Center Cemetery
Master Conservation Plan

Chesterfield, Massachusetts

prepared by

Martha Lyon Landscape Architecture, LLC
Monument Conservation Collaborative, LLC
CME Associates, Inc.

for the

Town of Chesterfield

2008

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by

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2008

Support for the Master Conservation Plan was provided by the Survey and Planning Grant Program of the Massachusetts Historical Commission,
a division of the Office of the Secretary of the Commonwealth, William Francis Galvin, Secretary,
and the Town of Chesterfield.

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ACKNOWLEDGEMENTS

Martha Lyon Landscape Architecture, LLC, Monument Conservation Collaborative, LLC and CME Associates, Inc. thank the following individuals for the generous assistance in the successful completion of this Plan.

Charlene Nardi, Chesterfield Town Administrator
Bill Jolly, Chesterfield Superintendent of Cemeteries
Dee Cinner, Chesterfield Historical Commission Chair and
Chesterfield Cemetery Commission Member

INTRODUCTION

Of the twelve cemeteries and burial grounds in Chesterfield, Center Cemetery is the oldest, established in 1764 by the early settlers of the town. It began on one and one-half acres near the main route through town, and gradually grew to 2.75 with two additional purchases of land. It holds the graves of Chesterfield's first residents, including farmers, mill operators, and town leaders. Many of its 18th and 19th century stones display the decorative carvings of local artisans. It occupies an important place in the history of Chesterfield and helps tell the story of the individuals and families who established the Town. *Figure 1* depicts the oldest section of Center Cemetery, while *Figure 2* displays the elaborate gravestone carving of Chester artisan Elijah Sykes.

Over the cemetery's near 250-year history, the Town has made an ongoing effort to maintain the landscape. As early as 1902, families began establishing trust funds for gravesite care. Other tasks during the 20th century included installing and re-painting iron fencing, constructing granite steps, and re-building the east retaining wall. At several points, the Town arranged for the straightening of monuments and markers, but despite these efforts, the cemetery landscape continued to decline.

Figure 1. The Center Cemetery landscape in fall. Even though the Town has continually cared for the cemetery, many of the gravestones and other historic features are in need of conservation treatment.

In 2000, Chesterfield resident and cemetery enthusiast Donald Fobes passed away, and bequeathed $25,000 to the town for upkeep of the Town's cemeteries. In the years following, the Town nominated Chesterfield Center to the National Register of Historic Places as an historic district, and included Center Cemetery in the district. Fobes's contribution, combined with the National Register application, spurred the Town to launch a long-range planning effort. Chesterfield applied for and was awarded a Survey and Planning Grant from the Massachusetts Historical Commission, and the result is this *Master Conservation Plan*.

Master Conservation Plan Goals

To complete the *Master Conservation Plan*, the Town established a three-person committee, with representatives from the Administrator's office, Cemetery Commission, and Historical Commission. This committee established the following goals for the Plan:

Figure 2. The gravestone of Nathanial Bates (d. 1788) was carved by Elijah Sikes of Chester. Sikes married Lucretia Anderson, the daughter of Archelaus Anderson. Anderson originally owned the land that in 1764 became Center Cemetery.

- To develop a detailed guide for restoring and preserving in an appropriate manner the memorials, markers, fencing and important landscape features of the Center Cemetery.
- To include in the guide, a complete inventory and assessment of the cemetery's landscape features;
- To identify preservation priorities;
- To develop budget projections for implementing a comprehensive, historically sound preservation strategy;
- To enhance the cemetery as an educational setting for students and scholars of local history; and
- To prepare a plan for maintaining the cemetery and its landscape over the long term.

HISTORICAL DEVELOPMENT of CENTER CEMETERY

Beginnings – Before 1764

The Town of Chesterfield began as the "New Hingham plantation," a 23,040-acre tract of land laid out as early as 1739, located to the north and west of the Town of Northampton. The earliest known European visitor was Gideon Bisbee, who came to the area in 1755 to clear land but did not settle. Seven years later, Chesterfield incorporated as a Town on 16,000 acres with its name deriving from the 4th Earl of Chesterfield. Between 1755 and 1775 nearly 200 families settled in Chesterfield.

Establishment – 1764-c. 1850

One of the early settlers' most immediate needs was for a place to inter their dead. In 1764, the Town voted to purchase land for a burying-ground, and to clear the land and build a fence. The land covered one and half acres, and stood upon "Anderson's Hill." At the time of the purchase, the property already held one grave – that of Mrs. Benjamin Bonney (d. 1764). The cemetery grew up around Mrs. Bonney's grave. In the same year Chesterfield organized the Congregational Church, and it built the first meeting house four years later.

Figure 3. The stone of Nehemiah Bates is likely a replica of an earlier stone, carved by an unknown local artisan.

Center Cemetery in its earliest years likely resembled a clearing in a field, surrounded by a fieldstone wall and/or fence, and set back from the main road through Chesterfield. Individuals were interred in single graves, and the inscriptions covered the gravestones' east side. A grassy path – wide enough to accept a horse and carriage, wound its way through the gravesites. Many of the gravestones were elaborately carved by local artisans (see *Figure 3*). Nathaniel Phelps, Elijah Phelps, Rufus Phelps, and Elijah Sikes, carving primarily in the 18th century, worked in the folk style, depicting winged faces, floral motifs and geometric patterns. Green Revival imagery, including urns, willows, and architectural elements, were popular in the early 19th century and typical of the work of Samuel Chapin, Thomas Sturges, William Sturges, and Abiel Rankin.

The largest physical changes to the cemetery during this establishment period were (1) the addition in 1769 of North Road to the east edge, which improved the ability of pedestrians and vehicles (such as hearses) to access the cemetery, and (2) the addition of ¼ acre of land along the western side, purchased by the Town in 1825.

Figure 4. The 1873 Beers Atlas of Hampshire County, Massachusetts depicted the cemetery resting along the west side of North Street (North Road). The tomb and retaining wall do not appear on the map, but the atlas may not have included such fine details.

Expansion and Embellishment - c. 1850-c. 1890

Little documentation exists about Center Cemetery in the second half of the 19th century. Based on the age of the materials used to construct the east retaining wall and tomb, it is likely both were erected during this time period. Receiving tombs typically appeared in New England towns beginning in 1840 and became popular around the time of the Civil War. The Center Cemetery tomb resembles many other tombs in style, method of construction, and material (stone with an iron recessed panel door) in nearby towns, most of which were built around this time.

During the second half of the 19th century, several Chesterfield families purchased several gravesites and created family plots. Most are distinguishable by their central monuments, surrounded by smaller individual markers. The monuments were constructed of marble and granite.

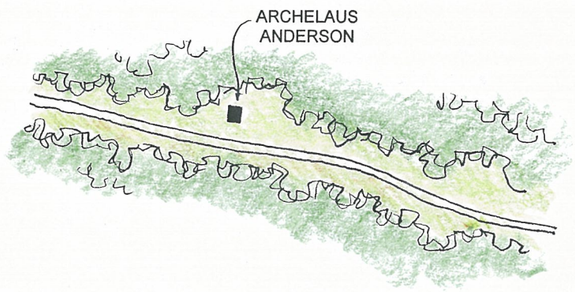
At some point in the late 19th century, an additional acre of land was added to the north edge of the cemetery, bring the total to 2.75 acres. It is likely that the pipe railing, ornamenting the top of the east wall, may have been constructed at this time. The Town laid out this new area on a regular grid, and did not appear to have planted any trees. As a result, the cemetery became aesthetically divided between the "Old Section" and "New Section." A grassy roadway cut a straight line between the sections, further reinforcing this division.

Figure 5. Town Reports indicate that the granite steps were constructed in 1954, in conjunction with several other cemetery improvements.

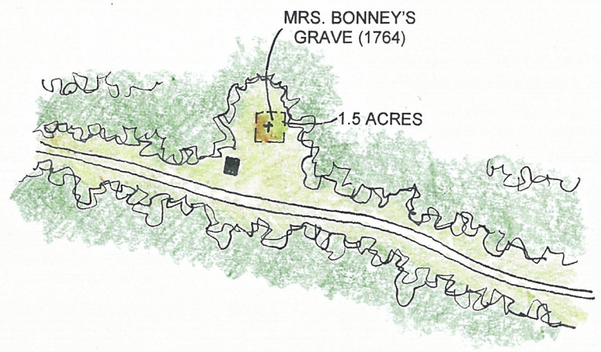
Maintenance – c. 1890-Present

Beginning as early as 1902, several Chesterfield individuals and families established trust funds for the cemetery to insure its upkeep. Up until the 1950s, the Town voted a yearly appropriation of between $25.00 (in 1928) to $450.00 (in the 1950s) to care for the "neglected cemeteries." Town reports document some of the maintenance performed during this time, including repairs to the Thomas Damon stone in 1940, and general straightening of stones in 1949. In 1954, the Town made three major changes to Center Cemetery, (1) an upgrade of the entry drive, (2)

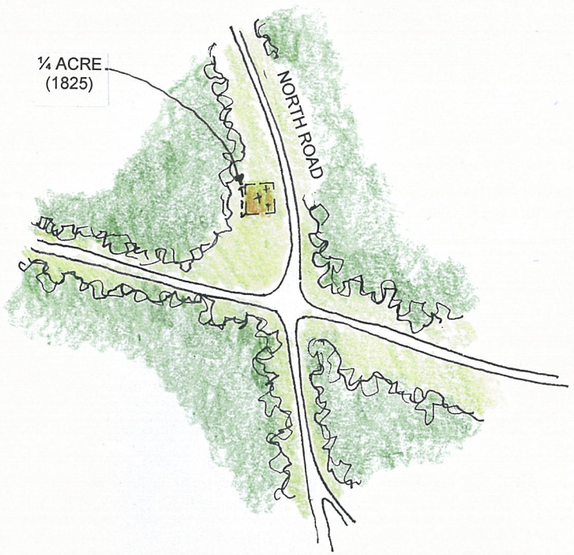
Before 1764



1764 - 1769



1769 - c. 1850



c. 1850 - c. 1890

c. 1890 - Present

SUMMARY

- Settlers came to the New Hingham plantation in the 1750s, and settled the area between 1755 and 1775. Chesterfield was incorporated in 1762, and held its first Town Meeting in July of that year.
- Center Cemetery was established in 1764, following the death of the wife of Benjamin Bonney. The cemetery began on 1.5 acres and grew up around Mrs. Bonney's grave. The Congregational Church was also formally organized the same year.
- In 1769, North Road was accepted, providing a more direct access route to Center Cemetery from the Town's main road. The "burying yard" was used in the formal road description to explain the layout.
- Sometime between 1769 and c. 1850, the Town added the stone retaining wall and receiving tomb to the east edge of Center Cemetery. The stones resemble those used in the wall at Ringville Cemetery (Worthington). According to local lore, the Ringville Cemetery wall stones from the Chesterfield Gorge. In 1825, the Town added ¼ acre to the cemetery's west side.
- Between c. 1850 and c. 1890 an additional acre was added to the north edge of Center Cemetery. While the Town attempted to obtain more land in future years, they were unsuccessful.

HISTORICAL DEVELOPMENT of the CENTER CEMETERY LANDSCAPE

TOWN OF CHESTERFIELD
Massachusetts

CENTER CEMETERY
MASTER CONSERVATION PLAN

MARTHA LYON LANDSCAPE ARCHITECTURE, LLC
Monument Conservation Collaborative, LLC
CME Associates, Inc.

installation of the granite steps (see *Figure 5*), and (3) painting the existing pipe rail fence and installing new fence along the western edge.

During the last half of the 20th century, Chesterfield continued to maintain the landscape at Center Cemetery, despite limited funding. Town reports document several landscaping efforts in the 1960s, including the removal of several dead trees. In the 1970s, the Town straightened leaning monuments and graded around sinking graves. In the 1980s, repairs were made to the west boundary fence and monuments continued to be straightened. The Town became increasingly concerned during the 1980s about the condition of the tomb.

By the 1990s, the east retaining wall was failing in several spots, and in 1992, a portion of the wall had collapsed due to heavy frosts of the previous winter. In 1996, a mason was hired to rebuild the wall, and in the process, installed weep holes to allow water to filter through. In 2000, Chesterfield resident and cemetery enthusiast Donald Fobes died, and bequeathed $25,000 to the Town for upkeep of its various cemeteries.

In 2007, the Town submitted an application to the National Register of Historic Places for the Chesterfield Center Historic District, and included Center Cemetery in the nomination. Later that year, the Town received a Survey and Planning Grant from the Massachusetts Historical Commission, which allowed for the preparation of this *Master Conservation Plan.* For an overview of the cemetery's historical development, refer to the pull-out illustration in this section of the Plan entitled *Historical Development of the Center Cemetery Landscape.*

Period of Historical Significance

The period of historical significance for Center Cemetery spans the years 1764 through 1890. During this 126-year period, the cemetery was established and enlarged twice to reach its current 2.75-acre size. Many of the cemetery's most distinctive historic features were added during this time, including its stone walls, tomb, grassy paths, and its numerous gravestones, some carved by local artisans. Efforts to preserve the cemetery should honor this period, placing high priority on conserving the historic features, and removing and/or altering features that fall outside this period.

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ASSESSMENT

The following is an assessment of the landscape conditions at Center Cemetery. Its purpose is to document the cemetery's existing natural, built, and functional features; analyze their condition; and outline preliminary recommendations for preservation treatment. Together with the historical chronology, the assessment provides a foundation for the Master Conservation Plan. For an illustration of the existing conditions at Center Cemetery, refer to the pull-out map in this section of the Plan.

Figure 6. The Center Cemetery granite front wall provides a strong separation between the cemetery and its North Road edge.

Context, Edges & Views

Center Cemetery lies along the western edge of North Road, approximately 1/10th mile from the intersection of Route 143 in Chesterfield Center. Visitors approaching the cemetery from the south proceed down North Road from Route 143, along a quiet roadway lined with regularly-spaced mature sugar maple trees. The cemetery sits very close to the road, in a largely wooded setting.

