A Phase II Archaeological Assessment and Evaluation of 21WA10
Afton, Washington County, Minnesota
SHPO Review and Compliance # 2015-1403

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FINAL REPORT
Management Summary/Abstract

Blondo Consulting, LLC (Blondo Consulting) was retained to conduct a Phase II Archaeological Assessment ("Phase II Study") of a portion of the City of Afton's Downtown Improvements Project ("the Undertaking"). The proposed Undertaking, located within Sections 22 of Township 28 North, Range 20 West, Washington County, Minnesota within Anfinson's Archaeological Region 4, includes the construction of a stormwater pond, directionally drilled sanitary sewer connections, and construction and connection of a lift station all within the mapped boundaries of site 21WA10. Review of the Undertaking under Section 106 is necessary because of Federal funding provided by the Minnesota Pollution Control Agency (MPCA) and a Federal permit to be provided by the U.S. Army Corps of Engineers (USACE). Parties to this Section 106 process agreed a Phase II Study was appropriate for site 21WA10. As part of the Phase II Study, LiDAR mapping and onsite geophysical work was completed by Archaeo-Physics, LLC, followed by soil coring, shovel testing, and test unit excavation conducted by Blondo Consulting. Steven J. Blondo, MA was the Principal Investigator for the project. He meets the Secretary of the Interior's Professional Qualifications Standards.

Archaeo-Physics reviewed LiDAR modeling, aerial and satellite photography, and previous documentation of the existing sewers and other utilities in the project area. It concluded that while some intact or fragmentary archeological features may remain, a geophysical survey of the site would more likely document the heavy historic and modern impacts on site 21WA10 than uncover “Native American archeological components. Archeo-Physics then conducted a geophysical survey using electrical resistance and ground penetrating radar, the results of which were used to guide Blondo Consulting’s subsurface archeological testing.

Subsurface archaeological testing was used to provide insight into the features of interest that were expressed in the geophysical data. Blondo Consulting tested these features using soil probing, shovel testing and test units. They also conducted methodical shovel tests on an approximately 15-meter grid in the area of the proposed pond, the area of the proposed lift station, and at three separate directional drilling locations. Historic cultural materials were present in most shovel tests, but all shovel tests were void of prehistoric cultural materials. A historic feature was identified at N5.5 E12 and excavated.

Following the archaeological testing of the area, site 21WA10 was evaluated for inclusion in the National Register of Historic Places (National Register). Due to the lack of extant mounds, the National Register evaluation of site 21WA10 focuses on the snake effigy mound portion of the site. The Rattlesnake Mound is the most significant and only visibly extant portion of the original 21WA10 site. Blondo Consulting recommends that the Rattlesnake Mound of 21WA10 is eligible for inclusion in the National Register under Criteria A, C, and D, because it is a significant example of Effigy Mound Culture and because it retains integrity of design, materials, workmanship, and association.
Furthermore, Blondo Consulting recommends a finding of No Effects on Historic Properties. The Undertaking will not alter the characteristics of the Rattlesnake Mound that make it eligible for inclusion in the National Register. Even if the Undertaking were to have effects on the Rattlesnake Mound, those effects would not be adverse because they will not affect the integrity of the Mound. To the contrary, elements of the Undertaking will actually protect or improve the integrity of the Mound, e.g., by ceasing the discharge of sewage into the existing Mound and preventing the Mound's further erosion.
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1.0 INTRODUCTION AND PROJECT BACKGROUND

The City of Afton, Minnesota, will soon undertake a series of proposed improvements—the Downtown Improvement Project (“the Project”)—within Section 22 of Township 28 North, Range 20 West, Washington County, Minnesota. The Downtown Improvements Project as a whole involves the construction of a large subsurface sewage treatment system, which includes a recirculating gravel filter, a series of subsurface soil absorption beds, and the construction of a small control building with pumps and valves, a gravel access drive, the addition of fencing, and other appurtenances. The Project also includes the installation of, approximately 1.8 miles of sanitary sewer lateral collection piping to be installed adjacent to, or beneath existing city and county roadways to serve the City’s historic Old Village area, and 8,800 feet of directionally drilled forcemain to connect the City’s Old Village area to the treatment facility. The Project also involves stormwater improvements, improvements to 2,200 linear feet of levee, and improvements to the roads within the Old Village area.

The proposed project will involve various at-grade or underground construction activities including installation of underground sewer lines, road reconstruction, and stormwater pond construction, using techniques such as horizontal directional drilling, and open cut installation methods, all of which will create certain conditions including, but not limited to, vibrations, noise, dust, and visual intrusion from construction activities.

A portion of the Project involves the proposed construction of the stormwater pond and lift station improvements and the installation of several sewer and storm sewer lines within the boundaries of site 21WA10. Site 21WA10 is a previously recorded, unevaluated mound group originally identified in 1883 by T.H. Lewis. For the purposes of Section 106 review, the above activities constitute the “undertaking” under review in this report, as defined under 36 CFR § 800.16(y) (“the Undertaking”). Review of the Undertaking under Section 106 is necessary because of Federal funding provided by the Minnesota Pollution Control Agency (MPCA) and a Federal permit to be provided by the U.S. Army Corps of Engineers (USACE).

At a consultation meeting on February 19, 2016, the City of Afton, the Minnesota Pollution Control Agency (MPCA), tribal representatives, Tribal Historic Preservation Officers (THPOs), and representatives of SHPO, Minnesota Indian Affairs Council (MIAC) and the U.S. Army Corps of Engineers agreed that additional archaeological testing was appropriate for site 21WA10. As part of the Phase II study, LiDAR mapping

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1 Other aspects of the Project involve potential effects on historic properties or eligible historic properties. The eligibility of other properties within the Project’s APE and the evaluation of effects on those other properties are examined in previous reports by Blondo Consulting, Merjent, and MVAC.
and onsite geophysical work was completed by Archaeo-Physics, followed by soil coring, shovel testing, and test unit excavation conducted by Blondo Consulting. Steven J. Blondo, MA was the Principal Investigator for the project. He meets the Secretary of the Interior's Professional Qualifications Standards.

The purpose of the archaeological investigation was three-fold: (1) to identify if archaeological artifacts or features were present in the area of the proposed stormwater pond and sanitary lift station; (2) to evaluate site 21WA10 for the National Register of Historic Places; and (3) to determine if the proposed project would have effects on site 21WA10 (if recommended eligible for inclusion in the National Register of Historic Places).

The investigation involved a background literature search, including a review of previously completed surveys, and a field survey. A LiDAR review and Geophysical Survey were completed prior to fieldwork. The field survey consisted of soil probing, shovel testing, and excavation of one-meter-by-one-meter test units. The results of the survey and recommendations are also included in this report.

Prior to Blondo Consulting's Involvement, the City of Afton had contracted with Merjent to complete an archaeological study of the Undertaking area. Additional studies regarding mound site 21WA10 were required and completed by the Mississippi Valley Archaeological Center. These investigations are discussed in detail in section 4.2 Previous Archaeological Investigations. Two previously identified archaeological sites are recorded within the Project APE. These sites include 21WA10 “The Rattlesnake Mound Group” and 21WA106 “The Valley Branch Creek Site”. These sites are described in section 4.1 Previously Recorded Archaeological Sites. This survey is focused on the the Rattlesnake Mound Group (21WA10) as it is the only one of the two that may be affected by the Undertaking.

2.0 PROJECT DESCRIPTION

As mentioned in the previous section, the proposed Undertaking is located within the boundaries of site 21WA10. The Undertaking consists of a proposed stormwater pond approximately 20 feet east of the northern half of the Rattlesnake Mound. This pond will be 310 feet long, approximately 50 feet wide in the north, approximately 20 feet wide in the south, and be a maximum of 6 feet deep. There is also a lift station planned approximately 35 feet west from the southern tail of the Rattlesnake Mound. This station will be approximately 30 feet long, and 20 feet wide. There will also be directional drilling for the installation of sewer and stormwater pipes 8-12 feet beneath the Rattlesnake Mound (See Attachment 3: Maps).

The Area of Potential Effect (APE) is an area defined in 36 CFR 800.16 as “the geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist. The
area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking”. For purposes of the Phase II Archaeological Assessment of the Undertaking, this APE has been defined as an area bordered by 33rd Street to the north, Upper 34th Street to the south, St. Croix Trail along the west and a large earthen levee to the east. It is an area within which the mound group 21WA10 was mapped by T. H. Lewis and has been generally accepted as the archaeological site boundary. It includes approximately 6.5 acres. The APE is located within NE¼ Section 22 of Township 28 North, Range 20 West, Washington County, Minnesota. The following table lists UTM coordinates for each of the corners of the APE.

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<thead>
<tr>
<th>Corner</th>
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<td>NW</td>
<td>517114.64 m E</td>
<td>4971973.15 m N</td>
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<tr>
<td>NE</td>
<td>517200.88 m E</td>
<td>4971973.74 m N</td>
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<tr>
<td>SE</td>
<td>517178.57 m E</td>
<td>4971727.28 m N</td>
</tr>
<tr>
<td>SW</td>
<td>517114.60 m E</td>
<td>4971723.24 m N</td>
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Site 21WA10 consists of an urban built environment. Homes, businesses, and infrastructure fill the landscape. Landscaped backyards of homes and businesses in this area of Afton have flower gardens, patio areas, and wooded areas. The ground shows a fair amount of topographic relief. An approximately ten foot high earthen levee separates the area from the St. Croix River.

3.0 RESEARCH DESIGN
3.1 Objectives
The purpose of the archaeological investigation was three-fold: (1) to identify if archaeological artifacts or features were present in the area of the Undertaking; (2) to evaluate site 21WA10 for the National Register of Historic Places; and (3) to determine if the proposed project would have effects on site 21WA10 (if recommended eligible for inclusion in the National Register of Historic Places).

3.2 Methodology
Field survey techniques were based on the Minnesota State Historic Preservation Office Manual for Archaeological Projects in Minnesota. Shovel testing involved hand digging an approximately 45-centimeter wide hole to a depth reaching culturally sterile sub-soils. In this project, most shovel tests were dug down to one meter, often far past the beginnings of sub-soils, to ensure a proper analysis of the site soils. It should be noted
that the rod used as a scale in the shovel test photographs is 45-centimeters long. All excavated soils were screened through 0.25-inch mesh. Shovel tests were first placed systematically in a 15-meter grid within the proposed stormwater pond area, and within the area of the proposed lift station. Subsurface features of interest identified during the geophysical survey were also marked and tested, along with three separate areas marked for directional drilling.

Lab methods also followed standard protocols and commenced with washing of recovered materials when appropriate. Analysis using comparative collections was conducted. Cataloging of artifacts using Minnesota State Historical Society artifact curation guidelines was also completed.

Evaluation of site 21WA10 used two Multiple Property Documentation Forms (MPDF). These MPDFs replace historic contexts for the earthworks property types and Woodland Culture and are considered a reliable resource for evaluation criteria. Dr. Clark A. Dobbs’ 1994 “Precontact American Indian Earthworks, 500 B.C. - A.D. 1650” and the 2008 “Minnesota Statewide Multiple Property Documentation Form (MPDF) for the Woodland Tradition” by Constance Arzigian were used in the evaluation of 21WA10. Both have been reviewed by the archaeological community and approved by SHPO and the National Park Service (NPS) for use in Section 106 assessments.

4.0 LITERATURE SEARCH
A records search was completed at SHPO and Office of the State Archaeologist (OSA) to identify previously recorded and reported archaeological sites to assist with archaeological understanding. For a historic property (including archaeological sites) to be considered important within a cultural resource management framework they must meet a level of significance and retain historic integrity for National Register of Historic Places listing (NPS 1997).

4.1 Previously Recorded Archaeological Sites
Research regarding archaeological sites in Afton was conducted at SHPO and OSA by Blondo Consulting staff member Laura Koski. Two separate sites have been recorded near the vicinity of Afton's Old Village. These sites include the Rattlesnake Mound Group (21WA10), and the Valley Branch Creek site (21WA106). The Rattlesnake Mound Group (21WA10) is the only site within the APE of the Undertaking and will therefore be the only site evaluated in this report.

Site 21WA10, the “Rattlesnake Group at Afton” was first mapped by T.H. Lewis on June 25, 1883. He recorded the site as having consisted of eight mounds varying in size and shape and of which two were “gone” (Winchell 1911:271). The Minnesota State Archaeological Site Form records 21WA10 as a mound group. Four round, one oval, and one effigy mound are identified. Handwritten notes from the Wilford era state
“obliterated - built up by businesses and homes” and “probably destroyed by housing construction - Birk and Peterson field check in 1971”. (Minnesota State Archaeological Site Form, n.d. n.p.). Additional notes contain landowners and contact phone numbers and “contact in Afton called 5-9-79 to let us know about md. group” (MN OSA Files). In Minnesota’s Indian Mounds and Burial Sites: A Synthesis of Prehistoric and Early Historic Archaeological Data, Arzigian and Stevenson describe the 21WA10 mounds as “six mounds (four circular, one elongated, one rattlesnake effigy); no excavation information found” (2003:516).

In an article for Science magazine in 1887, Lewis discussed three “Snake and snake-like mounds in Minnesota” (Lewis 1887). In discussing site 21WA10, he states “No. 1 is situated on the west side of the St. Croix Lake, on the town-site of Afton, Washington county. The land here slopes toward the lake, and the Rattlesnake lies just above the high-water mark. The head is 5½ feet high, 88 feet long, and 56 feet wide at the broadest point, which is also the highest, from which it gradually descends to the body. Where the head joins the body the embankment is 22 feet wide and nearly 2½ feet high. The body is but slightly curved. In the next 160 feet the width increases to 26 feet, but the height drops to 2 feet. From this point it gradually diminishes to 18 feet in width and 1 foot in height. Connected with the extremity or tail, there are three small mounds whose bases interlock, thus forming the rattles. The last of these mounds is 20 feet long and 18 feet wide, and the two between it and the tail are each 18 feet in diameter, and all three are of the same height as the end of the tail. The total length of this effigy is 534 feet. On June 25, 1883, when this survey was made, in addition to the snake, there were four round mounds and one embankment in the group. Formerly there were other mounds, but they had been demolished” (Lewis 1887:393).

