

REFURBISHMENT CASE STUDY 33

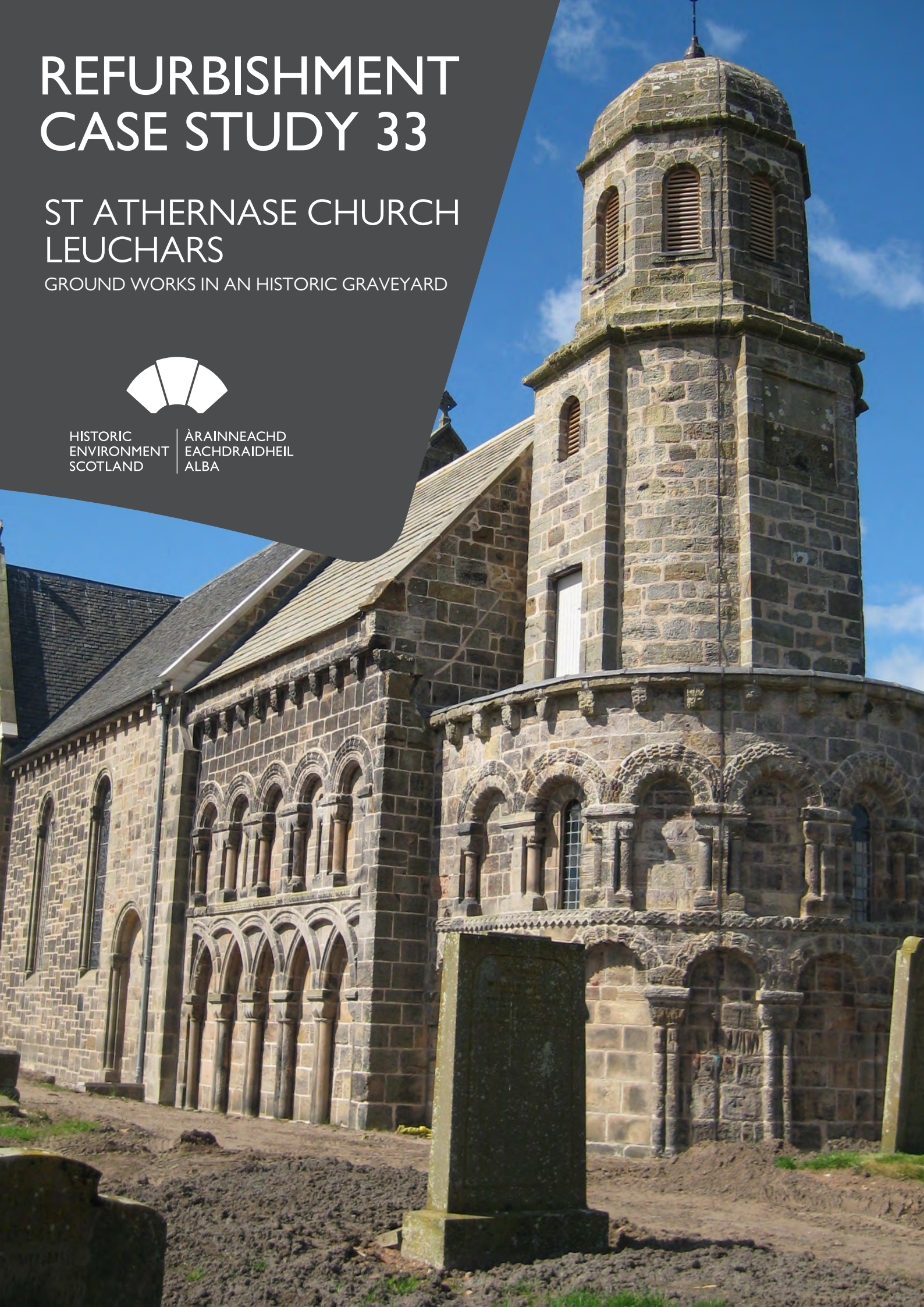
ST ATHERNASE CHURCH LEUCHARS

GROUND WORKS IN AN HISTORIC GRAVEYARD



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HISTORIC ENVIRONMENT SCOTLAND REFURBISHMENT CASE STUDY 33

ST ATHERNASE CHURCH, LEUCHARS

GROUND WORKS IN AN HISTORIC GRAVEYARD

ROGER CURTIS

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1. INTRODUCTION

Scotland has a rich ecclesiastical heritage that is reflected in a wide range of church buildings. Religious sites are managed under various ownership and custody arrangements which can be challenging when repairs and alterations are required. Graveyards are a key part of the ecclesiastical landscape and are recognised for their historic importance as well as their value as sacred burial and memorial sites. Graveyards are also important as community assets, for local history, genealogical studies, and their contribution to the natural heritage and biodiversity, as well as the built environment. They are unique in remaining little altered over centuries, allowing rare species to thrive and historic monuments to remain undisturbed.

