City of Circle Pines

City of Circle Pines
200 Civic Heights Circle • Circle Pines, MN 55014

# FEASIBILITY Report

January 28, 2014

# 2014 Street and Utility Improvement Project

*City of Circle Pines*
*Anoka County, Minnesota*

***WSB Project No. 1507-57***

WSB & Associates, Inc.
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# FEASIBILITY REPORT

## 2014 STREET AND UTILITY IMPROVEMENT PROJECT

## FOR THE
## CITY OF CIRCLE PINES, MINNESOTA

**January 28, 2014**

**Prepared By:**

**WSB & Associates, Inc.**
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January 28, 2014

Mr. Jim Keinath
City Administrator
City of Circle Pines
200 Civic Heights Circle
Circle Pines, MN 55014

Re: Feasibility Report
2014 Street and Utility Improvement Project
City of Circle Pines, MN
WSB Project No. 1507-57

Dear Mr. Keinath:

Transmitted herewith for your review is a feasibility report which addresses the street and utility improvements proposed for 2014. The streets with proposed improvements include all segments of West Road, Fire Barn Road, and East Road between Fire Barn Road and Center Road.

We are available at your convenience to discuss this report. Please do not hesitate to contact me at 763-287-7162 if you have any questions regarding this report.

Sincerely,

***WSB & Associates, Inc.***

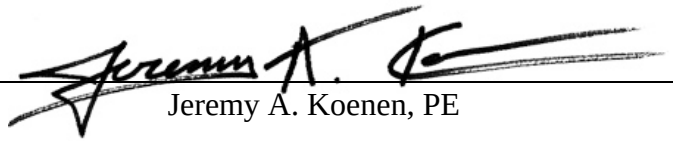
Shibani K. Bisson

Shibani K. Bisson, PE
Senior Project Manager

Enclosure

# CERTIFICATION

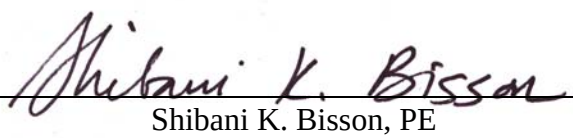
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly licensed professional engineer under the laws of the State of Minnesota.



Jeremy A. Koenen, PE

Date: January 28, 2014 Lic. No. 47995

Quality Control Review By:



Shibani K. Bisson, PE

Date: January 28, 2014 Lic. No. 41860

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# 1. EXECUTIVE SUMMARY

The 2014 Street and Utility Improvement Project includes roadway reconstruction and utility improvements of West Road, Fire Barn Road, and East Road between Fire Barn Road and Center Road. The streets total approximately 1.10 miles and include curb and gutter, sanitary sewer, water main, and storm sewer facilities. This project was initiated as part of the Long-term Streets Plan which was passed by the City Council in 2007.

In 2011, WSB prepared an updated Pavement Management Report which re-evaluated the condition of the City's street system and developed a Capital Improvement Plan (CIP) to reconstruct the remaining City streets that are in "poor" condition. The streets within the current project area were rated "poor" and are slated to be the next area to be reconstructed. Along with the street reconstruction, utility replacement is recommended due to the inflow and infiltration issues the City faces that result in increased fees the City pays to the Met Council for wastewater treatment. Utility replacements are also more cost-effective when completed as part of a larger roadway project. Completing utility replacement with roadway replacement will also align the lifecycles between the roadway and utility systems.

It is proposed that West Road, Fire Barn Road, and East Road be reconstructed to a standard width of 32 feet with B618 curb and gutter; these streets are currently 32 to 33 feet in width. The cul-de-sac streets of West Road A, B, and C will be reconstructed to their existing width of 28 feet with B618 curb and gutter. The "eyebrow" cul-de-sac within the southern leg of West Road is proposed to be removed. The typical street section would be centered within the right-of-way and the adjacent driveways would be extended to meet the roadway. The addition of a sidewalk along the east and north sides of Fire Barn Road and the northern leg of West Road between Lake Drive and Lexington Avenue was evaluated as it was identified in the City's 2008 Pedestrian Facility Plan.

Utility improvements include the replacement of approximately 5,270 feet of cast iron pipe (CIP) water main, 4,750 feet of vitrified clay pipe (VCP) sanitary sewer, 90 sewer and water services, and the installation of a new storm sewer drainage system.

Improvements to the storm sewer system include replacing the current storm sewer within the streets and adding catch basins and storm sewer pipe to better accommodate storm water runoff. Storm water treatment is proposed to be accomplished by constructing an infiltration system adjacent to the project area north of Carl Eck Park. Currently, staff is in discussions with Rice Creek Watershed District to utilize this on-site infiltration system which their current rules require. The infiltration system is anticipated to meet the permitting requirements for this project, make up for the 2012 Street Improvement Project debit, and potentially provide storm water credits which could be used for future street improvement projects located within the Golden Lake watershed.

Parking lot improvements were evaluated to provide off-street parking alternatives adjacent to Carl Eck Park. Two different options were investigated to relieve the current on-street parking congestion within the neighborhood. These options consist of delineating the existing Carl Eck Parking lot to provide 72 parking spaces and adding 21 bump out parking spaces to Fire Barn Road.

Conceptual intersection improvements at the intersection of Fire Barn Road/Lake Drive/Civic Heights Drive and at Pine Drive/Lake Drive were reviewed to increase pedestrian safety as well as improve aesthetics at this key intersection within the community.

In addition, an environmental investigation will be required to construct the utility improvements at Fire Barn Road near the intersection at East Road due to the petroleum spill from a Magellan gas main leak that occurred in 1982. The site was originally cleaned at the time of the spill. However, additional investigation is required to ensure that the materials in place meet today's environmental standards.

The total estimated project cost for the 2014 Street and Utility Improvement Project is $3,334,900 - $3,549,000. These costs include a 10% contingency and 25% indirect costs for legal, engineering, administrative, and financing costs. The project is proposed to be funded through the Street Reconstruction Fund, Special Assessments, Sanitary Sewer Enterprise Fund, Water Enterprise Fund, Storm Water Enterprise Fund, and Park Fund.

The City's current assessment policy consists of a flat and equal assessment rate and is proposed to be $3,950 per benefitting residential property for the street improvements. The City will fund the remainder of the street improvement costs and 100% of utility improvement costs. Benefitting properties along all improved streets are proposed to be assessed $3,950 per unit.