For the most part, the mounds mapped by Lewis in 1883 are not visible today. Portions of the Rattlesnake Mound are partially visible but the addition of soil to the head has artificially enhanced the height of the Mound. Other mounds are under parking lots, houses, and businesses. Site files and notes from a 1971 field visit state that although the mound group was correctly mapped by Lewis and Winchell, the site was “…probably all destroyed by private homes” (Sather, 2015). However, when this mound group was again visited in 1985 by State Archaeologist Christy Caine, she noted that the site had been impacted and buried by levee construction activities undertaken in 1971. In 2008, Richard Rothaus suggested that a “…majority of these mounds have been destroyed by modern development”. Sather noted, “despite the repeated visits of this site, no systematic assessment of site integrity has been conducted” (2015:2).

4.2 Previous Archaeological Investigations
Merjent conducted an archaeological reconnaissance survey of the Project area. In an April 17, 2015 report, Principal Investigator Dean Sather described the work conducted. A combination of pedestrian survey and shovel testing was completed. No subsurface
work was conducted in the area surrounding 21WA10. Sather states, “visual inspection of the property did not yield any evidence of intact mound remnants in the vicinity of 21WA10” (2015:5). Sather’s recommendations included “no direct impact upon known cultural resources” for the area of the “large subsurface sewage treatment system.” (Sather 2015:6). At the “forcemain and collection pipeline system” Sather further states, “a visual inspection of the property did not yield any evidence of intact mound remnants in the vicinity of 21WA10. The letter issued in 1985 by State Archaeologist Christy A.H. Caine indicates that the site had been impacted and buried by levee construction activities undertaken in 1971. The potential for the presence of subsurface remnants of the mounds exist” (Sather 2015:6). It was Merjent’s recommendation that coordination with the Minnesota Office of the State Archaeologist be initiated to develop a monitoring schedule during construction.

The City of Afton contracted with the Mississippi Valley Archaeology Center (MVAC) in May 2015. On May 8 and 9, 2015, Constance Arzigian and crewmembers visited the site. MVAC investigated two storm-water settling ponds, a ditch, and lift station facilities. Fieldwork included a combination of shovel tests and pedestrian survey. Arzigian’s report states, “Based on plans provided by the City of Afton and WSB Engineering, a portion of the city property in the 34th Street South has been previously disturbed. In 1988, a drainfield for a septic system for an adjacent building (then Lerk’s Bar) was constructed within the levee/dike east of 34th Street South, with a 20 foot excavation for a connecting pipe running between the rear of the building and the drainfield, along the northern edge of 34th Street South city property. This connecting line would have gone through the projected area of the snake mound but the septic system itself would have been to the east within the levee and would not have impacted the mound. The remainder of 34th Street South to the south of the sewer connecting line (an area approximately 60 feet north-south) would not have been disturbed by this construction, including a portion of the snake mound.” (Arzigian 2015:5).

Completion of archaeological studies by Merjent and MVAC were finished as part of OSA and SHPO review under Minn. Stat. Ch. 138 and § 307.08. These reports were submitted to SHPO, which issued the following concurrence in a letter dated June 24, 2015:

Per our recommendation to the MPCA, the City of Afton has contracted for and completed archaeological surveys for this project. David Mather, MNHS National Register Archaeologist has completed a review of the following documents and his comments and recommendations are summarized below:

• Letter report dated 17 April 2016 [sic] entitled Phase I Archaeological Reconnaissance Survey of the Proposed City of Afton Large Subsurface Sewage Treatment System and Associated Forcemain and Collection Facilities, Washington County, Minnesota prepared by Dean Sather, Merjent
Memorandum to the City of Afton dated 27 May 2015 from Constance Arzigian, Minnesota Valley Archaeology Center, regarding archaeological investigations, 21WA10, Afton, Minnesota

The Merjent letter report indicates that archaeological site 21WA106, which was previously determined to be not eligible for listing in the National Register of Historic Places, is located outside the area of potential effect for this project. Also, no archaeological sites were found at the location of the proposed wastewater treatment plant. Regarding the collection area, it is our understanding that the proposed forcemain and collection system corridors are primarily in road ditches or under city streets. The Merjent letter report shows proposed lateral and forcemain lines under the streets and levee that border the recorded limits of 21WA10 and describes the apparent lack of natural terrain within the site area. Based upon information included in our inventory records and in the recently completed archaeology reports, it appears that at least one portion of the site remains intact although the majority of site 21WA10 has been previously disturbed and mostly destroyed as a result of levee construction and adjacent residential/commercial development. Also, because of the cultural importance of this site, Merjent recommended archaeological monitoring of construction underneath the streets as a precautionary measure. We agree with this recommendation. We do not feel that additional archaeological survey work is warranted for this project as it is currently proposed, except as directed by the Office of the State Archaeologist (OSA) per comments below. If design changes involving undisturbed new rights-of-way or easements are made for this project, please forward additional information to our office for further comment.

It is our understanding that the City of Afton, concurrent with our office’s review of this project pursuant to M.S. 138.665 and M.S. 138.40, is consulting with the OSA and the Minnesota Indian Affairs Council (MIAC) pursuant to responsibilities under M.S. 307.08. Information recently provided to our office regarding the OSA’s review of project plans indicates that avoidance of additional damage to 21WA10 will be feasible for this project.

To reiterate, we agree with the recommendation for archaeological monitoring of construction in the vicinity of 21WA10, as directed by the OSA. We further recommend that a monitoring plan be prepared and submitted to the OSA and MIAC for approval prior to commencing construction, and that the plan include provisions for the authority of the monitoring archaeologists to direct and stop the construction machines, as necessary.

In an email response (August 17, 2015) to a letter (August 11, 2015) from the City that detailed adjustments in project design and the hiring of an archaeologist to monitor construction activities in the vicinity of 21WA010, Dr. Scott Anfinson, Minnesota State Archaeologist, stated:

I have reviewed the revised plan and comment letter regarding the Afton Wastewater Collection System. I concur that the City has fulfilled with my recommendations and is now fully complying with Minnesota statutes 307. The project should have no adverse effects on the mound site known as 21WA10.

As stated above by Merjent, MVAC, OSA, and SHPO, Blondo Consulting also recommends monitoring during construction activities in the area of the Undertaking.

5.0 ENVIRONMENTAL SETTING
The project area lies within Minnesota SHPO Archaeological Region 4: Central Deciduous Region. Dr. Scott Anfinson (1990) first described these archaeological regions
which help us to understand the prehistoric environment and better understand where archaeological sites may be located. Region 4: Central Deciduous Region is located in central and east central Minnesota. Its topography consists of a patchwork of moraines, till plains, and outwash plains (1990).

5.1 Soils
Within Region 4, soils reflect a diverse glacial and vegetational history. Most of the soils have medium to coarse textures with prairie soils in the south and west and forest soils in the north and east (Anfinson 1990). Soils in the project area are described as part of the Urban land-Chetek complex, which consists of sandy loam on 0-3 percent slopes. The complex consists of somewhat excessively drained soils found in outwash plains. The typical soil profile of this complex consists of sandy loam from 0-15 centimeters, gravelly sandy loam from 15-50 centimeters, and gravelly coarse sand from 50-152 centimeters (NRCS 2014).

5.2 Environmental Landscape
Anfinson (1990) tells us numerous lakes are found throughout the region, some reaching depths of 30 meters (1990). The Mississippi River flows through the eastern and central parts of the region with the St. Croix River forming the eastern boundary. The western part is drained by rivers that flow into the Red River. The natural vegetation is mostly Oak Openings and Barrens. Today the area is located on the edge of the Mille Lacs Uplands and Anoka Sand Plain Ecological Subsections, Western Superior Uplands and Northern Minnesota and Ontario Peatlands Sections, and Laurentian Mixed Forest and Eastern Broadleaf Forest Ecological Provinces of the Department of Natural Resources Ecological Classification System (DNR ECS).

5.3 Geological Background
H.E. Wright (1972) identifies the physiographic regions overlaying the state. Overlaying the Project area are the Brainerd-Automba Drumlin Area (#11) and Anoka Sand Plain (#12) (1972). Wright goes on to describe the Brainerd-Automba Drumlin Area as being “most of the round moraine of the Rainy and Superior lobes inside the arch of the St. Croix moraine and not buried by the Anoka Sandplain on the south or by younger drift on the north” (1972). Wright explains that much of the area is marked by drumlin fields interrupted in numerous places by outwash plains. He states that the Anoka Sand Plain is an area “formed largely by glacial drainage from the north and west that was held back by the moraine” (1972). Wright reminds us that the Anoka Sandplain is not featureless but offers examples of low regions of upland, patches of sand dunes, and lakes and marshes (1972).

5.4 Prehistoric Flora and Fauna
Anfinson (1990) tells us that early prehistoric subsistence resources of the area may have included tundra species such as musk ox, and barren ground caribou. As much of
the area was covered by pine forests, large herds of megafauna were rare. As prairies began to enter the southeastern portion of the region, large bison herds followed. Bison were common in all but the northeastern third of the region by about 7,000 years ago (1990). As prairie retreated in the late Middle Prehistoric, faunal resources including beaver, moose, and black bear became abundant. Also, fish and waterfowl became common in the region’s numerous lakes and rivers. Wild Rice was an important food source and economic resource during the Late Prehistoric and Early Historic periods (1990).

6.0 CULTURAL HISTORY
Statewide contexts have been developed by the Minnesota State Historic Preservation Office (SHPO), which examines Minnesota’s recent Prehistoric through Historic past. These contexts are based on archaeological and historic research. They describe the history of the state and assist in predicting where specific types of sites may occur.

American Indian contexts are commonly divided into three major traditions: Paleoindian, Archaic, and Woodland based on significant changes in how these communities lived and in what they ate. Historic contexts are generally divided into Contact and Post-Contact periods. The Contact period begins with early European exploration of the state and continues through the Post-Contact period including settlement and statehood.

6.1 Pre-Contact Period
6.1.1 Paleoindian Tradition (12,000 to 8,000 Before Present [B.P.])
The Paleoindian Tradition begins at the close of the Pleistocene era and beginning of the Holocene era. American Indian Communities are small, mobile, and focused on hunting. During this period, the glacial ice retreats, Lake Agassiz (located on the edge of Traverse County, Minnesota) drains, and prairie vegetation advances into western Minnesota. Archaeological evidence from Paleoindian sites in Minnesota include the Browns Valley Site, 21TR0005. Paleoindian sites reflect the same general characteristics and patterns noted for Paleoindian sites throughout the central United States and Canada. Based on the small number of artifacts recovered from these sites, it can be assumed that these communities hunted a limited number of large animals, mainly mammoth and mastodons. As the Pleistocene era ended and the Holocene era began, these mega fauna gradually died out. Ancient species of bison followed the advance of prairie vegetation, giving Paleoindian peoples a new species to hunt. In addition to hunting large and small game, it is likely that gathering wild plant foods supplemented the diet of Paleoindian peoples.

Paleoindian peoples are known for their distinctive stone tools. Projectile points of this period show advanced craftsmanship and include large lanceolate projectile points.
Because Paleoindian communities were small and nomadic, archaeologists have found only sparse, scattered evidence of Paleoindian peoples throughout the region.

6.1.2 Archaic Tradition (8,000 to 2,800 B.P.)
The beginning of the Archaic period is marked by a shift in diet and settlement patterns that represent an adaptation to environmental changes. Archaic peoples begin to use more diverse plant and animal resources. A broader range of tools, including new projectile point forms, copper tools, and ground and pecked stone tools, appear. Archaeological research does not present a clear picture of community size during this time. Research suggests both that community size increased and remained small, with day-to-day activities taking place at a series of seasonal camps (Anfinson 1987). Bison hunting remained an integral part of life for Archaic peoples. As with known Paleoindian sites, Archaic sites are relatively small and sparse.

6.1.3 Woodland Tradition (2,800 B.P. to European Contact)
In the Midwest region, archaeologists tend to divide the Woodland Tradition into three periods: Early, Middle, and Late. However Anfinson (1987) suggests that in Minnesota it is more appropriate to divide the era into Initial and Terminal Woodland periods. Manufacturing ceramic vessels, utilizing bows and arrows, building burial mounds, and cultivating specific plant species, all mark the transition from the Archaic to the Woodland Tradition. Overall, subsistence during the Woodland Tradition remained similar to that of the Archaic period with communities dependent upon a diverse, seasonal resource base of plants and animals (Johnson 1988; Anfinson 1987).

Although community sizes have many similarities between the Early Woodland and Late Archaic period, by the Late Woodland period, populations are on the rise. This may be due to increased efficiency in food acquisition. Woodland period sites include burial mounds, small, limited-use sites, and large village and habitation sites. Sites are located either in areas where a community could focus on a specific resource or in environments capable of sustaining larger communities over longer periods of time.

6.1.4 Plains Village & Mississippian/Oneota Traditions (1,100 B.P. to European Contact)
Terminal Woodland period sites in Minnesota exhibit significant changes in subsistence and settlement patterns. Ceramic vessels with different form and decoration, settlement patterns shifting to larger and more permanent villages (usually near river settings) mark the change archaeologists refer to as the Plains Village and Mississippian/Oneota Traditions. Archaeological evidence indicates that both the Plains Village and Mississippian complexes relied heavily on bison hunting and intensive corn horticulture.

Archaeologists are unsure how the Oneota complexes developed. There are two common theories. The first suggests that groups migrating into the Upper Midwest brought with them new cultural traditions. The second theory proposes that people
already living in the area began to adopt cultural changes different from groups around them.

Plains Village and Oneota site types are similar to those associated with the Woodland Tradition. The archaeological remains of these complexes range from burial mounds to small, limited-use sites and extensive habitation sites. Archaeological site location remains consistent with the Woodland Period.

6.2 Contact/Post-Contact Period (1630 to Present)
This period generally refers to the span of time extending from the first European explorations until intensive Euro-American settlement of the region. Minnesota's historical period began in 1673 when French explorers Marquette and Joliet discovered the upper portion of the Mississippi River. Ten years later, Catholic Missionary Father Louis Hennepin told his story of exploring Minnesota and being held captive by the Dakota Indians in the first book written about Minnesota, Description de la Louisiane.

