harled, but on closer inspection this proved to be carbonate precipitation, caused by water draining through the roof and reacting with the mortar. To the east this vault was obstructed by collapsed material, as it seemed to have been opened some time in the 20th century, and then roughly roofed over with re-used railway rails and concrete.

Only limited inspection of Vaults 5 and 9 was possible; they appeared to be constructed in the same fashion as Vaults 3 and 4. Vault 5 communicates with the vaults on either side. Vault 9 communicates with Vault
8 but it was impossible to ascertain if it communicates with Vault 10. Vault 9 appears to be of an irregular tapering shape, because the tenth and eleventh vaults, near the southern end of the site, are on a different alignment.

Dundee City Council Planning and Transport Department granted permission to Robertson Residential to break open the entire length of Vault 11 under archaeological supervision. This was done in three sections allowing time for scaled elevations to be drawn and a full photographic record to be made. Only the south facing elevation (Illus 8) was drawn in full as the north facing elevation (Illus 9) was relatively featureless and most of the detail of the coursing was not visible due to carbonate precipitation. This vault, like Vault 10 was divided into two by a substantial wall. In Vault 11 the south facing wall comprised six arches, three either side of the wall. Those three arches on the west side were fairly regular with a visible diameter of c 2.40 m whereas those on the eastern side of the wall were less regular and larger, varying between 3.0m and 3.2m.

The construction of the walls and arches was substantially the same as those to the north. This was unexpected from the limited view that had previously been available: it had been thought that these two vaults were of a different build. The dividing walls within each vault had initially appeared to be ashlar, with a
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finely built dressed stone arcade piercing the wall between the two vaults, while the barrel vaults themselves seemed to be of rubble masonry, more like the vaults to the north. On excavation it became clear that the vaults were of similar construction to those to the north. The western side of Vault 11 was exactly the same as those to the north, whilst on the eastern side of the dividing wall, presumably reused ashlar sandstone blocks had been used to form the arches. Interestingly only the eastern side showed any evidence of putlog holes, where two were present for each arch. It would be tempting to suggest that the east and west side of this vault were built at different times but there is no evidence for this and it is simply more likely that local conditions prescribed the use of putlogs.

Two access points were uncovered; these comprised two square ‘trapdoor’ openings, 0.60 m x 0.70 m, through the roof of Vault 10, one on each side of the dividing wall within the vault. One was covered with a heavy stone slab, while the other was not covered although it had been mostly filled in. After it was partially excavated, evidence of metal rungs forming an access ladder were identified. As it appeared from the construction that the ‘trapdoor’ was built at the same time as the vault, it probably formed an original entrance. This is the only evidence of an entrance to these structures and suggests that they had always been subterranean. The presence of two trapdoors, one on each side of the internal dividing wall in Vault 10, suggests that their was no communication through the dividing wall.

Discussion

Much debate has surrounded the age and function of the vaults, but, unfortunately, definite answers to these questions are not easy to find. No building that directly relates to these vaults can be found on any map. The first buildings on the site were erected by 1821 and appear to have no relation to the vaults beneath, forming a building of three wings arranged along the west, north and south sides of a courtyard. These buildings remained until 1846, but by 1851 the east range had been removed and the west range enlarged; the north range seems to have been the only range to remain unaltered. These buildings remained, with alterations, until the recent redevelopment. This is particularly important because it means that the trapdoors in Vault 10 were never entered from a building but were always in open ground.

It is possible that the vaults were constructed between 1776 and 1793, as part of the levelling up of ground behind the new sea wall and wharf. It is known that the ground between Whitehall Crescent and Dock Street, to the west of the site, was reclaimed from the Tay in about 1643, with further reclamation taking place in the 18th century to expand the harbour. The former shore in 1793 was on the approximate line of Exchange Street, and the 1793 shoreline was itself an advance from the 1776 shoreline, which presumably lay across the development site. In 1796 this shoreline was occupied by an embankment and wharf, where ships could tie up. This implies that the ground level had by then been raised up. Further reclamation took place before 1813.