The project is proposed to be completed, including all restoration items and the first lift of bituminous, in 2014. The final lift of bituminous is proposed to be placed in June 2015. The construction will be phased such that the southern leg of West Road from Fire Barn Road will be constructed as one phase, the northern leg of West Road from Fire Barn Road as a second phase, and the final phase will be Fire Barn Road and East Road. Fire Barn Road and East Road will not be constructed until mid- to late-July to allow for the completion of the summer baseball season.

The project is feasible, necessary, and cost-effective from an engineering standpoint and should be constructed as proposed herein.

# 2. INTRODUCTION

## 2.1 Authorization

On October 22, 2013, the City of Circle Pines City Council authorized the preparation of an engineering feasibility report for the 2014 Street and Utility Improvement Project.

## 2.2 Scope

This project consists of street and utility reconstruction of all segments of West Road, Fire Barn Road, and East Road between Fire Barn Road and Center Road. The project area can be seen in ***Figure 1*** of ***Appendix A***.

The objectives of this report are to identify long-term, cost-effective solutions which address the aging roadways and utility issues within the noted project area while attending to the aesthetic considerations of the existing neighborhood. This report will evaluate parking options for Carl Eck Park and the addition of pedestrian facilities, as well as evaluation of the existing drainage, and existing utility systems.

## 2.3 Data Available

Information and materials used in the preparation of this report include the following:

- City of Circle Pines record drawings
- City of Circle Pines topographic maps
- Field observations of the area
- Televising reports of the sanitary sewer system
- 2011 Pavement Management Program, WSB, dated October 2011
- Geotechnical Evaluation Report, American Engineering Testing, Inc., dated December 2013

## 2.4 Project Location

The project is located in the northeast portion of the City of Circle Pines. The project includes the following roadways:

- All segments of West Road, including:
  - West Road A
  - West Road B
  - West Road C
- Fire Barn Road
- East Road between Fire Barn Road and Center Road

The project area is shown on ***Figure 1*** of ***Appendix A*** of this report.

## 2.5 Project History

On October 22, 2013, the Circle Pines City Council authorized the preparation of an engineering feasibility report for the 2014 Street and Utility Improvement Project.

This project is part of the Long-term Streets Plan which was passed by the Circle Pines City Council in 2007. This plan identified the condition of all City streets and gave a general time frame for repairing deteriorating streets over the next 20 years. This is the City's fourth reconstruction project. The following conditions have been identified within this project area:

- Deterioration of the existing street conditions including alligator cracking, edge cracking, transverse cracking, longitudinal cracking, block cracking, and settled curb and gutter.

- Existing vitrified clay pipe sanitary sewer and cast iron water main are over 40 years in age and are starting to exhibit deterioration problems. Severe sewer sags have been identified via sanitary sewer televising tapes.

- Existing roadways are exhibiting drainage problems due to inadequate storm sewer and roadways grades. This is accelerating the deterioration of the roadways within the project area.

As a result, the City Council provided funding through their Street Reconstruction Funds and Utility Funds for the aforementioned streets for complete reconstruction. The City will sell bonds for the project and utilize these funds to pay back the bond.

# 3. EXISTING CONDITIONS

## 3.1 Streets

Streets within the proposed improvement area are generally 33 to 34 feet wide with surmountable concrete curb and gutter. The three streets that end in cul-de-sacs, West Road A, B, and C are 28 feet wide. WSB rated the streets as part of the 2011 Pavement Management Program and classified the project area streets as "poor." These roadways, paved in 1968, are aging and experiencing pavement failure in the form of alligator cracking, block cracking, edge cracking, longitudinal cracking, and transverse cracking. Additional distresses include curb settlement and aging pavement patching.

The existing right-of-way width for West Road, Fire Barn Road, and East Road is 60 feet. The existing right-of-way width for West Road A, West Road B, and West Road C is 40 feet. The right-of-way contains retaining walls, trees, and numerous other landscaping improvements located behind the curb and gutter.

A total of ten soil borings were completed within the project area and revealed the existing subbase soils were silty sands. Bituminous thicknesses ranged from 2 to 3½ inches with 1½ to 8 ½ inches of Class 5 mixed with sand. Groundwater was encountered in five of the performed boring locations. A thick layer of swamp material was found at Fire Barn Road. A geotechnical report can be found in ***Appendix D***.

In 1982, there was a petroleum spill from the then Williams Brothers, now Magellan, petroleum pipeline. Documents obtained from the Minnesota Pollution Control Agency (MPCA) indicated that the spill that occurred in the vicinity of Fire Barn Road was properly cleaned. However, it was noted by the geotechnical sub-consultant that very strong petroleum fumes were observed when performing the boring at Fire Barn Road.

Staff is currently working with the City Attorney and Magellan to determine who is responsible for performing further environmental investigation and cleaning up the site if the underlying soils and groundwater exhibit levels of contamination by today's standards. If the soils are found to be contaminated, the impacted soils will need to be excavated and disposed of at a landfill that is approved to accept such materials. If the groundwater is found to be contaminated, the water will need to be treated prior to discharge for any construction activities that require dewatering in this area. If the materials in question are found meet MPCA standards, the material could be reused in place. Costs associated with additional environmental investigation and potential cleanup activities have not been included in this report.

There are currently parking restrictions posted within the neighborhood that prohibit parking between 5:00 p.m. and 9:00 p.m. Monday thru Friday and 9:00 a.m. and 4:00 p.m on Saturday. The residents of the project area park on the streets outside of these restricted hours. On-street parking also occurs during athletic events that are scheduled at Carl Eck Park. The baseball fields are in use from late spring through mid-summer. When the fields are in use, vehicles park on Fire Barn Road and along West Road. The Carl Eck Park parking lot is adjacent to the ball fields but is not heavily used. There is no sidewalk that connects the parking lot to the park or in the vicinity of the ball fields which forces park users to walk along or within the street.

## 3.2 Sanitary Sewer

The sanitary sewer system in the project area consists of 8- and 12-inch-diameter vitrified clay pipe (VCP) and 36-inch-diameter reinforced concrete pipe (RCP). This sanitary sewer system was installed in the late 1960s, and pipe at this age in similar situations is in the range of its current life expectancy.