The territory containing modern-day Minnesota was claimed by Spain, France, Great Britain, and the United States. Lieutenant Zebulon Montgomery Pike lead the first United States expedition through Minnesota in 1805. Fort St. Anthony (later Ft. Snelling) was completed between 1819 and 1824, and in 1836 the Wisconsin Territory including a portion of Minnesota, was formed. Minnesota became a territory in 1849 and achieved statehood on May 11, 1858.

The fur trade drove much of the European exploration and settlement in Minnesota through the mid-1800s. While the fur trade impacted the American Indian communities throughout all of Minnesota, the heaviest impacts came with European settlement after the 1860s. At that time, intensive settlement and agriculture dramatically transformed the landscape, displacing a large number of American Indians. In 1862 tensions between white settlers and American Indians resulted in the Dakota Conflict. Ultimately, this war left 462 whites and "an unknown but substantial number" of American Indians dead (Anderson and Woolworth 1988). This conflict concluded with the hanging of 38 Dakota Indians in Mankato and the deportation of many others to Santee, Nebraska.

As white settlers made Minnesota their home, farming became the predominant industry. Wheat was the cash crop, and mills sprang up along major waterways across the state, notably in Minneapolis. Minnesota dominated the world in wheat processing until the 1930s.

In addition to milling, Minnesota was also a leader in lumbering and iron mining. Lumbering played a significant role in the development of northern Minnesota, with the industry peaking between 1899 and 1905. Iron mining began affecting the state's economy in 1884, when the Soudan Mine began shipping ore. The development of the
Soudan Mine opened the Vermilion Iron Range, one of Minnesota’s three iron ranges. Over the next two decades, mines sprang up across northern and central portions of the state. The Mesabi, Cuyuna, and Vermillion Iron Ranges employed thousands of people and brought millions of dollars into Minnesota’s economy. Minnesota’s iron industry spurred the rapid growth of mining cities such as Evelyth, Chisholm, Virginia, and Hibbing, as well as the port cities of Duluth, Minnesota and Superior, Wisconsin” (Minnesota State University-Mankato 2007).

American Indian archaeological site types associated with this period are generally consistent with those of earlier periods, but European and Euro-American traders, missionaries, settlers, and industries affect the locations of these sites. This period also includes Euro-American immigrant settlement patterns, subsistence activities, and economic strategies. Sites associated with Euro-American immigrants appear in the mid-nineteenth century. Associated archaeological and historic site types categorized in the Contact/Post-Contact period include standing structures as well as archaeological sites.

6.3 Regional History

6.3.1 Washington County

Washington County was founded as one of the original nine counties of Minnesota on October 27, 1849. It is positioned just to the east of the Twin Cities metropolitan area, and runs more than forty miles in length (Washington County 2015). Before the county was officially founded, the region developed along the St. Croix River, making the area’s economy dependent on the logging and lumber industries. The original county seat was named Dacotah (or Dahkota), just north of what would be Stillwater. As sawmills were built in Marine on St. Croix, and then Stillwater, the county seat transferred to Stillwater in 1846 (Upham 2001). During this time, the region was still part of Wisconsin territory. Early state leaders including Joseph Renshaw Brown called the settlers together in the currently unnamed territory to an event now deemed the “Stillwater Convention” in 1848. The gathering drafted a petition to Congress requesting that a new territory be created west of Wisconsin named “Minnesota,” (Upham 2001). Henry Hastings Sibley was elected to deliver the petition to Congress. It is because of this convention that Stillwater calls itself the “Birthplace of Minnesota,” (Upham 2001). The first governor was appointed in 1849, with the first county school district in 1850. After the forests began to deplete, the logging and lumber industries dwindled, and agriculture took over (Upham 2001). Its vast amount of lakes, and its location along the river, has made, and continues to make, Washington County attractive as a growing location of tourism and recreation.

6.3.2 Afton Township

The City of Afton was first settled in 1837 by a French Canadian voyageur, Gaspare Bruce. Two years later, Joseph Haskell and James S. Norris from New England claimed land and were the first to break ground for corn and wheat crops. Continued settlement
by French Canadians and Swedes helped develop the area. Afton was originally named for Catfish Bar, a sandbar in the St. Croix River that was a place where the river could be crossed by cattle and horses. “The earliest road from St. Paul passed by way of Bissell’s Mounds, a prominent landmark in Afton, to Catfish Bar, where travelers took to the St. Croix River to complete their journey” (WCHS 2015). The village of Afton was platted in 1855 on land once owned by Alexander McHattie, a French Canadian who claimed 120 acres in 1841 and later moved to Woodbury. This village site is known as the “Historic Village” and consists of Emil Asp blacksmith shop, Charles Getchell’s grocery store, the Patterson and Cushing House hotels, Spreeman’s fish market, and Selma’s Ice Cream Parlor, as well as others, including several churches (WCHS 2015).

<table>
<thead>
<tr>
<th>Year</th>
<th>Minnesota</th>
<th>Washington County</th>
</tr>
</thead>
<tbody>
<tr>
<td>1900</td>
<td>1,751,394</td>
<td>27,808</td>
</tr>
<tr>
<td>1910</td>
<td>2,075,708</td>
<td>26,013</td>
</tr>
<tr>
<td>1920</td>
<td>2,387,125</td>
<td>23,761</td>
</tr>
<tr>
<td>1930</td>
<td>2,563,953</td>
<td>24,753</td>
</tr>
<tr>
<td>1940</td>
<td>2,792,300</td>
<td>26,430</td>
</tr>
<tr>
<td>1950</td>
<td>2,982,483</td>
<td>34,544</td>
</tr>
<tr>
<td>1960</td>
<td>3,413,864</td>
<td>52,432</td>
</tr>
<tr>
<td>1970</td>
<td>3,804,971</td>
<td>82,948</td>
</tr>
<tr>
<td>1980</td>
<td>4,075,970</td>
<td>113,571</td>
</tr>
<tr>
<td>1990</td>
<td>4,375,099</td>
<td>145,896</td>
</tr>
<tr>
<td>2010</td>
<td>5,303,925</td>
<td>238,136</td>
</tr>
</tbody>
</table>

Today the area is predominately agricultural. Railroads once played an important role in this area, and many are still in use today. While some railroads are now gone, trucking has taken over as a means of transporting goods to and from town centers. The closest railroad to Afton today is the Chicago & Northwestern, crossing the St. Croix River into Hudson, Wisconsin five and-a-half miles north of Afton.

**7.0 WORK SUMMARY**

Archaeo-Physics looked at LiDAR modeling, aerial and satellite photography, and previous documentation of the existing sewers and other utilities in the project area. The purpose of the LiDAR analysis was to reconstruct Lewis’ mapped earthworks at site
21WA10 and detect, if possible, extant earthworks through analysis of the LiDAR data. Archeo-Physics concluded in its report, *Lidar analysis and plotting of T.H. Lewis survey 21WA10 mound group, Afton MN* (See attachments for full text), that Lewis had accurately mapped the site 21WA10 within the a meter, “with the understanding that outlines and centers of these earthworks themselves were difficult to exactly define” (Jones 2016a:2). Archeo-Physics suggested that while some “intact or fragmentary archeological features” (Jones 2016:2) may remain, due to the “heavily impacted condition of the site” (Jones 2016a:2) a geophysical survey of the site would more likely document the historic and modern impacts on site 21WA10 than uncover “Native American archeological components”. Archaeological monitoring was strongly recommended. Lastly, Archeo-Physics stated that a geophysical studies could be conducted but that "historic/modern impacts to the site are likely to be far more apparent than Native American archeological components" and that the value of geophysical survey may "lie more in documenting disturbance (or lack thereof) than in directly detecting features of archaeological interest" (Jones 2016a:2).

As a follow-up to the LiDAR survey, Archeo-Physics completed a geophysical survey of seven areas within the boundaries of 21WA10 using electrical resistance and ground penetrating radar (GPR). The goal of the geophysical study was to identify subsurface archaeological patterning and provide a guide for archaeological testing. Of these seven tested areas, Areas 3, 4 and 7 were identified as disturbed. The remaining four areas revealed inconclusive results regarding intact soils and disturbance. Archeo-Physics identified a number of "features of interest," i.e., areas where geophysical patterning suggests an anomaly within the soil matrix. They are best described as "pockets" within a larger fabric. Six of these features of interest warranted further archaeological investigation. Due to the extensive historic/modern disturbance at the site, Archeo-Physics described difficulty in interpreting natural and archaeological patterning and distinguishing natural features from "features of interest". The results of the geophysical surveys "showed (as expected) extensive disturbance, but also patterning that is recommended for subsurface testing as possible prehistoric or historic archaeological features" (the above-referenced “features of interest”) (Jones 2016b:1).

Using Archeo-Physics’ recommendation for archaeological testing using these targets as guidance, Blondo Consulting conducted archaeological fieldwork between April 4 and April 22, 2016. Blondo Consulting staff included Ms. Kelly Wolf, Field Director, and Ms. Laura Koski, Field Technician, under the direction of Principal Investigator Mr. Steven J. Blondo, MA. Cultural Resource Specialists Mr. Jim Jones and Ms. Melissa Cerda of the Minnesota Indian Affairs Council (MIAC) joined the field crew during numerous site visits. Additional site visits were completed by Ms. Amanda Gronhovd, Minnesota State Archaeologist, Mr. David Mather, National Register Archaeologist at the Minnesota State Historic Preservation Office, and Mr. Leonard Wabasha, Cultural Resource Specialist, Shakopee Mdewakanton Sioux Tribe.

Archaeological testing occurred at various locations throughout the APE: the proposed stormwater pond “South Pond” area; the proposed Lift Station location; and four...
directional drilling areas. All testing was completed outside the mapped Rattlesnake Mound location. Consultation and coordination with Mr. Jim Jones of MIAC assisted in determining placement of shovel tests. Testing strategies employed varied by location and appropriateness in relation to desired outcomes. For example, in the area of the south pond, thirteen shovel tests were excavated on two 15-meter transects with the intention of identifying intramound features or possible cultural artifacts. When testing features of interest identified by Geoff Jones during the geophysical survey, a staged approach was utilized. Soil coring to identify soil stratigraphy was first employed. If results were inconclusive or suggested historic or natural features, shovel testing was employed. Once completed and if required, shovel testing was followed by excavation of one-meter-by-one-meter test units. Moving from less intrusive to more intrusive in testing methods insured protection of features and allowed better interpretation of results. Daily coordination with MIAC, Mr. David Mather, SHPO, and State Archaeologist, Ms. Amanda Gronhovd, occurred during field investigations.

No prehistoric artifacts were recovered during the course of the assessment. No human remains were encountered. Historic (post-contact) artifacts were recovered in a number of locations. In the case of non-diagnostic pieces, artifacts were left in the field. Possibly diagnostic or pieces of interest were collected. At the conclusion of this project, artifacts will be curated with the Minnesota State Historical Society.

8.0 RESULTS
Archaeo-Physics, LLC (Archaeo-Physics) completed LiDAR and Geophysical Studies prior to archaeological fieldwork. The purpose of these studies was to assess the accuracy of T.H. Lewis' mapping of site 21WA10 and to assess if intact features may be present at the site. Complete letter reports from these studies can be found in Appendices A and B. Archaeological testing occurred at a number of locations within the Undertaking's APE (Attachment 2). The following discusses field results by area.

8.1 Proposed Stormwater Pond, “South Pond”
The first area tested for cultural material was the proposed stormwater pond location, which was marked by wooden stakes and consisted of manicured lawn, an existing natural stormwater pond and two wooded areas, one on the northernmost end and one in the central and southern portions of the proposed stormwater pond. Sixteen shovel tests were initially placed within the proposed pond location on two 15-meter transects. Thirteen shovel tests were ultimately completed. Three marked shovel tests were not completed due to heavy visible disturbance from existing sewer systems in the south end of the proposed pond (see Attachment 2: Maps). Two shovel tests fell within the existing pond area. These showed slightly sandy loam topsoil over a coarse reddish sand (5YR 3/4), which is a consistent subsoil throughout this area. The water table was fairly high in this location, between 60 to 80 centimeters below the ground surface. Two shovel tests were placed within the wooded area on the north end of the proposed pond. The
one to the east, closest to the existing levee, showed a lot of disturbance from tree roots, sediment build up from flooding, and mixed soils presumably from levee construction. Other shovel tests within the western transect, outside of the existing pond, demonstrated disturbance from filling and a buried sandy loam topsoil. Historic (1630-present) and modern (less than 50 year old) artifacts (glass, rusty metal, plastic, etc.) were noted within the first sandy loam layer and also the second sandy loam layer. Through conversations with the landowner, it was discovered that the existing pond had been dug out and the excess soil had been used to fill and level the backyard within the last 20 years, which would account for the existence of a buried sandy loam topsoil. There were areas of intact soils toward the center of the proposed pond area, in similar locations as those identified by MVAC in the previous survey. Shovel tests 4, 5, 7, 11, 12, and 13 show a clear evidence of historic use and dumping events. Attachment I: Soil Profiles describes each shovel test in detail.

Three features of interest were also located in this area during the geophysical survey and identified by their coordinates within the geophysical blocks (N39 E12, N29 E5, N11 E6). These features of interest were soil probed in the hopes of better understanding them and their precise locations through soil profiles. Each feature of interest was then shovel tested. Many of the features of interest marked changes in soil composition or historic dumping areas. On average these shovel test pits within the proposed stormwater pond location had similar results as the other shovel tests completed in this area that typically consisted of 10YR 2/2 sandy loam then transitioning to 5YR 3/4 reddish coarse sand. The three features of interest tested in this area consisted of a similar profile, but typically contained an extra layer of mottled coarse sand. This extra layer of mottled sand was not uncommon in the standard shovel tests conducted in this area (See Attachment 2: Shovel Test Pit Profiles for further detail on individual shovel test pits).

