

DRAINAGE ISSUES

Existing Conditions

As explained in a previous section, the cemetery complex is found on Tomotley-Urban land complex soils with very minor slopes, very poor drainage, and a seasonal high water table within a foot of the ground surface. We also know that even when Mount Olive was first purchased, three of the boundaries were either wholly or partially ditches. All of the boundary trees were also poplars – typical wet soil vegetation.

Historic maps (Figure 21) also reveal a drainage that flowed from the cemetery area northward to Scott Creek and from there into the Elizabeth River. In 1902 the drainage stopped north of the cemeteries, although topographic lines reveal the cemetery area to be part of the creek's drainage area. By 1921 the area around the cemetery complex has been developed and artificial drainage ditches appear to have been put in to help provide drainage.

Between 1961 and 1967 I-264 was built running east-west across this drainage. Far more impervious surfaces, such as roads, driveways, and parking lots, were constructed and these have added to the run-off.

The cemetery itself has had additional vegetation grow up, increasing the amount of moisture held by the soils. Given the absence of maintenance, it is unlikely that any drainage ditch maintenance has been conducted on the property in over 50 years. Only recently has the vegetation that clogged many of the ditches been removed by volunteers.

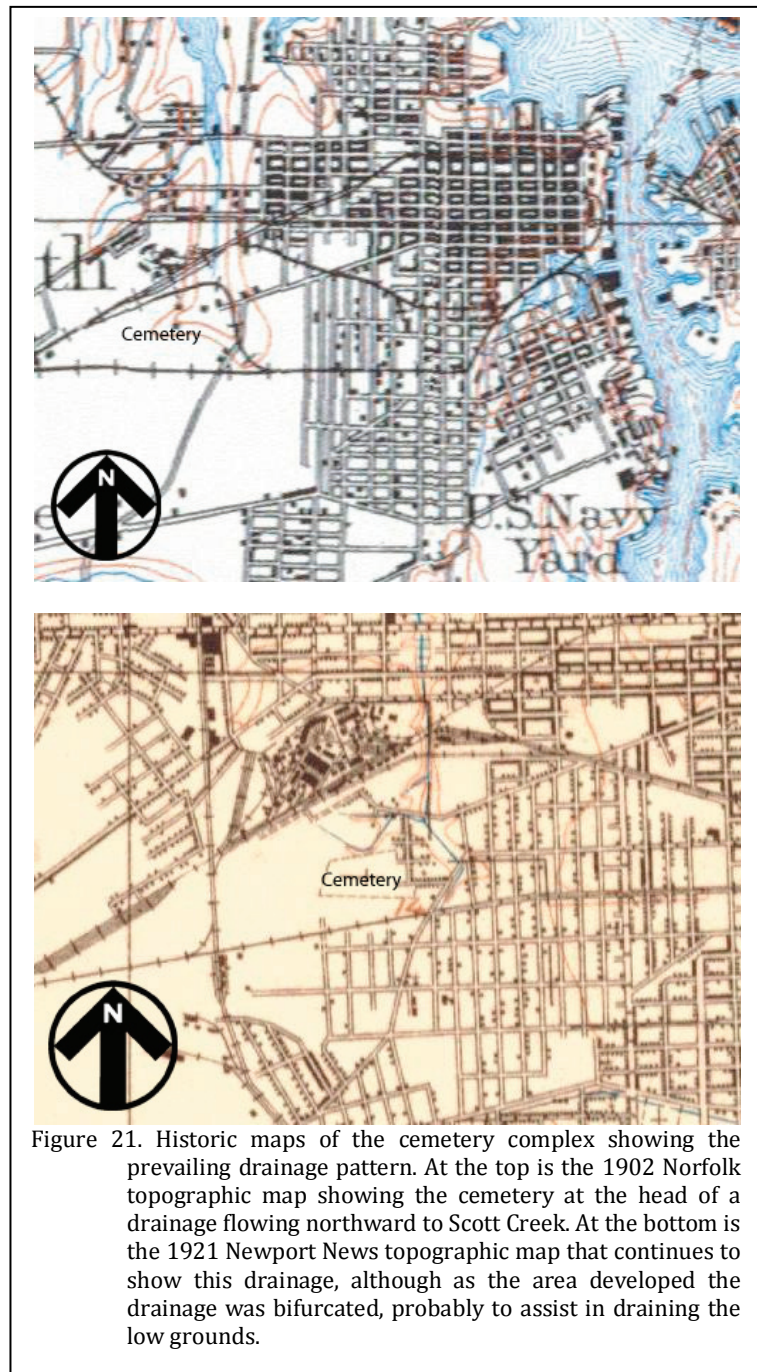


Figure 21. Historic maps of the cemetery complex showing the prevailing drainage pattern. At the top is the 1902 Norfolk topographic map showing the cemetery at the head of a drainage flowing northward to Scott Creek. At the bottom is the 1921 Newport News topographic map that continues to show this drainage, although as the area developed the drainage was bifurcated, probably to assist in draining the low grounds.

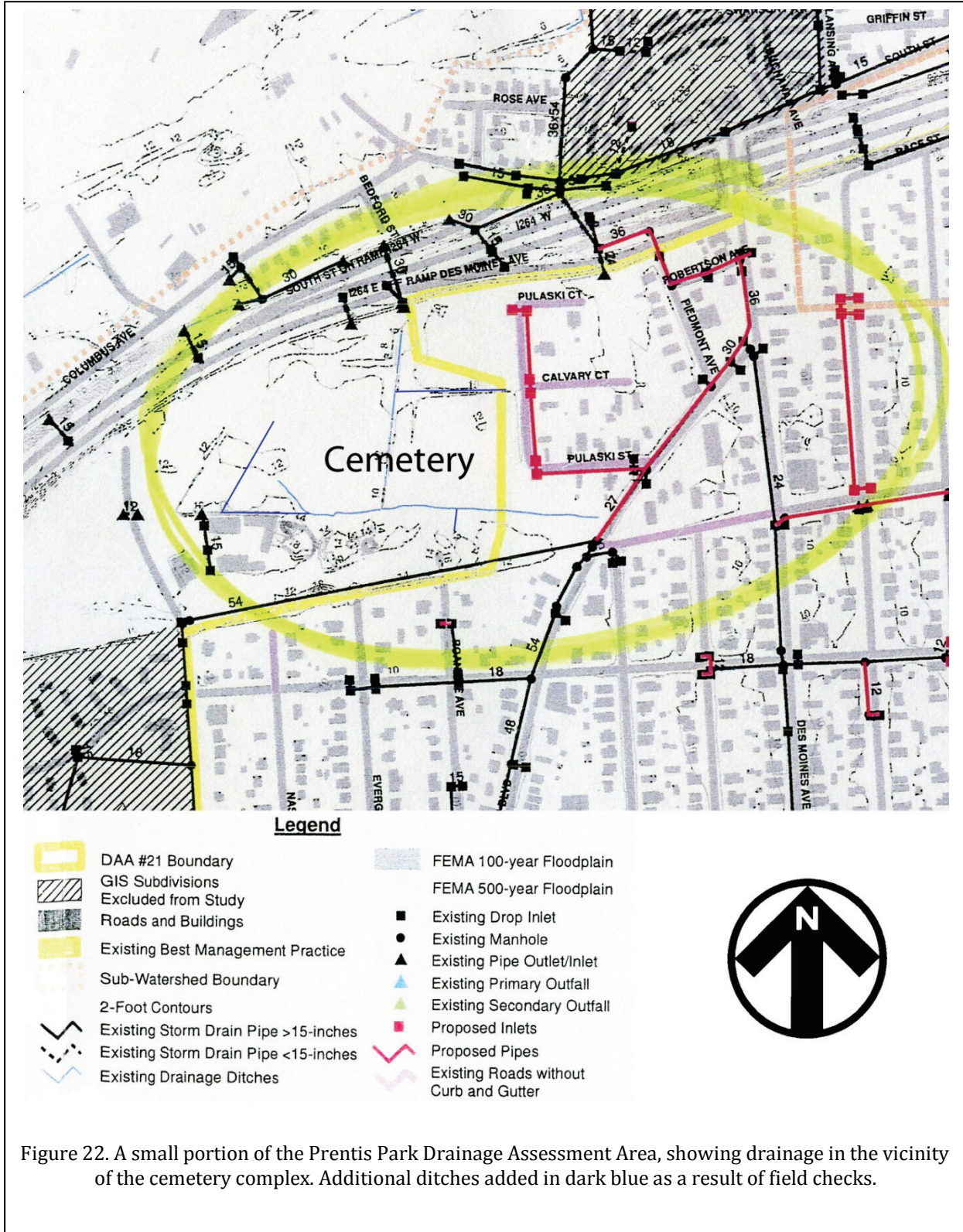


Figure 22. A small portion of the Prentis Park Drainage Assessment Area, showing drainage in the vicinity of the cemetery complex. Additional ditches added in dark blue as a result of field checks.