Over time the ground levels in graveyards tend to rise, often resulting in dampness at the base of church buildings. This is particularly common when coupled with poor building maintenance or inappropriate alterations. The subject of this study, St Athernase Church in Leuchars, Fife, was identified as having just such damp problems due to external ground levels being much higher than internal floor levels, and poor drainage around the building.

The management of graveyards involves a number of stakeholders and can give rise to complex legal and emotional implications. Delivering works on sites where there are graveyards and human remains present can be challenging. The condition of grave markers and other physical remains above ground must be taken into account. This Refurbishment Case Study describes the discussions required with stakeholders when conducting works to a graveyard, as well as the physical works needed to address damp problems. It aims to assist others who are considering works to address damp and related problems in historic churches, and gives an outline of the procedures to be followed and the consents required.

2. BACKGROUND AND CONTEXT

2.1 The site

St Athernase Church is of national importance and a Category A Listed building. The surrounding graveyard has a separate Category B Listing. The building has a Norman apse dating from the late 12th century, with extensive additions and alteration to the nave area dating from the mid-19th century, and a bell tower dated 1746. The site is on a former pilgrimage route to the Priory Church of St Andrews and would have attracted a large number of visitors before the Reformation. The church sits on a grassed knoll to the east of the village of Leuchars and has been a part of the settlement since its inception (Figure 1).



Figure 1. The location of the church (in red) at the east end of the historic settlement of Leuchars, shown here in an image from the Ordnance Survey of 1862 (courtesy of the National Library of Scotland).

The site is bounded on all sides by a retaining wall and the graveyard contains a large number of different types of memorials, mainly dating from the 19th century. The graveyard is no longer used for burials, although it is frequently visited. A physical survey was undertaken during the initial stages of the project to digitally record the location of the gravestones and tombs, and the church congregation has recorded and catalogued details of the various inscriptions where these still exist and are readable.

Due to concerns about stability, several stones had been made safe by the local authority by lying them flat on the ground (with the inscriptions facing upwards). There was a degree of uncertainty as to whether some of the table tombs had been previously moved and whether their lop-sided condition might be caused by a lack of proper foundations. The problem of identifying ownership of all the graves was also raised, as well as some hesitation regarding the shallow depth at which burials might be found. It was also likely that not all the graves were marked, and that remains had been moved during subsequent burials.

The church has been of antiquarian interest since the mid-18th century. Various images record its evolving and changing form, such as an engraving from 1838 (Figure 2). In the late 19th century the masonry of the

apse was repaired and missing elements were reinstated to replicate the original design (Figure 3). Figure 4 shows the church as it looks today.



Figure 2. The church in 1838. Image courtesy of Canmore.



Figure 3. The church in the early 20th century. Image courtesy of Canmore.



Figure 4. St Athernase as it looks today.

2.2 Increased rainfall and a changing climate

A changing climate means that there is now more heavy and sustained rainfall. According to the Scotland and Northern Ireland Forum for Environmental Research (SNIFFER), there has been a significant increase in rainfall across Scotland since 1961.¹ In many cases there is now more rain than traditional buildings can handle without improvements to their fabric and detailing. This is especially the case where ground levels around buildings have risen, and where attention to belowground drainage has been poor. Sustained rainfall is causing so much damage to the fabric of

¹ Scotland and Northern Ireland Forum for Environmental Research, *A Handbook of Climate Trends Across Scotland: Presenting changes in the climate across Scotland over the last century*, 2006
<https://www.sniffer.org.uk/Handlers/Download.ashx?IDMF=f6dde75e-810e-4a73-900b-4ae51bf0e084>

historic buildings that inaction is often no longer an option, and work will be required to improve drainage and water dispersal. In the case of St Athernase, this increase in rainwater meant higher levels of dampness, and occasionally water coming directly inside parts of the church.