8.2 Proposed Lift Station

Systematic shovel testing was conducted within the area of the proposed lift station, which was also marked by wooden stakes. Vegetation in this area consisted of lawn grass and sparse trees. One shovel test was completed at each corner and one in the center of the marked lift station location. Shovel tests were excavated using the above methodology. All shovel test pits identified historic materials, but no prehistoric cultural materials were identified. The soils in this area consisted of a more silty loam, but also transitioned into the same reddish coarse sand subsoil.

The geophysical survey identified two features of interest in this area, which were also shovel tested (N11.5 E24.5, and N5.5 E12). The feature of interest at N11.5 E24.5 was identified as a thick, dead root system. A shovel test placed near feature of interest N5.5 E12 (Shovel Test 20) resulted in a high amount of historic materials, and an ashy layer containing the highest concentration of historic materials identified. A test unit was
excavated at N5.5 E12 to further explore this feature. The test unit uncovered the
remains of what was likely the cellar of a building that had been burned down sometime
before 1900. According to Edwin G. Robb in his book Afton Remembered the Tilton and
Newman sawmill once stood in approximately this location between 1857 and 1860, but
Robb had no comments as to what happened to the structure (Robb 1996).

The test unit was located approximately one meter west of Shovel Test 20, and was
excavated in 10-centimeter levels. The first four levels (0-40 centimeters below the
surface) contained a profile of 10YR 2/2 sandy loam, consistent with the other shovel
tests within the proposed lift station area. The feature of interest in this area became
clear in the following levels and consisted of a heavily defined concentration of historic
artifacts, heavily mottled soils, and burned, ashy and sandy material. Historic (19th
century Euro-American) artifacts were recovered throughout the unit with the greatest
consistency recovered from the historic feature. Artifacts recovered included square
nails, metal sheeting, concrete, window glass, historic ceramics, glass, brick, charcoal, food
remains such as animal and fish bone, and personal items such as buttons. No prehistoric
artifacts were identified or recovered in the area of the lift station.

8.3 Directional Drilling Areas
In addition to the above outlined project areas, four areas are proposed to undergo
directional drilling for the installation of sewer and stormwater piping. Because the
drilling will reach depths of 8-12 feet, the disturbance will be well below any potential
cultural layers. Therefore shovel testing was only completed at the entrances and exits of
these directional drilling areas. Some of these areas were not excavated due to their
location on top of the existing levee.

The first shovel test (DD#1) was conducted at the northernmost edge of the project
area at the drilling entrance/exit between the mound and proposed stormwater pond.
Large, possibly industrial metal was identified in the shovel test at approximately sixty
centimeters below the ground surface. The metal completely obstructed the shovel test
pit, and prevented further excavation. This may be consistent with the past industrial use
of this area in association with the railroad that previously ran through Afton. No
prehistoric cultural materials were identified.

The shovel test pit for the second directional drilling location (DD#2) was conducted
east of the mound in the backyard of Afton Leather. This shovel test yielded more
historic materials indicative of a historic dump site, and a soil profile consistent with the
other shovel tests within the proposed stormwater pond area. No prehistoric cultural
materials were identified.

The shovel test pit for the third directional drilling location (DD#3) was conducted near
the northeastern corner of Selma’s Ice Cream patio. There is a large pile of cut limestone
and concrete slabs by this corner of the patio, and that seems to extend underground to some degree. This shovel test pit could only be excavated down to 40 centimeters below the ground surface before being completely obstructed by concrete and limestone slabs. There was also a broken PVC sewer or drainage pipe that ended within the shovel test pit and appears not to be in use. A large amount of historic materials were found in this shovel test, consistent with materials found throughout the area. No prehistoric cultural materials were identified.

Throughout the course of archaeological testing, no prehistoric cultural materials were identified. No human remains were encountered. Historic (post-contact/Euro-American) artifacts were recorded. Most of these appear to relate to the heavy historic disturbance within the boundaries of site 21WA10. Some pockets of undisturbed soils were identified. These were located outside the boundaries of the effigy mound and (like the areas of disturbance) correlated with previous archaeological results.

9.0 RECOMMENDATIONS

The following section outlines recommendations resulting from the completion of the field investigations. The most important of which includes the National Register evaluation of site 21WA10.

Archaeological testing resulted in the identification of no prehistoric cultural materials or features. Based on geophysical studies and assumptions made from adjacent archaeological testing, portions of the Rattlesnake Mound are likely intact. One feature of interest located at N5.5 E12 on the geophysical survey grid was found to contain post contact 19th century artifacts which may be associated with early Afton history. The feature is not related to the mounds mapped as 21WA10 due to the location of the feature and types and age of artifacts recovered from within the feature. If necessary, further analysis and future recommendations regarding this feature will be provided in a separate report.

9.1 National Register Evaluation of Site 21WA10

As part of the Phase II Assessment, an evaluation of site 21WA10 was completed. This evaluation follows and is arranged following the NRHP sequence outlined in the National Register Bulletin, How to Apply National Register Criteria for Evaluation. The Bulletin states “Evaluation of a property is most efficiently made when following the following sequence” (U.S. Department of the Interior, 1998:3) and goes on to describe the sequence as follows.

1. Categorize the property (e.g., district, site)
2. Determine which prehistoric or historic context(s) the property represents.
3. Determine whether the property is significant under the National Register Criteria (A, B, C or D)

4. Determine whether the property retains integrity.

This sequence will form the basis of the following discussion of National Register eligibility of site 21WA10. As mentioned in the above section, evaluation of site 21WA10 used two Multiple Property Documentation Forms (MPDF). These MPDFs replace historic contexts for the earthworks property types and Woodland Culture and are considered a reliable resource for evaluation criteria. Dr. Clark A. Dobbs’ 1994 “Precontact American Indian Earthworks, 500 B.C. - A.D. 1650” and the 2008 “Minnesota Statewide Multiple Property Documentation Form (MPDF) for the Woodland Tradition” by Constance Arzigian were used in the evaluation of 21WA10. Both have been reviewed by the archaeological community and approved by SHPO and the National Park Service (NPS).

9.1.1 Categorization of the Property (NR Bulletin, Section IV)

The Bulletin defines a site as “the location of a significant event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined, or vanished, where the location itself possesses historic, cultural or archeological value regardless of the value of any existing structure” (U.S. Department of the Interior, 1998:3). 21WA10 is categorized as a “site”.

Site 21WA10 was first mapped by T.H. Lewis on June 25, 1883. He recorded the site as having consisted of eight mounds varying in size and shape and of which two were “gone” (Winchell 1911:271). The Minnesota State Archaeological Site Form records 21WA10 as a mound group. Four round, one oval, and one effigy mound are identified. The following table describes extant mounds within the mound group 21WA10.

<table>
<thead>
<tr>
<th>Mound Number</th>
<th>Current Status</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>“destroyed north of the property line”</td>
<td>Jones 2016:4</td>
</tr>
<tr>
<td>2</td>
<td>unknown - currently under building</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>unknown - currently under building</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>unknown - under parking lot</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Rattlesnake Mound - extant</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>unknown</td>
<td></td>
</tr>
</tbody>
</table>
Due to the lack of extant mounds, as shown above, the National Register evaluation of site 21WA10 focuses on the snake effigy mound portion of the site. The Rattlesnake Mound is the most significant and only visibly extant portion of the original 21WA10 site.

9.1.2 Prehistoric or Historic Context(s) (NR Bulletin, Section V)

The following section will determine (1) the facet of pre/history that the property represents; (2) whether the facet of pre/history is significant; (3) whether it is a type of property that has relevance and importance in illustrating the historic context; (4) how the property illustrates that history; and (5) whether the property possesses the physical features necessary to convey the aspect of the pre/history with which it is associated.

Dr. Clark A. Dobbs’ 1994 “Precontact American Indian Earthworks, 500 B.C. - A.D. 1650” and the 2008 “Minnesota Statewide Multiple Property Documentation Form (MPDF) for the Woodland Tradition” by Constance Arzigian define a number of property types into which site 21WA10 may fit. These property types include: groups of earthworks and mounds (Dobbs), mortuary sites (mound and non-mound) (Arzigian), and special-use sites (Arzigian).

Dobbs defines and describes groups of earthworks as ubiquitous. They are found in many areas of Minnesota, vary in number, form and have a poorly known origin. According to the Earthworks MPDF, this property type consists of a number of earthworks located together within a group. Site 21WA10 as mapped in 1883 fits this definition. However, as house and business construction has destroyed most of the original eight mounds, evaluation of 21WA10 as a group of earthworks would not be appropriate.

The Property Type “Mortuary Sites” include both “mound” and “non-mound mortuary sites”. First described by Dobbs, Arzigian further explains “Two relevant property types are grouped together for discussion here: lone mounds, and groups of earthworks and mounds. In Minnesota, “the dominant form of mound is conical, although there are also linear, effigy, and flat-topped mounds. The mounds vary in height from less than a foot to 45 feet. Groups of mounds range from 2 to 225 mounds per group; a few sites with large numbers of mounds account for a significant proportion of the mounds. Mounds are typically located in prominent settings overlooking rivers, streams, or lakes, although

<table>
<thead>
<tr>
<th>Mound Number</th>
<th>Current Status</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-8</td>
<td>Lewis identified as &quot;gone&quot; in 1883</td>
<td>Winchell 1911</td>
</tr>
</tbody>
</table>

Table 3. Status of Mounds within 21WA10
there are exceptions” (Arzigian 2008:154). To date no human remains are recorded as having been identified or removed from the mound group at 21WA10. Local stories suggest that during historic construction, skulls may have been removed but historical research cannot confirm these stories. It is probable that at least some, if not all of the mounds within 21WA10, were created for mortuary purposes. The mound group at 21WA10 is managed under the Minnesota Private Cemeteries Act (State Statute 307.08). Regardless, evaluation of a “mortuary site” under the MPDF requires mortuary use of a site. Because it remains an unknown whether 21WA10 (including the Rattlesnake Mound) was used for mortuary purposes, it is not appropriate to evaluate 21WA10 (including the Rattlesnake Mound) under the mortuary property type.

“Special-Use Site” is a property type defined by Arzigian as “one generally recognized as comparatively rare or unique within the Woodland tradition, with the presence or concentration of artifacts, ecofacts, or features in a context suggesting use for a special purpose other than general habitation or resource procurement and processing. Some possible kinds of sites that could be included here are dated rock art sites, caches, or boulder effigies. Special-use sites are likely to be rare and unusual and reflect activities other than subsistence or resource extraction” (Arzigian 2008:153). The Rattlesnake Mound within Site 21WA10 could be evaluated as a special-use site. As an effigy mound, it is comparatively rare or unique within the Woodland tradition. The presence of features (the effigy mound and lack of identified burials) suggests a special purpose other than general habitation or resource procurement or processing. The evaluation of the Rattlesnake Mound within 21WA10 as a special-use site is the most fitting of identified property types.

The Rattlesnake Mound represents the Effigy Mound Culture, a significant period of prehistory. Effigy mounds are a type of property that holds relevance and importance in illustrating the Effigy Mound Culture by their form and shape and role they play within the Effigy Mound Culture. The Rattlesnake Mound possesses the features necessary to convey the aspect of the pre/history with which it is associated. These are described below under integrity.

9.1.3 National Register Significance (NR Bulletin, Section VI)
To be listed on the National Register of Historic Places, a property must meet one or more of four broad criteria:

Criterion A: Sites that are associated with events that have made a significant contribution to the broad patterns of our history.

Criterion B: Sites that are associated with the lives of persons significant in our past.

Criterion C: Sites that embody the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess
high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction.

*Criterion D:* Sites that have yielded or may be likely to yield information important in prehistory or history.

The *National Register* Bulletin “Guidelines for Evaluating and Registering Archaeological Properties” (Little 2000) gives guidance for determining eligibility of an archaeological site. As described above, an archaeological site can be significant under any of the four criteria used to evaluate standing structures.

The Rattlesnake Mound of 21WA10 may be eligible under Criterion A for its association with the Effigy Mound Culture, an important event that has made a significant contribution to our history. The Rattlesnake Mound at 21WA10 is an example of an effigy mound. Effigy Mounds are associated with a Late Woodland Culture (or Tradition) known as the "Effigy Mound Culture". “The Late Woodland Effigy Mound culture occupied an extensive territory comprising eastern Minnesota, eastern Iowa, northern Illinois, and the southern half of Wisconsin. The area of greatest site density is southern Wisconsin, although some Effigy Mound sites in Wisconsin are situated within the Northern Forest region. Hurley (1975) defines three periods within the temporal span of the Effigy Mound culture. Early Effigy Mound extends from AD 300 to 700, Middle Effigy Mound from AD 700 to 1100, and Late Effigy Mound from AD 1100 to 1642 (European Contact). Conflicting hypotheses regarding the origin of the Effigy Mound culture exist. Griffin (1960) proposed that Effigy Mound reflects a decline from Hopewell [Culture]. Hurley (1975) rejects this, proposing instead “a gradual dement in place from an indigenous population which interacted with both the Havana and Hopewell phases while it in turn gave rise to the Effigy Mound tradition (Hurley 1975:364). A great many questions regarding all aspects of this culture remain to be answered. Early investigations centered on excavation of the mounds (Barrett and Hawkes 1919; Barrett and Skinner 1932; Jeske 1927; McKern 1928; McKern 1930). More recently, non-mortuary Effigy Mound sites have been excavated (Hurley 1975). Rowe (1958) and Hurley (1975, 1986) provide overviews of Effigy Mound research, describe recently excavated sites, and synthesize what is known about this widely distributed and long-lived culture (Benchley, et al, 1997:258).”

The Effigy Mound culture is defined by the construction of effigy mounds, use of Madison-like ceramics, and a seasonal lifestyle. Wilford identified the culture early in Minnesota but over time the culture has often been lumped into Southeastern Minnesota Late Prehistoric tradition. However, the culture is present at a number of sites. Anfinson tells us “on the basis of known distribution of effigy-shaped mounds and Madison-like ceramics in Minnesota there are at least 17 mound sites and 9 habitation sites for EFFIGY MOUND [sic] in the state. All of the mound sites except one (21SC16) are built on the terraces or bluffs along rivers. The habitation sites have similar locations,
although at least five of the habitation sites are rock shelters” (Anfinson 1979:73). Gibbon disagrees and states that “Altogether, only thirteen to fifteen sites in Minnesota contain effigy mounds or possible effigy mounds. These include eighteen to twenty bird effigies, three panther, one human, one possible turtle, one possible fish with fins, and four possible snake” (Gibbon 2012:141).