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Figure 23. Water drainage in the cemetery after several days without rain. Upper left, north-south ditch near the west end of Mount Olive looking north. Upper right, north-south ditch between Mount Calvary and Mount Olive looking north. Lower left, north-south drain between Mount Calvary and Mount Olive looking south. Lower right, ditch and ponded area at the northwest corner of Mount Olive, looking southwest.



Figure 24. Examples of vaults, sunken graves, and other features filled with standing water on a regular basis.

DRAINAGE ISSUES



Figure 25. Drainage problems in the cemetery complex during heavy rainfall events. Photos courtesy Christina Carlton.

A city-wide drainage assessment conducted in 2007 by HDR reveals the extent of the problem throughout the city. The report notes that “many of the residential neighborhoods lack an appropriate drainage infrastructure” or they have inadequate capacity (HDR 2007:1). Other areas are subject to tidal inundation. The study notes that the most common neighborhood drainage system is the open ditch – found in backyards and/or along roads. Older neighborhoods – such as Prentis Park – have more problems than newer sections of the city.

The study found that the typical drainage ditches are not only aesthetically undesirable, but consist of small diameter pipes that easily clog. In conjunction with the low, flat terrain, there is “ponding of water which only slowly drains after the rainfall event has passed” (HDR 2007:2).

Figure 22 is a small section of the HDR Prentis Park Drainage Assessment Area, showing the vicinity of the cemetery complex. It reveals that the cemetery is drained by one 36-inch pipe crossing under I-264, although it is not clear from this plan where that pipe drains north of the interstate. We understand that once water makes it to this interstate drainage, it flows under the highway, along the ramp from South Street to box culverts across South Street (Bill Collier, VDOT Hampton Roads District, Interstate Maintenance Manager, personal communication 2010). Mr. Collier also noted that the water coming from the cemeteries would essentially “compete” with water from a variety of other sources during a storm. Nevertheless, the ditch flowing from the cemetery is 24-inches, while that under the interstate is 36-inches.

The cemetery itself is shown as being drained by one ditch along its southern edge and by a north flowing ditch situated between Mount Calvary and Mount Olive. Our survey added an additional ditch along the western edge of the cemetery complex, as well as a ditch between Mount Calvary and Fisher's. At least one ditch flows into that along the southern edge of the property.

Of these ditches, all are open, although there are culverts (about 18-inch pipes) laid

under the road at crossings. The ditches are about 3 feet in depth and have a rounded-V to elliptical cross section. All are vegetated and some appear to be clogged with vegetation, including trees, or other debris. We did not take elevations of the extant ditches to determine their existing grades. During this assessment, however, only one ditch – that flowing northward between Mount Calvary and Mount Olive – exhibited a free flow. That flow was not measured but appeared to be very slow. Other ditches, however, were stagnant with no appreciable movement.

We did not inspect the condition of the drainage under I-264 or the maintenance practices on the VDOT right of way.

Figure 23 illustrates the condition of ditches and cemetery area at the time of our assessment, several days after the most recent rain. Ditches remained full and there were multiple areas in the cemetery where there was standing water. In addition, many of the vaults behave as reservoirs and thus were filled with water (Figure 24). Figure 25 illustrates the condition of the cemetery during a significant rain event, revealing even more significant ponding of water.

All of this data indicates that drainage in the cemetery is poor and remains one of the most significant factors affecting long-term preservation.

The poor drainage obviously affects the ability to perform landscape maintenance. The wet ground bogs mowers and vehicles. It affects the ability of visitors to navigate safely through the cemetery. The wet ground undermines monuments, causing foundations to fail. The standing water promotes the breeding of numerous mosquito species, many of which are disease vectors. The high water table promotes rutting and damage to the roadways in the cemetery. In addition, vaults filled with water – even if not breeding disease – present aesthetic issues that detract from the beauty and serenity of the cemetery, discourage visitation, and dismay to relatives of the deceased.

The Virginia Department of Health, Vector-borne Disease Control, notes that, “standing water and organic matter, such as decaying leaves, provide ideal habitat for mosquitoes to breed” (<http://www.vdh.state.va.us/epidemiology/DEE/Vectorborne/mosquitofaq.htm>). This is the precise situation identified throughout Mount Calvary, Mount Olive, and Fisher’s. Specific diseases spread by mosquitoes and known to exist in eastern Virginia include West Nile virus (WNV), eastern equine encephalitis (EEE) and St. Louis encephalitis (SLE). Although not naturally occurring in Virginia, malaria is another mosquito-borne disease that is sometimes reported in the state.

As a result, the flooding and poor drainage in the cemetery complex is not simply an aesthetic issue or inconvenience, it poses a significant liability to the citizens of Portsmouth, those who work in the cemetery, and those who visit the property. It is critical that the owner(s) of these properties work to improve drainage.

Curiously, this is an issue recognized by the City of Portsmouth for other properties. The city’s website notes:

Ditch maintenance consists of cutting vegetation and removing debris/sediment that impedes the natural flow of water. If weather permits, ditch crews will cut public ditches 3 times per year to maintain the flow line. Residents are responsible for maintaining the banks of ditches that are adjacent to or run through their property.

Crews also inspect and repair the banks of public ditches to prevent blockages and subsequent ditch failure. (http://www.portsmouthva.gov/publicworks/stormwater_operations.aspx).

For reasons that are not clear, the city does not appear to have ever required cemetery property

owners – including the city itself – to maintain the ditches on this property.

In spite of this, the city website indicates that 2 of the 8 locations where active breeding sites were found within a mile of the downtown (25%) were situated in the cemetery complex (<http://www.portsmouthva.gov/publicworks/thebuzz/2009/thebuzz05-01-09.aspx>).

Analysis

In November 2006 the city’s Department of Parks, Recreation and Leisure Services prepared a 10 year master plan. In this plan, the first item for the Mount Calvary, Mount Olive, Fisher’s, and Potter’s Field cemeteries was:

Serious drainage issues are persistent at this cemetery. It appears that drainage from the surrounding neighborhood also collects in the cemetery. Extensive work needs to be done at this location. A complete drainage plan should be done for this area. The amount of work to be done is far beyond what the Perpetual Care Fund will ever be able to address. It is recommended that the City Engineering Department assist in creating a drainage plan for this location and add this to the future Capital Improvement Program (Anonymous 2007:16).

In spite of this assessment, no such drainage study was ever conducted and there is no evidence that the Department of Parks, Recreation and Leisure Services ever requested that the City Engineer undertake a study. When questioned about this recommendation we were told that it is unlikely such a study will ever be done because of the cost (Meg Pittman, personal communication 2010).

This creates a confusing – and troubling – scenario wherein the city owns the properties, recognizes the problem, admits the seriousness of the problem, but is expressing no willingness to take steps to rectify the problem. This is in spite of

the city's own website in which the hazards of mosquitoes are recognized, and the city assumes the responsibility for maintaining public ditches.

This may leave the citizens of Portsmouth with no viable alternative except to bring suit against the city to force the drainage situation at these cemeteries to studies - and most importantly rectified.

While the city has neglected its responsibility with regard to these drainage problems, we can venture to identify at least some issues.

In general, when water backs up during a storm, there is likely a capacity issue. In other words, the existing ditch network cannot move water off the property as quickly as it is being generated by the storm or is flowing onto the site from elsewhere. VDOT notes that there is less than a foot of elevation difference between the cemetery pipe at the interstate and the box culvert at South Street (Bill Collier, VDOT Hampton Roads District, Interstate Maintenance Manager, personal communication 2010). With such a very limited grade (not to mention the low topography of Portsmouth), water will drain slowly.

However, if this water stays on the cemetery after the storm and only slowly is absorbed into the soil, this scenario suggests design issues at the cemetery itself. In other words, there are inadequate ditches or other drains to move the water off.

One design solution would be to increase drains, including even the installation of subsurface tile drains. Using such techniques it is possible to make even low soils suitable for agriculture by lowering the inherent water table.

Such an approach, while suitable during the design of the cemetery, is impossible once a cemetery has been created. Adding drainage would require extensive archaeological investigations and likely the exhumation and reburial of at least some remains.

While existing drains may be widened or deepened, it is unlikely that new drains are a viable solution to the design problems that may

eventually be documented at the cemetery complex.