The sanitary sewer main in the segments of West Road A, B, and C flow to West Road. All flows in West Road continue east to Fire Barn Road which then enters the 36-inch RCP Metropolitan Council Interceptor at its intersection with East Road.

The sanitary sewer system was recently inspected with a specially designed television camera. The internal conditions of the pipe were found to vary between fair and poor with cracked segments, root intrusion, and mineral deposits at joints. Several segments were found to be in a sag condition. The severity of these sags was typically no more than 2 inches. However, there were segments of sewer on Fire Barn Road that were found to be fully submerged. Staff indicated that there have been no documented backups as a result of these severe sags.

## 3.3 Water Main

The existing water main in the project area was installed in the late 1960s and consists of 6- and 12-inch cast iron pipe (CIP). In general, the system has provided good service with only a few water main breaks; however, breaks become more likely as the pipes pass 40 years of service.

Service records do not indicate recent issues with the water main. Some hydrants are located in inconvenient areas such as a hydrant that is located on the edge of the driveway at 10 West Road.

## 3.4 Storm Sewer

Storm sewer is limited within the project area to accommodate storm water runoff. Storm sewer is present in the vicinities of the low points. This storm sewer system, on a whole, does have the capacity to serve the current drainage areas, and the catch basins are adequately spaced based on a 10-year design event. Staff has not received drainage complaints from the residents of the neighborhood.

All storm sewer networks within the project area convey storm water runoff via 15- to 21-inch RCP storm sewer through drainage and utility easements to County Ditch 53-62. There is an existing 72-inch corrugated metal pipe (CMP) culvert that crosses beneath Fire Barn Road to maintain the flow of County Ditch 53-62 which ultimately discharges to Golden Lake.

The existing storm water collection system servicing the area is shown on ***Figure 4*** in ***Appendix A***.

# 4. PROPOSED IMPROVEMENTS

## 4.1 Streets and Pedestrian Facilities

Street reconstruction is proposed for all roadways within the project area. Roadway replacement will improve the design strength of the pavement system and provide a street surface with an extended life for the City of Circle Pines.

The proposed reconstruction includes replacement of concrete curb and gutter, bituminous pavement, and subgrade improvements. West Road, Fire Barn Road, and East Road are proposed to be reconstructed to a uniform width of 32 feet. This is a typical residential street width used to accommodate the level of traffic on the streets and has been used in previous City street reconstruction projects. Reconstruction of the streets to 32 feet will provide two 12-foot thru lanes and an 8-foot parking lane. West Road A, West Road B, and West Road C are proposed to be reconstructed to their current width of 28 feet. The current parking restrictions along the roadways will not change after the streets are reconstructed. The streets will be constructed to the proposed street section as shown on ***Figure 2*** in ***Appendix A***.

The roadway section is proposed to be 3½ inches of bituminous pavement and 6 inches of Class 5 aggregate base. All roadways will be designed to a 10-ton standard.

The existing "eyebrow" cul-de-sac on the southern leg of West Road is proposed to be removed. The current conditions and layout of the road make this cul-de-sac difficult to maintain. It is proposed to construct the typical street section centered within the right-of-way to eliminate the "eyebrow" cul-de-sac. The driveways for the residences adjacent to this feature will be extended to meet the roadway. Areas of pavement that are eliminated will be restored to green space.

The addition of a sidewalk along the east and north sides of Fire Barn Road and the northern leg of West Road between Lake Drive and Lexington Avenue was analyzed. The sidewalk is identified in the City's 2008 Pedestrian Facility Plan to provide a connection between Lake Drive and Lexington Avenue. Construction of this sidewalk will require mitigation due to fill placed in County Ditch 53-62 to accommodate the widened street footprint with the sidewalk addition. The existing boulevard near the intersection of Fire Barn Road and West Road is narrow and will require the removal of the existing baseball field fence to be replaced with a taller fence for safety purposes.

Staff recommends the addition of the sidewalk to provide a safe route for pedestrians that currently walk adjacent to or within the street. However, Council should provide direction and/or seek resident feedback concerning the sidewalk as the sidewalk will require tree removal, power pole relocation and will reduce the amount of existing green space in front of each resident's home. City staff would be responsible for maintaining the sidewalk. It would also result in additional impervious surface area for which the City would then be required to provide treatment.

Restoration required due to the improvements will utilize existing topsoil that is native to the site. Organics (compost) could be added to improve soil conditions but add significant cost. As part of the project, the Contractor's maintenance period will be extended during construction and the residents will be encouraged to water to establish their lawn.

## 4.2 Sanitary Sewer

Replacement of most of the sanitary sewer system is recommended due to the deterioration of the existing main line. The existing 8- and 12-inch VCP sanitary sewer mains in all segments of West Road and Fire Barn Road are proposed to be replaced with 8- and 12-inch PVC (polyvinyl chloride) pipe. The 36-inch MCES Interceptor will not be replaced. MCES indicated that internal repairs were completed in 2013 and that replacement of their facility was not required.

It is proposed to replace all individual sanitary sewer services within the project to the road right-of-way by open cut construction along with the sewer main line in the street. Replacement of the sewer along Fire Barn Road will require improved bedding consisting of coarse aggregate wrapped in fabric beneath the sewer pipe. This technique is to improve the foundation due to the swampy materials that are present. Even with the improved bedding, it is expected that there will be some settlement; the pipe, however, should continue to convey the wastewater. Full removal of underlying soils is not cost-effective due to the excessive depth of the poor materials.

There is an existing retaining wall that is approximately 7 feet tall adjacent to Fire Barn Road that is part of the Carl Eck ball fields. Due to the depth of the sanitary sewer at Fire Barn Road, a trench box may need to be used during construction to avoid impacting the large retaining wall.

The City historically has had high rates of inflow and infiltration (I/I), specifically in the older sanitary sewer areas. Replacement of the main will eliminate I/I from the system. The City pays additional fees to the Metropolitan Council Environmental Services (MCES) to treat this additional water that is in the system. Eliminating I/I will reduce the fees the City must pay to MCES.

The sewer from the Village at Circle Pines townhome complex currently extends adjacent to the existing sewer line in West Road within the boulevard before tying into the system in the street. It is proposed to provide a direct connection at Village Parkway and West Road as part of the improvements to eliminate the dual sewer line.