The Rattlesnake Mound of 21WA10 may be eligible under Criterion C as a site that embodies the distinctive characteristics of a type, period, or method of construction or that represent the work of a master, or that possess high artistic values. The snake effigy mound is an unusual form and shape. Effigy mounds typify the Effigy Mound Culture. Other mound shapes are conical, linear, or compound. According to the Effigy Mounds National Monument, “Earthen effigy mounds began to appear 1,400 years ago, and were possibly religious sites or clan symbols used in seasonal ceremonies. Some show evidence of fire, probably ceremonial, in the mound’s head, heart, or flank. Some tribal stories hold that the bear is the guardian of Earth and the bird the guardian of the sky. Perhaps the mounds were a means of connecting the people to the land and their spirit world and ancestors” (NPS n.d.).

The Rattlesnake Mound represents Effigy Mound Culture. Effigy mounds in Minnesota are rare and tend to be located along the Mississippi River. Location of effigy mounds on smaller tributary rivers is not as common. “Effigy mounds are largely limited to the Mississippi River edge in southeastern Minnesota” (Anfinson 1984:19). Effigy mounds are a relevant and important type of property which give us insight into the lives of a late prehistoric people. The Rattlesnake Mound illustrates the history of effigy mound culture as an example of one of the most easily identified features of the culture. The unique snake form coupled with its location far north of the identified Effigy Culture range enforces to the importance of the site. Although six to seven of the original eight mounds mapped in 1883 within the boundaries of 21WA10 are not extant, the Rattlesnake Mound does exist. Further discussion of extant mounds will follow under integrity.

The Rattlesnake Mound of 21WA10 may be eligible under Criterion D as it may be likely to yield information important in prehistory or history.

Arzigian suggests special-use sites can be eligible for the National Register under Criterion D (Arzigan 2008:153). Arzigian states that they must have “unique attributes or material assemblage [that] could provide important or unique information, with the specific relevant themes dependent on the nature of the site. For example, rock art sites … could provide insights into ideology and artistic expression. Caches of exotic materials would be important for understanding patterns of technology, trade, interaction, or population movements (e.g., seasonal rounds)” (Arzigan 2008:153). Arzigian continues “Special-use sites would be considered eligible for listing on the National Register under
In Minnesota, Effigy Mound Culture is poorly understood. Research questions about the culture could be answered by the Rattlesnake Mound of 21WA10. Possible research questions would include:

1. Who built the effigy mounds and when were they constructed? Non-intrusive and non-destructive dating methods, means of dating construction without artifacts or features, and other technological advances will assist in our understanding of sites such as this one.

2. What is the purpose of effigy mounds? Are they mortuary in nature? Ceremonial? Do they mark procurement areas of valuable resources? What does the distribution of these individual mounds within groups, and the groups within the landscape tell us about their purpose?

3. Do the people who created the effigy mounds have a connection to modern indigenous groups? Can we connect groups with oral histories of effigy mounds like the Ho-Chunk to these sites and locations? What role do the Dakota play in living in, using, and maintaining these sites?

4. What happened to the Effigy Mound Culture? Did they absorb into another group? Did technological advances make effigy mounds obsolete? What is their relationship to the Oneota or Mississippian Groups?

9.1.4 Integrity (NR Bulletin, Section VIII)

Once a site has been shown to be significant under one or more of the four above listed criteria, it must then be shown to be able to “convey that significance” (US Department of the Interior, 1998:44). This is what the National Register means by integrity. There are seven aspects of integrity: location, design, setting, materials, workmanship, feeling, and association. An additional National Register Bulletin Guidelines for Evaluating and Registering Archaeological Properties directs that “integrity is the ability of a property to convey it’s significance” and “to retain historic integrity a property will always possess several, and usually most, of the aspects.” (Little 2000:35).

The first of the seven aspects of integrity is location. Archaeological sites “almost always have integrity of location” (Little 2000: 38).
Design is another aspect of integrity. Under Criterion D “integrity of design for archaeological sites most closely approximates intra-site artifact and feature patterning” (Little 2000:39).

Setting includes “elements such as topographic features, open-space, views, landscapes, vegetation, manmade features, and relationships between buildings and other features” (Little 2000:40).

Aspect Four is integrity of materials. To retain integrity of materials under Criterion D is described by Little as “the presence of intrusive artifacts/features, the completeness of the artifact/feature assemblage or the quality of artifact or feature preservation” (2000:41).

Integrity of workmanship is defined as “the evidence of an artisan’s labor and skill in constructing or altering a building’s, structure, object, or site” and under Criterion D workmanship is addressed “indirectly in terms of the quality of the artifacts or architectural features” (Little 2000:41).

The sixth aspect of integrity is feeling. Little tells us “a property has integrity of feeling if its features in combination with its setting convey a historic sense of the property during its period of significance. Integrity of feeling enhances a property’s ability to convey its significance under all of the criteria” (2000:42).

Association is the seventh aspect of integrity. According to the bulletin How to Apply the National Register Criteria for Evaluation “a property retains association if it is the place where the event or activity occurred and is sufficiently intact to convey that relationship to an observer” (Little 2000:42). Little tells us that “under Criterion D, integrity of association is measured in terms of strength of the relationship between the site’s data or information and the important research questions” (2000:42).

As a special-use site, the Rattlesnake Mound of 21WA10 is eligible under Criteria A, C, and D. Dobbs tells us “to be eligible for inclusion in the National Register under Criterion A or C, earthwork groups must possess integrity of design, setting, materials, workmanship, and association” (Dobbs 1994:F2).

Rattlesnake Mound has limited integrity of design. According to Dobbs “design includes the combination of elements that create the form, plan, space, structure, and style of a property. In the case of earthwork sites, this includes the layout and plan of the earthworks; the form and style of the individual earthwork (conical, effigy, linear, ditchwork, etc); and whether they are still physically present or have been plowed down or otherwise disturbed. To have integrity of design, at least some of the earthworks at
the site must be clearly visible and convey the original sense of design and layout” (Dobbs 1994:F2).

Portions of the Rattlesnake Mound are visible, notably the head and tail. Subsurface remnants of the Mound may be present but geophysical testing showed that much of the Mound has been disturbed. The head and tail of the Rattlesnake Mound are visible and convey a sense of design and layout. Portions of the body may be present but disturbance in the area of the body may reflect historic destruction of the body through construction, landscaping, etc.

The design of effigy mounds was such that the importance of the site was in the visibility of the form on the landscape. The visibility of the mound from the water was important. The construction of the levee and decrease in original height of the Rattlesnake Mound make it difficult to view on the landscape thus diminishing the integrity of design within the landscape.

The Rattlesnake Mound does not have integrity of setting. According to Dobbs, setting includes “elements such as topographic features, open-space, viewshed, landscape, vegetation, and manmade features, and the relationship between these features. For earthworks to have integrity of setting, the site area must by and large appear as it did during the site’s period of significance. A broad rule of thumb would be to ask whether the site today would be recognizable to someone who lived at or visit the site at the time it was occupied” (Dobbs 1994:F2).

The built environment consisting of the construction of homes, businesses, and a marina, have severely impacted the integrity of the historic setting. A large earthen levee separating the visual and physical connection to the St. Croix River further impacts the setting. Noise from river and street traffic degrade the setting. The lack of associated earthworks, modern vegetation, and current river water levels (after dams, etc) do not resemble the historic landscape. It is highly unlikely that the site would be recognizable to someone who lived at or visited the site at the time it was occupied.

The Rattlesnake Mound has integrity of materials. Materials are defined by Dobbs as “the physical elements that were combined or deposited during a particular period of time and in a particular pattern or configuration to form a historic property (Dobbs 1994:F2)”. Although the Rattlesnake Mound has been disturbed by a variety of activities (landscaping, excavation and fill episodes, and construction of septic systems), it appears that most of the materials at the Mound remained at the Mound. For example, excavation of a utility trench removed soil (materials) from the Mound, these soils were likely replaced during backfilling thus leaving the materials at the site. Dobbs states “even plowed or partially destroyed mounds may still contain intact deposits of materials. Soil staining, ditches or faint topographic relief may be visible in aerial photography, allowing
reconstruction of the site’s plan” (Dobbs 1994:F2). LiDAR analysis shows that much of the Rattlesnake Mound is present in topographic relief. Dobbs continues “mounds which have been partially excavated in the past may still contain clearly defined stratigraphy or additional subsurface features. To possess integrity of materials, a site must have visible earthworks present and intact deposit of materials that are verifiable by a variety of methods of investigation, including aerial photography, geophysical study and imaging, and excavation or other form of sub-surface investigation” (Dobbs 1994:F2).

During conversations with the local landowner, it was stated that within the last 20 years, portions of the head might have been covered with excavated soils from the eastern pond area. This addition of soil may have increased the visual appearance but also preserved intact deposits within the head of the Rattlesnake Mound. As mentioned above, LiDAR analysis shows that much of the Mound is present in topographic relief. Soil probing and shovel testing along the eastern edge of the site (in the area where the proposed stormwater pond is located) show a combination of intact and disturbed soils within the site.

The Rattlesnake Mound has integrity of workmanship. Dobbs defines workmanship as “evidence of labor and skill of the individuals who built the earthwork. An earthwork site must retain enough integrity to demonstrate the construction methods used. Mounds which have been partially reconstructed may still retain integrity of materials. Mounds that have been largely or completely reconstructed do not. In general, workmanship of earthworks is not especially relevant to their significance since the same basic methods were used to construct them through time and space” (Dobbs 1994:F2-F3).

As mentioned above under Materials, portions of the Rattlesnake Mound—such as the above ground expressions of the head and tail—remain undisturbed and would have integrity of workmanship. Other portions of the Mound have been disturbed during construction and excavation; these areas do not retain integrity of workmanship. The body of the Rattlesnake Mound has been affected the most by excavation of septic systems and landscaping. This section of the effigy mound does not have integrity of workmanship.

The Rattlesnake Mound has integrity of association. Dobbs defines association as being present “if a site is the place where an event or activity occurred and is sufficiently intact to convey that relationship. Integrity of association is especially important under Criterion A” (Dobbs 1994:F3). As no artifacts have been identified in association with the Rattlesnake Mound, it is difficult to place the site within a specific temporal period. Effigy Mounds are credited to the Effigy Mound Culture (a temporal period). The construction of an effigy mound clearly suggests some event or activity out of the ordinary. As discussed previously, the head and tail portions of the Rattlesnake Mound
are visible above ground. Geophysical survey suggests portions of the Mound may be intact as well.

Dobbs warns “the problem of integrity for earthwork sites requires careful thought and judgement about the inter-relationship of the various elements of integrity as applied to particular criteria of significance” (Dobbs 1994:F3). He continues with four examples. None of the examples compare to the current situation but do lend some insight into the analysis of integrity of association. The Rattlesnake Mound has never been excavated (professionally or avocationally), and evidence of looting is not apparent. Current disturbance of the Mound is limited to leveling, landscaping, and excavation to install and operate existing septic systems. LiDAR analysis shows portions of the Rattlesnake Mound are still intact. Geophysical survey confirm that portions of the Mound have been impacted and are disturbed and other portions retain integrity.

The lack of artifacts in an effigy mound is common. In his book on Minnesota Archaeology, Gibbon discusses excavation of the Prior Lake Effigy Mound cluster (the only effigy mound excavated in Minnesota) (21SC16) and states “No artifacts were found within the mound. This is the only effigy mound in Minnesota that has been test excavated by an archaeologist” (Gibbon 2012:144). Personal communication with Amy Roseborough, Wisconsin State Historic Preservation Office Archaeologist confirmed that artifacts are rare in effigy mound excavations.

**Blondo Consulting recommends the Rattlesnake Mound as eligible for inclusion in the National Register of Historic Places under Criteria A, C, and D.** The site is significant as an effigy mound (special use site). The site has integrity of design, materials, workmanship, and association.

### 9.2 Assessment of Potential Effects

Under Section 106, federal agencies must take into account potential effects an undertaking may have on historic properties. According to the definition given in 36 CFR § 800.16(i), an effect is an “alteration to the characteristics of a historic property qualifying it for inclusion in or eligibility for the National Register.” Characteristics that make the Rattlesnake Mound eligible for the National Register are as follows: integrity of design, materials, workmanship, and association. Further discussion follows.

The Rattlesnake Mound has limited integrity of design. Proposed work at the Undertaking will not affect the design of the Rattlesnake Mound. No excavation of the Mound will occur. Work completed near the Rattlesnake Mound will include directional drilling beneath the Mound.

The Rattlesnake Mound has integrity of materials. Materials are defined by Dobbs as “the physical elements that were combined or deposited during a particular period of time
and in a particular pattern or configuration to form a historic property (Dobbs 1994:F2)”. Proposed work at the Undertaking will not affect the integrity of original materials at the Rattlesnake Mound. Materials will not be removed, nor new materials deposited within the Rattlesnake Mound.

The Rattlesnake Mound has integrity of workmanship. Dobbs defines workmanship as “evidence of labor and skill of the individuals who built the earthwork. An earthwork site must retain enough integrity to demonstrate the construction methods used” (Dobbs 1994:F2-F3). Proposed work at the Undertaking will not affect integrity of workmanship. Directional drilling beneath the Rattlesnake Mound will not affect the evidence of labor and skill of those that built the earthwork.

The Rattlesnake Mound has integrity of association. Proposed work at the Undertaking will not affect the integrity of association at the Rattlesnake Mound. The integrity of association at the site is related to the association of information within the Mound (construction techniques, artifacts, etc) which will not be disturbed during the course of the project. Directional drilling at a depth of 8 to 12 feet below ground surface will not affect buried deposits. Subsurface Mound features in Region 4 are typically located no more than five feet below ground surface (Arzigian 2003:219).

Based on the above assessment of effects, Blondo Consulting recommends a finding of No Effect to the National Register Eligible Rattlesnake Mound pursuant to 36 CFR § 800.4(d)(1).