Another option - albeit long-term - is for the Prentis Park Drainage improvements to ensure that water from adjacent properties is diverted away from the cemetery and handled *prior* to arriving on the cemetery tract. This should have been a critical feature of the HDR plan, but it seems to have been ignored.

In the short-term, the only viable option may be improved ditch maintenance.

Most fundamentally, open ditches are open designed to be vee-shaped or trapezoidal in cross-section. Intended to ensure free flow of water, they are usually designed to have a grade of not less than 1% (i.e., a fall of not less than 1 in 100).

Virtually all authorities agree that open ditches require periodic maintenance. As ditch maintenance declines, there is diminished flow capacity as a result of the accumulation of silt, debris, and other blockages. Further reducing the ability of ditches is increased development. As there are more impervious surfaces, there is more water run-off with more discharge into the ditch network.

In order to maintain flow and avoid obstructions ditches are cleaned and reshaped. Vegetation within the ditch is removed. Ditch length, width, and height are dredged back to their original dimensions. Mowing, which causes less erosion of exposed soil, is often a more viable approach than mechanical cleaning. Nevertheless, it is critical that ditch sides are well shaped, clean, and properly graded - something which cannot be said for the ditches in the cemetery property(http://environment.transportation.org/environmental_issues/construct_maint_prac/compendum/manual/10_11.aspx).

Thus, the city should immediately assume the task of cleaning, reshaping, and improving the grade of ditches within the cemetery complex. The city's public works department must place the cemetery ditches on its routine maintenance list

and ensure that the ditches are cleaned tri-annually.

The city's stormwater management department should focus efforts on larval reduction in the cemetery area using biological controls.

Recommendations

As owner of the cemetery complex the city should fulfill its own 2007 recommendation and immediately conduct a detailed assessment of drainage issues at the cemetery complex. The existing drainage issues promote mosquito development and pose significant hazards to the visiting public. The drainage problems at the cemetery are also disturbing to descendants who see the graves of loved ones consistently flooded.

The city should ensure that the Prentis Park Drainage Improvement Plan takes into consideration the drainage issues already existing in the cemetery. No additional water should be funneled into this catchment area.

The city should immediately begin routine tri-annual cleaning, reshaping, and grade improvement of the existing ditches in the cemetery complex.

The city should immediately begin a larval mosquito control program in the cemetery complex using biological controls.

ROADS AND PEDESTRIAN ISSUES

As is clear from the previous discussions, the cemetery complex is comprised of perhaps four different cemeteries: Mount Olive, Mount Calvary, potter's field, and Fisher's. Nevertheless, today they are generally viewed as one cemetery – and it appears that eventually that the city will acquire ownership of all four. Consequently, this discussion examines the issues of roads and pedestrian access for the tracts as though they are one entity.

Access and Circulation

Maps of the properties reveal that historically Mount Calvary was accessed by one of two roads: either Maple Drive (at the end of Pulaski) or Elm (at the end of what is today Calvary and was previously called Brighton). These east-west roads were connected close to the western boundary of the cemetery by Willow Drive (Figure 14).

These roads remain today, although in various conditions. All three are soil based-roads; Maple has occasional areas of gravel, but is rutted and difficult to traverse in wet weather. Elm is even more poorly graded and far less frequently traveled. Willow can be discerned among the graves, but there is no indication that it has been used as a road in many years.

Mount Olive was apparently accessed by Brighton (Elm Drive), which passed over the ditch separating Mount Olive and Mount Calvary and dead ended in Vinyard [sic] Street, which ran north-south along the eastern edge of Mount Olive. A road, apparently an extension of Maple, continued west to the western end of Mount Olive.

Today, the north-south Vinyard Road is still evident, although not drivable. The extension of Maple is in fair condition and can be driven during good weather.

All of these roads are 8 feet in width with graves in close proximity to both shoulders. None are surfaced and all are badly rutted; their condition is made worse by the poor drainage in the cemetery and failure to maintain the roads for many years. Crossing of ditches appears to be achieved using 18-inch pipes that appear to be in satisfactory condition. The roads are relatively flat, providing no crown to promote drainage off the road. There is no evidence that the roads were ever professionally constructed.

Thus, the cemetery complex is facing multiple access issues. The roads are poorly constructed and maintained, there is no visitor parking area, and those driving into the cemetery soon realize that there is no convenient means of getting back out (i.e., there is no true circulation pattern).

The first issue should be the construction of more permanent roads in the cemetery. The city has a Public Works Department that certainly is able to design and construct adequate light duty roadways. That should be an immediate task for the city. Although asphalt roads can clearly be constructed on the soils in the area – as evidenced by the recently paved Pulaski Street and Calvary Court – this is probably not necessary in the cemetery given the relatively low visitation anticipated.

Ideally, roads should be built on soils that are strong and well-drained – features that are not likely present in the cemetery complex. These problems may be surmountable through the use of a woven geotextile to help maintain separation between the subsoil and the overlying gravel. With a geotextile it may be possible to construct the roadways using 10 to 12-inches of gravel.

We recommend that the roadways originally identified as Maple, Elm, and Willow be graveled and identified as one-way roads. This would allow visitors to drive into the cemetery



Figure 26. Entrances to the cemetery complex. Upper photo shows the Maple Drive entrance at the end of Pulaski Street. The middle photo shows the Elm Drive entrance at the end of Calvary Street. The bottom photo shows the wet conditions and potholes in Maple Drive at the time of the assessment.

and exit without having to turn around on graves or wet soils.

These gravel roads should require relatively minimal maintenance by the city. Low spots will need to be periodically filled with gravel scraped from high spots. The curves at the north and south end of Willow may have gravel pushed to the outer edges; these areas will require that the gravel be brought back to the center and inner part of the curves. However, given the low anticipated use of the road, this maintenance is not expected to be costly.

We also recommend that Maple (or Vinyard) be extended to the rear of Mount Olive, but that this road be closed to routine travel through the use of a chain or lockable bollards. This would allow a roadway for routine maintenance, but it would prevent the public from driving to the rear of the cemetery.

During this work the drainages under the road between Mount Calvary and Mount Olive could be increased in size, providing some additional safety margin for drainage of the property.

There is a third roadway, running off Pulaski, following I-264 to the west, and providing access to the rear of Mount Olive and the potter's field. This is not a historic road and with the improvement of the existing Maple and Elm access roads, we do not believe this access is necessary. Since it is largely obscured from public view for much of its route, we recommend that the road be closed, perhaps with a chain or lockable bollards. There already exists here a dilapidated chain link fence. It may be appropriate to repair this fence and install lockable gates.

As a longer-term goal the city may wish to acquire one of the tracts to the north or east of Fisher Cemetery for a parking area. This would remove traffic from within the cemetery and allow access to be refocused on pedestrian activities. This would promote heritage tourism visitation and would lend itself to more focused interpretative efforts.

Pedestrian Access, Sidewalks and Pathways

Situated in a residential neighborhood there is little pedestrian activity. There are no

sidewalks or walking tours that incorporate the cemetery complex. Some in the neighborhood use the cemetery as a convenient cut through – an activity that should be discouraged.

While the arrangement of Mount Olive is unclear, the historic map of Mount Calvary clearly reveals that the property was laid out with 3 foot pathways running north-south between every two family plots. These pathways would have provided convenient pedestrian access to plots throughout the burial ground. These pathways are still visible in some sections of the cemetery today (Figure 27), although the loss of coping and clearly defined plots have made these pathways difficult to identify in many areas. Moreover, it is likely that no paths existed in Fisher’s Cemetery or in potter’s field – burials were likely placed in a gridded arrangement. Such designs tend to maximize available plots and there was little thought given to pedestrian movement since cemetery visitation was limited to burials.

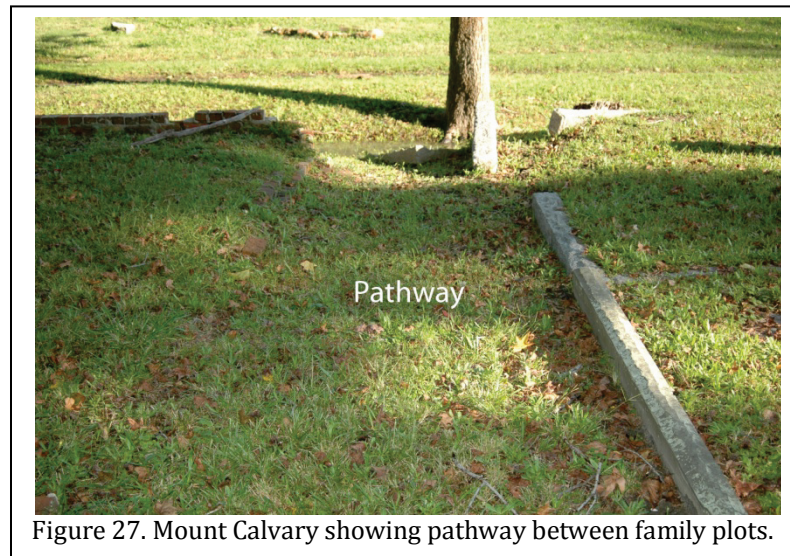


Figure 27. Mount Calvary showing pathway between family plots.