2.3 The regeneration project

The church remains in use with an active congregation, but in addition to the damp issues, there were concerns over the roof, stained glass windows, external masonry, heating arrangements and facilities for visitors. The congregation also wanted to be forward-thinking and develop plans to adapt the internal space to suit more flexible worship and new facilities for visitors. As a result, the Leuchars St. Athernase Regeneration Project was set up by the Kirk Session; an appointed group of parishioners who help oversee the running of the church. This initiative was intended to be a long term approach to the refurbishment of the church. The project's remit included investigating funding options, and appointing consultants and architects. Following a tender process, an architectural practice based nearby in Broughty Ferry, Nichol Russell Studios, was appointed to lead the project. In partnership with the stakeholders, the designers progressed a high level plan for the church which addressed some of the wider issues mentioned above, as well as the damp problems that are the focus of this case study.

3. ADDRESSING THE DAMP PROBLEMS

3.1 The problems

Possibly as a consequence of the high levels outside, the original timber floor in the nave had been removed in the past and a new timber floor laid over a base of concrete and compacted ash. Timber panelling had been installed below the dado rail in the nave, probably during the inter-war period. The panelling had decayed at the base of the walls and had been removed by the church in 2015 before the project started (Figure 5). This revealed the dampness of the masonry at the base of the walls. In some instances the walls were wet to the touch after rain. The water ingress was also creating extensive pattern staining to the flagstones in the historic apse (Figure 6).



Figure 5. The north side of the nave, showing the areas of stonework exposed by removal of the decayed panelling.



Figure 6. Damp and staining on the floor of the apse.

The dampness in the walls caused damage to the historic fabric, but it also created a cold internal environment such that the boiler and heating system struggled to keep the building warm. Initially, the church had commissioned investigation works in 2015 by a local timber preservation and damp proofing company to seek advice and indicative costs. Their proposed plan of action suggested the use of waterproof tanking with a plastic membrane. This approach, however, merely managed the symptoms of water ingress and did not address the source of the moisture. It would also have inhibited the building's ability to disperse moisture, contrary to good conservation practice. Therefore it was not considered an appropriate approach for solving the damp issues in an historic church.

3.2 Investigation work

It was clear from the outset that there were issues resulting from the external ground levels. Works in the past had tried to address these in some places, including a lowered area created around the choir and the apse. However, the earth remained at high levels on the north and south side of the nave. It appeared that water from the nave roof was routed into this area (Figure 7) corresponding to the areas of damp visible internally in the apse.



Figure 7. The outlet point (the base of the downpipe) for water from the nave roof was effectively directing water into the lowered area around the choir and the apse.

The rainwater goods handling the water from the nave roof were in a poor state and the routes and depth of the belowground drainage adjacent to the church were largely unknown. Additionally, there were no inspection points or rodding eyes to allow cleaning. There were no rhones on the chancel or the apse. The congregation had tried to put in place interim arrangements to mitigate the water damage and the damp. While these efforts were commendable and showed initiative, they were not long term solutions.

During the surveying work, trial pits to the north and south of the nave were made to check the levels of the foundations (Figure 8). These excavations produced several bone fragments (Figure 9). After taking advice from the minister, the bones were returned to the ground once survey works were complete. A further hole was dug at the southeast corner of the nave where the downpipe enters the ground at the junction with the chancel. The excavations confirmed that ground levels had risen considerably. In addition to drainage deficiencies, the wet earth in contact with the wall was causing damp to penetrate the building at low level.



Figure 8. One of the investigation pits dug on the south wall of the nave.



Figure 9. Bone fragments uncovered during the investigation work.

The investigations around the north side of the nave showed that surface water drainage was equally poor or non-existent, and the routes of the buried pipes in the graveyard could not be identified. Evidence of previous attempts to divert water away from the nave was also uncovered. Excavation work revealed poor drainage design and very basic attempts at

clearing blockages during previous refurbishment works (Figures 10 and 11).



Figure 10. Long turns with no rodding facility resulted in blockages.



Figure 11. Fireclay drain adjacent to the nave wall, showing previous efforts to clear blockages.

3.3 Analysis

The differences in levels and the resulting damp problems were not a surprise. When the church was built, the interior floor level would have been the same or higher than the external ground level, but over time the outside earth level has risen. Figure 12 shows the base course of the nave wall which was uncovered during the investigations, some 300mm below the modern ground level. The ground level to the west of the nave in the slightly raised vestibule was more or less at the same level as the internal floor and was less of an issue. This gradual raising of external ground levels is common with many older structures, but particularly in churches with graveyards where there has been a history of burials over hundreds of years.