- To the south and west lie woodlands, with hedgerows of deciduous trees abutting the cemetery. A similar woodland fills the east side of North Road. To the north is a residence surrounded by a large lawn and meadow.
- The cemetery is edged on the east and south sides by two types of stone walls. A dry-laid stone wall, standing approximately three feet high, rims the entire south edge, and the same wall stands two feet high along the northern portion of the east edge. A mortared, cut granite stone retaining wall supports most of the east edge (see *Figure 6*). In some spots, this wall stands as much as five feet, creating a clean edge between the cemetery and road, and providing one of the cemetery's most distinctive features. An iron pipe rail once stood atop this wall, and pieces of it still remain. The rail is in poor condition.
- An iron fence – constructed in a style to match the iron pipe rail – encloses the cemetery's west side, and while leaning in spots, is in fair condition. The fence consists of two iron pipe rails, supported by interim vertical pipe iron, topped with round finials.
- A gravel road is all that separates the northern edge from the adjacent residential property. Because of this, the cemetery appears to spill over into the neighbor's meadow.
- Because of the cemetery's pleasant setting within woodlands and meadows, views from both the outside looking in, and the inside looking out are positive. From each of the four corners, visitors can scan across the cemetery's old section. Views from the center of the cemetery looking eastward include hills of the Connecticut Valley. The only less positive view is from inside the

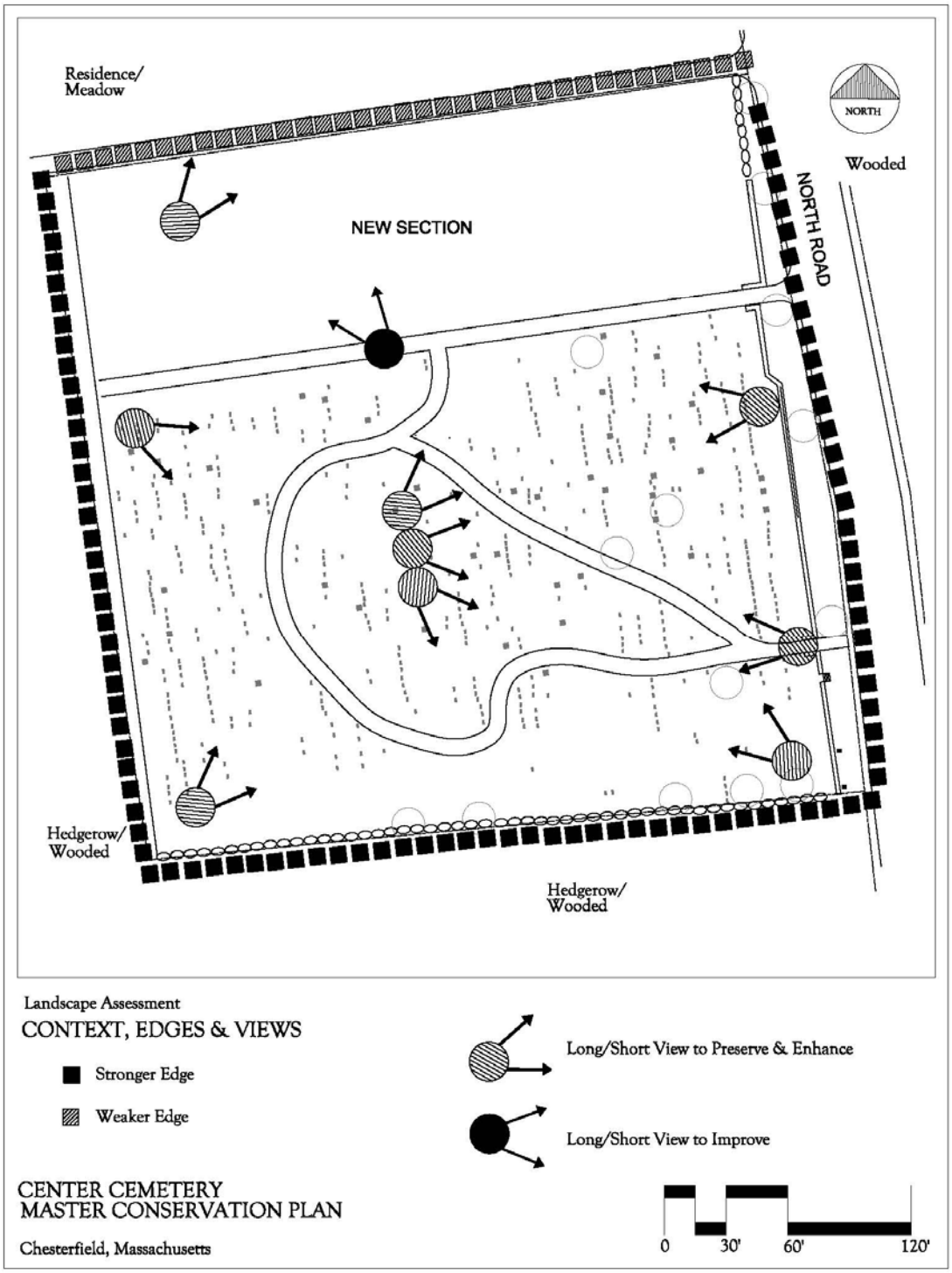

Figure 7. Assessment of the context, edges and views at Center Cemetery.

EXISTING CONDITIONS of the CENTER CEMETERY LANDSCAPE

LEGEND

- INDIVIDUAL GRAVESTONES
- FAMILY MONUMENT
- TOWER — FAMILY PLOT
- TREE OR STUMP

TOWN OF CHESTERFIELD
Massachusetts

CENTER CEMETERY
MASTER CONSERVATION PLAN

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cemetery looking northwest toward the residence. Lack of a vertical edge on the northern boundary makes the residence appear to be part of the cemetery landscape.

Entrances, Circulation & Accessibility
Visitors to Center Cemetery may enter the cemetery at one of four defined points, and circulate along established roads and paths.

Figure 8. The pedestrian path leading into the Old Section passes the flagpole area and loops through the gravesites.

- Visitors to the cemetery by vehicle generally pull their cars to the either side of North Road and park outside the cemetery edges. Motorists entering the cemetery generally park along one of the established roadways on the north and south sides of the "New Section."
- Vehicular entrances stand along North Road at the north and south edges of the "New Section." Each is wide enough to accommodate a car, and each is defined by a break in the perimeter wall. Neither is marked with an "entry" or "exit" sign. Vehicles entering the southern of the two entrances must motor up a steep slope into the cemetery.
- Pedestrians may enter at one of two points along North Road along the "Old Section." A break in the perimeter wall defines a primary entrance (to the north), and a set of steps through the perimeter wall provides a secondary entrance (to the south). Each entrance requires that pedestrians traverse a steep slope or climb steps, limiting accessibility to the cemetery.
- The established vehicular roads along the north and south edges of the "New Section" lead from North Road to the cemetery's western edge and dead-end. Each is surfaced in a different material – turf (lining the south edge) and gravel/dirt (lining the north edge).
- An established grassy path leads from the primary entrance westward (see *Figure 8)*, meandering through the cemetery's "Old Section" and looping back to the entrance.
- Nearly all of the cemetery's slopes are accessible (5% or less), except for the several entry points along North Road. These steep areas limit access to the cemetery by users with physical disabilities.

Trees & Plants
Most of the Center Cemetery landscape stands open, with its large trees surrounding at the edges, as follows.

- A row of regularly-spaced sugar maple trees stands along the west side of North Road, creating a strong edge feature. Some of the trees have died and been removed, resulting in holes in the regular pattern.
- Hedgerows of deciduous trees line the south and west edges outside the cemetery wall/fence. These provide an important sense of enclosure, privacy and intimacy to the cemetery.

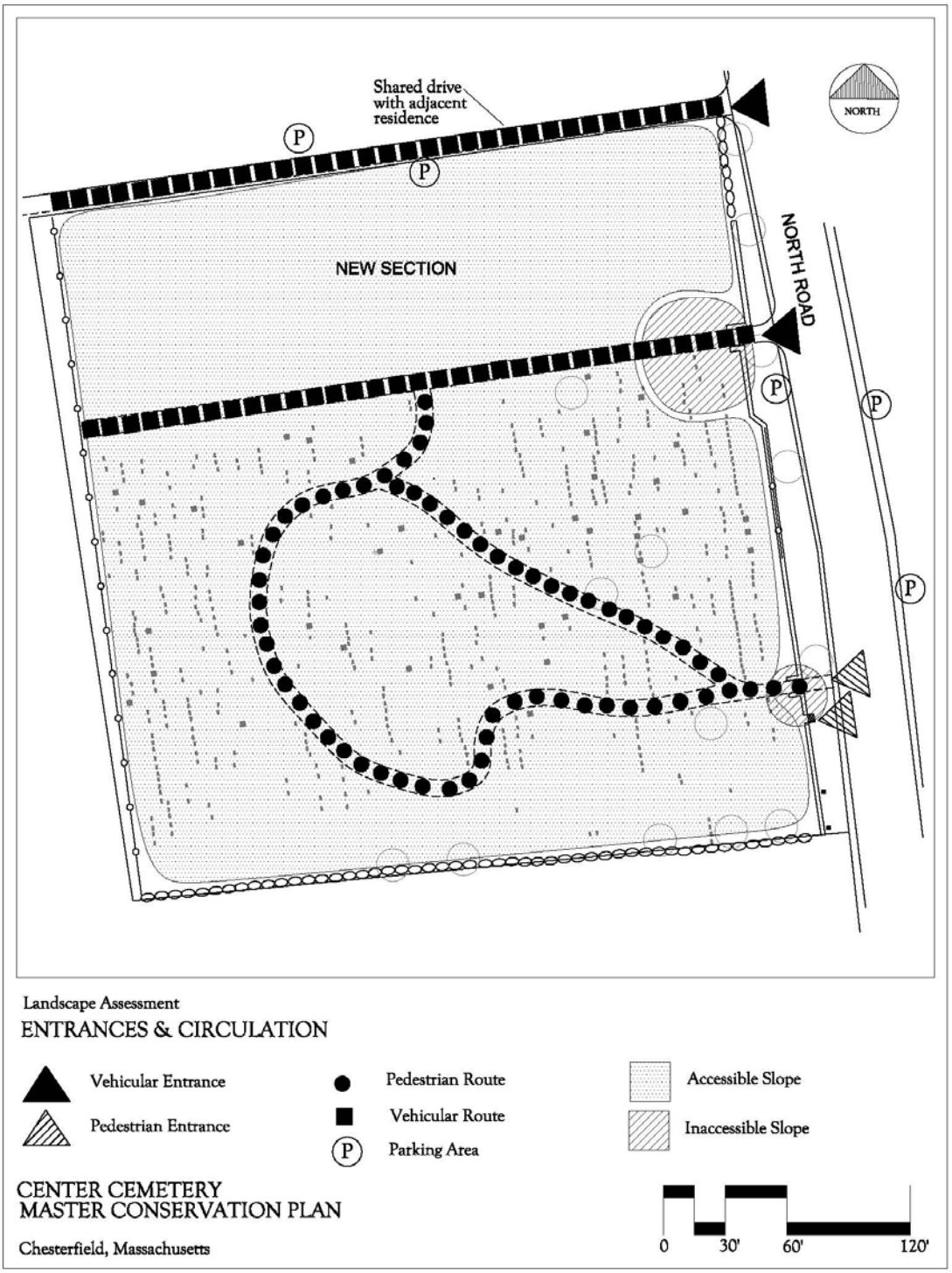

Figure 9. Assessment of the entrances and circulation at Center Cemetery.

- A few large white pines stand at the southern edge of the "Old Section." Many of these have begun to lose limbs, resulting in hazards to the gravestones and monuments.
- Three trees – two cedars (see *Figure 10*) and one birch – have become overgrown within the cemetery, resulting in an unkempt appearance.
- A few families have placed flowering shrubs, including *Spiraea* and *Andromeda*, near gravesites. These have aged and have become overgrown.
- A mix of turf and groundcover fills the floor of the cemetery, creating a soft, multi-textured surface.

Figure 10. Two cedars may have been originally planted to ornament gravesites. Now, they are overgrown and appear unkempt.

Structures

Center Cemetery contains several stone structures that add to the landscape's historic character and visual appeal. They include the mortared stone retaining wall, steps and receiving tomb, and a detailed assessment of each appears in *Appendix B* of this Plan. In summary, their condition is as follows.

- *The receiving tomb.* This cut granite structure was likely constructed around 1850, stands at the northern end of the cemetery's old section, and is built into the mortared retaining wall. Access to the tomb is via a recessed panel iron door, affixed to an iron frame. The frame is bolted to the tomb's stone façade. The tomb's interior consists of cut granite walls and a flat slab granite roof, with a floor of multiple granite slab stones. The interior walls have been mortared, but the mortar has failed in several places, allowing water to seep into the structure. The façade, rear interior wall and portion of the interior side walls have shifted forward, with the most severe shifting along the north portion of the façade.
- *The steps and mortared wall south section.* The south section of the retaining wall and adjacent steps are both constructed of cut granite, with the wall standing approximately three feet high and the steps consisting of four treads. This stretch of wall was fitted with weep holes and re-pointed in 1996 and is in better condition than the remaining wall sections. The wall shows signs of efflorescence bleeding (diluted salts in the mortar), which does not pose any type of structural problem to the wall (rather, just an aesthetic one). The steps appear to be stable.
- *The mortared wall center section, extending from the steps, northward to the tomb.* This section of wall also stands approximately three feet high, and half of the section has been restored and remains in good condition. In contrast to the south section, the central shows little efflorescence bleeding, suggesting it was re-pointed with a different mortar. The other half of the center section has not been restored, and shows several signs of failing. Sink holes have developed above the wall,

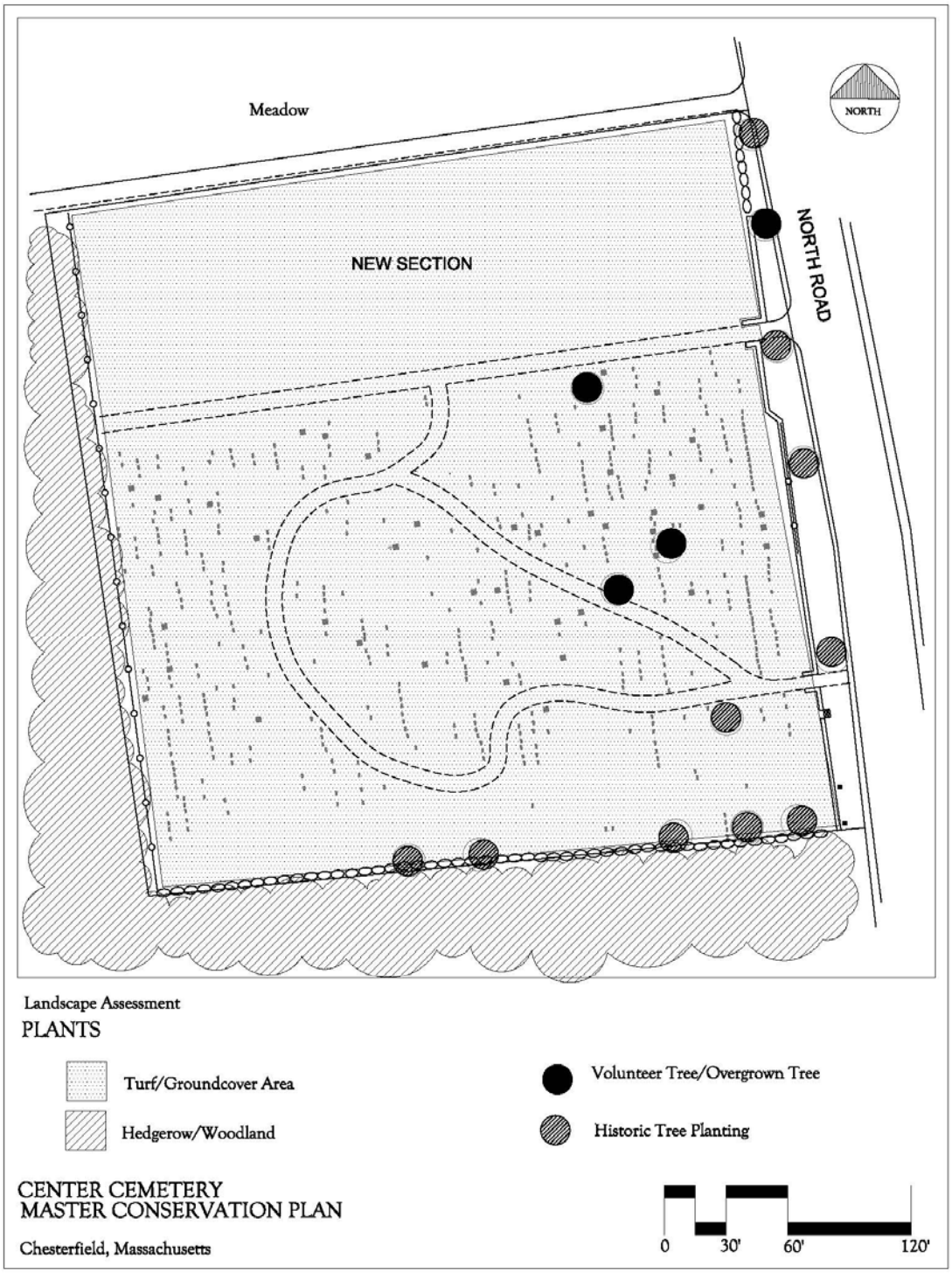

Figure 11. Assessment of the plants at Center Cemetery.