Although it eventually may be possible to redefine the planned paths in some cemetery areas, for the foreseeable future the only well-defined access areas for pedestrians will be the roads themselves. This is not likely a significant issue given the low visitation.

Universal Access

There are few naturally limiting factors for ADA compliance or universal access at the cemetery. The topography is such that ramps are unnecessary. The major limiting factor is the poorly drained soil that would make wheelchair access problematical. Likewise, the proposed gravel roads would be impossible for wheelchair movement.

While extensive modifications would be out of character, at the present level of use we are not convinced that there is a demand adequate to justify either the expense or the damage to the historic fabric.

In addition, the ADA or the Rehabilitation Act of 1973 is generally not interpreted to apply to cemeteries by the Department of Justice. Nevertheless, we are an aging population and it would be appropriate for the city to establish a protocol that would allow staff to assist wheelchair patrons or other disabled reach specific gravesites in the cemetery. Some cemeteries have achieved this goal by training their staff in the correct means of assisting the disabled¹ and by providing golf carts to help ferry individuals to grave locations. This should be a long-term goal of the city for the cemetery.

Another low impact approach suitable for tourism is to ensure that there are interpretative plaques and exhibits at the entrance – allowing disabled visitors to experience and learn about the cemeteries.

¹ Sites for establishing such protocols include <http://www.apparelyzed.com/etiquette.html>, <http://www.afb.org/Section.asp?SectionID=36&TopicID=163&DocumentID=2104>, <http://www.unitedspinal.org/pdf/DisabilityEtiquette.pdf>, and <http://faculty.ed.uiuc.edu/tgrayson/SPED205/Etiquette.html>.

Recommendations

We recommend that the city Public Works Department construct all-weather gravel roads in Mount Calvary along Maple, Elm, and Willow. The resulting road should be identified as one-way; it would provide convenient movement through the cemetery.

We recommend that Maple/Vinyard westward from the ditchline separating Mount Calvary and Mount Olive also be improved, but that this section of road be closed to routine traffic.

We recommend that the northern access road, running to the western end of the cemetery be closed to public travel. This road is not historic and poses significant security issues to the cemetery and visitors.

While at least Mount Calvary and probably Mount Olive at one point had pedestrian pathways, these are no longer clearly visible. Fisher's and potter's field likely never had any pathways. Regardless, visitation at the cemetery does not reveal a need for pathways at present.

We do not recommend major efforts to provide universal access at the cemetery at this time.

The city should establish a protocol for assisting disabled clients and visitors. This should include appropriate training of staff and a means to provide access to remote graves.

LIGHTING AND SECURITY ISSUES

Vandalism

At the time of our assessment, caregivers reported no known vandalism. There is, however, evidence of toppled stones that, absent vandalism, would likely still be standing. Thus, at some point in time the cemetery has seen intentional damage.

It is, however, difficult in many cases to distinguish vandalism from poorly set stones, acts of nature, or previous clearing efforts. As revealed by the historical documentation, the cemetery has gone through cycles of abandonment followed by cleaning using various techniques.



Figure 28. This stone was likely vandalized (the base is relatively level and there are no trees or stumps nearby).

The Parks, Recreation and Leisure Services Department – the city’s caretaker of the cemetery – has no formalized mechanism for reporting vandalism. When local citizens have reported problems to the local police, it is reported that no action was taken by police, who

apparently left it up to Parks, Recreation and Leisure Services to deal with the incident.

We know from the previous discussion that the cemetery is situated in an area where property crimes are relatively high. For example, in 2009 the Prentis Park neighborhood reported 167 larcenies and 129 incidents of vandalism. The cemetery area therefore ranks third in number of larcenies (Westhaven Park and Brighton each reported more) and ranks first in vandalism (followed by Port Norfolk and Brighton).

We know also that the Parks, Recreation and Leisure Services Department does not have a permanent cemetery crew that would not only improve maintenance (there is a correlation between maintenance and vandalism), but also provide a visible presence in the cemetery.

Fencing at the cemetery is found only in selected areas, forming a permeable boundary. In addition, none of the entrances have lockable gates.

At the present time there is no systematic inspection process – either by the city or by a caregiver group. It seems unlikely that the city staff – visiting the cemetery complex so irregularly – would recognize vandalism for what it is, or have any idea when it occurred. It will be difficult to ascertain the level of damage the cemetery suffers without some method of periodic inspection.

As will be discussed more fully in a following section, we recommend a stone-by-stone assessment for the cemetery, documenting all stones requiring conservation treatments. With this photo documentation in hand it will be possible for the city to not only begin budgeting

for the necessary repairs, but also recognize new damages when they occur.

We also recommend that a friends group be created. Such a group could begin “patrols” of the cemetery. The goal is not to have these groups confront vandals, but to be eyes and ears, providing a public presence in the cemetery and immediately reporting any suspicious activities. There are a number of people interested in cemeteries and cemetery preservation. We do not believe it would be difficult to organize such a group to help protect such a valuable city resource.

Another approach we recommend is for representatives of Parks, Recreation and Leisure Services to contact the residents immediately adjacent to the cemetery (on Pulaski Street, for example) and enlist their assistance in the protection of the resource. They should be specifically asked to call if they see any suspicious activities in the cemetery. They should also be asked to be especially vigilant during weekends and holidays.

These steps will help maximize the attention that the cemetery receives. Coupled with other recommendations offered by this study, it will further reduce the risk of significant vandalism.

We recommend that Parks, Recreation and Leisure Services develop a form designed for the reporting of cemetery-specific vandalism. This form should include several items:

- What was damaged, with specific information concerning each stone, including the name and lot/plot?
- How was the stone damaged (toppled, broken into how many fragments, scratched, etc.)?
- Where is the stone now (was the broken stone gathered up for storage, if so, where is it stored)?
- An estimate of when the damage occurred. This should routinely include

the last time the stone was known to be undamaged.

- An estimate – from a conservator – of the extent of the damage and cost for repair.
- A photograph of the damaged stone.
- When police were notified.
- When police responded and took a report, with a copy of the report attached.
- The outcome of the police investigation.

It is critical that the city report each and every case of vandalism, regardless of extent, to the police. The police must be educated concerning the historical value of these stones and the financial cost of the damage to ensure that damage and vandalism is taken seriously. If the damage is recent, the police should be expected to assign crime scene investigators to collect evidence. This evidence may include shoe prints in soil or on stones, discarded beverage containers with finger prints, collection of evidence such as cigarettes, and collection of any eye witness accounts. The police should be expected to assign an investigator and this individual should be expected to treat this as a real crime deserving of real investigatory efforts.

It is also essential that vandalized stones be repaired. Simply allowing broken stones to remain where they fell is not only disrespectful, but it gives the entire cemetery a run-down and uncared for appearance. We know of no city that would allow park benches or picnic tables to remain in a park in a vandalized condition – they would be immediately repaired or replaced. Likewise, it is critical that vandalized stones be repaired by a stone conservator.

Nothing suggested here, however, is intended to take the place of routine police patrols. A police presence can be a major deterrent to cemetery-related crimes and is a critical element in cemetery crime prevention. It should be relatively easy to ensure that City Council directs the police to make routine (not occasional) patrols through the cemetery during

open hours. The more difficult issue is whether the entrance gate should be locked.

Locking the gate may deter some inappropriate activities – but it will also deter after hours police patrols. We have found that police officers will not exit their cruisers, unlock gates, make drive-throughs, and then relock gates.



Figure 29. Street lamp at the Maple Drive entrance to Mount Calvary on Pulaski Street.

Thus, for a night time police presence, we recommend that gates remain open.

Of course, it will be impossible to obtain police patrols through the cemetery until the city creates passable roads. Until that time, we recommend that nightly police patrols along Pulaski Street slow or stop, using their spotlights to search the cemetery for activities.

Patrols are crucial at night – and especially on long weekends and holidays when alcohol consumption increases. Halloween is a particularly common time for cemetery vandalism.