Figure 12. The base of the nave wall, now some 300mm below the present ground level.

4. DESIGNING A REPAIR SCHEME

4.1 Key design actions

It was likely that the problems identified in the survey had been recognised in the past. However, here, and in other historic burial grounds, there is often a degree of apprehension about digging in graveyards, and the potential disturbance to buried remains and archaeological features. This can result in damp problems never being properly addressed, instead a series of small interventions are carried out that address the symptoms of the dampness rather than the causes. While these concerns are understandable, they should not prevent necessary works being carried out. As long as the correct planning procedures are followed and approvals obtained, works should be able to take place.

The project team and the client agreed that the ground levels needed to be reduced on most elevations and that the belowground drainage arrangements should be redesigned. This would return the outside ground levels close to their original level and allow the masonry to dry out. Better belowground drainage would also reduce the amount of water in the soil, and keep the walls dry. Procedures for these works had to be agreed, with the following points considered:

- The design and planning issues, including the calculation of the volumes of soil to be moved.
- The removal of bones from the soil and a strategy for their collection, storage and final resting place.
- The removal of other materials from the excavations which had been deposited during previous projects (including ash, concrete and lime deposits).
- The dispersal of the accumulated soil and how the it was to be retained.
- The careful movement and/or protection of affected memorials.
- The finish to the exposed masonry which had previously been below ground level.
- The finish to the lowered ground around the church.

The church authorities were not in favour of any of the excavated soil and bones being removed from the churchyard, though Fife Council suggested the use of the nearby Leuchars Cemetery. However, there were concerns over whether the volume of excavated soil could realistically be accommodated within the footprint of St. Athernase graveyard. Various ways of dealing with the soil were considered, including backfilling a redundant basement. However, it was eventually decided, with the agreement of Fife Council Bereavement Services, that once any bones were removed, the soil could be redistributed across the graveyard. This

involved narrowing the paths, which had been widened by aggressive grass cutting maintenance measures over several years.

4.2 Including the works in the wider scheme

A wider programme of works relating to other areas of the church was also prepared and programmed for delivery in 2017 as part of the regeneration scheme. The ground level works were phased to fit in with roof and masonry works as far as was reasonably practical. This meant that the groundworks could only start once the scaffolding was removed from around the church. This placed some restrictions on timing and the speed at which work could progress. Due to some issues with the external fabric works, the start of the groundworks was delayed. This resulted in much of it being done in the winter, which was not ideal. In the winter of 2017-18 there were periods of hard frost and heavy snowfall, especially from January onwards, which affected the progress of the project.

4.3 The handling of human remains

Although there was an agreement in principle with the client over moving any remains found, formal consent was required. This involved researching and being aware of the legal and moral considerations.

In Scotland an order from the local Sheriff Court is required to permit excavation in any place of burial. Based on the findings of the preliminary excavations, it was considered likely the excavations would only uncover disarticulated remains from previous earth movement and the turnover of soil for burials. Whole burials close to the church walls were considered unlikely. However, the submission to the Sheriff Court still had to describe the procedures in place to handle these remains appropriately. Those involved in developing these procedures were the architect, with contributions from the contractor, the church's project team, including the minister, the legal services department of the Church of Scotland, Fife Council Bereavement Services and Fife Council Property Services. Formal permissions and consents were required as follows:

Authority to dig in a graveyard: This was part of the Sheriff's Decree, granted by the Sherriff Court, to allow excavation in a burial area and to give anyone (not necessarily anyone connected with the graveyard or persons buried in the area) the opportunity to lodge an objection. The legal services department of the Church of Scotland applied and the notification was published in two local newspapers. All legal and advertisement costs had to be met by St Athernase Church. There were no objections.

The Church of Scotland: The burial area around the church is not under the jurisdiction of the Church of Scotland. However, they mandated respect and appropriate care for the remains. After discussions between St Athernase's project team and the Church of Scotland's legal adviser, it was decided that the contractor would need to have a suitable and approved methodology for handling any human remains. All legal costs had to be met by St Athernase.