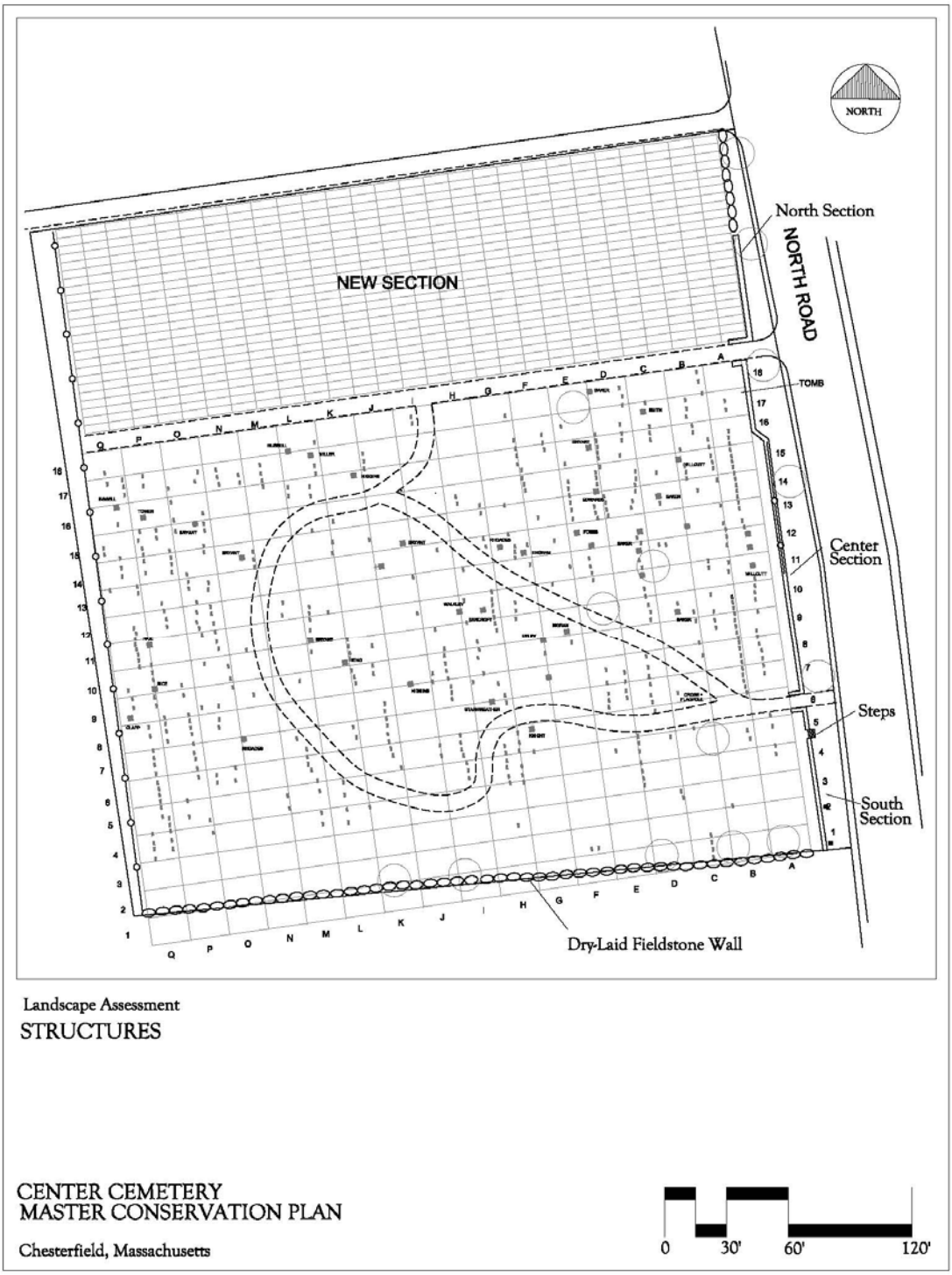

Figure 12. Assessment of the structures at Center Cemetery.

suggesting that soil behind the wall has settled and water is collecting. The result is a shifting outward of this half of the center wall section.

- *The mortared wall north section, extending from the tomb northward.* This wall also stands approximately three feet high and most of its condition is poor, with minor bulging of several stones. It appears that the wall was re-pointed at some time, and steel pins were inserted at the wall corners, intended to either stabilize the wall or serve as hardware for a gate.
- *The perimeter dry-laid stone wall.* A dry-laid fieldstone wall rims the cemetery's south edge. It is likely that this wall dates to the early days of the cemetery, and was constructed of stones gathered from surrounding farmlands. It stands approximately thirty inches, and contains stones ranging in size from eight to 24 inches in diameter. While the wall is visible across the entire boundary, many of the stones have dislodged, giving it a messy appearance. In some spots, suckering trees have sprouted from among the stones, further weakening the wall.

Figure 13. The headstone of Joshua Healy, c. 1791, was attributed by Robert Drinkwater to Elijah Sikes, a stone carver who worked in Chester, Massachusetts, before moving to Dorset, Vermont.

Gravestones & Monuments

Center Cemetery's gravestones are among its most distinctive features. In 1986, Robert Drinkwater examined the stones, and found the carvings of Nathaniel Phelps (1721-1789), Elijah Phelps (c. 1761-1842), Rufus Phelps (1766-1826, son of Nathaniel), Elijah Sikes (born c. 1770, see *Figure 13*), as well as several other artisans working in the early 19th century. The collection bears both local and regional significance for its many examples of early American gravestone art.

Monument Conservation Collaborative, LLC studied all of the stones at Center Cemetery, and identified a total of 197 in need of conservation treatment. Center Cemetery's unusually high water table combined with its severe winters, produce conditions unfavorable to gravestone stability. When water in the soil freezes and thaws, it results in movement, shifting stones and, if present, their foundations. Tree roots also contribute to unstable conditions around the bases of stones.

Of the 197 stones found to be in need of treatment, 97 were in hazardous condition, or in need of immediate conservation treatment. Forty were found to be unstable, and in need of treatment as soon as possible. Sixty were suffering from ongoing deterioration and would likely need treatment within two to five years. The remaining stones appeared in stable condition, but should be re-inspected in five to ten years.

A more detailed summary of the gravestone conditions, along with a listing of hazardous, unstable, and deteriorating stones, appears in Appendix C of this Plan. A complete assessment, including an individual commentary on each deteriorated stone, accompanies this Plan as an addendum.

Landscape Features

In addition to the elements noted above, Center Cemetery contains, or once contained, many other landscape features important to its history. Several other more contemporary features have been added over the years.

- Historic features include the sugar maple allee along North Road, perimeter stone walls (see *Figure 14*), steps, granite hitching posts, grassy pathways, the tomb, and the many monuments and gravestone markers. One family plot – the Starkweather Plot – is surrounded by a series of granite posts once connected by a rail or chain.
- Missing historic features include several sugar maples along North Road.
- Contemporary features include the modern road and plot layout of the "New Section," pipe railing and fence, and the overgrown plant material (cedars and birch).

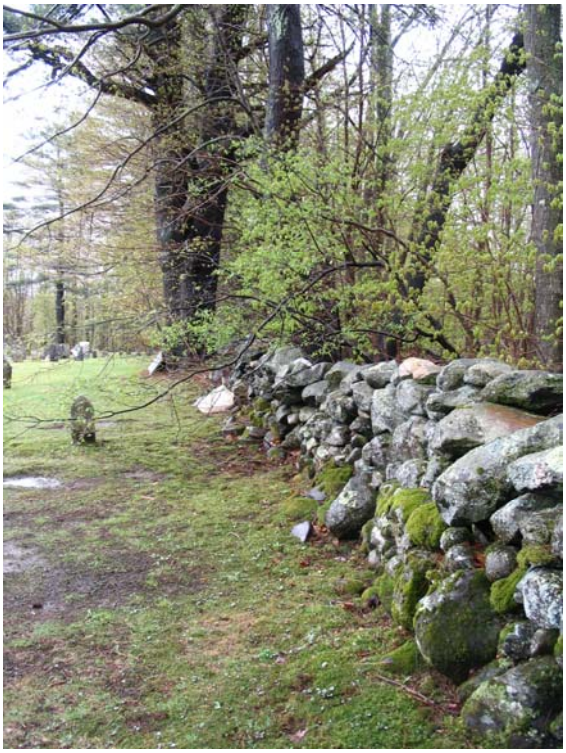

Figure 14. The dry-laid stone wall along the cemetery's south edge may be one of its oldest remaining original features.

Preliminary Recommendations

The following preliminary recommendations for the *Master Conservation Plan* have emerged, based on the historical chronology and assessment of the cemetery.

- The Town should consider enclosing the cemetery on its northern most edge, as a way of separating it from its neighbor and better blending to "Old" and "New" sections. Such enclosure should include a fence or wall and planting of shade trees.

- The Town should stabilize and/or restore the perimeter walls (both dry-laid and mortared stone), and the pipe rail fencing should be removed.

- A stone wall should be built along the cemetery's west and north edges.

- An official vehicular entrance/exit should be defined with directional signage, and parking areas should be established and marked with signs.

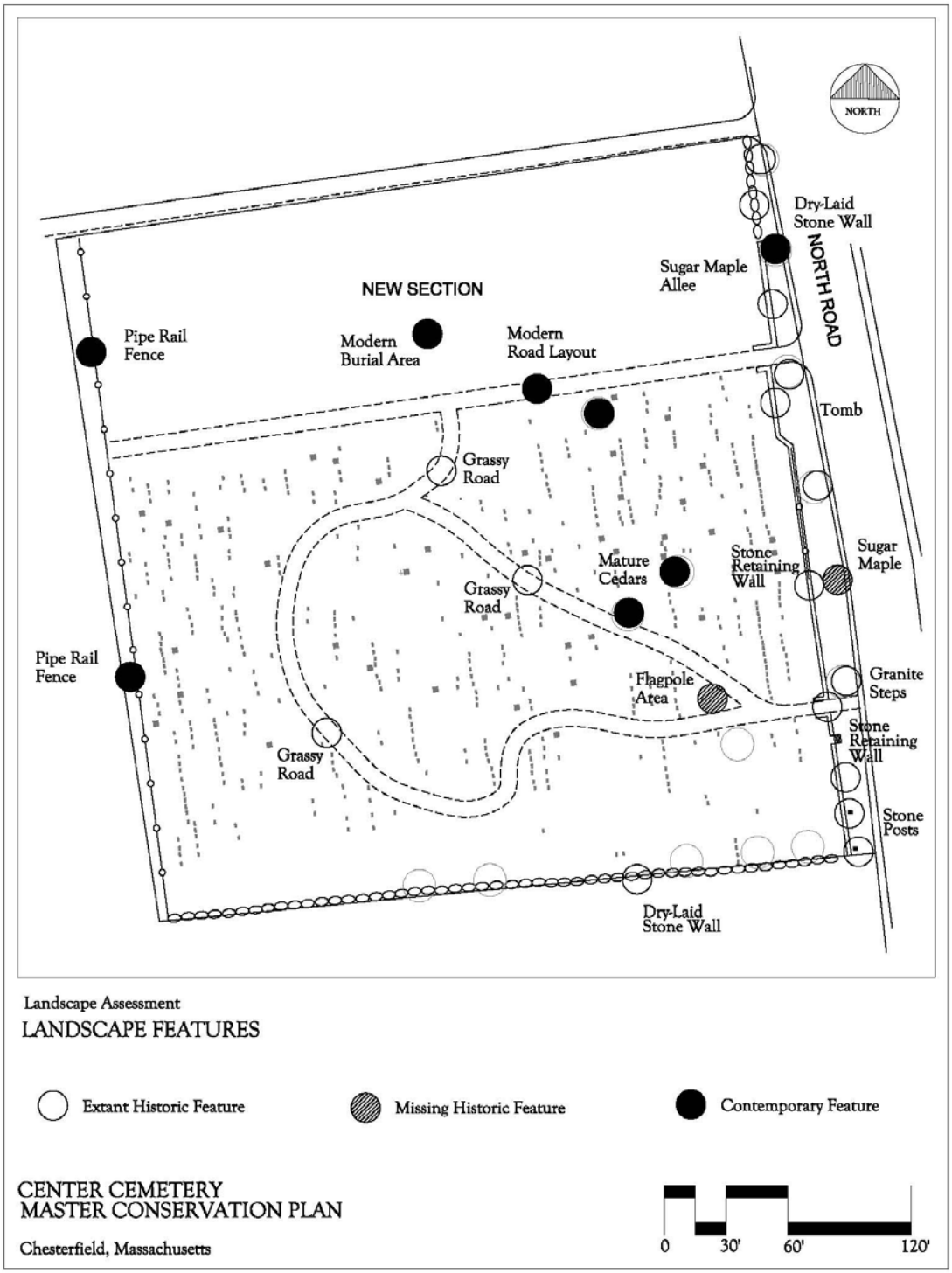

Figure15. Assessment of the landscape features at Center Cemetery.

- The two existing pedestrian entrances should remain, and a welcome sign should be installed at the ramped entrance into the Old Section.

- The Town should add the missing sugar maples to the North Road edge and remove overgrown and/or volunteer trees growing in the cemetery. Existing white pines should remain, but be carefully monitored and maintained.

Figure 16. Preliminary recommendations include stabilizing the tomb structure by rebuilding the façade and installing an improved drainage system.

- The Town should stabilize the mortared stone wall, beginning with the center section, and moving to the north, and lastly the south. The center and north sections will require re-construction, while the section can be stabilized with re-pointing and an improved drainage system.

- The Town should stabilize the tomb structure (see *Figure 16*) by re-building the façade, replacing soil behind the wall with good quality back-fill material and installing an improved drainage system. The door should also be stabilized, with new paint applied and replacement hinges and latches.

- The Town should begin conservation of the stones identified as needing treatment, beginning with the hazardous group first (97), and continuing with the unstable group (40) and deteriorating group (60).

- The Town should re-establish the flagpole area and add seating to the feature.

- The Town should retain and preserve the cemetery's other historic landscape features.

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RECOMMENDATIONS

Treatment Projects

The following are specific recommendations for treating the historic Center Cemetery landscape. Organized around a series of "treatment projects," the recommendations incorporate a combination of methods prescribed by the United States Secretary of the Interior's *Guidelines for the Treatment of Cultural Landscapes.* The methods include:

- Areas for *preservation* (stabilization), where existing form, integrity and materials of the cemetery landscape will be sustained;
- Areas for *rehabilitation*, where features in the cemetery landscape will be repaired or altered to make their use compatible with the cemetery's historic value;
- Areas for *restoration*, where landscape features will be returned to their original form; and
- Areas for *reconstruction,* where landscape features no longer extant will be recreated.