Cemetery Lighting

There are a number of street lamps on Pulaski Street around the exterior of the cemetery. In fact, one is found at each entrance to the cemetery complex. All are standard single arm

steel brackets with cobra head luminaires mounted on existing utility poles. A typical example is found immediately before the Maple Drive entrance to the cemetery on Pulaski Street (Figure 29). There are no lights within the cemetery.

Lighting is sometimes seen as reducing vandalism. There are two problems with this approach. The first is that cemeteries were not lighted historically. Thus, the introduction of lighting detracts from the historical integrity of the properties, changing the historic fabric. The second problem is that lighting is only useful if there is someone guarding the property, using the lighting to identify problems. This is not the case in most cemeteries, including this cemetery complex.

We do not recommend that any additional lighting be installed.

Hardening Targets

Thefts in cemeteries nationwide have dramatically increased. The reasons for this are two-fold. First, there is an increasing market for gates, urns, ironwork, and statuary – created by an increase in upscale garden design and individuals willing to pay large sums for original artwork. Second, there is less attention being paid to cemetery fixtures, largely the result of decreased maintenance budgets and fewer police patrols.

Items that are targeted for theft are not common in many African American burial grounds. Fences, for example, are very rare at this complex. Statuary is non-existent. There is vernacular art, but in general these items are not usually targets of theft.

Nevertheless, having a comprehensive inventory of objects in the cemetery and their condition, will provide valuable assistance in evaluating theft and damage potential.

Fragmentary stones will be discussed in greater detail in a following section, but it is important that damage be repaired to prevent loose items from being readily available to thieves or souvenir seekers.

Recommendations

We recommend that a multifaceted approach against vandalism be taken:

- **A stone-by-stone assessment should be conducted to document all damaged or broken stones.**
- **Staff should be periodically reminded to be alert to evidence of vandalism.**
- **A friends group should be created to assist in patrolling the cemetery.**
- **Residents adjacent to the cemetery should be contacted and asked to report suspicious activities in the cemetery.**
- **The City should develop a form specifically for cemetery-related vandalism.**
- **All vandalism should be immediately reported to the police and should be thoroughly investigated.**
- **All vandalism should be repaired as soon as possible.**
- **Police patrols should be increased and made a regular, daily occurrence.**

CEMETERY FIXTURES AND FURNISHINGS

Cemetery Buildings

There are no extant buildings in the cemetery, although at least one early twentieth century plan (Figure 14) shows a caretaker's cottage in the southeast corner of Mount Calvary. There is no evidence of this building today, but this assessment did not attempt to ascertain if plots were sold in the area once the structure was (supposedly) removed. This is an important archaeological and historical question since relatively few African American burial grounds had a caretaker living on the premises.

The Boundary Fence

African American burial grounds did not often exhibit costly cast iron fencing. It was more common for an entrance gate to be erected, with the remainder of the property perhaps being fenced using woven wire.

For reasons that are not entirely clear, in 1941 brick columns were erected at the entrance to Mount Calvary and then in 2000 a faux-wrought iron fence was erected. The fence is not in keeping with what would be found at most African American cemeteries and we have identified no historical account that suggests such a fence existed at the cemetery and was at some point lost.

Regardless, the fence is present today and we do not recommend replacement. At the present time it is in good condition. It should, however, be placed on a yearly maintenance schedule by Parks, Recreation and Leisure Services to include inspection for damage and touch-up paint as necessary.

In addition, the signage on the fence has been vandalized and is partially missing. This should be immediately replaced by Parks, Recreation and Leisure Services.



Figure 30. Entrance gate to Mount Calvary showing the loss of letters that require replacement.

Although there is additional fencing elsewhere at the edge of the cemetery complex, it is primarily chain link and the fence is not contiguous. In many areas it is in poor condition.

Once the cemetery complex is consolidated under city ownership, we recommend that the approximately 3,200 feet of the cemetery boundary be fenced. This fence will exclude intruders and will also serve to eliminate cut-through pedestrians. We recommend the use of a high-security fence, primarily because such a fence will dramatically reduce long-term maintenance costs for the city.

A high security chain link fence will minimally have 2½-inch square posts; the fabric will be held with clips, not bands; it will have drive anchors for posts; and 1¼-inch 6-ga. mesh that is thermally fused vinyl coated.

Lot Amenities

Relatively few lot amenities, such as benches, trellises, or urns are present in the cemetery complex. Where present they are in deteriorated condition. In some cases this may be



Figure 31. This monumental bench lacked an appropriate foundation, evidencing improper construction.

the result of vandalism; in other cases it is the result of natural deterioration. In some situations it is the result of improper construction.

Figure 31 shows a granite bench, likely erected by a monument company. The bench entirely lacks a foundation – only a few granite rocks were thrown into a shallow footing for the placement of the bench. Given the shoddy construction it is no surprise that the bench failed. This documents the types of problems that occur when there is no cemetery administration to oversee monument construction.

We recommend that once consolidated, Parks, Recreation, and Leisure Services prohibit

any future placement of monuments or lot amenities.

We did not observe lot amenities such as iron benches, trellises, or urns (although some may exist). In fact, we noticed remarkably few examples of plot copings – a feature that is typically quite common in cemeteries of this type and age.

The few copings observed include cast concrete, marble or limestone, and granite. Although most were to some degree either sunken or covered by grass, they otherwise appeared in satisfactory condition. The limestone copings, however, were uniformly in poor condition.

Recommendations

Mount Calvary is reported as having had a caretaker's house. This may have left archaeological remains. Maintenance activities in the cemetery should take care to avoid damaging these remains.

Parks, Recreation and Leisure Services should place the Mount Calvary fence on a yearly maintenance schedule, inspecting it for damage and touching up paint as necessary.

Parks, Recreation and Leisure Services should immediately repair the Mount Calvary name on the entrance gate where it has been vandalized.

Once the cemetery is consolidated, it should be enclosed with a high-security chain link fence. We estimate that approximately 3,200 linear feet will be required, tying into the extant fence at the front of Mount Calvary.

Parks, Recreation and Leisure Services should prohibit any future erection of monuments or lot amenities in the cemetery.

LANDSCAPE MAINTENANCE

Maintenance Operations

As the history of the cemetery complex is revealed, maintenance has long been an issue. Even after it became common knowledge that the city owned both potter's field and Mount Calvary, Portsmouth consistently failed to provide adequate maintenance to the properties. The city called on volunteers to provide a service at the African American cemeteries that was being routinely paid for by the tax payers at the white cemeteries.

It has been only recently that Parks, Recreation and Leisure Services negotiated a contract with a local landscaping firm to provide some level of maintenance at the cemetery complex. Problems, however, remain.

The current contract does not incorporate all of the property – only that portion which was open at the time of the contract's inception. As volunteers that opened more of the cemetery the landscape firm has been under no obligation to maintain those additional areas since they are not part of the current contract. Yet without maintenance, these newly opened areas will be quickly lost again to undergrowth. While some may classify this as a “catch-22,” we view it as absurd bureaucracy. All future contracts should require the selected landscape firm to maintain all of the cemetery property, not just some portions.

The current contract does not incorporate a reasonable range of maintenance tasks. In fact, only grass cutting and litter pick-up are included. During our visit we found considerable litter, suggesting that the current firm is not providing especially thorough litter control.

Moreover, it is impossible to maintain the grass if branches are not gathered up. Mowing around fallen branches is not appropriate.

We were also told that most of the work at the cemetery, because of the uneven terrain, required the use of nylon trimmers. Yet, it appears that large deck mowers are being routinely used – resulting in scalping of the grass in many areas.

Although it is convenient to attribute such deficiencies to the use of a low bid contractor, the problem actually lies in the development of the contract specifications coupled with inadequate supervision.

Chicora Foundation has for years provided a sample contract that could be readily adapted for contract specifications available at <http://www.chicora.org/pdfs/Sample%20Landscape%20Maintenance%20Contract%20for%20a%20Cemetery.pdf>. This document should be consulted by Parks, Recreation and Leisure Services prior to rebidding the maintenance of the cemetery.

It is also important for Parks, Recreation and Leisure Services to understand that cemeteries are scenic landscapes and in that sense similar to parks or open spaces. But they are far more; they are sacred sites, permanent collections of three-dimensional artifacts, and archives. The care they require is very different from the ordinary community park or recreation center. They demand different expertise and attention to the preservation of their historic integrity. There is far more to the maintenance of a cemetery than simply cutting the grass. We are not seeing that Parks, Recreation and Leisure Services understands the complexity of cemetery maintenance.