Fife Council Bereavement Services: Since the 1920's local authorities in Scotland have had jurisdiction over the management, maintenance and operation of church graveyards. While the graveyard at St. Athernase has not been used for burials for many years, Fife Council Bereavement Services still manage the grounds. A discussion was required with the council regarding the works and how materials were going to be handled, the soil dispersed, and the process and likely timescales involved. Site meetings took place over several months during the planning and construction phases with Fife Council Bereavement Services. This culminated in final discussions regarding the re-landscaping of the graveyard, its paths and circulation routes. The scale of the task, the planting season, and restrictions on Council funding and resources had to be factored into the project planning. This generally took longer than the congregation had envisaged.

Authority to access and occupy the graveyard: It was necessary to acquire a servitude (right of access), granting the contractor temporary occupancy and custody of the graveyard for the purposes of the works. This process (and formal agreement with Fife Council Property Services) suspended the graveyard maintenance activities of the Council for the period of the works but permitted full access to the contractor. Consent also covered the use of excavation tools and other equipment.

Listed Building Consent: It was also necessary to apply for Listed Building Consent. The graveyard is Category B Listed and the works would have an impact on the character and appearance of the site. The lowering of ground levels and the drainage works were discussed with the planning department of Fife Council and Historic Environment Scotland. After consideration for the justification of the work, consent was granted with the condition that there was an archaeological supervision during the excavations. This watching brief was provided by an archaeologist appointed by Fife Council. The work was not deemed to be harmful to the historic character of the site.

After the stakeholders were consulted, the necessary paperwork approved and the required permissions obtained, it was essential to inform the principal contractor of the agreed protocols. These were written into the tender documents and formed part of the construction contract.

5. DELIVERING THE PLAN

5.1 Procurement and establishing the site

After a standard tender process, Laing Traditional Masonry was appointed as principal contractor. The church was closed for the duration of the refurbishment project as the building was surrounded by scaffolding and access was hazardous. The congregation used other churches and venues within the presbytery for worship. Using the wayleave granted by Fife Council, the contractor was able to occupy and use specified areas of the site. The site compound was set up in a parking area by the west entrance to the graveyard, clear of any planned works. Site facilities were provided by the client in a temporarily vacated building on site. Protection of grave markers and headstones was necessary, and this was done by securing timber enclosures over exposed memorials for the duration of the contract (Figure 13).



Figure 13. Timber enclosures in place to protect memorials from damage.

5.2 Moving memorials

Several stone memorials had to be re-sited before works could start. One headstone that was close to the excavations and porch had to be moved to avoid the new embankment that was created as a result of the groundworks. The sarcophagus tomb on the north side of the church, placed close to the nave wall (Figure 14) also needed to be moved as it

was preventing the lowering of the ground levels. The tomb's inscription is dated 1726, but it was apparent from records and photographs that its location close to the nave was not its original one. Therefore, it was unlikely that there would be any human remains within or below it. Its position unusual, and the large profiled stone capping channelled water directly against the abutment with the church walls and prevented the continuation of the banking along the nave to the chancel. It was decided to re-locate the tomb away from the church, close to the edge of the graveyard. The construction of the sarcophagus tomb and its various component parts was recorded as it was being dismantled, before being re-erected using traditional masonry techniques in the new location (Figure 15).



Figure 14. The sarcophagus tomb in its original location.



Figure 15. The sarcophagus tomb in its new location.

Two table tombs to the north of the nave were also moved to accommodate new drainage routes and allow undulations and dips in the surface of the graveyard to be filled with dispersed soil. The tombs were recorded to allow like-for-like reconstruction and relocated to the north edge of the graveyard (Figure 16).



Figure 16. One of the table tombs in its new position.

5.3 Lowering the ground levels

The excavation was originally intended to be carried out by hand. However, the volume of excavated earth and the requirement for it to be moved and laid out in spoil heaps in the graveyard, resulted in the contractor being allowed to use a small mechanical excavator. During the work to the south side of the nave, the footings of an earlier wall were uncovered which was probably the base of the wall of the 12th century nave. This restricted the depth to which the trench alongside the external face of the church walls could be excavated and where field drains could be located (Figure 17).



Figure 17. The newly dug trench along the south wall of the nave, where the base of an earlier wall can be seen. This restricted the depth of the excavation.

5.4 Moving human remains

An archaeologist appointed by Fife Council oversaw the work involving moving human remains. Once a dialogue and a working relationship had been formed, regular communications, reports and photographs were provided by the architect to fulfil the watching brief.