Project 1: South, West & North Edges

This project will provide a face-lift to the cemetery's exterior edges, and create a stronger sense of enclosure. It will also provide an identification marker, giving the cemetery more prominence within the center of Chesterfield. Tasks will include:

- Removing existing pipe rail along western edge;
- Removing all suckering trees and shrubs, leaves, and other debris from existing wall along south edge;
- Stabilizing, restoring and reconstructing the south wall to a 30"-36" height;
- Constructing dry-laid fieldstone walls along the west edge; and
- Installing a sign near the ramped pedestrian entrance, welcoming visitors to the cemetery, informing them of the cemetery's history and importance to the Town of Chesterfield, noting its status as part of a National Register District, and detailing cemetery rules and regulations.

Project 2: Hazardous Stone Conservation, Part 1

This project will involve treatment of roughly half (50) of the stones determined to be hazardous. Work will begin at the east side (front) of the cemetery and proceed westward. Treatments will include re-setting stones (either in the ground or in new bases) and stabilizing foundations.

Project 3: Hazardous Stone Conservation, Part 2

This project will complete the treatment of the remaining half (47) of stones determined to be hazardous. Work will begin at or near the center of the cemetery and proceed westward to the west border. As with *Project 2*, treatments will include re-setting stones (either in the ground or in new bases) and stabilizing foundations.

Project 4: East Edge –South and Central Wall Sections
This project will serve as the first step in stabilizing the cemetery's east edge. Its primary purpose is to secure the central wall section, which was determined to be in the poorest condition. Secondarily, it will upgrade the visual quality of the south section and improve the street edge. Tasks will include:

- Removing and disposing of the existing pipe railing;
- Restoring the central wall section by removing the existing stones, removing soil behind the wall, installing a drain behind the wall at its base, rebuilding the wall by re-pointing with original mortar composition, and replacing soil behind the wall with good quality backfill material;
- Re-pointing the south wall section with original mortar composition to eliminate further efflorescence (if desired); and
- Planting deciduous trees along the North Road edge, between the wall and street, to re-establish the regular allee of trees. The trees may be maples, but must be a salt-tolerant species, such as *Acer rubrum* (Red Maple).

Project 5: Unstable Stone Conservation
This project will involve treating the 40 gravestones determined to be unstable. The stones are scattered throughout the "Old Section" of the cemetery. Work will include re-setting stones in the ground, constructing new bases, stabilizing existing foundations, and repairing cracks.

Project 6: East Edge – Tomb
This project will include restoring the tomb façade and its two wing walls. Per the engineering assessment, restoration will include:

- Excavating behind the tomb and sealing the roof with a modern waterproofing system;
- Installing a drainage system around the tomb and backfilling the structure with high-quality material;
- Removing and numbering the façade stones, cleaning the stones with masonry cleaner applied at a low pressure, and re-building the façade, setting the stones to their original line and grade; and
- Removing the iron door, removing the paint and laminar rusting, and re-painting the door, and reconstructing the handle in a matching style.

Project 7: Deteriorating Stone Conservation
This project will involve treating the 60 gravestones determined to be suffering from ongoing deterioration. These stones appear throughout the "Old Section" of the cemetery. Treatments include re-setting in existing bases, re-setting in the ground, constructing new bases, stabilizing foundations, and repairing cracks through structural adhesion.

Project 8: East Edge - North Wall Section
Project 8 will involve stabilizing the north section of the cemetery's east edge, in the area bordering the "New Section." Tasks will include:

- Removing and disposing of the existing pipe railing;

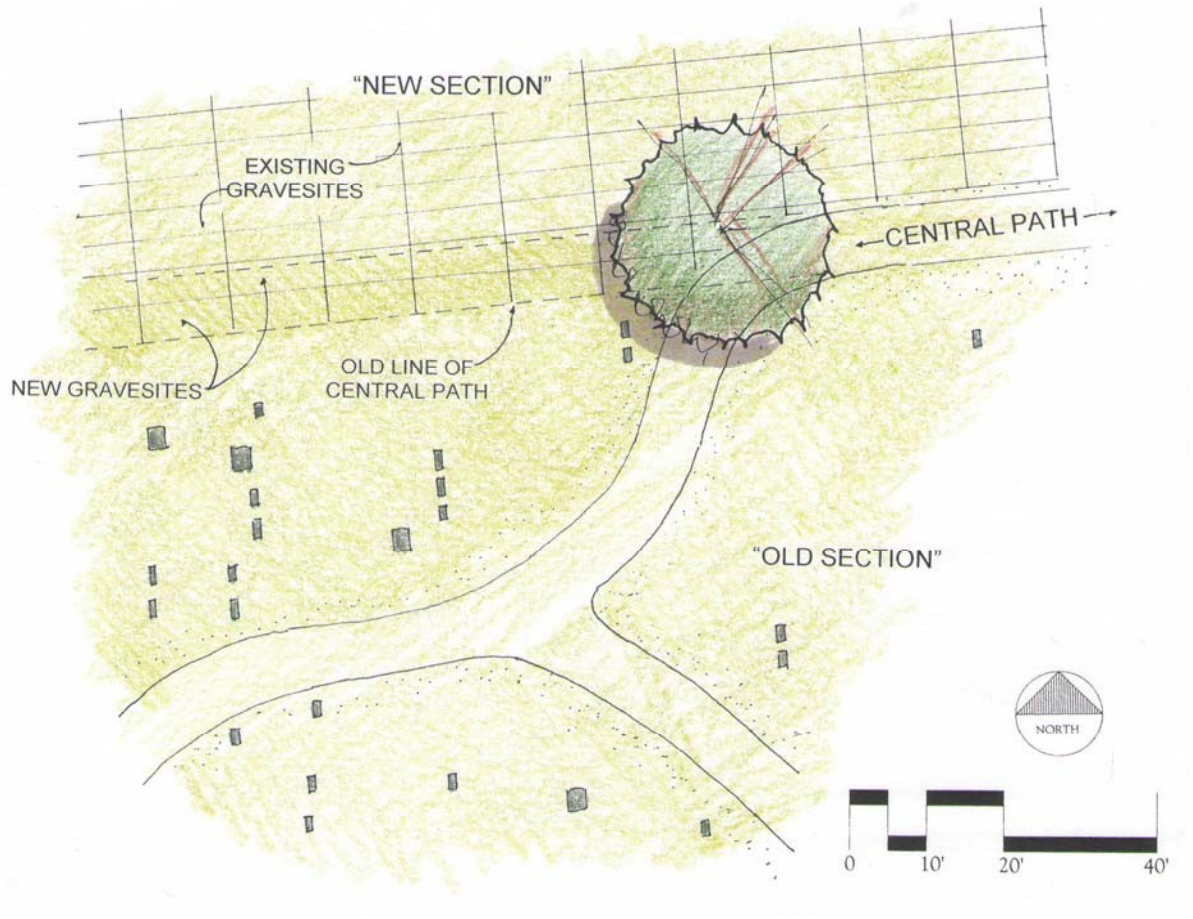

Figure 17. An illustration of the re-routed Central Path. The existing straight path will connect to the paths in the "Old Section," and the remainder of Central Path will be removed. New space will open for approximately 26 new gravesites.

- Removing and numbering the wall stones, and cleaning the stones with masonry cleaner applied at a low pressure;
- Removing the existing soil and installing a drainage system at the base of the wall;
- Rebuilding the wall and backfilling with a high-quality fill material; and
- Planting deciduous trees along the North Road edge, between the wall and street, to re-establish the regular allee of trees. As in *Project 4*, the trees may be maples, but must be a salt-tolerant species, such as *Acer rubrum* (Red Maple).

Project 9: Cemetery Interior

The final project will provide a face-lift to the cemetery interior. The existing grassy paths and layout of gravestones contribute to the historic character, and both should be maintained. The following tasks will help enhance these features, and protect them over the long term:

- Designing and constructing a more substantial setting for the flagpole – one that anchors the pole within the cemetery and provides space for seating and quiet contemplation (see *Figure 18*);

- Terminating the existing central path at a mid-point in the cemetery (on the line between the "Old Section" and "New Section") and connecting it to the existing grassy path system in the "Old Section" (see *Figure 17*).
- Creating new burial sites in the dismantled portion of the central path;
- Removing diseased or dying trees and all shrubs;
- Construction a 30" high dry-laid stone wall along the north edge, with central entry for access into the cemetery;
- Planting deciduous trees in a regular pattern (50' apart) just inside the north wall; and
- Planting new trees in vacant areas. These trees should be chosen from a list of species appropriate for planting in Colonial style burial grounds (see the *Management* section of this plan).

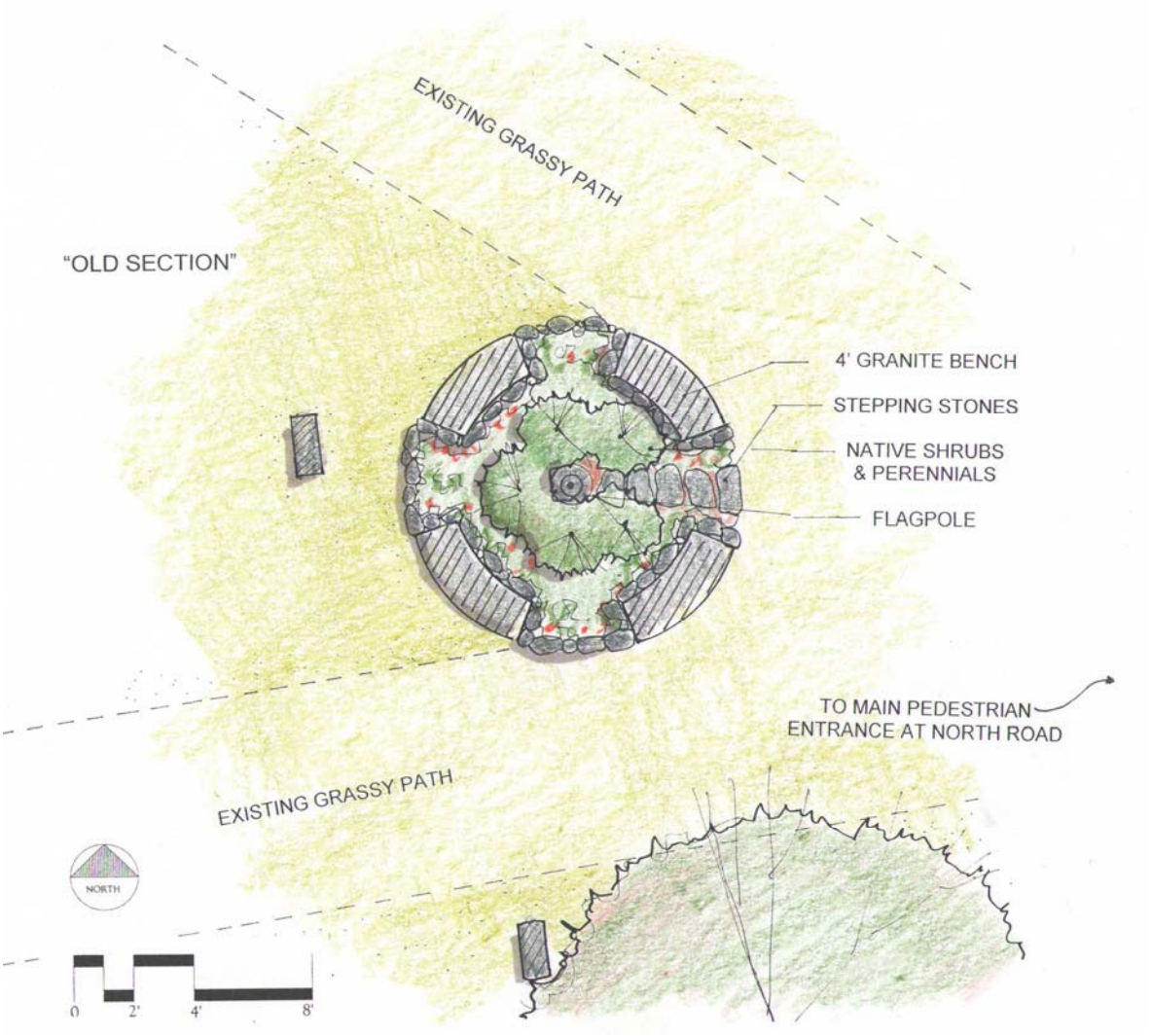

Figure 18. An illustration of the flagpole setting. The existing pole will be surrounded by a low fieldstone wall and granite benches. Stepping stones will provide access to the pole. Native shrubs and perennials will offset the flagpole base.

Cost Projections

The following are projections of costs for the nine treatment projects. Each projection lists the major costs involved in the project. The projections have been prepared at the planning level, and are intended to be used in fundraising efforts only. Actual costs of treatment and/or construction will change during design and engineering, construction detailing, and possibly during construction itself.

Project 1: South and West Edges $ 37,500

- Remove suckering trees and shrubs from existing south wall
- Remove pipe railing from west edge
- Stabilize south wall
- Construct dry-laid stone wall along west edge

Project 2: Hazardous Stone Conservation, Part 1 $ 35,000

- Treat 50 stones determined to be hazardous, using several methods

Project 3: Hazardous Stone Conservation, Part 2 $ 35,000

- Treat 47 stones determined to be hazardous, using several methods

Project 4: East Edge – South and Central Wall Sections $ 38,000

- Restore central wall section
- Plant deciduous trees along North Road edge
- Re-point south wall section (optional – add $ to budget)

Project 5: Unstable Stone Conservation $ 35,000

- Treat 40 stones determined to be unstable, using several methods

Project 6: East Edge – Tomb $ 35,000

- Excavate behind tomb
- Seal (waterproof) tomb roof
- Remove, clean and re-build stones
- Restore iron door

Project 7: Deteriorating Stone Conservation $ 48,000

- Treat 60 stones determined to be suffering from ongoing deterioration, using several methods

Project 8: East Edge – North Wall Section $ 30,000

- Restore north wall section
- Plant deciduous trees along North Road edge

Project 9: Cemetery Interior $ 54,500

- Design and construct new flagpole setting
- Terminate existing central path, lay out new gravesites
- Remove trees and shrubs

- Construct dry-laid stone wall along north edge
- Plant new deciduous trees along north edge just inside new wall

Ongoing Maintenance
The gravestone assessment identified a need to budget an additional $15,000 every two years for ongoing inspection and maintenance of stones.

MANAGEMENT

This section of the Master Conservation Plan will help the Town of Chesterfield care for the landscape at Center Cemetery. It includes strategies for the care of plants (trees and turf), structures (walls and the tomb), monuments and markers. By following this guide, Town employees and cemetery volunteers will help ensure the long term health and beauty of one of Chesterfield's oldest landscapes.

EXISTING PLANTS

Trees

To maintain health and ensure the long-term growth of trees, the Town of Chesterfield should adhere to the measures that follow.

General Tree Management Guidelines

1. Test the cemetery soil for quality in relationship to the mature tree population. The test will detect any soil deficiencies, and determine a remedy for correcting them.

2. Provide and install cables as required. These will help stabilize any weakly-joined tree limbs.

3. Treat trees with a systemic insecticide to minimize stress caused by leaf-feeding pests.

4. Prune trees, removing all dead wood greater than ½" in diameter.

5. Create rings of mulch around the base of each tree, as wide as possible and up to the diameter of the tree crown, and taking care not to obscure gravesites.