Even if the Undertaking were to have one or more effects on the Mound, those effects would not be adverse. Under 36 CFR § 800.5(a), an “adverse effect” is found when, as “an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association. Consideration shall be given to all qualifying characteristics of a historic property, including those that may have been identified subsequent to the original evaluation of the property's eligibility for the National Register. Adverse effects may include reasonably foreseeable effects caused by the undertaking that may occur later in time, be farther removed in distance or be cumulative.” As explained in more detail below, the Undertaking will not diminish the integrity of those aspects of the Mound that make it eligible for inclusion in the National Register. To the contrary, elements of the Undertaking will actually protect or improve the integrity of what remains of the Mound, while also improving the environment surrounding the Mound.

Relocation and Redesign of the Stormwater Pond
A key element of the stormwater management system for the downtown area is the stormwater pond that is located east of the Rattlesnake Mound. This pond is located at the lowest point of the downtown area, to which a substantial amount of stormwater already flows naturally. The pond was initially designed as an L-shaped pond that crossed a portion of the Rattlesnake Mound. Based on an archeological analysis regarding site 21WA10 that was done in conjunction with Scott Anfinson, State Archeologist, and recommendations from Anfinson regarding the City’s Project plans, the City relocated and redesigned the pond to eliminate any encroachment on the Rattlesnake Mound and to keep it a minimum of 20 feet away from the Rattlesnake Mound. The pond has also been designed with a natural retaining wall to protect the steep slope that is currently eroding in the area of the Rattlesnake Mound and pond. The natural material used for the retaining wall, as well as the native plantings that will be used in the pond, will provide a natural character for the pond and a natural setting for the Mound. This will prevent future disturbance to the Mound from water erosion due to seasonal flooding.

Elimination of the Use of the Drainfield in the Head of the Mound
Septic system drainfields were installed in the area of the head of the Rattlesnake Mound and are currently discharging waste into the Mound. The sanitary sewer project will eliminate future septic system discharges to the drainfield by providing a connection to a new sanitary sewer system. This will prevent further disturbance to, and degradation of, the Mound.

Abandonment of Existing Septic Systems in-Place
The septic tanks, lines and drainfields that are currently in or adjacent to the Mound will be abandoned in-place to avoid disruption by excavation to remove them. This will prevent additional disturbance to the Mound from the current septic systems.

Private Sewer Connections
Three properties currently have private sewer connections that were installed through the Rattlesnake Mound by open excavation. These connections run from the rear of the properties to septic drainfields in the levee. To avoid impacts to the Mound, these existing sewer connections will be replaced by new connections to a sewer line along the levee by directionally drilling the connection lines eight-to-twelve feet under the Rattlesnake Mound in the same location as the previously disturbed areas.

The directional drilling of the connection lines under the Rattlesnake Mound has a much smaller impact on the Rattlesnake Mound than the open trench excavation that would be required if the connection lines were to be routed from the rear of the homes to the front of the property. The directional drilling requires a small pit in the area where the connection line enters the house. In contrast, particularly for the connection of the house located adjacent to the midpoint of the Rattlesnake Mound, the trench would
need to encroach on the Rattlesnake Mound itself. For the connection of the house adjacent to the head of the Rattlesnake Mound, a trench would be located partially within the 20 foot buffer area. Because directional drilling is minimally invasive and runs approximately eight-to-twelve feet underground, minimal-to-no disturbance of the Mound will take place. Subsurface Mound features in Region 4 are typically located no more than five feet below ground surface (Arzigian 2003:219).

**Stormwater Line Connection**
A stormwater line carrying stormwater to the pond will be directionally drilled under the midpoint of the Rattlesnake Mound in the area where a sanitary sewer line was historically installed by open trench excavation. The use of the sanitary sewer line will be eliminated and the line will be abandoned in-place. Following the existing excavation trench will cause minimal to no additional disturbance to the Mound. Directional drilling at a depth of 8 to 12 feet below ground surface will not affect buried deposits. Subsurface Mound features in Region 4 are typically located no more than five feet below ground surface (Arzigian 2003:219).

**Sanitary Sewer Line Connection**
The sanitary sewer line that will run along the levee will be connected to the sanitary sewer lift station located west of the southern end of the Rattlesnake Mound by a line that will be directionally drilled under the south end of the Rattlesnake Mound. To avoid impacts to the Mound, the line will be directionally drilled eight-to-twelve feet underground.

**Monitoring During Construction Excavation**
Although the Phase II investigation summarized in this report found no prehistoric artifacts or cultural features (including burial sites) associated with the Mound, the City nevertheless will have an archaeologist with expertise regarding mounds on site during construction to provide monitoring in the area of the Mound. The City also will invite the tribal governments to provide a representative to monitor excavation in the area of the Mound during construction.

The City also will prepare an inadvertent discovery plan. This plan will outline procedures to follow should significant artifacts or human remains be identified during construction related to the Undertaking.

**Preserving and Sharing the Significance of the Mound Site**
Finally, although not directly associated with the potential effects of the Undertaking, the Phase II investigation and the consultation process with the tribal governments has resulted in new information and new understanding regarding the Rattlesnake Mound site and the significance of the Mound. It is important to both preserve and share this information with the public in a way that highlights the significance of the site to both
the tribes and the history of Afton, while also protecting the Rattlesnake Mound site. This could be done through displays at the Afton Historical Museum and/or with a plaque or kiosk in Town Square Park or Steamboat Park.

10.0 CONCLUSION
Blondo Consulting recommends the Rattlesnake Mound as eligible for inclusion in the National Register of Historic Places. Assessment of effects resulting from the current Undertaking resulted in a recommendation of No Effects.

Additionally, Blondo Consulting recommends the following:

(1) completion of an inadvertent discovery plan
(2) archaeological monitoring during excavation within the boundaries of 21WA10,
(3) if necessary, further analysis and future recommendations regarding the identified feature at N5.5 E12 will be provided in a separate report,

and
(4) public dissemination of the archaeological work. This could be in the form of interpretative signage or public presentations in coordination with the local historical society.
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Winchell, N. H.

Wright, H. E.
Attachment 1: Soil Profiles
# Table 1. Shovel Test Pit Profiles

<table>
<thead>
<tr>
<th>Area</th>
<th>STP #</th>
<th>Depth (cmbs)</th>
<th>Soils</th>
<th>Artifacts (Pos./Neg.)</th>
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<tbody>
<tr>
<td>Proposed Pond</td>
<td>1</td>
<td>0-20</td>
<td>10 YR 2/2 Sandy Loam, Bioturbation just beneath the layer</td>
<td>Positive</td>
</tr>
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<td>20-60</td>
<td>10 YR 3/4 Sandy Loam</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>1</td>
<td>60-77</td>
<td>10 YR 4/3 Coarse Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>1</td>
<td>77-92</td>
<td>10 YR 4/3 Coarse Sand mottled with 10 YR 3/2 Clay</td>
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</tr>
<tr>
<td>Proposed Pond</td>
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<td>0-13</td>
<td>10 YR 2/2 Loam</td>
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<td>5 YR 3/4 Sand with small gravel, wet – hit standing water</td>
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<td>10 YR 3/2 Sandy Clay Loam</td>
<td>Negative</td>
</tr>
<tr>
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<tr>
<td>Proposed Pond</td>
<td>5</td>
<td>0-38</td>
<td>10 YR 2/2 Sandy Loam</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>5</td>
<td>38-72</td>
<td>10 YR 2/2 Sandy Loam mottled with 5 YR 3/4 Coarse Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>5</td>
<td>72-100</td>
<td>5 YR 3/4 Coarse Sand</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>6</td>
<td>-</td>
<td>Not Dug – Located Above Sewer Pipeline</td>
<td>-</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>7</td>
<td>0-51</td>
<td>10 YR 2/2 Sandy Loam</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>7</td>
<td>51-53</td>
<td>7.5 YR 3/1 Ashy Layer with thick amounts of charcoal</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>7</td>
<td>53-58</td>
<td>10 YR 2/2 Sandy Loam mottled with a rusty color</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>7</td>
<td>58-98</td>
<td>10 YR 3/3 Loamy Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>8</td>
<td>-</td>
<td>Not Dug – Located Outside Proposed Project Area</td>
<td>-</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>9</td>
<td>0-10</td>
<td>10 YR 3/3 Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>9</td>
<td>10-28</td>
<td>5 YR 3/4 Sand with Clay Inclusions</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>9</td>
<td>28-40</td>
<td>5 YR 3/4 mottled Sand – Bioturbation Present</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>9</td>
<td>40-63</td>
<td>10 YR 3/2 Loamy Sand</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>9</td>
<td>63-97</td>
<td>10 YR 2/2 Loamy Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>10</td>
<td>0-20</td>
<td>10 YR 3/2 Sandy Loam</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>10</td>
<td>20-100</td>
<td>5 YR 3/4 Coarse Sand with Gravel and Cobbles ranging small to large</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>11</td>
<td>0-20</td>
<td>10 YR 3/2 Sandy Loam</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>11</td>
<td>20-32</td>
<td>10 YR 3/2 Sandy Loam, Compact, Rich</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>11</td>
<td>32-44</td>
<td>5 YR 2.5/2 Sandy Loam with slight Clay ribboning, Compact</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>11</td>
<td>44-100</td>
<td>5 YR 3/4 Coarse Sand with loose Gravel</td>
<td>Negative</td>
</tr>
</tbody>
</table>
## Table 1. Shovel Test Pit Profiles

<table>
<thead>
<tr>
<th>Area</th>
<th>STP #</th>
<th>Depth (cmbs)</th>
<th>Soils</th>
<th>Artifacts (Pos./Neg.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Pond</td>
<td>12</td>
<td>0-30, 35</td>
<td>10YR 3/3 Organic Sandy Loam, slopes lower to the east</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>12</td>
<td>30, 35-100</td>
<td>5YR 3/4 Coarse Sand with larger gravel towards top of the level, and smaller gravel towards bottom of the level</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>13</td>
<td>0-19</td>
<td>10YR 2/2 Sandy Loam</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>13</td>
<td>19-55</td>
<td>10YR 2/2 Sandy Loam mottled with 5YR 3/4 Coarse Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>13</td>
<td>55-100</td>
<td>5YR 3/4 Coarse Sand</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>14</td>
<td>-</td>
<td>Not Dug – Located above existing sewer line</td>
<td>-</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>15</td>
<td>-</td>
<td>#15 and #7 were combined into one STP</td>
<td>-</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>16</td>
<td>-</td>
<td>Not Dug – Located Outside Proposed Project Area</td>
<td>-</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>17</td>
<td>0-30</td>
<td>10YR 2/2 Dark Sandy Loam</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>17</td>
<td>30-40</td>
<td>10YR 2/2 Dark Sandy Loam mottled with 5YR 3/4 Find Sand – Posthole profile remnant begins here at 30cmbs</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>17</td>
<td>40-100</td>
<td>5YR 3/4 Fine Sand mottled with 10YR 2/2 Dark Sandy Loam – Posthole profile remnant ends at 80cmbs</td>
<td>Positive, down to 50cmbs</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>18</td>
<td>0-10</td>
<td>10YR 3/2 loose Gravelly Sandy Silt</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>18</td>
<td>10-56</td>
<td>10YR 3/2 Silty Loam with some Clay, contained large dead roots</td>
<td>Positive, starting at 30cmbs</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>18</td>
<td>56-65</td>
<td>10YR 3/3 Sandy Loam</td>
<td>Positive, ending at 60cmbs</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>18</td>
<td>65-70</td>
<td>5YR 3/4 Coarse Sand with medium Gravel</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>18</td>
<td>70-100</td>
<td>5YR 3/4 Coarse Sand</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>19</td>
<td>0-47</td>
<td>10YR 2/2 Dark Sandy Loam</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>19</td>
<td>47-52</td>
<td>5YR 3/4 Coarse Sand, hit historic feature (old cellar?) and could not go further</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>20</td>
<td>0-54</td>
<td>10YR 2/2 Dark Sandy Loam</td>
<td>Positive, down to 20cmbs</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>20</td>
<td>54-70</td>
<td>10YR 2/2 Dark Sandy Loam mottled with 10YR 7/4 Ashy Layer</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>20</td>
<td>70-100</td>
<td>10Yr 2/2 Dark Sandy Loam mixed with 5YR 3/4 Coarse Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>21</td>
<td>0-15</td>
<td>10YR 2/2 Silty Loam, large Gravel</td>
<td>Positive, down to 30cmbs</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>21</td>
<td>15-48</td>
<td>7.5YR 2.5/1 Dark Sandy Loam</td>
<td>Negative</td>
</tr>
</tbody>
</table>
## Attachment 1: Shovel Test Profiles

<table>
<thead>
<tr>
<th>Area</th>
<th>STP #</th>
<th>Depth (cmbs)</th>
<th>Soils</th>
<th>Artifacts (Pos./Neg.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Lift Station</td>
<td>21</td>
<td>48-100</td>
<td>SYR 3/4 Coarse Sand</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>22</td>
<td>0-23</td>
<td>10YR 3/2 Loamy Silt</td>
<td>Positive, on surface</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>22</td>
<td>23-50</td>
<td>7.5YR 2.5/2 Sandy Silt Loam, compact and mottled</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>22</td>
<td>50-67</td>
<td>7.5YR 2.5/2 Sandy Silty Loam with small to medium sized gravel</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>22</td>
<td>67-100</td>
<td>SYR 3/4 Silty Sand</td>
<td>Negative</td>
</tr>
</tbody>
</table>

### Table 1. Shovel Test Pit Profiles

<table>
<thead>
<tr>
<th>Area</th>
<th>STP #</th>
<th>Depth (cmbs)</th>
<th>Soils</th>
<th>Artifacts (Pos./Neg.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Lift Station</td>
<td>21</td>
<td>48-100</td>
<td>SYR 3/4 Coarse Sand</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>22</td>
<td>0-23</td>
<td>10YR 3/2 Loamy Silt</td>
<td>Positive, on surface</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>22</td>
<td>23-50</td>
<td>7.5YR 2.5/2 Sandy Silt Loam, compact and mottled</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>22</td>
<td>50-67</td>
<td>7.5YR 2.5/2 Sandy Silty Loam with small to medium sized gravel</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>22</td>
<td>67-100</td>
<td>SYR 3/4 Silty Sand</td>
<td>Negative</td>
</tr>
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</table>