As expected, the excavations revealed extensive human remains. The remains were carefully collected by the contractor, as per the method statement, and then washed and dried in the church. The church's project team, including the minister, decided that the remains should be placed into a wooden coffin provided by a local undertaker (Figure 18). This coffin was stored in the apse before being removed to the undertaker's facility for custody once excavations were complete.



Figure 18. Bones recovered during the excavations were washed and placed in a coffin in the apse pending re-burial.

Options were then debated for how the remains should be laid to rest, either through cremation or reburial. Factors such as the practicality and location of a crematorium, the appropriateness of cremation for those of certain faiths, costs, and the availability of a piece of ground for burial within the graveyard were all considered. Eventually, after discussions with Fife Council Bereavement Services, it was decided to inter the coffin in a new burial plot within the graveyard. Once the works to the church had finished and the landscaping and re-seeding of the graveyard was underway, a committal service was administered by the minister and attended by members of the congregation. A temporary grave marker indicates the location of the coffin and the church intends to provide a permanent headstone, or plaque, in commemoration in due course.

Even with these comprehensive preparations, mistakes were made. During the works a member of the public, who had entered the graveyard without consent, identified some bone fragments in the excavated soil. This resulted in an article in the local paper and on social media. While the fragments were small they should not have been left in the spoil, and it illustrated the sensitive nature of this kind of work.

5.5 New roof drainage

The work plan also included installing new, functional drainage arrangements to take away rainwater and ground water. The drainage system had to be redesigned, working from the roof, via the downpipes, to the final point of exit into the ground. Some lead detailing was changed at roof level, particularly at the foot of the valley gutters, to deal with increased volumes of rainfall and water velocity caused by a changing

climate. Rainwater goods were upgraded to a larger diameter, from 65mm to 75mm, and a rainwater downpipe was added on the north elevation. The new downpipes were also fitted with a rodding eye at low level to allow easy cleaning from the ground. An angled 'shoe' was fitted at the end of the downpipes to ensure the water passed into the belowground drainage via a horizontal grilled opening or 'gully trap' (Figure 19).



Figure 19. The new angled shoe directs water into the gully trap.

5.6 New belowground drainage

Initially, it was hoped that the new drainage routes from the roof could connect to existing drainage outside the graveyard. However, this was not possible due to the location of existing services and difficulties in obtaining the necessary change in level, for drainage. After approval by Fife Council Bereavement Services and a technical assessment by the architects and the structural engineers, it was agreed that the rainwater drainage from the north, east and south of the church should be routed to three new soakaways north and south of the nave (Figure 20). This was disruptive for the graveyard, but it was the simplest option. The drains from the downpipes on the west end of the nave were able to be connected to an existing drain that joins into the town drainage system. Fife Council's roads and transport department were content with the use of this connection as it had existed previously.

Field drains made from buried perforated pipes were laid in pea gravel around the base of the walls around the apse and chancel as there were no downpipes and water had ponded. These pipes drained to two new soakaways to the southeast and northeast of the apse (Figure 20). This

meant that a second sequence of excavation in the graveyard was needed, following the procedures established during the ground lowering works.