Although it is reasonable to see the vaults as part of the process of land reclamation and levelling up behind the sea wall, this does not exclude their having other functions too. The walls of the vaults were finished to a very high standard and were apparently meant to be seen. Supporting the vaults on arcades rather than solid walls would have economised slightly on stone, and would have improved ventilation, but would have substantially increased the skill and labour required in construction. It would be surprising if such sophisticated and well-built spaces were not also intended to be accessible and useable, rather than sealed and flooded as they are today.

This is confirmed by comparison with vaults similar in size and level, though probably later in date, just to the south of the site, under the former Exchange Coffee House, latterly the Bouquet Garni (Prof C A McKean, pers comm). With one exception, these are still dry and
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accessible, despite being nearer the shore line than the present site. It is certainly not unknown for subterranean vaults to be located near harbours. ‘Cellars’ were permitted to be built for storage and tanning at Port Glasgow at various times between 1741 and 1756 (Bruce Walker, pers comm). Vaults at Dunbar Harbour are thought to have formed the basement of a storeyed superstructure above in the late 18th century (Dutton 2003).

It appears from the present investigations that the Exchange Street vaults never had direct, floor-level access, but always relied on trapdoor access from above, for example as seen in the roof of Vault 10. However, the trapdoor openings are large enough to accommodate goods being lowered by ramp or hoist, rather like contemporary ships’ cargo hatches, or public house beer cellar doors even today, rather than mere manholes or inspection covers. Eighteenth and early 19th-century commerce would have been much more tolerant of manual handling than modern business practices.

The present flooding of the vaults is almost certainly a later development. The water is stagnant, its level is quite unaffected by the tides, and is probably a local aberration, perhaps created when the shore line was moved further southward, the ground levelled up to the south and west with the formation of Castle Street, and the vaults sealed and abandoned. The present investigations found later drains being inserted to discharge into the vaults, presumably after their abandonment, while the culverting of the Maws Burn, which runs just to the east of the site, would have created another possible source of leakage. Once the vaults ceased to be used and maintained, any leakage or storm water entering would be trapped by the impervious whinstone floor of the vaults, perhaps rising to the south, and by the now redundant shore wall to the south of the site. The water would simply build up until it filled the vaults to overflowing.

Debate also centred around the proposal that Vaults 10 and 11 were separate from the rest. Excavations in Trench 2 and the excavation of Vault 11 did not identify the relationship between Vault 10 and Vault 9. However, it is likely that they represent two different phases of construction, within a single building programme, because the dividing walls of these vaults have to be built in such a way as to allow a pair of barrel vaults to spring from each wall head. This would be very difficult to achieve if Vaults 10 and 11 were built at a later date, as it would mean a major redesign of the southernmost wall of Vault 9. Although it was not possible to physically see if Vaults 10 and 9 communicated, it is quite likely that they do, as a blue dye was added to Vault 4 and when next checked (several weeks later) it was noticed in Vault 11.

Conclusions

The vaults found under the development area at 16–18 and 22 Exchange Street seem to be entirely undocumented in themselves, but from the scant evidence available it is possible to fix their construction between the mid 17th century and early 19th century, most probably in the period 1776–1793, or 1793–1813, when the shore line was extended onto land reclaimed from the Tay.

The vaults are a remarkable and intriguing survival from the early development of the Port of Dundee, and evidence of the beginning of industrial-scale development in the burgh at the point of transition to an industrial city. The scale and quality of their construction demonstrate the ambition and confidence of the burgh’s business community as it prepared itself for the great expansion to come.

The methods employed by the Robertson Group in preserving ten of the eleven vaults in situ and recording and infilling the vault closest to the street frontage was, from an archaeological point of view, a well-balanced accommodation of conservation and development requirements.

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Cartographic (in chronological order)

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Abstract
This paper describes the discovery of some sizeable un-recorded stone vaults close to the site of the former harbour in Dundee. Existing cartographic evidence is reviewed and suggestions made as to their date, form and function.

Keywords
Alexander Riddoch
Exchange Street
stone vaults