Sanitary sewer service replacement is anticipated to cause significant impacts to trees located near services; however, joint trench construction with water services will minimize tree impacts. It is estimated that approximately 50 trees will need to be removed for proper service installation to the right-of-way. A replacement tree will be provided for each tree removed due to utility installation. Property owners will be notified in advance if their tree(s) are to be removed. Adjustments to the length of the service to be replaced in order to eliminate removing a tree(s) will be made on a case-by-case basis during construction.

The proposed sanitary sewer improvements are shown on ***Figure 3*** of ***Appendix A***.

## 4.3 Water Main

The proposed water main improvements consist of replacing the existing 6-inch CIP water main with 8-inch PVC pipe. Increasing pipe sizes from 6 inches to 8 inches improves the delivery of potable water and provides fire flow volume at reasonable pressure and head loss. In addition, the replacement of the service taps and lines may possibly increase the pressure by providing service pipes that are free of corrosion and internal flow resistance. The existing 12-inch water main is proposed to be replaced with 12-inch PVC pipe.

When the retaining wall for the Carl Eck Park ball field was constructed adjacent to Fire Barn Road, a portion of the water main was removed or abandoned removed due to the conflict with the wall location. A new main was directionally drilled behind the wall. It is proposed to leave the directionally drilled water main in place and to connect to the newer main at its termini points to avoid replacement.

The replacement of sanitary sewer at the existing depths will result in the water main being partially or entirely exposed. This will provide a timely opportunity for improvements to the water distribution system before significant problems are experienced.

Service replacement is anticipated to cause significant impacts to trees located near services; however, joint trench construction with sewer services will minimize tree impacts. It is estimated that approximately 50 trees will need to be removed for proper service installation to the right-of-way. A replacement tree will be provided for each tree removed due to utility installation. Property owners will be notified in advance if their tree(s) are to be removed. Adjustments to the length of the service to be replaced in order to eliminate removing a tree(s) will be made on a case-by-case basis during construction.

A temporary water system will need to be set up to provide water service for the duration of utility installation along each street and may include adjacent side streets.

Irrigation lines that are affected by the construction will also be replaced as part of the project.

The proposed water system improvements are shown on ***Figure 3*** of ***Appendix A***.

## 4.4 Storm Sewer

Proposed replacement of the sanitary sewer will result in the existing storm sewer being partially or entirely exposed. This provides a timely opportunity to reconstruct the storm sewer system which will help align the life cycle between the utility and the roadway.

The existing storm sewer provides adequate inlet capacity and pipe sizes for storm water conveyance based on a 10-year storm design event. The proposed storm sewer will be designed in accordance with the City's standards for a 10-year storm design event for the storm sewer system within the project area. The storm sewer will be located to minimize the number of inlet structures while keeping required separation from the water supply system. In accordance with RCWD pre-treatment requirements, 2-foot sumps will be added to each catch basin manhole prior to the storm water being discharged to County Ditch 53-62. The sumps will catch sediment but will require maintenance.

Rice Creek Watershed District's (RCWD) requirements for this project include rate control and water quality treatment. The District would require the project to infiltrate 0.75 inches of runoff from the proposed impervious surfaces. Based on the recommended street improvements outlined in this report, the District would require the project to capture and infiltrate approximately 0.29 acre-feet of runoff within a 72-hour time period.

The City is currently in discussions with RCWD to address the District requirements by means of an underground infiltration system. The City proposes to construct this system in the green space at Carl Eck Park south of Stardust Boulevard. The City would receive credit for the system based on actual monitoring results upon completion of the infiltration system similar to the system that was constructed as part of the West Golden Lake project. It is anticipated that the system will meet the requirements necessary for the 2014 Street and Utility Project as well as to relieve a debit that the City currently holds from the 2012 Street and Utility Project. Depending upon the monitored results of the system, staff is working with RCWD to utilize any credits achieved from this system to be applied toward future improvement projects located within the Golden Lake drainage area.

## 4.5 Parking Improvements

The Carl Eck Park ball fields generate heavy vehicle traffic as well as a high demand for parking. There is a small gravel parking lot located adjacent to the ball fields within Carl Eck Park that accommodates some parking but ultimately the parking occurs on the streets. Typical design standards recommend that 40 parking spaces be provided for each ball field. Two alternatives were investigated to provide sufficient parking. The first alternative is to expand and better delineate the parking at the Carl Eck Park parking lot. Approximately 72 stalls could be provided for parking within this lot. In order to present a parking facility that will be used by the public, it is proposed to expand the existing gravel parking lot by constructing a bituminous parking lot with striping.

A second parking alternative is to provide bump out parking on the City-owned lot located east of 52 West Road (on the south side of Fire Barn Road). The layout provided would be similar to that of the parking expansion at Inner Park that was constructed as part of the 2012 Street Reconstruction Project. The bump out parking would accommodate 21 vehicles and would require a crosswalk to Carl Eck Park from the parking stalls to the north side of Fire Barn Road.

It is recommended that both the Carl Eck Park parking lot and Fire Barn Road bump out parking alternatives be constructed. These two alternatives would provide 93 total parking spaces which would exceed the 80 parking spaces recommended for Carl Eck Park based upon typical design standards.

The proposed parking alternatives are shown on ***Figures 5*** and ***6*** in ***Appendix A***.

## 4.6 Aesthetic Intersection Improvements

Conceptual landscape enhancements for possible inclusion along the intersection of Fire Barn Road / Civic Heights Drive / Lake Drive as well as Pine Drive / Lake Drive can be seen in ***Figures 7*** and ***8*** in ***Appendix A***. Landscape enhancements are meant to increase pedestrian safety as well as improve aesthetics at this key intersection within the community. Possible enhancements could include the use of standard or decorative pavements along the intersections where pedestrians wait for the crossing; providing connections to future sidewalks and trails; creating improved sightlines between pedestrians and vehicles at the intersection; and inclusion of ornamental landscape features such as plants, fencing, and monument signage.

Estimated costs for the proposed improvements, consisting of concrete pavement and plantings, can be seen in ***Appendix B***. Additional improvements such as ornamental fencing and concrete posts were considered to further improve the intersection aesthetics and were estimated to cost $55,000 per intersection, or a total of $110,000. These additional elements could be constructed at a future date.