6. Where soil has built up at the base of trees, remove enough to expose the root collar.

7. Continue to remove any dead trees or tree limbs.

Shrubs

Shrubs at Center Cemetery largely lie alongside individual gravesites, providing opportunities for individual expression and personal commemoration. Unfortunately, gravesite shrub plantings are inconsistent with the cemetery's 18th century style. Furthermore, they present long-term maintenance problems. They quickly become large and overgrown, obscuring grave markers and complicating lawn mowing. For the most part, families do not maintain the shrub plantings, leaving the arduous maintenance task to the cemetery crews. As existing shrubs mature and die, they should be removed and replaced with ground covers and/or turf.

Ground Covers

Perennial ground covers flourish throughout the cemetery, spreading many textures and hues across the landscape. The Town should make every attempt to retain and encourage growth of the perennial thyme, creeping phlox, bluets, lamb's ears and other ground cover plants. Allowing each time to

bloom, whither, and cast their seeds before they are mown, will allow them to multiply. Weed killers and other such herbicides should not be used where these plants are growing (some species may be classified as "weeds").

Turf

The following fertilizing and mowing guidelines will help maintain the turf areas, promoting a lush, green appearance and healthier, longer living plants.

1. Fertilize sparingly, as too much fertilizer can cause grass to grow too rapidly, requiring more mowing and making the plants more susceptible to disease. Not enough fertilizer can result in weaker plants that are more susceptible to disease or stress brought on by drought.

2. Apply fertilizer three times per year – around Memorial Day and Labor Day, and finally, around Halloween.

3. Do NOT fertilize in mid-summer. At this time of year, roots have become dormant. Fertilizer will cause the leaves to grow, making the plants less tolerant of drought, heat and disease.

4. Follow these fertilizing instructions:
   - *Memorial Day* – apply 1 pound of Nitrogen per 1,000 sf (with 50% of Nitrogen slow-release). Use an N:P:K Ratio of 14-14-14.
   - *Labor Day* - apply 2 pounds of Nitrogen per 1,000 sf (with 50% of Nitrogen slow-release). Use an N:P:K Ratio of 14-14-14.
   - *Halloween* - apply 1 pound of Nitrogen per 1,000 sf (with 75% of Nitrogen slow-release). Use an N:P:K Ratio of 28-3-9.

5. When mowing, remove no more than one-third of the height of the turf at one time, always leaving twice as much leaf height as is cut.

6. The best level for mown grass is 2 ½ inches, with 2 to 3 ½ inches the range.

7. It is best to mow lawns on an as-needed basis, not on a regular schedule, such as once per week.

8. When mowing around monuments and markers, the Town should avoid contact between the equipment and stones. Slashes near the base of stones are one of the most common causes of breakage. Weed-whackers should be used sparingly, and preferably not at all.

NEW PLANTS

When introducing new plants to Center Cemetery, the Town should select species from a palette of plants typically grown throughout the 18th century in Colonial burial grounds and churchyards. Center Cemetery's high water table provides an opportunity to plant water-loving trees and groundcovers. A list of such plants and recommended planting methods follow. Where possible, the Town should plant native plant species (designated with an asterisk on the following list).

Evergreen Trees

**Abies concolor*	White Fir
**Picea glauca*	Black Spruce

Shade Trees

***Acer rubrum*	Red Maple
**Aesculus hippocastanum*	Horse Chestnut
**Liquidambar styraciflua*	Sweetgum
**Liriodendron tulipifera*	Tulip Tree
***Platanus occidentalis*	Sycamore
*Quercus rubra	Red Oak
**Quercus velutina*	Black Oak

**Native tree species.*
***Native trees that thrive in wetter areas.*

No-Shrub Policy

As part of the planting policy for the cemetery, the Town should adopt a "no shrub" rule. As shrub plantings at gravesites grow and mature, they begin to obscure plots, increasing the cemetery's maintenance needs. Instead, the Town should ask families to donate trees to the cemetery, allowing for the replacement of dead trees with new, needed species.

Ground Covers

Ajuga reptans	Bugleweed
Cornus canadensis	Bunchberry
Dennstaedtia punctiloba	Hay-scented Fern
Gallium odoratum	Sweet Woodruff
Housatonia caerulea	Bluets
Phlox stolonifera	Creeping Phlox
Phlox subulata	Moss Pink
Potentilla tabernaemontani	Spring Cinquefoil
Sedum	Stonecrops
sp. reflexum, sp. cauticola, sp. anglicum, sp. brevifolium	
Thymus serpyllum	Creeping Thyme
Viola spp.	Violet species
Waldsteinia ternata	Barren Strawberry

Turf

In areas where ground covers are inappropriate or not preferable, the Town should apply seed and cultivate turf. Where necessary and appropriate, aerate and top-dress any compacted areas, prior to applying seed. The following measures will help insure long-lived, healthy turf areas:

1. A seed mixture, consisting of Kentucky bluegrasses, fine fescues and perennial ryes is best, as it minimizes the amount of mowing (each grows at a different rate) and provides a consistent green appearance. Using a mix will avoid the problems arising from monocultural plantings. A local seed market will offer mixes appropriate for the Hilltown area.

2. Once applied, seed should be covered with straw mulch. Hay should be avoided as it encourages weed growth.

3. The seeded area should be watered as frequently as possible to encourage germination (approximately one inch of rainwater per week).

4. Do not use herbicides to control weeds when the turf is becoming established.

5. Once the turf is established, remove the straw mulch and follow the instructions listed above for ongoing management.

Planting Methods

When introducing new plants to each of the existing communities, the Town should adhere to industry standards for planting of trees, herbaceous perennials and ground covers. At a minimum, the Town should adhere to the recommendations included in the following planting details (*Figures 19* and *20*).

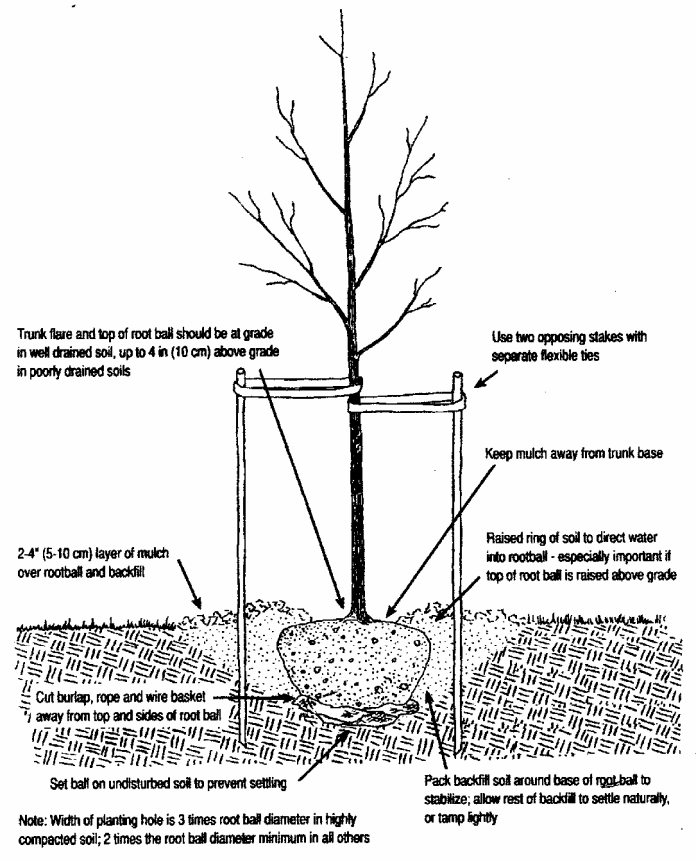

Figure 19. Tree Planting Detail. Source: University of Connecticut Extension Service.

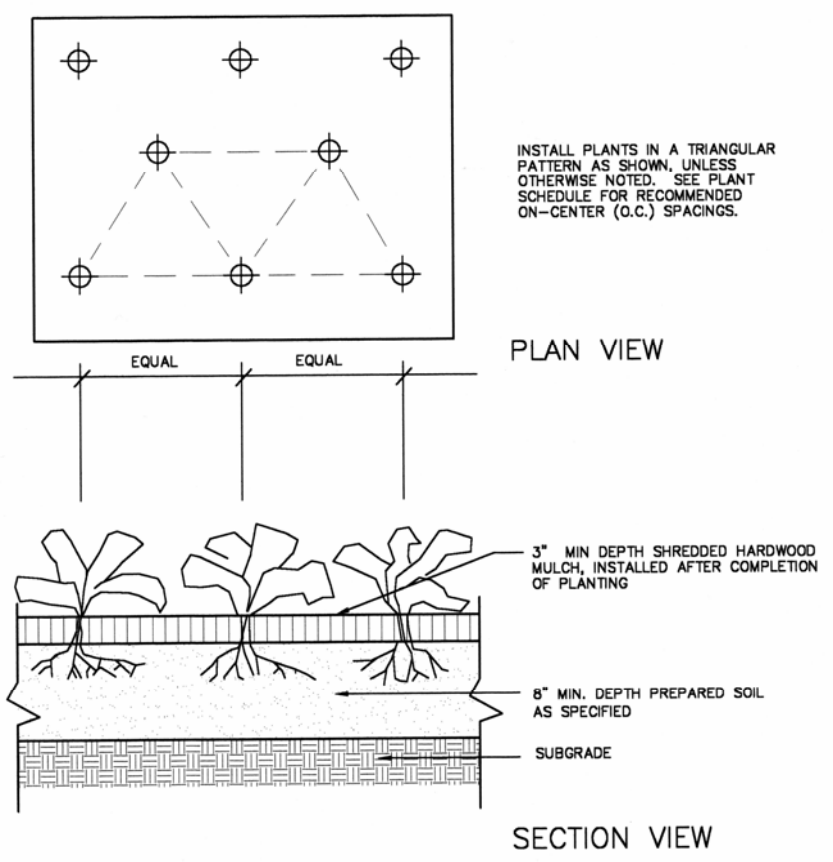

Figure 20. Ground Cover Planting. Source: Martha Lyon Landscape Architecture, LLC.

GRASSY PATHS

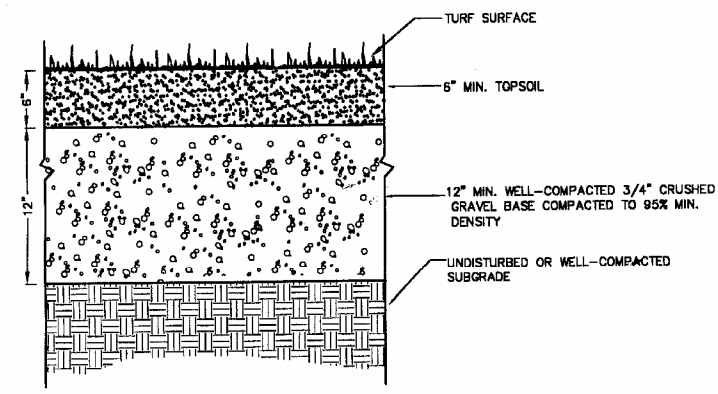

Figure 20. Reinforced turf detail. Source: Martha Lyon Landscape Architecture, LLC

The Town should inspect the turf paths yearly, looking for damage from frost heaves or vehicle tires. If the routes require patching, the Town should fill holes and grooves with crushed stone or gravel, and allow turf to naturalize around filled areas (see *Figure 20* for details). Adding four to six inches of topsoil and seed to the gravel will expedite the naturalizing process. The gravel will reinforce the turf, minimizing future wear.

STRUCTURES

The Town should inspect the east walls, tomb, and perimeter wall yearly, looking for dislodged stones, cracked mortar, and dirt. Repairs should be made by qualified professionals only. To prevent build up of dirt and grime on the east wall and tomb façade, the Town should wash the surface yearly with a low-pressure application of water (less than 250 psi).

MONUMENTS & MARKERS

Specific recommendations for treatment of Center Cemetery's gravestones appear in the Gravestone Assessment (*Appendix C*) of this plan. Conservation can be carried out by restoration specialists or, depending on the type of damage, properly trained volunteers. Under no circumstances should untrained individuals attempt to repair stones, as improper treatment of stones can lead to further deterioration. Conservation professionals will employ treatments that help stabilize the monuments and markers for many, many years. However, because the stones lie exposed to weather and are vulnerable to vandalism, further deterioration is always possible. Should further damage occur, the Town should consult a stone conservation specialist, before undertaking any type of repair.

MANAGEMENT SCHEDULE

January - March	▪ If removing snow, minimize (or eliminate altogether) the use of salt.
April	▪ Inspect the historic structures (walls and tomb) and gravestones for damage that may have occurred over the winter. Consult a specialist about repairing any major damage. ▪ Remove leaves from inside and outside the cemetery's dry-laid stone retaining wall (south side) ▪ Inspect grassy paths for damage that may have occurred over the winter. Patch accordingly.
May	▪ Inspect trees for damage that may have occurred over the winter and note any needs for pruning and removals. ▪ Begin mowing turf on an as-needed basis to a height no less than 2-1/2 inches. ▪ Around Memorial Day, fertilize turf areas (14-14-14). ▪ Plant new trees and groundcovers, and seed lawns, as required.
June	▪ Conduct pruning and removals of trees. ▪ Continue mowing turf on an as-needed basis to a height no less than 2-1/2 inches. ▪ Continue to plant new trees and groundcovers, and lawns, as required.
July	▪ Continue mowing turf on an as-needed basis to a height no less than 2-1/2 inches. Suspend mowing during hot, dry periods.
August	▪ Continue mowing turf on an as-needed basis to a height no less than 2-1/2 inches. Suspend mowing during hot, dry periods. ▪ Around Labor Day, fertilize turf areas (14-14-14).
September	▪ Continue mowing turf on an as-needed basis to a height no less than 2-1/2 inches. ▪ Resume planting of new trees and groundcovers, and lawns, as required ▪ Inspect historic masonry and gravestones for damage that may have occurred over the summer. Consult a specialist about repairing any major damage.
October	▪ Around Halloween, fertilize turf areas (28-3-9).
November - December	▪ If removing snow, minimize (or eliminate altogether) the use of salt.

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APPENDIX A
Historical Chronology

1739. The New Hingham plantation was laid out as early as this year, consisting of 23,040 acres.

1755/56. Gideon Bisbee came to town and cleared land, but did not stay.

1762. Chesterfield was incorporated as a Town, consisting of 16,000 acres (the town of Goshen broke off from Chesterfield), and was named after the 4th Earl of Chesterfield. The Town was settled between 1755 and 1775, by nearly 200 families. The first resident was George Buck, who established a residence on Ireland Street (Buck was Irish). Chesterfield held its first Town Meeting on July 20, 1762, and at this meeting a committee was appointed to obtain a minister for the Town. The first minister was Thomas Allen, who only stayed for six months.

1763. A proposal was made to Town Meeting to agree upon a place for a burying-ground, but the proposal was voted down.

1764. Center Cemetery was established. At May Town Meeting, a vote was taken to establish a committee to purchased land for a burying-ground, and clear and fence the same. A Town Meeting was held again in October, and during the meeting, the committee reported that they had agreed with Mr. Archelaus Anderson for one acre and a half of land, laying upon said Anderson's Hill, for 2 pounds 8 shillings, lawful money. The boundaries of the burial-place were defined as:

> *Beginning five rods west of Benjamin Bonney's wife's grave, thence running east eighteen rods by Archelaus Anderson's north line, thence south thirteen and one-third rods, thence west thirteen rods, thence north eighteen rods to the place of first beginning, containing one acre and a half.*

The wife of Benjamin Bonney had died this year, and her grave had been dug at the Center Cemetery site by Abiel Stetson. The cemetery grew up around Mrs. Bonney's grave.

The Congregational Church of Chesterfield was formally organized on October 30th.