We typically recommend two workers and one supervisor per 10 acres on a full-time basis. This is based on the Boston Historic Burying Grounds Initiative (Atwood et al. 1989) and is particularly suitable for Portsmouth's situation



since it is estimated that mowing old cemeteries with 3-dimensional monuments requires six-times the labor than modern lawn park cemeteries (Klupar 1962:239; Llewellyn 1998:100).

Appropriate maintenance established by good practice includes weed control, tree trimming, pruning, seasonal cleanup, maintaining the roads, conducting section inspections, survey of monuments for maintenance needs, maintenance of shrub beds, maintaining section signs, maintaining water lines, rehabilitation of barren areas, raking, resetting stones as needed, inspecting and repairing fences, watering newly planted areas, sodding as necessary, identification of trees for removal, removal of flowers and grave decorations, removal of wild growth, and inspection and cleaning of catch basins (see, for example, Klupar 1962:226-228). The importance of maintenance was clearly stated by West, “one thing is certain, the cemetery must be maintained in a proper manner or public confidence will suffer” (West 1917:26).

Consequently, the city must provide a staffing level that will maintain the beauty, dignity, and historical significance of this cemetery.

**Table 3.
Trees Identified in the Cemetery Complex**

| Scientific Name | Common Name | undesirable/ significant | | | root problems |
|--------------------------------|---------------|--------------------------|--------|----------|---------------|
| | | invasive | litter | breakage | |
| <i>Acer</i> spp. | maple | | x | x | x |
| <i>Albizia julibrissin</i> | mimosa tree | x | x | x | x |
| <i>Celtis occidentalis</i> | hackberry | | x | x | x |
| <i>Liquidambar styraciflua</i> | sweetgum | | x | | x |
| <i>Liriodendrom tulipifera</i> | tulip poplar | | x | | |
| <i>Magnolia grandiflora</i> | magnolia | | x | | |
| <i>Pinus</i> spp. | pine | | x | x | x |
| <i>Platanus occidentalis</i> | sycamore | | x | | x |
| <i>Prunus caroliniana</i> | cherry laurel | x | x | | |
| <i>Quercus</i> spp. | oak | | x | | |

If the city intends to continue contracting out the maintenance of the cemetery complex, it is critical that appropriate specifications be developed following best practices for cemetery maintenance.

It is also critical that the city provide adequate supervision of the contractor. Too often work is contracted out and the contracting officer never steps foot on-site to evaluate contract

performance. Had a contracting officer been on-site during any of the existing maintenance activities the trash still in the cemetery, the scalped grass, the areas not being mowed, and the problem with branches left throughout the property would have been immediately recognized – providing an opportunity for contract correction or modification.

Trees

Cemeteries, in general, have historically been dominated by large deciduous trees, although evergreens such as cedar are also very common. They provide a distinctly inviting image for visitors and passersby. These trees also provide some visual separation from adjacent buildings – especially in cluttered urban environments.

Ideally the trees selected should be historically appropriate. In the case of a planned cemetery the ideal would be to use those trees selected by the original designers – respecting their original intent and interpretation. However, we have not identified any information concerning the original plan. It is possible that many of the plantings were native and already present on the site.

Mount Calvary is only lightly wooded and Fisher’s is wooded only at the edges. Mount Olive, however, is densely wooded, as are parts of the potter’s field. The trees identified are shown in Table 3, as well as some of their less desirable traits, such as invasiveness, the production of significant litter, their tendency to break during storms, and the prevalence of shallow roots. Most of the trees in the cemetery today are not especially appropriate. Many will cause an increase in long-term maintenance.

In addition, as Figure 33 reveals, trees are especially dense in Mount Olive, possibly because this cemetery was abandoned prior to Mount Calvary and possibly because maintenance work always began in the front of the cemetery and often did not penetrate to the rear. In any event,

the density increases as one moves west through the cemetery complex.

We recommend the removal of all mimosa and cherry laurel trees in the cemetery because of their invasive potential.

We also recommend the removal of all trees in Mount Olive under 9-inch diameter breast height (dbh). These are very recent trees that have either self-seeded or that have been seeded by animals. The removal of these smaller trees will serve to significantly open the cemetery and perhaps aid in the drying of the soils.

We also recommend the removal of all dead or obviously diseased trees. All trees that are impinging on drainage ditches should also be removed as soon as possible.

If possible, all of these trees should be chipped on-site, with the mulch stockpiled in some area where it won't obscure monuments or be in the way of grass maintenance. This mulch should be used in areas under trees where grass is not healthy.

Trees should be cut as close as possible to the ground surface, but stumps should *not* be ground. Instead they should be left to decay naturally since this will do far less damage to graves and monuments. It will, of course, require periodic stump infilling, but this is a relatively minor maintenance activity. Large stumps or downed wood should never be left in the cemetery, as has been the case in the past (Figure 34).

We estimate that this will remove approximately 40-50 trees from Mount Olive.

Replacement Trees

We do not foresee any immediate need to replace trees, but it is important that caregivers not allow the cemetery to become denuded.



Figure 33. Dense trees in Mount Olive require thinning with the removal of all trees under 9-inch dbh.

African American burial grounds were rarely treeless lawn park cemeteries. Certainly Mount Olive and Mount Calvary were never completely open.

Thus, if it becomes necessary to remove a large tree – for example, if it is hit by lightning or damaged by disease – then it is appropriate to replace that tree.

While there are many possible replacements, one that is appropriate for African American burial grounds, while at the same time, exhibits very few negative features, is the Eastern red cedar (*Juniperus virginiana*). Red cedar is an evergreen growing 40 to 50 feet tall in an oval, columnar, or pyramidal form and spreading 8 to



Figure 34. Stump left in the cemetery. All stumps and downed wood should be removed from the cemetery or chipped as quickly as possible.

15 feet when given a sunny location. It has no significant litter problem, requires little pruning, and surface roots are not generally a problem. The tree may have breakage issues so should be located where it is not likely to damage stones.

Another excellent choice, especially for the wetter areas of the cemetery, is the arborvitae or white cedar (*Thuja occidentalis*). This slow-growing tree reaches 25 to 40 feet in height and spreads to about 10 to 12 feet wide, preferring a wet or moist, rich soil. It has no litter problem, the wood is resistant to breakage, and the roots are not shallow. This is another tree that is often found in African American cemeteries.

All replacement trees should be of at least 1-inch caliper and meet the minimum requirements of the American Nursery and Landscape Association's American Standard for Nursery Stock (ANSI Z60.1-2004).

Maintenance Issues

Research is suggesting that trees, especially older mature trees, improve in health when turfgrass is removed under the branch spread and mulch is applied at a depth not exceeding 3 to 4-inches. This is a practice that could be productively employed at the cemetery complex. Staff should be closely supervised to prevent over mulching of vegetation.

It is also crucial in a cemetery context that trees be periodically inspected and pruned. We do not believe that either has occurred in the cemetery complex.

Trees should be inspected for potential threats to monuments, as well as general health. Ideally these inspections should be made yearly and after any storm where the winds exceed 55 mph. They should be pruned to remove potentially hazardous dead wood on a yearly basis, but safe pruning every 5 years by a certified arborist is acceptable. Rigging and/or a crane must be used to minimize the potential for damage to stones or the landscape. Under no circumstances are tree climbers (hooks, spikes, gaffs) to be worn while ascending, descending, or working in trees to be pruned.

There are a number of trees that require pruning for either thinning or cleaning. Thinning is a technique of pruning that removes selected branches to increase light and air movement through the crown. This also decreases weight on heavy branches. The natural shape of the tree is retained and its overall health is improved. In cleaning, the pruning removes branches that are dead, dying, diseased, crowded, broken, or otherwise defective. This includes narrow crotches.

In pruning, branches should always be cut just beyond the branch collar (an extension of the main stem) and not flush with the trunk. Large branches should be removed with three cuts to prevent tearing of the bark, which can weaken the branch and lead to disease. All pruning within the cemetery should be performed by an ISA Certified Arborist, preferably one who is also an ISA Certified Tree Worker/Climber Specialist. The ISA Certified Tree Worker/Climber Specialist has knowledge in the major aspects involved in tree care including pruning, removal, cabling and safety. These are critical skills when working among historic monuments.



Figure 35. Examples of plots or stones damaged by tree growth. The top left photo shows a large tree with roots beginning to encompass a tablet. Here it may be possible to remove the stone without damage to the tree. The top right photo shows a stone completely grown into a tree. The stone cannot be recovered without killing the tree – which we do not recommend. Middle row left photo shows coping displaced by a large tree. We recommend relocating the coping to avoid the tree. Middle row right photo shows a large tree growing into a vault. It may be possible to relocate the vault cover and tablet. Lower row left and right photos show extensive damage to coping and stones by a large tree. Here it may be possible to relocate coping and stones to avoid the tree. In most cases the tree, if mature and healthy, should be retained.