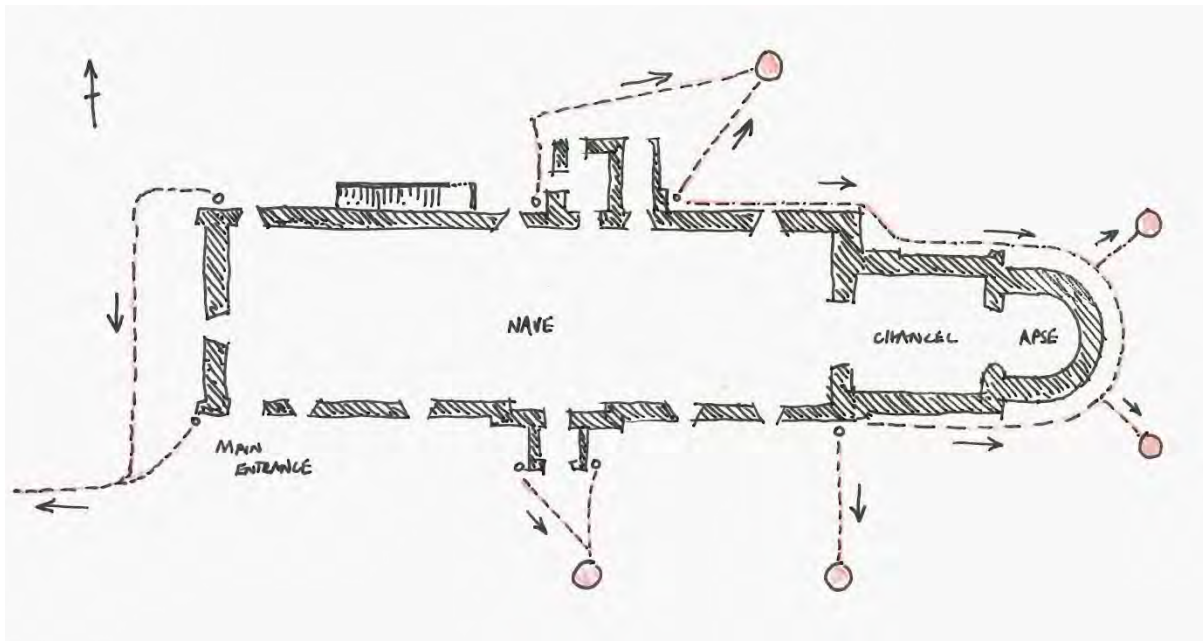


Figure 20. The new drainage layout for the church. The new soakaways to the north, east and south are marked as red circles.

Drainage specification: The new drainage around the church comprises 100mm diameter PVCu pipes laid to fall in a granular pea bed. They have rodding eyes at ground level at every change of direction to facilitate future access and cleaning (Figure 21). The new drainage was photographed throughout the installation (Figure 22) and the locations recorded on a site plan.



Figure 21. New drain route, note the rodding eye on the left for cleaning.



Figure 22. The new drain route from the southwest corner of the nave.

These deep tracks in the graveyard were costly and work progressed slowly due to the risk of damaging buried services (Figure 23). In some places the depth being dug was deeper than 1.4m so the trenches had to be shuttered. Signage and protection was set up for public safety. Human remains were encountered during this stage of the works, typically at a depth of 2m. These were handled following the protocols outlined in Section 5.4 above. The surplus earth following backfilling was checked for human remains then dispersed around the churchyard in accordance with the protocols agreed for the work around the nave.

Soakaway design: The results of soil porosity tests determined that each of the five soakaways should be in the region of 1.5m square and 2.5m deep and be located at least 5m away from the church. The soakaway pits were lined with a permeable geotextile material and filled with gravel to the engineer's specifications (Figure 24).

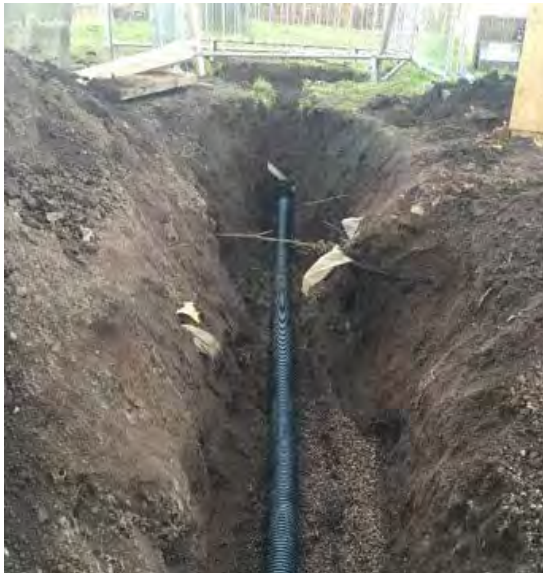


Figure 23. The new drain track from the apse to the soakaway.



Figure 24. The soakaway pit lined and filled with gravel.

5.7 New landscaping and finishing

It was agreed that the finishing works to the new ground levels were to be kept as simple as possible. They were kept free of modern landscaping and plastic materials, which might have durability and resilience issues. Modern landscaping materials or finishes were also not considered suitable for such a historic location. Once the field drainage and support material had been installed, the earth banks were taken back to approximately 500-700mm away from the external faces of the church walls. An edging kerb was formed parallel to the wall of the nave with a course of squared rubble recovered from the site. This was supplemented with additional reclaimed

stone from local sources, and bedded on the scraped formation without foundation (Figure 25). The joints and larger voids were filled with packed earth and small stones, and a curved line was formed around the apse (Figure 26). The gradient of the slope down to the edging was made as shallow as space would permit (approximately 35°) to allow Fife Council to cut the grass.



Figure 25. Reused stone edging by the nave.



Figure 26. Stone edging around the apse.