1768. The first meetinghouse was built.

1769. North Road was accepted and described as *"Beginning at a hemlock tree on ye county road about six rods east of ye Rev. Benj. Mills; house and thence straight by ye east end of his Barn, the thence straight by re east end of ye Burying Yard, thence straight to and Between ye lowermost ledge and ye Second ledge and St. Abner Brown's lot, and thence between ye ledge to a convenient place to go down thence straight to ye meeting house, and ye road is four rod wide"* (64').

1776. The population of Chesterfield was 1092.

1825. The Town purchased ¼ acre of land on the western side of the burying ground from Oliver Edwards, Jr.

1893. Beginning in this year, the annual reports recorded payments for "driving hearse," "going with hearse," "driving and care of hearse." Between 1893 and 1921, these yearly payments were made to A. O. Bisbee. In 1922, 1928, and 1931 hearse driving was done by Bisbee Brothers. After 1931, the Town Reports do not include hearse driving or upkeep payments.

1902. The annual report makes mention of the Daniels and Reed Trust Funds (these may have existed before that time). The report does not mention the intent of these funds.

1918. The annual report lists the Cemetery Trust Funds: Daniels, Reed, Engram, and Bisbee, ranging in balance from $100 to $500. These individual funds were maintained for the purposes of cemetery care well into the 20th century.

1927. The Town Report cites a need to care for "neglected cemeteries." The Town pledges $25.00 for 1928 to be used for such purposes. This yearly appropriation for neglected cemetery care continued up until the 1950s when the amount reached $450.00.

1928. A new cemetery fund was established, known as the Kelso Cemetery Fund, with a balance of $846.66.

1930. The Town Meeting warrant appears for the first time in the Town Report. In it an article appears asking for $25.00 to work on neglected cemeteries.

1934. Work continued on "neglected cemeteries," and included the use of cement.

1935. Four new trust funds were added for cemetery care. A State Auditor's report recommended that the trust funds be accepted by Town vote and maintained by the Town Treasurer.

1940. The Town Report notes that repairs were made to the Thomas Damon stone by the firm of Brown, Stevens & Fifield.

1949. In this year, the Town Report includes an entry from the Cemetery Fund Trustees. Also in this year, the Town spent $250.00 to straighten stones at Center Cemetery.

1951. The Cemetery Trustees reported that old unmowed land had been reclaimed in the cemeteries so that power mowers could be used.

1952. The Cemetery Trustees reported that the yearly appropriations for "care of neglected cemeteries" had paid off – that the condition of the cemeteries had much improved.

1954. The Center Cemetery Association voted to dissolve at the February 1st Town Meeting. The Town Meeting also voted to accept land and all monies over which the Association had previous jurisdiction. Two trustees were appointed by the Select Board to oversee all cemeteries except the Bofat (which had its own association). Also in this year:

- the Center Cemetery entrance drive was repaired;
- the front steps were put in place and cemented;
- the iron fence remaining on the north side was placed on the west boundary; and
- all of the fence was freshly painted.

1955. The Town Report noted that one dead pine tree was cut from Center Cemetery, and that the wall from the tomb south to the driveway was pointed up and its overall appearance and safety greatly improved.

1957. The Cemetery Trustees were given a charge by the Select Board to oversee expenditures of the Cemetery Trust Fund income. The Town Report began referring to the Trustees as the Cemetery Committee. The Committee continued to maintain all Town cemeteries with yearly appropriations combined with trust fund interest.

1964. The Town Report noted that brush had been cleared along the highway between the tomb and the northern right-of-way and "with some additional landscaping in the near future, this will allow for a number of additional lots."

1965. In this year, the Cemetery Committee began to cite the future need for more land, ideally to be obtained adjacent to Center Cemetery. The Town Report stated that while "there is no immediate need for additional land for lots at Center [and Mount] Cemetery, it should be kept in mind that in the not too distant future more land will be needed to accommodate the Town's growing population.

1966. The Town Report noted that landscaping was done at Center Cemetery.

1967. The Selectmen contacted abutters to Center Cemetery regarding the purchase of more land, but there was "no chance" at this time.

1968. Concern about the need for additional land continued. The Town Report noted that "more land adjacent to Center Cemetery was becoming necessary," and if something did not become available, that another site would have to be pursued.

1969. The town established the position of Cemetery Sexton. The tTwn Report referred to the duties of the job as "unpleasant."

1970. Homer R. Bisbee and Frank & Mabel Kent established two new trust funds, intended for the care of Center Cemetery. The Town Report noted that the Cemetery Committee would like to see winter burial prohibited, because it made a mess of the landscape. Instead, they recommended using the tomb for storage.

1971. A dead elm was removed from Center Cemetery.

1973. The Town Report noted that leaning monuments were straightened and landscaping was done around sinking graves. It also restated the Cemetery Committee's concern that the need for more land was acute. The Committee suggested appointing a special committee to investigate the possibility of acquiring more land.

1974. The Cemetery Needs Committee was appointed, charged with either finding "an agreeable means of enlarging the present area of the cemetery or locating a new site." The Town also voted to charge $50.00 per grave for residents and $100.00 for non-residents.

1975. The Town Report noted that an experiment was tried in a small section of the Center Cemetery by placing some of the older stones with poor foundations flat upon the ground. The Cemetery Committee stated that "although the initial cost of this work is somewhat greater than the conventional straightening and aligning of stones," they believed that over a period of time money would be saved because of decreased mowing and trimming time.

The Cemetery Committee also adopted a set of rules and regulations for the Town-owned cemeteries. They included:

- duties and responsibilities of the cemetery committee;
- fees for lots;
- restrictions governing planting and removal of trees, shrubs, and certain plants;
- requirements for foundations and monuments;
- prohibiting of horseback riding, recreational vehicles use;
- prohibiting of wooden burial cases, except for newborn or child burials.

The Cemetery Committee also reported their progress with acquiring more land in the immediate vicinity of Center Cemetery. They had not had any success, and noted that land may be available by enlarging an existing private cemetery.

1976. The Town Report noted that graves were leveled and brush cut away from the back fence.

1977. The Cemetery Committee purchased several pieces of equipment, including a riding mover, push mower, and power grass trimmer. Maintenance help was provided by the CETA program.

1979. The map of Center Cemetery was updated by Mrs. Nancy Hewes. The Cemetery Committee hired a sexton to open graves by hand, as well as a superintendent. The Committee raised grave prices to $100 for residents and their sons and daughters, and $200 for non-residents. Grave openings were priced at $125, with $35 for cremation graves. Several stones were straightened.

1981. The Town Report noted that a new iron pipe fence was needed along the rear boundary of the cemetery, and that temporary repairs had been made to the pipe. It also reported that

monuments had been straightened and in some places, new foundations had been installed.

1983. The Town Report stated that only 142 lots remained unsold at Center Cemetery.

1984. The Town Report noted that the Cemetery Committee hoped that work on the vault would be completed during the summer of 1985. This was to include work on the ceiling, floor and walls and the addition of racks.

1985. The Cemetery Committee received a quote for work on the vault, and restoration was to commence after Memorial Day [it doesn't appear that this ever happened].

1986. The Cemetery Committee's report to the Town mentioned three projects that should be considered: rebuilding and repairing the vault; repairing and replacing the fence at the rear of the cemetery; straightening monuments.

1987. The iron fence along the east cemetery edge (North Road) was damaged by the Town bucket loader while pushing snow.

1989. The Cemetery Committee turned care of the cemetery over to an independent contractor. The Town Report noted that the vault had still not been repaired, and land had still not been identified.

1991. The Cemetery Committee made an appeal to local families and individuals for funds to support cemetery care. They raised $2,000.

1992. The front wall of Center Cemetery was rebuilt after it collapsed due to heavy frosts of the previous winter.

1993. The Town Report mentioned that the rear fence remained un-repaired.

1994. Several of the monuments near the front (east) of the cemetery were straightened to improve the landscape's appearance from the highway.

1995. A request for bids was issued for reconstruction of sections of the cemetery retaining wall. The estimate was $9,800.

1996. Bruce Mason was hired to rebuild a substantial portion of the wall facing North Road. The Town Report noted that the Superintendent (Fred Hewes) was intending to rebuild more of it.

1997. An old pine was removed from the cemetery. The Cemetery Committee once again investigated the possibility of acquiring more land.

1998. An additional pine was removed.

2000. Donald Fobes, a Chesterfield resident and cemetery enthusiast, died and bequeathed $25,000 to the Town for cemetery upkeep.

2007. The Chesterfield Center Historic District was nominated to the National Register of Historic Places. Center Cemetery is a part of that district.

Appendix B:

Engineering Assessment

CENTER CEMETERY
Chesterfield, Massachusetts

May 2008

CME

Architecture, Engineering, Environmental Science & Land Surveying
333 East River Drive, Suite 400
East Hartford, Connecticut 06108
(860) 290-4100 ◆ fax (860) 290-4114
www.cmeengineering.com

Engineering Assessment

CENTER CEMETERY
Chesterfield, Massachusetts

Table of Contents

1.0 Structures at Center Cemetery

The purpose of this report is to review the existing conditions of significant structures located within the cemetery. These structures include the following:

Receiving Tomb
South Section of Wall and Stairs (south of entrance path)
Center of Wall (from south entrance path to the tomb)
North Section of Wall (north of the tomb)

In order to use a common point of reference, this report will refer to the project grid that has been established on a plan entitled "Existing Landscape Conditions" developed by Martha Lyon Landscape Architecture, LLC. We will refer to this document as the "site plan." This plan is located in the Master Conservation Plan for this project.

2.0 Condition Assessments of Structures

2.1 Existing Conditions of the Receiving Tomb

Center Cemetery contains one receiving tomb. It is located on the eastern side of the cemetery along North Road. The tomb is located on grid A17 on the site plan. This tomb is constructed with cut granite stonework. The exact date of the construction is not known.

East Elevation of the Receiving Tomb

Exterior: The exterior front wall has a noticeable lean at this time, and there are minor sink holes in the topsoil above the front wall. The front wall stones at the north end have shifted significantly. When viewed from the interior, it is apparent that the entire front façade of the tomb has shifted toward the road. This has opened up gaps between the roof stones and the front façade, which is now allowing water to come in.

Side view of Front Facade

The joints between the stones are mortared. Most of the joints have been re-pointed in the past. An inspection of the mortar deep within the wall indicates that the structure was originally mortared as opposed to a dry laid wall. There is minor staining on the exterior of the front wall.

The entrance to the tomb consists of an iron door supported by iron hinges. The door is a recessed panel door that is made up of several plates. There are large hinges on the front of the door, and rivets on the rear. There is a door lock near the handle and several latches to secure the door when closed.

It appears that the door and hinges are original to the tomb. The only portion of the door that is missing is the upper and lower portions of the door handle, which have broken away. The door frame is also iron, and is bolted to the stone façade. There is some laminar rusting on the door, especially the lower portions. The door frame is very tight; therefore, the door does not close properly at this time.

Tomb Door

Interior: The tomb was opened for inspection. The interior stonework consists of cut granite walls and a flat slab granite roof. The floor is made up of several granite slab stones. The entire interior of the tomb has been re-pointed several times. The stonework in the interior of the tomb is in fair condition. The rear wall, lower portions of the side walls and the ceiling do not appear to have shifted at all over time; however, the front wall and the upper front portion of the side walls has moved forward approximately 2 inches. There are diagonal cracks running along both side walls from the upper rear portion of the wall to the lower front portion of the wall. The cracks are wider at the top than the bottom. There are no significant cracks in the rear wall.

North Wall of Tomb Interior
(Arrows show cracking pattern)

There is heavy infiltration of water. The tomb was inspected during a rainy day and after a storm. It was obvious that water was essentially flowing through the tomb. The water is either coming from the roof joints, or up through the floor.

2.2 Existing Conditions of Retaining Walls

The purpose of retaining walls is to provide relatively level ground where slopes exist. This is typically done in cemeteries to provide additional space for burials on uneven ground. The Center Cemetery has one long retaining wall along the eastern edge; however, this wall has several distinctly different areas. For the purpose of this report, the retaining walls have been broken out into three separate sections as follows:

- 2.2.1 South Section of Wall and Stairs (From Grid A1 to A5 on site plan)
- 2.2.2 Center Section of Wall (From Grid A7 to A15 on site plan)
- 2.2.3 North Section of Wall (north of the tomb)

Below is a brief description of the make-up and condition of each of the retaining walls:

2.2.1 South Section of Wall and Stairs

This wall is a mortared rough cut granite stone wall that is approximately 3 feet tall. This wall is in good to fair condition. All of the stones are in place and the there is no appreciable lean or bulges. We have been informed that this wall was re-pointed in 1996. At that time, small polyvinyl chloride plastic pipe weepholes were also installed. The mortar used for the re-pointing has significant efflorescence bleeding from it. Efflorescence is caused by water migrating through the mortar during and after the curing process. The water carries diluted salts that may be present in the mortar mix and draws them to the surface. When the water evaporates, the salt is left behind as a white flaky substance. Efflorescence is not a structural problem, but an aesthetic issue. The remainder of the wall has a natural covering of lichen.

South Section of Wall Elevation (looking south)

There is a small staircase built into this wall. It consists of four granite steps. The historical research for this project revealed that these steps may have been built as late as 1954. There is a steel pipe railing on this wall with portions of missing railing. The remaining portions are in poor condition with heavy rust at the bases of the posts.

South Portion,Center Section of Wall

2.2.2 Center Section of Wall

South half of wall: The southerly portion of the center section is most likely of the same vintage as the southeast wall. This wall is a mortared rough cut granite stone wall that is approximately 3 feet tall. The south half of this wall is in similar condition to the southeast wall, which is in good to fair condition. This section has been partially re-pointed. This section does not have the same level of efflorescence, which leads us to believe that a different mortar was used. Most of the steel pipe railing is missing from this portion of the wall.

North half of wall: The northern half of the center section is also a cut rough granite wall; however; it is in much worse condition when compared to the south half. The wall is shifting and bulging. We would classify the condition of this portion of the wall as being in poor condition. The face of the wall has shifted outward, which is a sign of either inadequate design, or high soil pressures due to the presence of water. This type of shifting is technically categorized as a failure. Over time, this movement will get worse and eventually lead to a complete collapse of the wall; however, this is a very slow process.

Northern portion, Center Section

Sinkholes behind Wall

There are several sinkholes located directly behind this wall. This is due to settlement of the soil behind the wall combined with the intrusion of ground and surface water. The sinkhole now collects more water, which accelerates the progressive failure of this wall.

Portions of the joints have been re-pointed; however all of the mortar is in poor condition. Most of the pipe railing is still present, but is all in poor condition.

The portion of the wall directly south of the tomb is in very poor condition. The wall in this location has shifted considerably and opened up large voids. There is a large void under the corner of this wall. It does not appear that there are stones below grade. This would need to be verified with a test pit.

East Wall near Tomb

2.2.3 North Section of Wall

This wall is also a mortared rough cut granite stone wall that is approximately 3 feet tall. This wall is in fair condition. All of the stones are in place but there is minor bulging of several stones. There are several iron pins near the corners, which indicate that the wall might have been moving in the past. The pin shown in the adjacent photo was probably installed to help support the gate post. There is a pin on the north end of the wall that was apparently helping to support the wall end.

North Section (looking North)

This wall has been re-pointed in the past. The pointing is older than the 1996 pointing done to the southeast wall. Most of the steel railing is still in place; however, the condition of the railing is poor.