Trees should be pruned in such a manner as to preserve the natural character of the plant and in accordance with ANSI A300 (Part 1) - 2001 standards.

There are many plots in the cemetery where trees have been allowed to grow and cause extensive damage to the monuments, vaults, and graves. The solution to these problems, however, is complex since often the tree is mature and in good condition. Generally trees should not be sacrificed in order to restore a plot. Figure 35 shows several examples and outlines possible solutions. Wherever possible coping and stones should be relocated slightly to permit the growth of the tree.

Shrubbery and Ground Cover

While it is likely that the cemetery originally contained a wide variety of heirloom plants, many have likely been lost to either the shade or drastic “clean-up” efforts. Today relatively few examples remain and we identified yaupon holly (*Ilex vomitoria*), which can grow into a small tree; boxwood (*Buxus* sp.); yucca (*Yucca filamentosa*); and Confederate rose (*Hibiscus mutabilis*).

The yaupon holly was likely planted by animals and may be safely removed from most cemetery contexts. The boxwood, yucca, and Confederate rose are all intentional plantings and every effort should be made to ensure their survival.

Two ground covers (excluding turf, discussed in a following section) are also present – English ivy (*Hedera helix*) and periwinkle (*Vinca minor*). Both are considered invasive and consideration should be given to their removal from the cemetery.

English ivy is found growing on a number of trees. The plant flowers most readily when it becomes aerial – as it has at Mount Olive. Left unchecked the ivy will kill the trees it is on and we recommend immediate steps to eradicate it. This can be done by cutting out 6-12 inches of the stem close to the ground and painting the freshly cut stem with a pesticide such as Roundup Promax® used without dilution. This 47.8% glyphosate herbicide will prevent the ivy from returning (<http://www.utextension.utk.edu/publications/wfiles/W231.pdf>).

Periwinkle is even more difficult to eradicate and many herbicides have little effect (<http://imapinvasives.org/GIST/ESA/esapages/documents/vincmaj.pdf>). Manual removal over a substantial period of time is likely the best (and

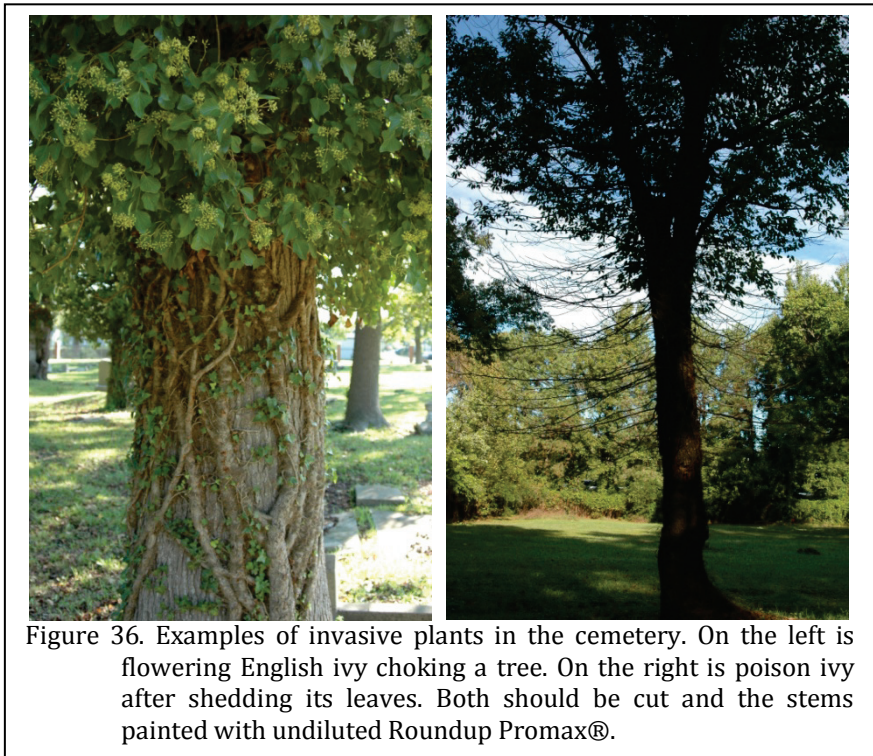


Figure 36. Examples of invasive plants in the cemetery. On the left is flowering English ivy choking a tree. On the right is poison ivy after shedding its leaves. Both should be cut and the stems painted with undiluted Roundup Promax®.

most environmentally sensitive) approach.

Another ground cover worth mentioning is poison ivy (*Toxicodendron radicans*). This plant is not only invasive, but it can be hazardous to a large proportion of the population. It was observed growing aerially on several trees and should be removed in a fashion similar to English

ivy – the stems should be cut and then painted with undiluted Roundup Promax®.

It is very likely that bulbs also exist at the cemetery complex. Daffodils (*Narcissus* spp.), snowdrops (*Galanthus* spp.), and “naked ladies” (*Amaryllis belladonna*) are among the most common bulb plants found in African American cemeteries. None, however, would be obvious at the time of our assessment.

Maintenance

It is unlikely that any of the shrubs in the cemetery have received appropriate pruning or maintenance in a number of years. There is certainly no maintenance being provided under the current contract. They are, nevertheless, an important aspect of the cemetery landscape and an effort must be made to ensure their survival.

First, it is important to prevent untrained individuals from shearing shrubs. The use of shears will create a thick outer shell of foliage that shades out interior branches. This continuous shade will result in significant foliage drop, decline in health, value, and aesthetics.

Shrubs are best pruned, rather than sheared, to maintain a natural shape and to keep plants at a desired size so that they do not outgrow their landscape too quickly.

After years of neglect, many of the shrubs exhibit much deadwood on their interiors and significant rehabilitation will be necessary. Those that can be saved by careful pruning should be. Those that are dead or that cannot be rehabilitated should be removed and similar species replanted.

Thinning (cutting selected branches back to a side branch or main trunk) is usually preferred over heading back. Thinning encourages new growth within the interior portions of a shrub, reduces the size, and provides a fuller, more attractive plant.

In some cases it may be necessary to prune more severely, a process called renewal

pruning, in an effort to bring the plants back into scale with their surroundings.

Renewal pruning means cutting the plants back to within 6 to 12 inches of ground level. In this instance, timing is more important than technique. The best time to prune severely is before spring growth begins. Pruning in late fall or midwinter may encourage new growth that can be injured by cold. Renewal pruning results in abundant new growth by midsummer. Once the new shoots are 6 to 12 inches long, the tips should be pruned to encourage lateral branching and a more compact shrub.

Renewal pruning works well with most broadleaf shrubs, while narrow-leaf evergreens (such as boxwood) do not respond well when severely pruned and may actually decline.

An alternative to the drastic removal of top-growth on multiple stem shrubs is to cut back all stems at ground level over a period of three years. At the first pruning, remove one-third of the old, mature stems. The following year, take out one-half of the remaining old stems and head back long shoots growing from the previous pruning cuts. At the third pruning in yet another year, remove the remaining old wood and head back the long new shoots.

In general, summer-flowering plants should be pruned before spring growth begins since these produce flowers on the current season's growth. Spring-flowering plants, such as forsythia, should be pruned after flowering since they produce flowers on the previous season's growth.

Turfgrass Issues

The cemetery complex lacks a defined type of turf and appears instead to represent a variety of grasses. Much of the cemetery, however, is dominated by broad leaf “weeds” – undesirable species that cause the grounds to look unkempt and require frequent mowing to keep them in check.

Turfgrass should be an important concern of cemeteries, although rarely is it given adequate

attention. With an appropriate turfgrass, mowing frequency is reduced. This reduces labor costs, pollution, equipment expenditures, and perhaps most importantly for historic properties, damage to the stones.

It is clear that the cemetery turf has received little attention beyond mowing. This has led to an overall decline in appearance and an increase in maintenance costs.

Mowing and Trimming

Mowing at the cemetery is conducted by at least two mowers, a Toro Zero-Turn Riding mower with at least a 48-inch deck and a Hustler zero-turn commercial riding mower, also with a 48-inch deck (see Figure 32).

Although these deck sizes are at the low end of commercial equipment, the use of riding or large walk behind mowers can be problematical, especially in a setting such as Mount Calvary and Mount Olive where monuments and coping present significant obstacles. Stones in the cemetery clearly reveal the damage that can be done by large equipment and less than perfect handling (see Figure 37).