A 150mm layer of gravel at 20mm diameter was laid on perforated mesh between the church walls and the stone kerb to prevent plant growth. This created a continuous detail that was consistent in appearance along the length of the nave and the apse (Figures 27 and 28).



Figure 27. The finished gravel and edging on the north side of the church.

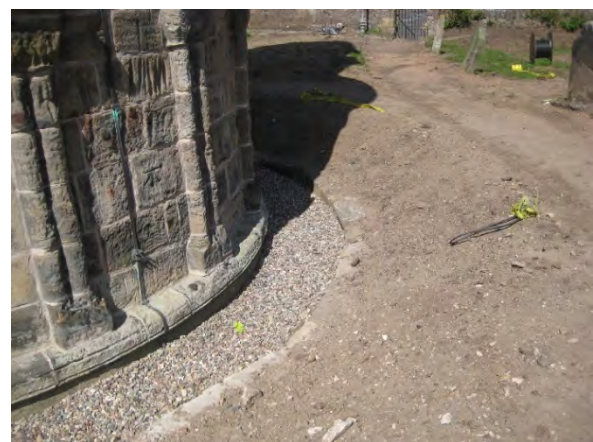


Figure 28. The finished gravel and edging around the apse.

On the north side of the nave the lowered the ground levels exposed a rubble layer (Figure 29). The surface of this exposed stone was cleaned and re-pointed with a quicklime based mortar. This facilitated moisture movement, which also allows the walls to dry out quickly (Figure 30).



Figure 29. Newly exposed rubble on the north side of the nave.



Figure 30. The masonry re-pointed using a quicklime based mortar.

6. INTERNAL WORK

While the project focused on external works to address sources of water ingress, the damaged internal linings that had been removed as part of the earlier investigation works were also reinstated. A 1.5m high dado rail was reinstated along the inside faces to the north, west and south sides of the nave. Due to budget and programme constraints, re-instatement of the vertical timber lining was not possible. However, by agreement with the Committee on Church Art and Architecture (CARTA), the wall finishes above the level of the dado were replaced using traditional lath and plaster. As an interim measure and in anticipation of further regeneration works, the uncovered areas were lined with insulated moisture resistant plasterboard attached to timber framing with a ventilated air gap. This was set to give a finished surface, in line with the plane of the wall above, that would be resistant to the damp remaining in the walls. On completion, the interior of the nave was repainted.

7. EVALUATION OF THE COMPLETED WORKS

The ground works were carried out over the winter of 2017 and 2018. Poor weather made progress slower than planned, with the total time on the excavations and landscaping taking four months. There were inevitable adjustments to the initial plan, but in principle the works were delivered as envisaged. The reduction in ground levels and the new drainage arrangements created an immediate improvement in the internal conditions of the church. Although no new heating was installed, the

reinstated wall finishes at the level of the pews, and repairs to the stained and leaded glass windows, has undoubtedly improved the environment and the feedback from the members of the congregation has been positive. The walls of the nave are expected to progressively dry out over the next few months, although it will be 12 months or more before it fully dries out.

The walls to the apse and chancel may take longer to dry out, but the situation is considerably improved from the previously poorly drained area. However, as there are no rainwater goods to protect the external stone facades, some splashback will be inevitable. Phase 2 of the Leuchars St. Athernase Regeneration Project will consider the interior architecture of the church and new facilities for the congregation.

8. CONCLUSION

Raised ground levels and saturation of the ground adjacent to historic churches inevitably results in degraded internal conditions, and deterioration of historic masonry, internal linings and finishes through water ingress and rising damp. A changing climate and history of poor, or inadequate maintenance, increases the potential for damage. Sometimes significant interventions are required to identify the problems, deal with the causes and improve internal conditions.

The work at St Athernase Church has shown that penetrating damp and water ingress in a church can be addressed with a simple approach based on a thorough understanding of the problems and their causes. In order to implement the works, careful understanding of the sensitivities and context of the historic graveyard was required, and the correct administrative procedures adopted to make the necessary changes. While such considerations are complex and potentially time consuming, a properly resourced team with a clear plan and delivery framework can make them feasible.

REFURBISHMENT CASE STUDIES

This series details practical applications concerning the conservation, repair and upgrade of traditional structures. The Refurbishment Case Studies seek to show good practice in building conservation and the results of some of this work are part of the evidence base that informs our technical guidance.

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THE ENGINE SHED

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