### Table 2. Anomaly Shovel Test Pit Profiles

<table>
<thead>
<tr>
<th>Area</th>
<th>Anomaly</th>
<th>Depth (cmbs)</th>
<th>Soils</th>
<th>Artifacts (Pos./Neg.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Pond</td>
<td>N39 E12 A</td>
<td>0-22</td>
<td>10YR 3/2 Loamy Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>N39 E12 A</td>
<td>22-78</td>
<td>10YR 4/6 mottled Sand</td>
<td>Positive, down to 30cmbs</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>N39 E12 A</td>
<td>78-102</td>
<td>SYR 3/4 Coarse Sand, wet, with roots and some gravel</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>N39 E12 B</td>
<td>0-19</td>
<td>10YR 3/2 Loamy Sand</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>N39 E12 B</td>
<td>19-53</td>
<td>10YR 4/6 reddish Coarse Sand</td>
<td>Positive, between 40 and 50cmbs</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>N39 E12 B</td>
<td>53-100</td>
<td>SYR 3/4 Very Coarse Sand</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>N29 E5</td>
<td>0-26</td>
<td>10YR 2/2 Dark Sandy Loam</td>
<td>Positive, down to 20cmbs</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>N29 E5</td>
<td>26-56</td>
<td>SYR 3/4 Coarse Sand</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>N29 E5</td>
<td>56-100</td>
<td>SYR 5/8 Very Coarse Sand with cobbles</td>
<td>Negative</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>N11 E6</td>
<td>0-14</td>
<td>10YR 2/2 Dark Sandy Loam</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>N11 E6</td>
<td>14-23</td>
<td>SYR 4/4 Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>N11 E6</td>
<td>23-37</td>
<td>10YR 2/2 Loamy Sand, rich</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>N11 E6</td>
<td>37-45</td>
<td>SYR 3/4 Coarse Sand with medium to large gravel</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>N11 E6</td>
<td>45-100</td>
<td>SYR 3/4 Coarse Sand with small gravel</td>
<td>Positive, down to 56cmbs</td>
</tr>
<tr>
<td>North of Mound</td>
<td>N1.5 E3</td>
<td>0-15</td>
<td>10YR 2/2 Sandy Clay Loam</td>
<td>Positive</td>
</tr>
<tr>
<td>North of Mound</td>
<td>N1.5 E3</td>
<td>15-16</td>
<td>SYR 3/4 Coarse Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>North of Mound</td>
<td>N1.5 E3</td>
<td>16-33</td>
<td>SYR 2/1 Sandy Clay Loam</td>
<td>Positive</td>
</tr>
<tr>
<td>North of Mound</td>
<td>N1.5 E3</td>
<td>33-58</td>
<td>10YR 2/1 Sandy Clay Loam mottled with SYR 3/4 Coarse Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>North of Mound</td>
<td>N1.5 E3</td>
<td>58-100</td>
<td>SYR 3/4 Very Coarse Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>N11.5 E24.5</td>
<td>0-48</td>
<td>10YR 2/2 Loamy Sand, with large dead roots</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>N11.5 E24.5</td>
<td>48-80</td>
<td>SYR 3/4 Coarse Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>N5.5 E12</td>
<td>-</td>
<td>Test Unit - See Table 4</td>
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</tbody>
</table>
### Attachment 1: Shovel Test Profiles

#### Table 3. Directional Drilling Shovel Test Pit Profiles

<table>
<thead>
<tr>
<th>Area</th>
<th>DD #</th>
<th>Depth (cmbs)</th>
<th>Soils</th>
<th>Artifacts (Pos./Neg.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proposed Pond</td>
<td>1</td>
<td>0-17</td>
<td>7.5YR 2.5/2 Loamy Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>1</td>
<td>17-34</td>
<td>7.5YR 2.5/3 Coarse Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>1</td>
<td>34-50</td>
<td>10YR 2/2 Loamy Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>1</td>
<td>50-62</td>
<td>10YR 2/2 Loamy Sand mottled with 7/5YR 3/4 Coarse Sand – hit metal historic feature</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>2</td>
<td>0-13</td>
<td>10YR 2/1 Sandy Clay Loam</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>2</td>
<td>13-49</td>
<td>7.5YR 2.5/3 Sandy Loam mottled with 10YR 2/1 Sandy Loam</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>2</td>
<td>49-78</td>
<td>7.5YR 2.5/3 Loamy Sand mottled with 10YR 2/2 Loamy Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>2</td>
<td>78-95</td>
<td>5YR 3/4 Coarse Sand</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Pond</td>
<td>3</td>
<td>0-40</td>
<td>10YR 2/2 Sandy Loam – hit solid concrete and limestone blocks that cover a large area, impassable, broken end of old drain pipe visible at roughly 15cmbs</td>
<td>Positive</td>
</tr>
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</table>

#### Table 4. The tesN5.5 E12 Test Unit Profile

<table>
<thead>
<tr>
<th>Area</th>
<th>Anomaly</th>
<th>Depth (cmbs)</th>
<th>Soils</th>
<th>Artifacts (Pos./Neg.)</th>
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</thead>
<tbody>
<tr>
<td>Proposed Lift Station</td>
<td>N5.5 E12</td>
<td>0-10</td>
<td>10YR 2/2 Sandy Loam</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>N5.5 E12</td>
<td>10-20</td>
<td>10YR 2/2 Sandy Loam</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>N5.5 E12</td>
<td>20-30</td>
<td>10YR 2/2 Sandy Loam</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>N5.5 E12</td>
<td>30-40</td>
<td>10YR 2/2 Sandy Loam</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>N5.5 E12</td>
<td>40-50</td>
<td>10YR 2/2 Sandy Loam, beginning to see 10YR 7/4 Ashy Layer, but not quite formed yet</td>
<td>Positive</td>
</tr>
<tr>
<td>Proposed Lift Station</td>
<td>N5.5 E12</td>
<td>50-60</td>
<td>Southern Half: 10YR 2/2 Sandy Loam mottled with 10YR 2/1 Silty Loam and 10YR 6/2 Mortar and 10YR 5/4 Ash Northern Half: 10YR 2/2 Silty Loam with Medium Coarse Sand with three spots of 5YR 5/4 Reddish Clay</td>
<td>Positive</td>
</tr>
</tbody>
</table>
Attachment 2: Maps
Attachment 2: Maps
Afton Stormwater Improvements
N.H. Winchell's 1911 map of site 21WA10 - Rattlesnake Mound Group
Afton, Washington County, Minnesota
Blondo Consulting, LLC
Figure 1: Existing Sanitary Septic Systems & Septic Drain Fields
Attachment 3: Photographs
Attachment 3: Photographs

Photo 1: Of northern end of proposed stormwater pond location, from foot of existing levee facing west, Washington County, Minnesota.

Photo 2: Of northern portion of proposed stormwater pond location, from existing levee facing southwest, Washington County, Minnesota.
Photo 3: From northern end of proposed stormwater pond location facing north across existing levee, Washington County, Minnesota

Photo 4: From levee at eastern edge of proposed stormwater pond location facing south across existing levee, Washington County, Minnesota
Photo 5: Of northern portion of proposed stormwater pond location from existing levee facing northwest, Washington County, Minnesota

Photo 6: Of northern portion of proposed stormwater pond location and existing levee, facing north, Washington County, Minnesota
Photo 7: Of proposed stormwater pond location facing northeast, Washington County, Minnesota

Photo 8: Of center of proposed stormwater pond location, from existing levee facing west, Washington County, Minnesota
A Phase II Archaeological Assessment of 21WA10
Afton, Washington County, Minnesota
blondoconsulting/AftonCulturalResourcesReport.pages

Photo 9: Of southern portion of proposed stormwater pond location, from existing levee facing southwest, Washington County, Minnesota

Photo 10: Of southern portion of proposed stormwater pond location and existing levee with sewer and drainage connections, facing south, Washington County, Minnesota
Photo 11: Of southern portion of proposed stormwater pond, from existing levee facing northwest, Washington County, Minnesota

Photo 12: Of southern and central portions of proposed stormwater pond and existing levee, facing north, Washington County, Minnesota
Photo 13: Of southern edge of proposed stormwater pond location, from existing levee facing west, Washington County, Minnesota

Photo 14: From levee at southern edge of proposed stormwater pond location facing southwest towards proposed lift station location, Washington County, Minnesota
Photo 15: From existing levee at southern edge of proposed stormwater pond facing south, Washington County, Minnesota

Photo 16: Of proposed lift station location facing northwest (note wooden stakes marking corners), Washington County, Minnesota
Photo 17: Of proposed lift station location facing southwest (note wooden stakes marking corners), Washington County, Minnesota

Photo 18: Of proposed lift station location facing northeast (note wooden stakes marking corners), Washington County, Minnesota
Photo 19: Of proposed lift station location facing southeast (note wooden stakes marking corners), Washington County, Minnesota

Photo 20: Of proposed lift station location facing east (note wooden stakes marking corners), Washington County, Minnesota
Photo 21: Of proposed lift station location facing north (note wooden stakes marking corners), Washington County, Minnesota

Photo 22: Of proposed lift station location facing west (note wooden stakes marking corners), Washington County, Minnesota
Photo 23: Of proposed lift station facing south (note wooden stakes marking corners), Washington County, Minnesota

Photo 24: Of raise from historic driveway through center of proposed lift station, oriented north-south (white flag in center of photo marks the northern tip of the driveway), Washington County, Minnesota
Photo 25: Of southern two directional drilling locations (DD#2 and DD#3) from existing levee facing south, Washington County, Minnesota

Photo 26: Of southern two directional drilling locations (DD#2 and DD#3) from existing levee facing north, Washington County, Minnesota
Photo 27: Of central directional drilling location (DD#2 was in the thicket), Washington County, Minnesota

Photo 28: Of southernmost directional drilling location (DD#2 was just north of the rock pile), Washington County, Minnesota
Photo 29: Typical shovel test pit, STP N29 E5, within proposed stormwater pond, Washington County, Minnesota

Photo 30: Typical shovel test pit, STP N11 E6, within proposed lift station, Washington County, Minnesota
Appendix A: LiDAR Report
Overview

21WA10 is a Group of Native American earthworks in the city of Afton, Minnesota. The site was originally recorded by Theodore H. Lewis of the Northwestern Archaeological Survey in 1883. As mapped by Lewis, the group consisted of six round mounds (two already destroyed), one elongated (oval) mound, and a rattlesnake effigy mound approximately 160 meters in length. Since that time, the site has been heavily impacted by construction and earth moving. No obvious surface expression remains of the earthworks mapped by Lewis. A description of the site and an assessment of its present condition can be found in Arzigian (2015).

Archaeo-Physics, LLC was contracted by the city of Afton, MN to reconstruct the locations of the earthworks as accurately as possible, and to detect possible earthwork remnants through analysis of Lidar data. Analysis included archival research and comparison of numerous datasets in GIS. A secondary purpose of the study was to assess the feasibility of subsurface mapping with geophysical survey.

Plotting earthworks from the T.H. Lewis notes

Lewis' survey notes are in the form of tables of angles and distances between mounds and landmarks, mound dimensions, schematic sketch maps, and brief descriptions. Although the mounds had been mapped by Winchell (Winchell et al.1911) from Lewis' survey notes, but Winchell’s maps (while generally excellent) have been found to suffer from distortions in scaling and occasional errors. Use of the original notes also avoided possible transcription errors and provided better insight into Lewis' original intent in cases of ambiguity, and to possible degradations in accuracy inherent in his methods.

Vector drawing software (Corel Draw) was used to draw each earthwork at a scale of 1:1000. Each earthwork was positioned following the bearings and distances in Lewis' table.

In the thousands of earthworks surveys performed by Lewis, compass bearings are most typically relative to magnetic directions (at 21WA10, 8.4° east at the time of survey), but are sometimes relative to true north, or an arbitrary direction sometimes several degrees from either true or magnetic direction. The latter appears to be the case in his survey of 21WA10. In this case, orientation can be deduced by the city lot boundaries used by Lewis as landmarks. Block and street dimensions have remained consistent with those mapped by Lewis, and it is presumed that these boundaries remain valid as landmarks.

In GIS (QGIS) the scaled vector drawings were georeferenced using property boundaries as a reference. Mound outlines were then digitized as shapefiles.

Lidar modeling

Lidar modeling was performed using data from the Minnesota Elevation Mapping Project. Although prepared data products in the form of 1m resolution DEMs and hillshade model images are available, these are intended for general-purpose use. Archaeological assessment is much better served and mound detection rates are higher using specialized processing and modeling from the original point cloud data.
Raw Lidar data were parsed using the libLAS library. Surfer mapping software was used to grid the data and produce hillshade and local relief models and close-interval contour maps.

**GIS analysis**

Numerous data layers were compared in GIS to assess the condition of the site, search for possible mound remnants. These included: posited mound positions; Lidar imagery; utilities including sewer and septic systems and wells; recent and historic aerial photography; present and historic parcel boundaries; testing locations from Arzigian's (2015) archaeological investigation; and proposed construction maps.

**Summary of findings**

Although T.H. Lewis was often hasty or error-prone in his surveys, his survey at 21WA10 appears to have been performed carefully, using marked lot boundaries as references. Some ambiguities in his notes were resolved with reasonable confidence. Assuming that the boundaries between lots and city street right-of-way have not substantially changed, and that available GIS data of these property boundaries is accurate, the reconstructed mound locations are likely to be accurate within the limitations of Lewis' survey methods. In general, Lewis' level of accuracy may be estimated as being within a meter, with the understanding that the outlines and centers of the earthworks themselves were difficult to exactly define. Three portions of the survey where lesser accuracy may be expected are noted in the text accompanying Figure 2.

Lidar modeling, aerial/satellite photography, and documentation of sewers and other utilities combine to show a pattern of nearly ubiquitous impact to the site, and little suggestion of any remaining surface expression of the Native American earthworks. Site setting, Impacts to the integrity of the site, and a possible mound expression are shown in Figures 1-7.