It would be far better to abandon riding mowers and convert mowing at the cemetery complex to the use of walk behind mowers with decks no larger than 21-inches. Larger mowers could be used in those areas with few or no stones – such as the potter’s field, rear portion of Mount Olive, and Fisher’s.

All mowers operating in the cemetery should have closed cell foam bumpers installed to assist in preventing damage to the stones. This should be part of the city’s contract for work in the cemetery. In addition, the city should periodically inspect the condition of the stones to ensure that no additional damage is being done during maintenance activities.

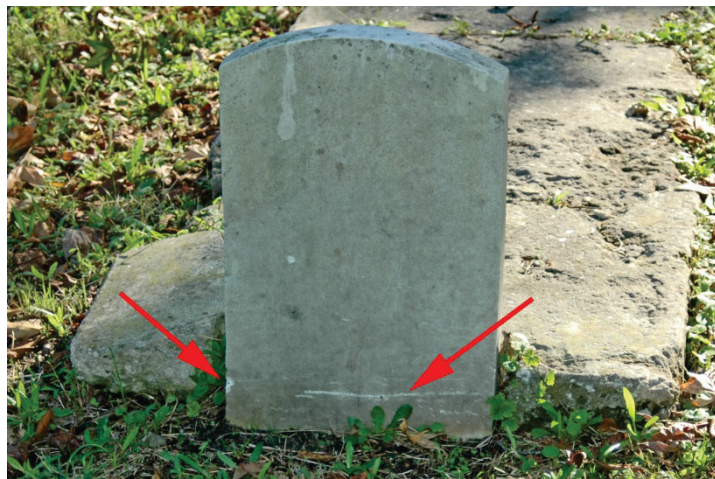


Figure 37. Damage to stones in the cemetery caused by mowers. Top photo shows numerous direct hits causing chipping. Bottom photo shows not only a direct hit on the left, but also a long scrape across the stone. These are the result of using equipment that is too large for cemetery, coupled with inattentive and unsupervised workers.

In addition to mowing, nylon trimmers are used in some areas around monuments, coping, fencing, and plantings. This is an acceptable practice, but it is critical that a very light weight line be used – along with worker attention – to minimize damage to soft stone such as marble. The maximum line diameter for use in the cemetery should be 0.065-inch. Thicker lines will cause unnecessary damage to the stones.

The Parks and Recreation Department reports that mowing is being conducted during the growing season every two weeks. This is a fairly general policy used by many cemeteries and it is generally satisfactory.

Fertilization, Weed Control, and Renovation

It is reported that the city does not conduct any fertilization, pre-emergent, or post-emergent control of weeds in the cemetery. Since there is no established turf, this is understandable. It is not, however, good long-term practice and it would benefit the city if the cemetery – or at least some parts – were established in a turf grass. The presence of a healthy turf would reduce mowing costs, especially if a slow growing, tall grass were used.

The city may wish to explore some alternative grasses. One worth considering is Buffalograss (*Buchloe dactyloides*). While this grass doesn't hold up to traffic well, we anticipate little traffic over much of the cemetery. It does withstand drought and mowing requirements are infrequent; once a month is sufficient, once a year for a naturalistic landscape. This may be worth considering in the open areas of Fisher's and Potter's field.

Another grass with potential is seashore paspalum (*Paspalum vaginatum*). It is a warm season perennial grass that grows well in areas that receive extended periods of heavy rains and low light intensity. Its dense growth discourages weeds.

One or more alternative grasses should be planted in the cemetery to replace the current weedy vegetation. A renovation program would allow the city to tackle the replacement of existing grass using a phased approach. A publication to assist in this process can be found at <http://www.ca.uky.edu/agc/pubs/agr/agr51/agr51.pdf>.

Once a defined turf is established there will be greater incentive to conduct soil tests, apply appropriate fertilization, practice good weed control, and properly aerate the soils.

Virginia Tech will provide soil tests, including organic matter, for only \$14 (<http://www.soiltest.vt.edu/soiltest.html>) – a very reasonable fee that is well within the city's budget.

Documents such as Virginia Tech's *Simple Lawn Care Schedule* (available at <http://www.pwccgov.org/docLibrary/PDF/006790.pdf>) provide excellent advice on establishing a maintenance schedule.

In order to minimize salt uptake by the stones, slow release organic fertilizers are preferable to commercial inorganic fertilizers. An excellent source explaining the differences between organic and inorganic fertilizers is <http://www.cmg.colostate.edu/gardennotes/234.pdf>. The publication at <http://pubs.caes.uga.edu/caespubs/pubs/PDF/C853.pdf> provides information on converting traditional inorganic fertilizer recommendations to safer organic recipes.

Other Landscape Issues

We have previously indicated that the contractor must do a better job collecting litter in the cemetery. In addition, the city must amend the contract to require that all downed branches be collected at least once every month.

The cemetery will exhibit a large number of leaves during the fall season. While some cemeteries attempt to rake and remove leaves, there are more cost effective approaches. For example, many cemeteries today are using micro-mulch mower blades and simply mulching leaves during the mowing process. For example, some blades have jagged teeth instead of a traditional-looking cutting edge. Others have multiple cutting edges. Many mulching mowers employ kickers or tails that force blades upward for repeated chopping. Examples of commercial mulching mowers include the Toro 21" Heavy Duty models, Snapper Pro with their Ninja blade, and the Honda HRC Commercial mowers. All get very high ratings from professional users.

This approach not only eliminates the work of gathering and removing leaves, but it also

adds nutrients back into the soil. For example, at Spring Grove Cemetery and Arboretum in Cincinnati, Ohio, the 430 acres have leaves blown away from markers and flower beds, then mulch them with riding mowers.

Recommendations

The city must develop appropriate specifications for the maintenance of the cemetery. Examples of best maintenance practices are available on the Chicora website. The city must also exercise greater control over their landscape contractor, visiting the cemetery, before, during, and after operations to ensure that appropriate work is being done.

All mimosa and cherry laurel trees in the cemetery should be removed as soon as possible. So, too, should all diseased or dead trees. We also recommend that all trees in Mount Olive under 9-inch dbh be removed.

Trees should be chipped on-site and the mulch stored for use in the cemetery. Stumps should be cut as close as possible to the ground, but should not be ground.

Appropriate trees for replanting include Eastern red cedar and white cedar. All replacement trees should be of at least 1-inch caliper and meet the minimum requirements of the American Nursery and Landscape Association's American Standard for Nursery Stock (ANSI Z60.1-2004). Nursery stock should be carefully inspected and specimens with wounds, crooked or double leaders, broken branches, or girdling roots should be rejected.

All trees should be inspected yearly and after any storm with winds in excess of 55 mph. These inspections should be conducted by an ISA certified arborist

The cemetery evidences trees that require pruning for thinning or cleaning. These issues should be dealt with immediately. If the city does not have adequate staff to permit the level of care necessary, then a contract should be awarded to an ISA Certified Arborist for the work.

English ivy, poison ivy, and periwinkle in the cemetery should be eradicated. English and poison ivy should be cut from trees and their stems painted with an herbicide. Periwinkle should be manually removed wherever possible.

Shrubbery is not common, but much of what remains is in poor condition. Much of the shrubbery requires renewal pruning. We recommend that if the city cannot devote trained staff to care for these issues that they let a contract specific for the renewal and rehabilitation of the shrubbery.

The use of large deck mowers in the cemetery is causing damage to monuments and the practice must be stopped. Only 21-inch walk-behind mowers should be used on the cemetery grounds. All mowers should be fitted with closed cell foam bumpers to reduce accidental damage to the stones. These bumpers should be inspected on a weekly basis and replaced as needed.

The nylon trimmer line being used in the cemetery must not have over 0.065-inch line. There is damage to monuments suggesting that a heavier line is being used or has been used in the past.

We recommend a gradual program of turf renovation until sustainable stands of a single turf are achieved. The city may wish to explore the use of alternative turfs such as buffalo grass or seashore paspalum.

With the establishment of a good turf, soil analysis should be conducted every five years to determine if adjustments are necessary for the turfgrass. Where fertilization is needed, only organic, slow release fertilizers should be used in order to minimize salt damage to the stones.

Limited pre-emergent and post-emergent weed control should be instituted at the cemetery, taking care to avoid stones. The herbicides will affect the stones and this work will need to be very carefully done to ensure

that the stones are not damaged. However, a better stand of turf will reduce the overall maintenance cost of mowing. Mowers with mulching blades should be used to allow leaves to be mulched on-site.