3.0 Causes of Movement in the Tomb Facades and Retaining Walls

All of these structures can be classified as retaining structures. They all support a certain amount of soil, both vertically and laterally. Original plans do not exist for any of the structures; therefore, we cannot offer specific comments on the structural integrity. We can only comment on the information that we gathered during the site inspection. The most common causes of retaining wall failures are inadequate design, poor backfill soils, and excess ground water. The failures and leaning of the walls at the Center Cemetery can be attributed to a combination of all of these causes.

Control of water is extremely important in order to provide a durable long lasting retaining wall. Water infiltration in the backfill soil of a wall can cause several problems:

1. The water will increase the unit weight of the soil, thereby increasing the pressures acting on the wall face.
2. If water is present in the backfill soil during freezing weather and if the backfill soil is not free draining, the soil will freeze and expand causing enormous pressures to build up.
3. Water will decrease the strength of the soil under the base of the wall and limit its ability to support loads.

There is very little control of surface and ground water at Center Cemetery. The walls did not originally have wall drains (weepholes) and the surface runoff is allowed to collect behind the top of the walls where the water can soak into the ground. The weepholes that were installed are inadequate to properly drain the backfill soil. These walls were probably not engineered. They were probably constructed by masons using a rule-of-thumb approach. The tomb façade movement is most likely caused by freezing of the soil directly behind the façade stones. The expansion of the freezing soil has slowly pushed the wall forward.

4.0 Recommendations for Preservation, Rehabilitation and Restoration

4.1 Areas for Preservation

The tomb structure is in fair condition, with the exception of the front façade. In the short term, the tomb can be preserved by means of careful cleaning. The cleaning should not involve high pressure water blasting, or sand blasting. There are modern masonry cleaners that can remove dirt and grime without damaging the base stone. More significant rehabilitation of this structure could easily be justified (see below).

4.2 Areas for Rehabilitation and Restoration

The tomb structure, the south section of wall, the south portion of the center section of wall and the north section of wall are structures that are in need of rehabilitation. This investigation brought out several key issues:

1. The soil behind the walls is most likely frost susceptible.
2. There is no existing drainage system for the removal of groundwater behind the walls and around the tomb.

Recommendations:

- Reconstruction of the Tomb Front Façade

  The materials on the front façade are essentially intact. There is minor damage, however the wall is salvageable. The stones can be carefully removed and numbered. The stones can then be reset to their original line and grade. Stainless steel pins may be used in inconspicuous locations to join the stones together. The interior mortar joints need not be restored as they are not visible from the outside.

  The iron door can be removed and repaired. This will involve removal of all paint and laminar rusting followed by re-painting. The hinges and latches can be salvaged in a similar manner. The broken upper and lower portions of the handle do not need to be replaced in order to keep the door functional. It may be desirable to replace the handle for functional reasons; however, we would not recommend this since it would mean a loss of a portion of the original material of the door. The door is probably coated with lead-based paint. This will need to be carefully removed during restoration.

- Installation of Ground Water Drainage on Wall Structures

  The best way to control ground water is to install a foundation underdrain along the entire length of the wall. The underdrain should be covered with filter fabric in order to prevent clogging from backfill soils. The drains can easily be conspicuously daylighted at the cross culvert in and along the road.

- Replacement of Backfill Material

  This is a very useful method of stabilizing walls that are being subjected to frost action. The backfill material directly behind the face of the wall can be removed and replaced with a high quality gravel or crushed stone. The backfill can be topped with 4 to 6 inches of topsoil that can support new plantings.

  If it is desired to provide a permanent seal to the roof of the tomb, the entire tomb can be excavated and sealed with a modern waterproofing system. This will not be visible once the backfill is replaced; therefore, it would not detract from the historic character of the tomb.

4.3 Areas for Reconstruction

- Reconstruct Failing Walls

  The north half of the east wall has failed. This wall will need to be reconstructed because it is in a state of partial collapse. The existing stones can be removed, numbered and re-used to produce a historically accurate reconstruction. Additional stones may be required in order to provide a structurally sound wall. The backfill material should be a high quality gravel, and a drain system should be incorporated into the design.

5.0 Need for Railings on Walls

It is not known whether or not the iron pipe railings on the retaining walls are original to the wall construction. If the cemetery committee considers these railings to be inconsistent with the appearance of the overall cemetery, it may consider permanent removal of the railings. The railings are also a maintenance issue, as they need routine cleaning and painting. The Massachusetts State Building code does not require railings on retaining walls unless they are over 4 feet tall and have a walkway located within 2 feet of the wall drop off. All of these walls meet these criteria; therefore, railings are not required.

6.0 Costs for Rehabilitation and Reconstruction

We have recently overseen the completion of similar work in other cemeteries in Massachusetts. The largest project involved a similar rehabilitation of a receiving tomb and the reconstruction of stone walls in Adams, Massachusetts. Based on the bid prices for this project, we offer the following general costs for the work at the Center Cemetery.

Installation of Rear Drains and Cleaning of Walls: South Section of Wall South Portion of Center Section of Wall North Section of Wall	$10,000
Façade Reconstruction and Drainage System for the Receiving Tomb	$35,000
Reconstruction of the North Portion of the Center Section of Wall	$30,000

MONUMENT CONSERVATION COLLABORATIVE LLC

Preserving the substance and significance of gravestones

IRVING SLAVID *Conservator*
MARTIN JOHNSON *Conservator*
PROF. NORMAN R. WEISS *Consultant*

CONDITIONS SUMMARY, CONSERVATION RECOMMENDATIONS AND CONDITION ASSESSMENTS

FOR

HISTORIC CENTER CEMETERY, CHESTERFIELD, MA

May 2008

P.O. BOX 6, COLEBROOK, CT 06021 860 379 2462 *MCCLLC@gmail.com*

INTRODUCTION

MCC started inspecting the older section of the Historic Center Cemetery on April 28, 2008 shortly after the snow cover melted. A new location map for the markers was made utilizing an aerial photograph of the cemetery taken in 1966.

We discovered that almost 200 markers are in need of repair; almost half this number is hazardous. This is a significant number.

While there may have been vandalism in years past, the numerous excessively tilted markers and the fallen, overgrown markers are due to a combination of ground water conditions, a lack of maintenance and tree root damage.

The early aerial photo shows a significant number of large trees that are no longer there and have since been taken (or fallen) down. The large root systems of these trees no doubt also contributed to disturbing the adjacent markers.

Approximately 50 years ago a number of concrete bases were poured to help stabilize some markers. A trench was dug around the base of the stone and, after resetting the stone plumb, concrete was poured into the trench. This is neither an acceptable practice, nor is it an adequate foundation for long term stabilization. Many of these "foundations" have now cracked and separated from the markers. There does not appear to be any evidence of other recent restoration work.

CONDITIONS SUMMARY

The phased programming of work projects depends on a number of factors, including the severity (and progressive nature) of deterioration, and the nature and complexity of the required treatments. In most cases, the development of a monument conservation plan also incorporates non-technical priorities. This involves the defining of "value" in terms of the artistic quality and/or historic significance of individual monuments, and thus requires collaboration with local experts, including historians and genealogists.

The primary consideration, however, is safety. A monument that is structurally unsound may pose an immediate danger to the cemetery worker, to the visitor, to itself, or to other monuments nearby. For most historic cemeteries, monuments surveyed can be placed into four technical categories, by priority:

1 hazardous—requires immediate action;
2 unstable deterioration—requires treatment as soon as possible;
3 ongoing deterioration—may require treatment in 2 to 5 years (perhaps monitor);
4 stable—no treatment required (re-inspect in 5-10 years).

Non-technical prioritization involves the defining of particular "value" in terms of:

- artistic quality;
- historic significance (national or local);
- visual contribution to the overall appearance of the site.

Monuments in historic cemeteries may be hazardous if they are not plumb and level. Identification of individual monuments that are in hazardous condition is essential, as is the development of a plan to reduce the potential for damage and injury, and to remove the danger entirely. Markers tilting 15° or greater are listed as 1- hazardous. Depending on their size, markers can be listed as 2- unstable when they have a tilt of less than 15°. Frequently, tilted markers less than 15° are listed as hazardous because they are adjacent to hazardous markers and are at risk.

In general, the risks are greater with taller monuments. Tall markers and large monuments can have a high center of gravity when they are tilted which increases the risk of falling at a lower angle of tilt. Because of their greater size they are also more visible than other stones. For these reasons the larger stones are usually classified hazardous or unstable at lower degrees of tilt.

A total of 197 markers were found requiring restoration treatments in the Historic Center Cemetery.

The prioritisation study for the markers determined that more than half of these stones to be in a hazardous condition. The following are the totals of the study; a complete list with a brief condition description is attached:

1. Hazardous	**97**
2- Unstable	**40**
3- Ongoing Deterioration	**60**

Phased work schedule
The work to be done could be spread over 3 - 4 years if necessary, with the first year concentrating on the 97 hazardous markers.

Realistic conservation estimates at 2008 rates for a professional conservator would be:

Restoration to 97 Hazardous markers:	$62,000 to $67,000
Restoration to 40 Unstable markers:	$29,000 to $33,000
Restoration to 60 with Ongoing Deterioration:	$42,000 to $48,000

Total budget $133,000 to $148,000

Maintenance
After the phased work schedule is completed, and because of the on-going ground problems, MCC recommends a budget of $15,000 every 2 years for a maintenance schedule.

Priority 1 - Hazardous immediate action required

5 - Axtell?, Frank - Re-set in existing base
8 - Utley, Zeruah - Re-square bottom edge Construct new base
11 - Parson, Mary - Possible new base
14 - Luce, Olive and Jonathan - Re-set in ground
17 - Luce, Nehemiah - Re-set in existing base
19 - Stephens, - Re-set in ground Possible new base
20 - Tower, Isaac - Construct new base
21 - Tower, Mary - Construct new base
23 - Carpenter, Ezra - Re-set in ground
24 - Harris, Abigail - Re-set in ground
25 - Ludden, Esther - Re-set in ground
29 - na, Thomas - Re-set in ground
40 - Baker, Marion - Re-set in existing base Stabilize foundation
43 - Baker, Levi - Re-set in ground Stabilize foundation
44 - B., A. - Re-set in existing base
45 - Mills, Benjamin - Re-set in ground
46 - Smith, Eunice - Re-set in ground
47 - Stone, Betsey - Re-set in ground
48 - Stone, Laura - Re-set in ground
61 - E. (Edwards), J. - Re-set in ground Possible new base
62 - E. (Edwards), E. - Re-set in ground Possible new base
63 - E. (Edwards), C. - Re-set in ground Possible new base
64 - E. (Edwards), E. - Re-set in ground Possible new base
65 - E. (Edwards), A - Re-set in ground Possible new base
66 - E. (Edwards), L. - Re-set in ground Possible new base
67 - E. (Edwards), H. - Re-set in ground Possible new base
73 - Hatch, John - Re-set in ground Possible new base
74 - Hatch, Harris - Re-set in ground Possible new base
75 - Swift?, - Re-set in ground Possible new base
76 - na, - Re-set in ground Possible new base
77 - Burnell, Martha - Re-set in existing base Stabilize foundation
78 - na, - Re-set in ground Possible new base
79 - Burnell, - Re-set in ground Possible new base
80 - na, - Re-set in ground Possible new base
81 - Burnell, Hannah - Re-set in ground Possible new base
85 - Bancroft, Talcott - Re-set in ground Stabilize foundation
86 - Bancroft, Dyar - Re-set in ground Stabilize foundation
88 - Engram, - Stabilize foundation
90 - Rhoades, Cynthia - Re-set in ground Stabilize foundation
91 - Rhoades, Chapman - Re-set in ground Stabilize foundation
92 - na, - Re-set in ground
93 - Cooswell, Hezikiah - Re-set in ground
94 - , Mary - Re-set in ground
96 - Brett, Ebenezer - Re-set in ground
97 - South, - Re-set in ground
102 - Sylvester, George - Re-set in ground
103 - na, - Re-set in ground
104 - Bryan, Willard - Re-set in ground
106 - Bryant, Susan - Re-set in existing base
108 - Jacobson, Benjamin - Re-set in ground
113 - Rice, Samuel - Re-set in ground Stabilize foundation
114 - Rice, Amasa - Possible new base

Priority 1 – Hazardous (continued)

115 - Kingsley, Daniel - Re-set in ground
116 - Kingsley, Alan - Possible new base Stabilize foundation Structural adhesion Crack fillers
120 - , David - Re-set in ground
121 - Ban?, Eunice - Re-set in ground
129 - Rice, O. - Re-set in ground
130 - na, - Re-set in ground
131 - Anderson, - Re-set in ground
134 - Bryant, William - Re-set in existing base Stabilize foundation
135 - Bryant, Ansel - Possible new base
136 - Litchfield, Lot - Possible new base
137 - Hayden, Noah - Re-set in ground
139 - Witherell, Julia - Re-set in ground
141 - Stetson, Ruth - Re-set in ground
142 - Stetson, Cynthia - Possible new base Stabilize foundation
143 - Stetson, Bela - Construct new base
144 - Sanderson, Hannah - Re-set in ground
146 - , Timothy - Re-set in ground
147 - Rhodes, Marshall - Re-set in ground
148 - Gibbs, Sarah - Re-set in ground
149 - Edwards, Benjamin - Re-set in ground
150 - Beswick, Quire - Re-set in ground
151 - na, - Re-set in ground
155 - Witherell, Joanna - Re-set in ground
159 - Taylor, Clarissa - Re-set in ground
164 - na, - Re-set in ground
165 - Witherell, Sarah - Re-set in ground
166 - Torres, Ruth - Construct new base
167 - Graves, Franklin - Re-set in ground
169 - Culworth, Charles - Re-set in ground
172 - na, - Re-set in ground
174 - Stebbins, Celia - Re-set in ground
176 - Nichols, Jospeh - Re-set in ground
179 - na, - Re-set in existing base Stabilize foundation
181 - Clapp, Francis - Re-set in ground
182 - Stephenson, Nathaniel - Re-set in ground
186 - Johnson, - Re-set in ground
187 - Nichols, - Re-set in ground Stabilize foundation
188 - Johnson, Sylvia - Re-set in existing base Stabilize foundation
189 - Damon, Isaiah - Re-set in ground
191 - Everett, Rachael - Re-set in ground
192 - , Charlotte - Re-set in ground
193 - Rodgers, Julia - Re-set in existing base Stabilize foundation
195 - Burnell, Mehitable - Re-set in ground
196 - Burnell, - Re-set in ground
197 - na, - Re-set in ground