## 4.7 Permits and Approvals

Reconstruction of the roadways will disturb over 1 acre and will require a National Pollution Discharge Elimination Systems (NPDES) General Storm Water Permit (MNR 100001) that must be obtained by the City of Circle Pines from the Minnesota Pollution Control Agency (MPCA).

The reconstruction of the existing water main will require a permit from the Minnesota Department of Health (MDH). No permit is required from the MPCA for the sanitary sewer replacement seeing as additional flows are not being introduced to the sanitary sewer system. A permit will be required from MCES for the adjustment of their manhole castings on East Road and Fire Barn Road.

Since the project proposes to remove and replace impervious surfaces, a Rice Creek Watershed District permit will be required for the project. At a minimum, District rules for storm water management and erosion control will apply to the project. The District may also review the permit application for wetlands and floodplain issues.

A permit from Anoka County Highway Department will be required due to the work at the intersection of Fire Barn Road and Lake Drive as well as the West Road intersections at Lexington Avenue.

Work within the Magellan easement and potential improvements to the Carl Eck Park parking lot will require the City to enter into an agreement with Magellan. The City has executed these agreements with Magellan on previous projects.

## 4.8 Right-of-Way / Easements

It is anticipated that all work will take place within the existing roadway right-of-way or within existing drainage and utility easements. Additional right-of-way or easement acquisition is not expected to be needed to construct the project as proposed.

## 4.9 Detour Routes / Project Phasing

This project will require significant excavation and disposal of unacceptable materials from the existing street area and a supply of significant volumes of select granular base, aggregate base, and bituminous pavement materials. This effort will require closing the roads under construction to through traffic and increasing loaded truck traffic on the streets adjacent to the construction area. Adequately signed detours will be identified in final construction plans to direct traffic around the construction zones and notify users of the increased truck and construction activity. In order to accommodate the property owners along the excavated roads, temporary parking on the adjacent streets may be necessary during the periods of time when vehicle access is not possible.

This project will need to be phased so that reconstruction of Fire Barn Road and East Road will not begin until after the baseball season is complete at Carl Eck Park. It is proposed that the project be phased so that only one leg of West Road (northern or southern) between Fire Barn Road and Lexington Avenue is constructed at a time. This will be done to maintain access and to ensure that all roads are not under construction at the same time.

The three vacant City-owned lots at the end of the West Road C cul-de-sac are proposed to be used as a staging area during construction. Using these lots as a staging area will limit the amount of equipment and materials stored on residential streets.

## 4.10 Gas Main

The City of Circle Pines owns and operates Centennial Utilities, a natural gas distribution company. All roadways within the project area have either an existing 2- or 6-inch-diameter steel line located approximately 15 feet off the centerline. The gas main typically is at a depth of 36 inches and ¾-inch-diameter steel services provide natural gas to the residents along each street.

At the time of this report, Centennial Utilities indicated its desire to remove and replace the existing steel lines and services with plastic pipe. Pipeline replacement is anticipated to be completed in the spring by the City prior to street and utility construction. The existing steel lines and services will be abandoned and removed by the contractor once the utility construction takes place. For the purposes of this feasibility report, a cost analysis has not been incorporated into project funding or overall project costs.

## 4.11 Private Utilities

It is anticipated that coordination will need to take place with private utility companies in order to construct the project as proposed. A utility coordination meeting will be held to best determine how to construct this project while minimizing impacts to the existing private utilities. Follow-up meetings and coordination between utility companies will take place to ensure that all possible utility conflicts are addressed prior to construction.

All private utility companies that have aerial utilities have been contacted to review their facility to ensure that it is at the proper height and is not a safety concern. All utility companies have responded that their utility meets their minimum height requirements.

# 5. FINANCING

## 5.1 Opinion of Probable Construction Cost

Detailed breakdowns of the Opinion of Probable Cost for the construction are included in ***Appendix B***. The opinion of cost incorporated the construction costs experienced in the surrounding area during 2012 and general costs from 2013 and includes a 10% contingency factor. Administrative costs are projected at 25% of the construction cost and include engineering, legal, financing, and administrative costs. ***Table 1*** below provides a summary of the estimated project costs:

**Table 1 – 2014 Street and Utility Improvement Cost**
**Summary of Cost**

| | **Total** |
|---|---|
| Schedule A – Surface Improvements | $1,517,600 |
| Schedule B – Sanitary Sewer Improvements | $662,400 |
| Schedule C – Water Main Improvements | $599,600 |
| Schedule D – Storm Sewer Improvements (Including Infiltration System) | $462,900 |
| Schedule E – Aesthetic Intersection Improvements | $92,400 |
| **Total** | **$3,334,900** |
| Alternate 1 – Sidewalk Improvements | $99,200 |
| Alternate 2 – Parking Option 1 (Carl Eck Parking Lot) | $82,000 |
| Alternate 3 – Parking Option 2 (Fire Barn Road Bump Out) | $32,900 |
| **Grand Total** | **$3,549,000** |

## 5.2 Funding Sources

The City's assessment policy consists of a flat and equal assessment rate and is proposed at $3,950 per benefitting residential property for the street improvements. The City will fund the remainder of the street improvement costs. Benefitting properties along all improved streets are proposed to be assessed $3,950 per unit. Houses on corner lots are assessed as one unit on a street where they have their driveway or address on the street to be reconstructed. Per the City's assessment policy, each townhome unit within the Fire Barn Road Townhome complex is to be assessed $3,950. The City owned properties consisting of Carl Eck Park, the Carl Eck Park parking lot, and the Centennial Fire Station have been calculated as residential equivalent units (REU). One REU was assigned for each 75-feet of footage fronting the project area. This calculation was the same method used to calculate the assessment for Inner Park as part of the 2012 Street and Utility Improvement Project. A proposed assessment roll is included in ***Appendix C*** of this report along with an Assessment Map ID highlighting the benefitting properties. The proposed Special Assessment calculations for benefitting properties are shown in ***Table 2*** on the following page.

| Table 2 – Assessment Calculations | |
|---|---|
| **Street Improvement Assessment** | |
| Schedule A Surface Improvements | $1,517,600 |
| Assessable Units | 117* |
| Assessment Rate | $3,950 |
| **Total Recovered Through Assessment** | **$462,150** |

* Includes three City-owned lots at the end of the West Road C cul-de-sac and a total of 17 residential equivalent units for Carl Eck Park, the Carl Eck Park parking lot, and the Centennial Fire Station totaling $79,000.