Not presented here, and outside the formal scope of this study, historic aerial photographs from 1938 and 1957 were examined. While the resolution of this imagery was poor, there appear to have been additional structures in this area. Careful examination of historic aerial photography and archival research may yield additional information about historic/modern impacts to the site.

In spite of the heavily impacted condition of the site, there is a possibility of intact or fragmentary archaeological features remaining in portions of the site. These may include mound remnants, sub-mound features, and inter-mound features. At a minimum, careful archaeological monitoring of construction activities is strongly recommended.

Geophysical survey might be performed, but historic/modern impacts to the site are likely to be far more apparent than Native American archaeological components. Because of this, any value in geophysical survey may lie more in documenting disturbance (or lack thereof) than in directly detecting features of archaeological interest.
Figure 1: Posited location of mounds at 21WA10
Figure 2: Posited location of mounds at 21WA10 in relation to property boundaries

The property boundaries facing 33rd Street and Afton Trail were the basis for this reconstruction from the T.H. Lewis notes. At the time of Lewis' survey, the mounds labeled x1 and x2 had been destroyed, and their size and position should be considered approximate. Mound 1 was destroyed north of the property line. The tail of Mound 5 (the rattlesnake effigy) is at the end of an open traverse (a series of surveyed points whose endpoint is not checked for accuracy). This end of Mound 5 therefore has greater potential for degraded accuracy than features in the northern portion of the group. Lewis shows the last bulb on the tail as bisected by the property line.
Proposed construction (pond, sewer lines, etc. are shown in orange. The construction area is outlined in red. Note that the construction limits are not defined along 33rd Street in the vicinity of the northernmost mound (Mound 1).
Figure 4: Lidar hillshade model

Illumination is from the northwest. Alternate plots with illumination from multiple angles were also examined.
Local relief modeling essentially “flattens” large-scale variations in elevation, thus enhancing the detectability of small and subtle features. In this image, darker shades indicate higher elevation. Note the raised area coinciding with the head of the snake effigy. This was noted by Arzigian (2016) as a possible expression of the mound. Although its location and height coincide well with the head of the effigy as mapped by Lewis, the diameter is considerably smaller.
Figure 6: Contour map showing modern fill

Elevation is shown in 25cm contours. The green shaded areas appear to be modern fill to raise the elevation of houses. Lewis describes the area as prone to flooding. It is possible that this fill may overlie intact original ground surfaces. Note that the knob coinciding with the head of the rattlesnake effigy forms part of the slope of one of these modern house platforms. Red lines delineate the construction area.
Figure 7: Disturbances to site and archaeological testing.

Existing sewers, septic systems and wells are shown in blue. Lot boundaries are shown in purple and the construction area in red. Other utilities and sources of disturbance are certainly present. Pink dots represent archaeological shovel tests, and the labels “Undisturbed” and “Disturbed” follow the characterizations given by Arzigian (2015) based on her testing results.
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Appendix B: Geophysical Report
OVERVIEW

21WA10 is a Group of Native American earthworks in the city of Afton, Minnesota. The site was originally recorded by Theodore H. Lewis of the Northwestern Archaeological Survey in 1883. As mapped by Lewis, the group consisted of six round mounds (two already destroyed), one elongated (oval) mound, and a rattlesnake effigy mound approximately 160 meters in length. Since that time, the site has been heavily impacted by construction and earth moving. A description of the site and an assessment of its present condition can be found in Arzigian (2015). A spatial analysis of the site was previously prepared by Archaeo-Physics, LLC that included high-resolution Lidar mapping and plotting of the mound locations surveyed by T.H. Lewis (Jones 2016).

Archaeo-Physics, LLC was contracted by the city of Afton, MN to conduct geophysical survey and subsurface imaging of potions of the site that would potential be affected by a proposed sewer construction project. The investigation used electrical resistance and ground penetrating radar (GPR) survey to detect and map possible subsurface archaeological patterning. Fieldwork was conducted between 28 March and 15 April 2016 by Geoffrey Jones with the assistance of David Thiel, field technician.

Seven separate areas were surveyed. The results of the surveys showed (as expected) extensive disturbance, but also patterning that is recommended for subsurface testing as possible prehistoric or historic archaeological features.

METHODS

The geophysical methods used in this survey were electrical resistance and GPR over an area within and immediately surrounding the palisade of the fort. These surveys were be configured to map spatially small and generally shallow features. Lidar mapping utilized data from the Minnesota statewide Lidar project to create high-resolution topographic maps.

A very brief introduction to these methods is presented below. Geophysical survey in archaeology is treated in greater depth in Clark (1996) and Johnson (2006).

Survey grid system and general procedures

The seven survey areas surveyed were consisted of rectangular survey “grids”. Each grid was measured on the ground with tapes, and the corners marked with wooden stakes. Grid corners were recorded with a GPS receiver having sub-decimeter accuracy to assure that grids could be re-located in the future, and to allow survey results maps to be georeferenced.

The general procedure for survey with both instruments involves taking readings at regular intervals along regularly spaced transects. Successive transects are surveyed until the grid is completed. The value and position of each data point is recorded by the instrument. Data are later downloaded to a computer for processing and analysis. With both instruments, data are assembled into graphical plots that to visualize subsurface patterning.
Figure 1. Location of project area in downtown Afton

locations of Mounds mapped by T.H. Lewis are shown in yellow; areas surveyed with GPR are shown in red; areas surveyed with resistance are shown in blue; and areas surveyed with both instruments are shown in purple.

**Electrical resistance survey**

The resistance meter responds to differences in the electrical resistivity of subsurface materials. The instrument responds to differences in grain size, organic content, moisture content, and chemistry. Many types of features are detectable if sufficient contrast exists between the feature

*Geophysical survey of the 21WA10 mound group, Afton MN*
and the surrounding matrix. Features may be detectable because of intrusive materials such as stone architecture or fill within pit features, or because of organically enriched, compacted, or disturbed soils.

A Geoscan Research RM15 resistance meter was used to perform the resistance survey. The instrument was used in twin-probe configuration. An attached MPX15 multiplexer allowed simultaneous data collection with two different mobile probe spacings (50cm and 100cm). The narrower electrode spacing is capable of higher resolution but is limited in depth of investigation to approximately 75cm or less. The wider electrode spacing can achieve approximately twice the depth of investigation but sacrifices resolution of smaller features. Data was collected at 1m transect intervals, with 2 sampling stations per meter along each transect at each station three samples were collected, two side-by-side samples with 50cm probe spacing (effectively collecting two parallel lines of data 50cm apart) and one sample with the 100cm probe spacing. This resulted in a sample density of 4 samples/m2 with the narrower electrode spacing and 2 samples/m2 with the wider electrode spacing.

Resistance survey data processing included:

- Removal of extreme statistical outliers (despike).
- Merging data collected with the two 50cm parallel array.
- Interpolation to a uniform number of data points (4 per meter) in both the x and y directions.

After processing and analysis using Geoscan Research Geoplot® software, Resistance data were exported to Golden Software Surfer® mapping software for display as image maps. A number of alternate displays were created during analysis to isolate or emphasize different aspects of each dataset. The maps used in this report were selected as being the most versatile for interpretation.

**Ground penetrating radar**

GPR survey can map many types of archaeological features based on contrasts in their electrical and magnetic properties. Possible GPR survey targets include a wide range of cultural and natural features. GPR is often of particular value because it is often able to distinguish spatially small targets better than other geophysical methods. The capability of GPR to discriminate depth is useful for distinguishing deep features such as privies form those near the surface.

GPR data are traditionally examined as profile maps depicting individual transects. Time-slicing is a technique for constructing planview maps of an area at specific depths. Time (or depth) slicing not only makes interpretation of data in the horizontal plane much more intuitive, but also allows us to isolate specific depth slices (or more properly, the two-way travel times of reflected waves) for examination. GPR data will be examined and analyzed as both profile maps and as planview time-slice maps. Time data is converted to depth data (depth-slices) after estimating the velocity of the signal through the soil.

GPR survey was performed using a Sensors & Software pulseEKKO 1000 ground penetrating radar operating at a center frequency of 450 MHz. Data were collected using a transect spacing of 0.5 m, with 20 traces taken per meter along each transect (80 traces per m2). Using a wheel odometer for spatial control along each line. Each GPR trace consists of data points within a 60 nanosecond time window, encompassing an estimated depth of 2 meters, although the effective range of the instrument was somewhat less than this.

Processing of GPR data were performed with Sensors and Software EKKO View Deluxe® and EKKOmapper® software:

- DEWOW signal saturation correction was used to remove unwanted inductive low frequency components.
For time slices, data were converted from wavelets with both positive and negative components to a monopulse wavelet with all positives (average enveloped amplitude).

Time slice maps were created representing planviews at 20cm vertical intervals (a wave velocity of 0.1 m/ns was used to estimate depths). Time slice maps represent depths only to 160cm below surface (estimated). Signal return from greater depths was very weak with the data dominated by noise.

Further processing including interpolation and smoothing of time-slice data was performed in Geoscan Research Geoplot® software.

After processing and analysis, GPR data were exported from Geoplot to Golden Software Surfer® mapping software for display as image maps. Depth sections were displayed with EKKOmapper® software.

**Survey Results**

Features of interest are generally interpreted based on their patterning, and are rarely obvious based on their data values alone. In general, small and discontiguous survey areas are unfavorable for interpretation, as patterning is best interpreted in its broader context. Interpretation at 21WA10 was further compromised because of the extensive historic/modern disturbance at the site. This not only disrupt natural and archaeological patterning, but also may not be distinguishable from phenomena of interest.

Because of these factors, interpretation of geophysical survey results is less straightforward than it would be at many other sites. The results should nevertheless be useful in giving targets for archaeological testing, and extrapolating testing results into untested areas.

Because the multiple depth investigations with both instruments produced a very large number of individual data plots, only representative maps of the seven survey areas are shown here Figures 2-12). The full set of data plots accompany this report as digital files. These may be valuable for future investigation and ongoing interpretation, particularly in the light of testing results.
Area 1

Figure 2. Electrical resistance survey (50cm array) of Area 1.

1. A high resistance anomaly probably associated with historic/modern features.
2. Anomalies associated with a historic/modern driveway visible on surface.
3. Faint, possibly rectangular patterning, likely of historic/modern origin.
4. Diffuse linear low. Origin is ambiguous, but relatively near (several meters west) of mapped location of rattlesnake mound.
5. Resistance high. Likely historic/modern disturbance, but also near (slightly east) of rattlesnake mound location.
6. Area of historic/modern disturbance associated with drainage ditch.
1. an area of relatively discrete reflection, ambiguous but consistent with an archaeological feature
2. A strong and relatively distinct reflection. It is near (slightly to the west) the recorded location of the rattlesnake effigy, but largely outside the boundaries of the archaeological investigation.

1. a strong and coherent reflection that appears in multiple depth slices between 60 and 160 cm depth. This is very likely to be a cultural feature of either historic or prehistoric origin.
2. disturbance associated with a drainage ditch.
Area 2

Figure 5. Electrical resistance survey (100cm array) of Area 2.

1. This area of low resistance coincided with the boundary of a brushy area.
2. A resistance high. Surface inspection showed sandy soils, and a small piece of burned sandstone was found on the surface.
3. Low resistance patterning coinciding with GPR reflections (see Figure 6).
Figure 6. GPR time slice (60-80cm depth) of Area 2.

1. Very faint patterning forming an oblong or rectangular pattern, roughly coinciding with the orientation of more distinct anomalies to the south.

2. relatively strong patterning with possible faint linear/rectilinear elements. This is ambiguous, but possibly associated with historic features.
**Area 3**

21WA10 Area 3 electrical resistance survey

![Image](image1)

**Figure 7.** Electrical resistance survey (50cm array) of Area 3.

This area has obviously been highly disturbed by installation of a septic system. The plainly seen linear high is likely of modern origin, and other patterning is ambiguous.

**Area 4**

21WA10 Area 4 electrical resistance survey

![Image](image2)

**Figure 8.** Electrical resistance survey (50cm array) of Area 4.

1. the south edge of a trench for a sewer line. The north edge is ambiguous, possibly obscured by overlying fill.

21WA10 Area 4 GPR survey 140-160cm depth

![Image](image3)

**Figure 6.** GPR time slice (140-160cm depth) of Area 4.

1. A relatively strong reflection at 140-160 cm depth in an area that was not obviously disturbed by the sewer trench.
Area 5

21WA10 Area 5 electrical resistance survey

Figure 10. Electrical resistance survey (50cm array) of Area 5.

This area is composed of fill, which has been further disturbed by installation of a septic system. Patterning is not thought to be of archaeological interest.

Area 6

21WA10 Area 6 GPR survey 40-60cm depth

Figure 11. GPR time slice (40-60cm depth) of Area 6.

Area 6 was surveyed with GPR only to investigate a former mound location beneath pavement. Higher amplitude reflections (on the right side of the data plot) are associated with the sidewalk and boulevard, but no patterning of archaeological interest is apparent.

*Geophysical survey of the 21WA10 mound group, Afton MN*
Area 7

Figure 12. GPR time slice (60-80cm depth) of Area 7.

Area 6 was surveyed with GPR only to investigate a former mound location beneath pavement. The linear east-west anomaly is likely a utility line or trench. No patterning of archaeological interest is apparent.

SUMMARY

All of the survey areas appear to have been heavily disturbed by historic/modern activities. This is consistent with the results of the geophysical investigation, which show obvious disturbances and general ambiguity of patterning. The difficulty of interpreting these results is compounded by the small size and scattered locations of the survey areas, which prevents seeing large-scale patterning and does not allow patterning to be examined in meaningful contexts. A number of anomalies have been suggested as targets for subsurface testing, but confidence is generally low in their interpretation as features of interest.

These results may nevertheless be valuable for archaeological investigation, beyond offering a number of (generally ambiguous) targets for testing. Subsurface testing (whether arbitrary or targeting geophysical anomalies) will provide insight into the physical phenomena that are expressed in the geophysical data. This information may allow a second round of revised or elaborated interpretations. Where correlations can be drawn with geophysical patterning, testing or excavation results can be extrapolated into untested areas.
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