Total: 97

Priority 2 Unstable, -treat asap

1 - Angell, Martha - Re-set in ground
3 - Wilder, Nancy - Construct new base
6 - Axtell, Violet - Structural adhesion Repair mortars Crack fillers
7 - Edwards, Alonzo - Re-set in existing base
10 - na, - Re-set in ground
12 - Edwards, Morris - Re-set in ground
15 - Luce, Mehitable - Re-set in ground
16 - Luce, Lydia - Re-set in existing base Structural adhesion Crack fillers
18 - na, - Re-set in existing base Stabilize foundation
22 - Clapp, Dwight - Possible new base
26 - Ludden, Benjamin - Re-set in ground
27 - Baker, - Re-set in existing base Structural adhesion Crack fillers
30 - Baker, - Re-set in existing base Stabilize foundation Structural adhesion Repair mortars
31 - Cudworth, Chloe - Possible new base
32 - Stobbins, Levi - Possible new base
33 - Stobbins, Alva - Possible new base Structural adhesion Repair mortars Crack fillers
34 - , (daughter of) - Possible new base
35 - na, - Possible new base
36 - na, - Possible new base
37 - na, - Possible new base
38 - na, - Re-set in existing base Stabilize foundation
39 - Baker, Addie - Re-set in ground
41 - Baker, Emma - Re-set in ground Stabilize foundation
42 - Baker, Clara - Re-set in existing base Stabilize foundation
50 - na, - Re-set in ground Possible new base
51 - na, - Re-set in ground Possible new base
52 - na, - Re-set in ground Possible new base Structural adhesion Repair mortars Crack fillers
53 - Knight, Lucy & Theo - Re-set in ground Possible new base Structural adhesion Repair mortars
54 - na, - Re-set in ground Possible new base Structural adhesion Repair mortars Crack fillers
55 - Knight, Shurael - Re-set in ground Possible new base
56 - Knight, - Re-set in ground Possible new base
57 - Knight, Marion & Elizabeth - Re-set in ground Possible new base
58 - Baker, Howard - Re-set in existing base
59 - Baker, Andrew - Re-set in existing base Stabilize foundation
68 - na, - Re-set in existing base Stabilize foundation
69 - Igham, - Re-set in existing base Stabilize foundation Structural adhesion Repair mortars
111 - Rice, Lynda - Re-set in ground
161 - Warner, Joseph - Re-set in ground
163 - Warner, Noel - Re-set in ground
171 - na, - Re-set in ground

Total: 40

Priority 3 Ongoing deterioration, treat within 2-5 years

2 - Prince, James - Possible new base Structural adhesion Crack fillers
4 - Wilder, Nathan - Re-square bottom edge Construct new base Structural adhesion Crack fillers
9 - Torrey, Joseph - Possible new base Structural adhesion Crack fillers
13 - Edwards, Maria - Possible new base Structural adhesion Repair mortars Crack fillers
28 - na, - Re-set in existing base
49 - na, - Re-set in ground Possible new base
60 - Edwards, Oliver - Re-set in existing base Stabilize foundation
70 - Bates, Abner - Re-square bottom edge Construct new base
71 - Witherell, Chauncey - Re-set in existing base Stabilize foundation
72 - Hatch, Ellen - Possible new base Structural adhesion Repair mortars Crack fillers
82 - Bunell, - Re-square bottom edge Construct new base
83 - Bunell, - Construct new base
84 - na, - Re-set in existing base Stabilize foundation
87 - na, - Re-set in existing base Stabilize foundation
89 - na, - Re-set in existing base Stabilize foundation
95 - na, - Construct new base
98 - , Douglas - Re-set in existing base Stabilize foundation
99 - na, - Re-set in existing base Stabilize foundation
100 - na, - Construct new base
101 - na, - Construct new base
105 - Bryant, Mary - Re-set in ground Possible new base
107 - Bryant, Eli - Re-set in ground
109 - Pynchon, Francis - Re-set in existing base Stabilize foundation
110 - na, - Re-set in existing base Stabilize foundation
112 - Rice, Mary - Possible new base Structural adhesion Repair mortars Crack fillers
117 - H. (Higgins), J. - Re-set in ground
118 - H. (Higgin), J. - Re-set in ground
119 - H. (Higgin), A. - Re-set in ground
122 - King, - Possible new base
123 - King, George - Possible new base
124 - King, na - Possible new base
125 - King, Eleazer - Re-set in ground Possible new base
126 - na, - Construct new base
127 - na, - Construct new base Structural adhesion Crack fillers
128 - Banister, Jothan - Re-set in existing base Stabilize foundation
132 - na, - Construct new base
133 - Baker, Mary - Re-set in existing base Stabilize foundation
138 - na, - Possible new base Structural adhesion Crack fillers
140 - Mayhew, - Re-set in ground
145 - Phelps, Spencer - Re-set in existing base Structural adhesion Repair mortars Crack fillers
152 - na, - Construct new base Structural adhesion Crack fillers
153 - na, - Construct new base
154 - na, - Re-set in existing base Stabilize foundation
156 - na, - Construct new base
157 - , Frank - Re-set in ground
158 - Taylor, - Construct new base Structural adhesion Crack fillers
160 - , Julia - Re-set in ground
162 - Warner, Beulah - Re-set in ground Structural adhesion Repair mortars Crack fillers
168 - na, - Re-set in existing base Stabilize foundation
170 - , Lizzie - Re-set in ground
173 - Stebbins, Howard - Re-set in existing base Stabilize foundation

Priority 3 Ongoing deterioration (continued)

175 - Nichols, Joshua - Re-set in ground
177 - na, - Construct new base
178 - na, - Construct new base
180 - na, - Construct new base
183 - Bryant, - Re-set in ground Stabilize foundation
184 - Bryant, - Re-set in ground Stabilize foundation
185 - na, - Re-set in ground
190 - Damon, Lucinda - Structural adhesion Repair mortars Crack fillers
194 - , Theodany - Construct new base

Total: 60

Cemetery Total: 197

CONSERVATION RECOMMENDATIONS

CLEANING

In general, we do not recommend cleaning unless necessary to perform repairs. Most of the soiling is biological, and while it is slowly attacking the surface of the stone, most cleaning procedures are more aggressive than the micro-organism and additional surface material would be lost. In some instances, discoloration may be associated with the degradation of the older repair materials, such as iron fixings or unstable surface treatments.

Having all the stones clean is not historically accurate. Because of the wide range of death dates in the cemetery and continuing soiling, at no time in its history did all the stones appear "clean".
In the case of marbles, cleaning does not necessarily make the inscriptions more legible, and many times the "whiteness" makes it harder to decipher. Thus cleaning is a complicated issue involving both aesthetic and technical considerations.

If cleaning is necessary for repairing the stone the surfaces to be cleaned should be sprayed with water and brushed lightly with natural bristles. Repeat as necessary. The use of biocides for partial cleaning is not recommended.

Removal of failed repairs

Repairs are considered as having failed if they are no longer functional, are unsightly, or have induced damage to adjacent original stone. Failed adhesives, mortars and pins require careful removal before proceeding with conservation treatment. Some temporary stabilization may be necessary as poorly attached fragments are disassembled.

Removal of degraded structural resins (and of the associated discoloration within the stone) may be particularly difficult and time-consuming. Mechanical removal is generally done with small hand tools. The cutting of pins and fasteners may require power tools. Ferrous metal pins are most often locked in place by corrosion expansion; their removal is best done by careful drilling with a properly-sized coring bit.

RESETTING

Eighteenth and early nineteenth century New England gravestones are typically long panels of stone that were set directly in the ground. By the first half of the 19th century, it appears that many headstones were set onto bases, some composed of several individual elements. Some bases were designed with a setting slot; others have pins. Although the re-setting of these stones is relatively straight-forward, inept handling practices can cause great harm.

For larger monuments, this work is considerably more complicated, and often involves the use of specialized lifting techniques. The input of architectural conservators and structural engineers may prove to be essential.

Resetting in ground

Tilted stones sitting directly in the ground can be made plumb by careful excavation of soil with hand tools, to permit re-setting in the proper position. The concrete around many of the tilted markers in Historic Center Cemetery will have to be removed. In most cases the concrete has become separated from the marker, any remnants should be carefully removed with hand chisels. If there is not an adequate length of below grade material to adequately support the marker a new cast concrete below grade base will be required (See below: New cast concrete base).

Once the stone is carefully placed into vertical position at the proper depth, the stone is made plumb and level, and aligned with adjacent markers. Backfill with a mixture of sand and small gravel, wetted and compacted. Disturbed areas of the ground are re-graded with topsoil, which is then seeded if required.

Resetting on/in existing base

Unsecured stones with existing bases should be re-set, but often require re-leveling and aligning of some or all base elements, and the removal of failed pins. For larger stones, which can weigh more than 300 pounds, lifting can be the most difficult and expensive portion of the operation. This work requires the careful use of hoisting equipment, and can be dangerous.

Re-setting is on a full bed of modified lime (or hydraulic lime) mortar, with fine sand; 3 parts cement, 2 parts high calcium lime and 5 parts fine sand (000 is preferred if available) all measured by volume. For maximum bond the mating surfaces should be primed with Acryl 60 diluted 1:3.

For more massive stones, small squares of thick lead sheet are used as corner shims, to establish a reasonable joint dimension, and for minor adjustments to level. A commercial setting compound (Bicknell) is used for re-setting the larger elements. Pins, if required, should be threaded stainless steel, 10 to 25 mm in diameter for most situations. They are secured in a moisture-insensitive structural adhesive.

Stones that require insertion into existing slotted bases can be set with the same mortar mix 3:2:5 as above made fluid with a high-range water reducer. This is poured and/or injected into the base slot. Stones are set plumb and level, and are braced for a minimum of five days to limit movement during curing of the grout.

Resetting into new cast concrete base

Fractures at (or just below) grade are relatively common for thinner headstones, but the success of structural adhesion in these situations is limited. In the past, the upper portions of these monuments have simply been inserted further into

the ground. A better solution is the fabrication of a new below-grade base, to re-set the stone at a more reasonable height, allowing for the viewing of inscriptions and decoration. These are fabricated on site by casting in the ground with concrete, using a removable form insert to create a setting slot (½" thicker and ½" wider than the marker); the finished top surface of the base should be entirely concealed by new topsoil, which is then seeded.
The bases are minimally 12 inches deep, 12 inches greater in thickness and 6 inches wider than the stone itself. Once the concrete has cured, forms are removed and the stones are reset into the slot as above.

On left, a new base partially filled with concrete and foam setting form in background.

On the right, the poured base with setting form in place

When lower fragments are missing or there is a fracture at or below grade the lower edge of the stone will have to be re-squared prior to re-setting keeping losses at a minimum. Any inscriptions that will be lost or hidden are to be recorded.

Resetting Larger monuments

As the scale of cemetery monuments increases, so does the difficulty of their conservation, even for a highly skilled memorial mason. This is due, in part, to the structural inter-relationship of elements, and the greater number of concealed metal fixings. These factors often make it impossible to re-set one or two pieces of stone that are out of alignment. What may actually be required is partial disassembly and re-building of the monument, which is a serious task. Some slender monuments, such as obelisks, exhibit a particular problem of instability. Their small "footprint" and solid construction makes them especially sensitive to the load bearing capacity of the soil beneath, and to the soundness of their foundations. Over time, the high center of gravity of a tilted obelisk can easily lead to progressive tilting. Re-levelling can be done with small hydraulic jacks, but this is a difficult and dangerous operation, requiring considerable skill. Lead shims together with a commercial setting compound (Bicknell) can be used to reset the larger elements.

REPAIR

Repair programs deal with the reassembly of fractures, and the filling of open joints, cracks and delaminations, and larger areas of materials loss. Most broken stones can be re-assembled with structural adhesives. Depending on the geometry of the break, reinforcement with pins may or may not be required.

Structural adhesion

Potential bonding surfaces are carefully cleaned and the pieces dry fitted to test for conformation, identifying contact areas. All fragments found nearby should be examined at this point; systematic soil probing in the general vicinity is frequently successful in locating missing pieces. (As noted earlier, structural adhesives do not perform adequately when used below or near grade.)

A thixotropic, moisture-insensitive two-part epoxy (Aboweld 55-22, Abatron) is applied along both surfaces of the glue line, keeping the adhesive slightly back from the edge of the break. Most of these adhesives require a minimum air and surface temperature of 10^{o} C. Properly-aligned fragments are joined with clamps, and the assembly braced during curing of the epoxy, typically a week or so. Any excess adhesive flowing from the glue lines should be allowed to partially cure, then carefully cut or chipped away with sharp hand tools. A recent fracture of sound material generally requires less epoxy than a weathered surface with poorer "fit". When fully cured, areas along the glue line are concealed with a lime-based repair mortar.

Reinforcement

The extensive and routine use of pinning to repair fractured stones is controversial. There are many variables to consider before drilling. The cross-section of stone, the type and soundness of material, and the location and shape of the fracture can all influence the decision to reinforce a structural repair. If the fractured stone is sound and/or recently broken, the attachment of fragments with a structural adhesive should be sufficient.

The use of pins has sometimes been recommended to provide a "slow failure" if the adhesive should fail in the future. This assumes that if the monument were to fail again it would be along the previous failure line. This may or may not be the case. In fact, the use of pins can increase the length of the moment arm when force is applied at some distance from the repair. This means that a lesser force can fracture the stone, and that failure will not occur at the glue line, but rather at the end of the pins.

Complex breaks, however, may require some drilling and structural pinning for safer reassembly. If there are missing fragments, voids can be spanned by these pins to provide an armature for the subsequent installation of repair mortars.

Where pinning is required, holes should be drilled at slow speed, using an appropriately sized masonry bit. Water should be liberally applied into the hole

while drilling. Before inserting pins, the drilling debris should be thoroughly flushed out with water and the hole allowed to dry fully, or (alternatively) blown clean with compressed air. The drilling of holes into the edge of a weak, deteriorated stone may be very destructive, and is often impossible.

Threaded stainless steel rods are recommended for pinning. The diameter of the drill hole should be less than 1/3 of the thickness of the stone, and the total length of the pin equal to 6 to 10 times its diameter. Pins are secured in a moisture-insensitive structural adhesive.

Repair mortars/ crack fillers

Losses designated for compensation can be filled with commercially-available cementitious restoration mortars (Jahn Restoration Mortars, Replical, both from Cathedral Stone), or a pigmented lime mortar, using colored aggregates. Mortar color and texture should be matched to that of the unsoiled stone, seen after cleaning or (more often) where fractured. If the stone will not be cleaned, artificial "soiling" of the cured mortar surfaces can be done by a variety of means, including use of a pigmented, transparent potassium silicate coating (Silin, Cathedral Stone), or a diluted acrylic dispersion). Dry colors for this purpose and for incorporation into the mortar itself must be alkali-stable oxides, as used in the construction industry.

These materials and methods are also useful for crack filling. In this instance, however, the aggregates must be considerably finer in size. As for pointing, work with repair mortars should not be undertaken when there is a risk of freezing temperatures in the following 14 days.

Filing of delaminations

Repair of delamination is designed to prevent further detachment of stone, by re-establishing cohesion between layers, and preventing the penetration of water.

Best practice begins with the careful removal of loose debris in the voids, using hand tools and the cautious use of compressed air. Interior surfaces are then saturated with a wetting solution, such as isopropanol/water. Commercial products are available (Relical Crack Filler, Cathedral Stone) or a low strength cement/lime (3:2:5) grout, with fine aggregates is used to fill the voids.

When it is necessary to pour the grout it is made fluid with a high-range water reducer or commercial flowable grouts (M-40, Cathedral Stone) can be used. The filled areas and surrounding surfaces are lightly misted with water and kept covered for a minimum of 3 days. After a partial cure the covering is removed and the filled areas and adjoining surfaces of the stone are treated with a weak acetic acid wash applied with a soft brush to remove excess grout and fully rinsed with water.

PRODUCTS/SUPPLIERS

*RepliCal™
*Jahn™ Restoration Mortars
*M-40 Flowable grouts
*Silin

from: Cathedral Stone Products Inc.
7266 Park Circle Drive
Hanover MD 21076 USA
800 684 0901 fax 800 684 0904

*Aboweld 55-22

from: Abatron Inc
5501 95th Avenue
Kenosha, WI 53144
262 653 2000 fax 262 653 2019

*BBB Setting Compound
*Lead Strip

from: Bicknell Manufacturing Company
Elberton, Georgia
800 241 7105

APPENDIX D
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