Funding for the project is proposed to come from the Street Reconstruction Fund, Water / Sewer Enterprise Funds, Storm Sewer Enterprise Fund, and Special Assessments to benefitting properties as shown in ***Table 3*** below.

| Table 3 – 2014 Street and Utility Improvement Project<br>Proposed Funding | |
|---|---|
| | |
| **Funding Source** | **Total** |
| Special Assessments | $462,150 |
| Street Reconstruction Fund | $1,101,650 – $1,317,750* |
| Sanitary Sewer Enterprise Fund | $662,400 |
| General Fund | $46,200** |
| Water Main Enterprise Fund | $599,600 |
| Storm Water Enterprise Fund | $462,900 |
| **Total Funding** | **$3,334,900 - $3,549,000** |

* Surface improvements, sidewalk improvements, aesthetic intersection improvements at Fire Barn Road / Lake Drive / Civic Heights Drive, Carl Eck Park parking lot, and Fire Barn Road on-street parking.

** Aesthetic improvements at Lake Drive and Pine Drive.

## 6. PROJECT SCHEDULE

The proposed schedule for this improvement project is as follows for construction to occur in 2014:

**Phase 1 – Feasibility Report**

City Council Authorizes Feasibility Study ..... October 22, 2013

Survey Work ..... November 18, 2013

Public Informational Meeting ..... January 22 or 23, 2014

City Council Accepts Feasibility Report and Sets Public Hearing Date ..... January 28, 2014

Hold Public Hearing / Authorize Preparation of Final Plans and Specifications ..... February 18, 2014

Submit RCWD Permit ..... February 28, 2014

**Phase 2 – Final Design**

Final Design ..... February – March 2014

Public Informational Meeting ..... March 2014

City Council Approves Plans / Authorizes Ad for Bids ..... March 25, 2014

Anticipated RCWD Permit Approval ..... April 23, 2014

Open Bids ..... April 24, 2014

Award Contract ..... May 13, 2014

**Phase 3 – Construction**

Preconstruction Meeting ..... May 2014

Public Informational Meeting (with Contractor) ..... May 2014

Begin Construction ..... June 2014*

Substantial Completion ..... October 2014

Assessment Hearing ..... October 2014

Final Completion (Final Lift of Bituminous Wear Course) ..... Spring 2015

* Reconstruction of Fire Barn Road and East Road is not to begin until the end of the baseball season (mid- to late-July).

Note: The schedule assumes all private utility and gas main relocation work would be complete prior to the start of construction.

## 7. FEASIBILITY AND RECOMMENDATION

The 2014 Street and Utility Improvement Project includes roadway reconstruction and utility replacement on all segments of West Road, Fire Barn Road, and East Road between Fire Barn Road and Center Road. The streets total approximately 1.10 miles and include curb and gutter, sanitary sewer, water main, and storm sewer facilities.

It is proposed that West Road, Fire Barn Road, and East Road be reconstructed to a width of 32 feet with B618 curb and gutter. It is proposed that West Road A, West Road B, and West Road C be reconstructed to a width of 28 feet with B618 curb and gutter. It is proposed to eliminate the "eyebrow" cul-de-sac on the southern of West Road as it is a maintenance issue. It is recommended that resident feedback be gathered to determine support for a sidewalk that is proposed to be constructed along the east and north sides of Fire Barn Road and the northern leg of West Road.

Utility improvements include the replacement of water main, sanitary sewer, sewer and water services, and the installation of a new storm sewer drainage system.

It is recommended that the Carl Eck Park parking lot and Fire Barn Road bump out parking alternatives be constructed to provide adequate parking facilities for Carl Eck Park.

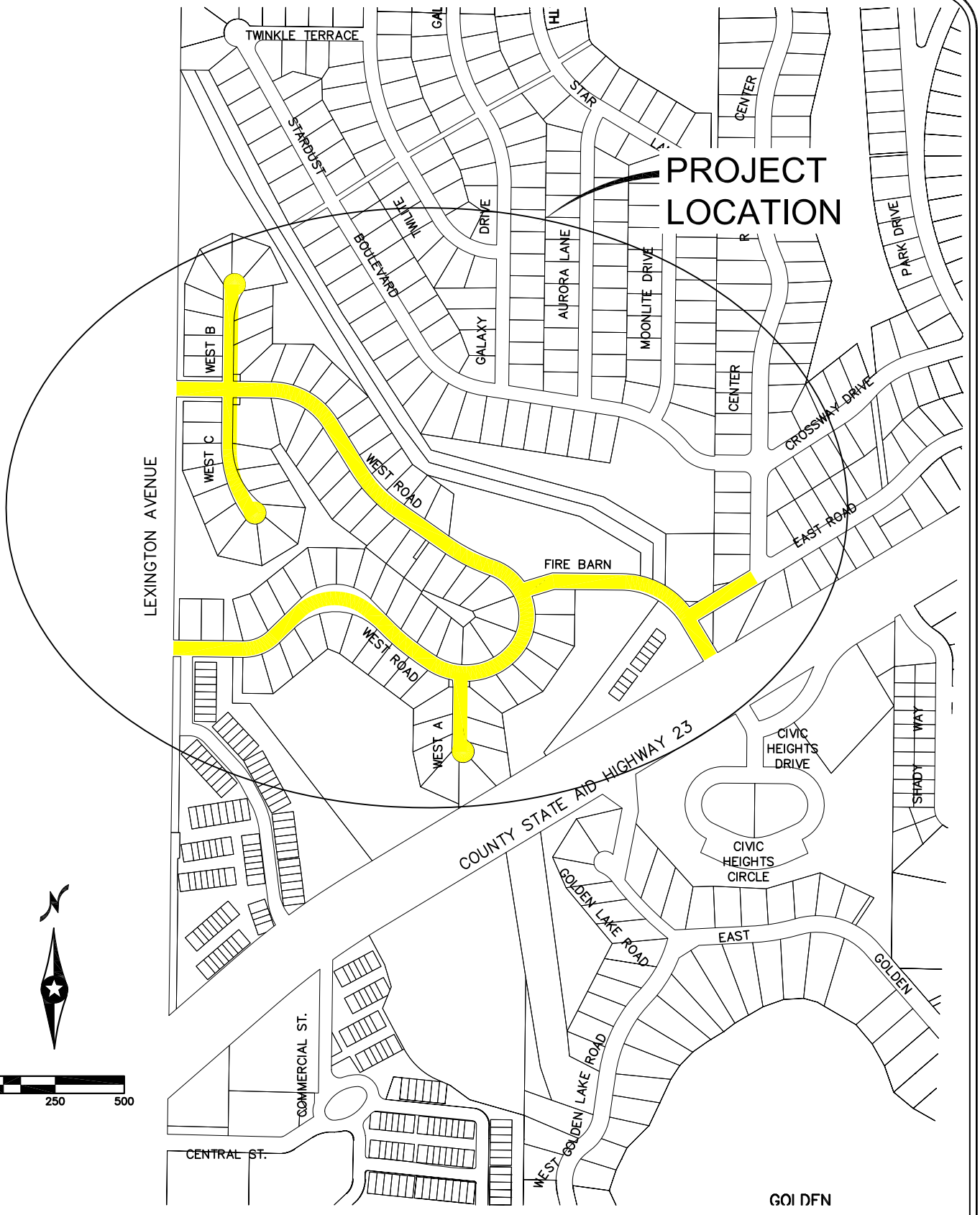
The total estimated cost for the 2014 Street and Utility Improvement Project including roadway improvements, pedestrian improvements, and utility improvements is **$3,334,900** or **$3,549,000** depending upon the parking lot alternative(s) selected. Proposed funding for the project is provided through a combination of Special Assessments to benefitting properties, Street Reconstruction Funds, Water / Sewer Enterprise Funds, and Storm Sewer Enterprise Funds.

The funding level anticipated through the levy of Special Assessments to benefitting property owners is **$462,150** with a proposed assessment of **$3,950** per unit.

This project is deemed feasible and necessary from an engineering standpoint because the deterioration of the existing streets and utilities warrant full replacement. Replacing the utilities at the same time as reconstructing the roadway aligns the life expectancies of both the roadway and utilities. It is recommended to proceed with the improvements as outlined in this report.

# APPENDIX A

**Figure 1: Location Map**
**Figure 2: Typical Section**
**Figure 3: Proposed Sanitary Sewer and Water Main Improvements**
**Figure 4: Proposed Storm Sewer and Street Improvements**
**Figure 5: Potential Parking Alternate 1**
**Figure 6: Potential Parking Alternate 2**
**Figure 7: Aesthetic Intersection Improvements**
**Figure 8: Aesthetic Intersection Improvements**

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2014 STREET AND UTILITY IMPROVEMENT PROJECT

# LOCATION MAP

CIRCLE PINES, MINNESOTA

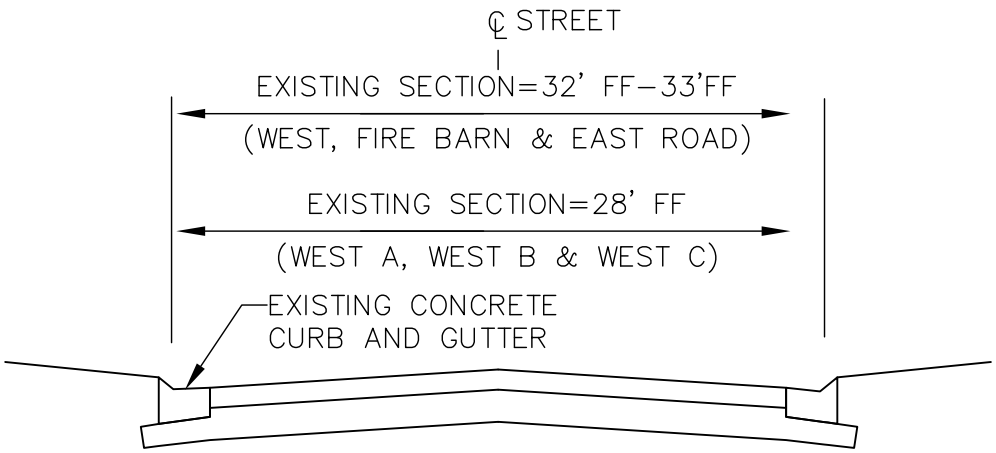
City of CIRCLE PINES

January 28, 2014
WSB Project No.1507-57

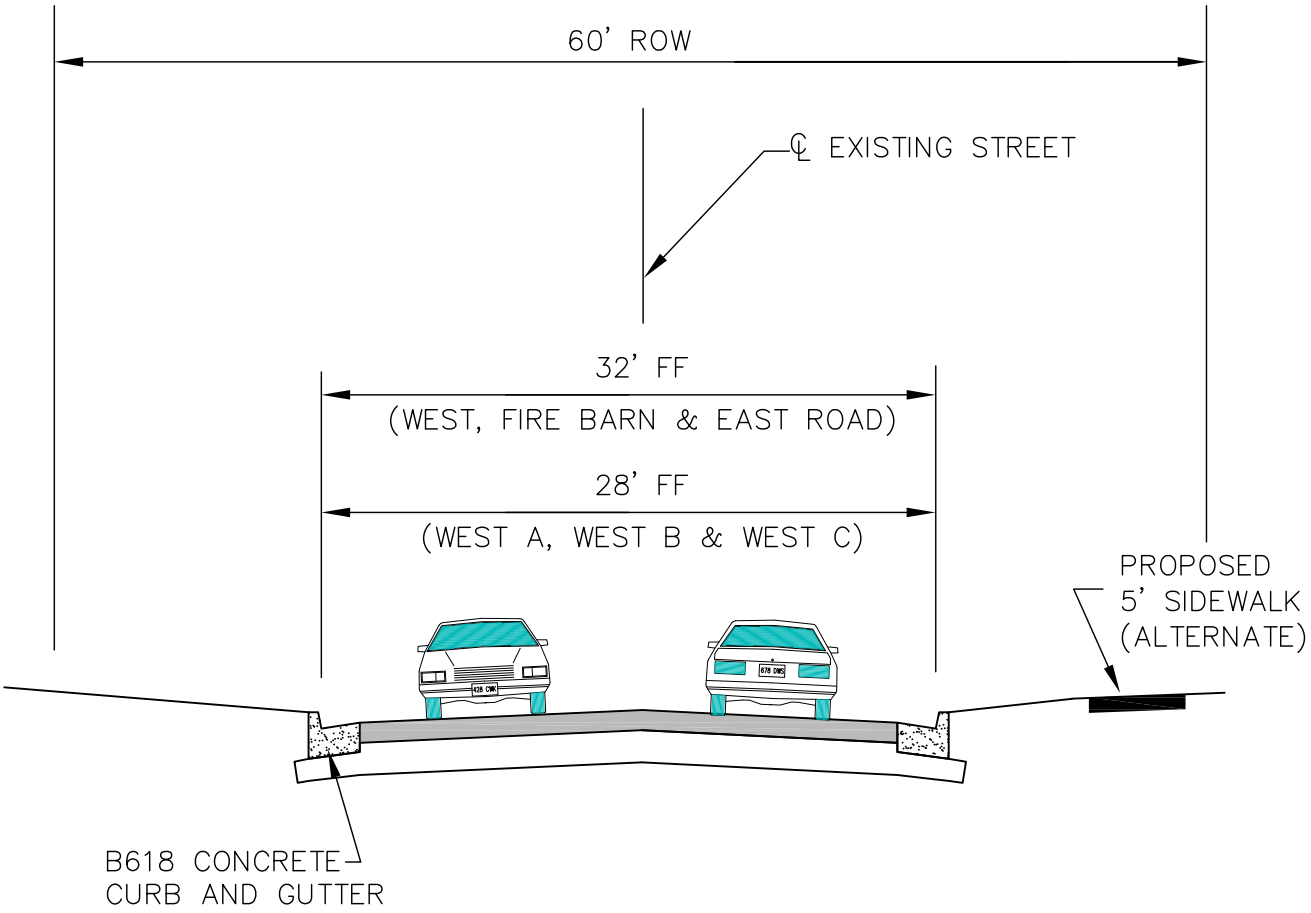
FIGURE 1

K:\01507-570\Cad\Exhibits\FIG_01.dwg, Layout1

# LOCAL STREETS




## EXISTING CONDITIONS




## PROPOSED TYPICAL SECTION

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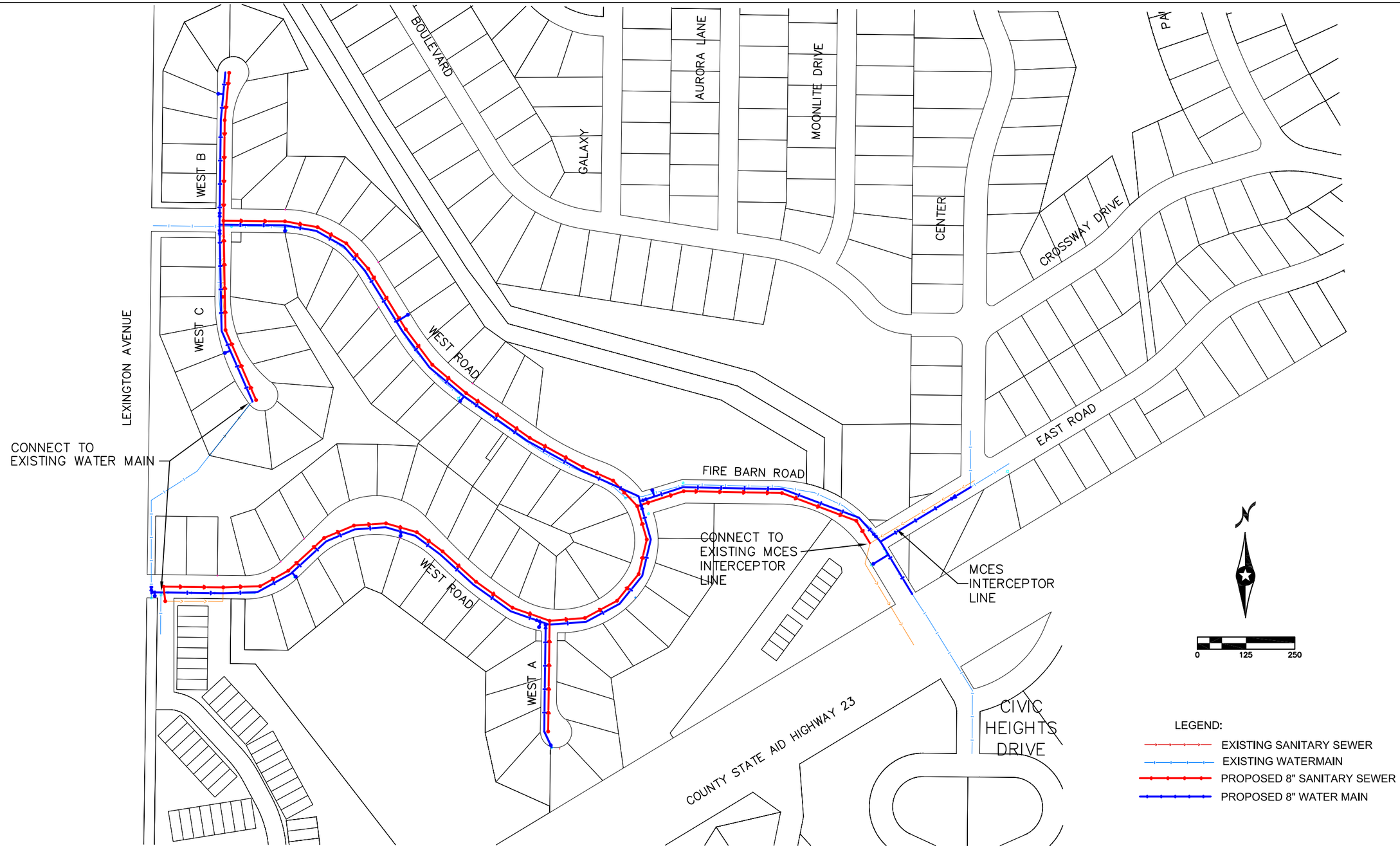
2014 STREET AND UTILITY IMPROVEMENT PROJECT
TYPICAL SECTION
LOCAL STREETS
CIRCLE PINES, MINNESOTA

City of CIRCLE PINES

January 28, 2014
WSB Project No.1507-57

FIGURE
2

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2014 STREET AND UTILITY
IMPROVEMENT PROJECT

# SANITARY SEWER AND WATER MAIN

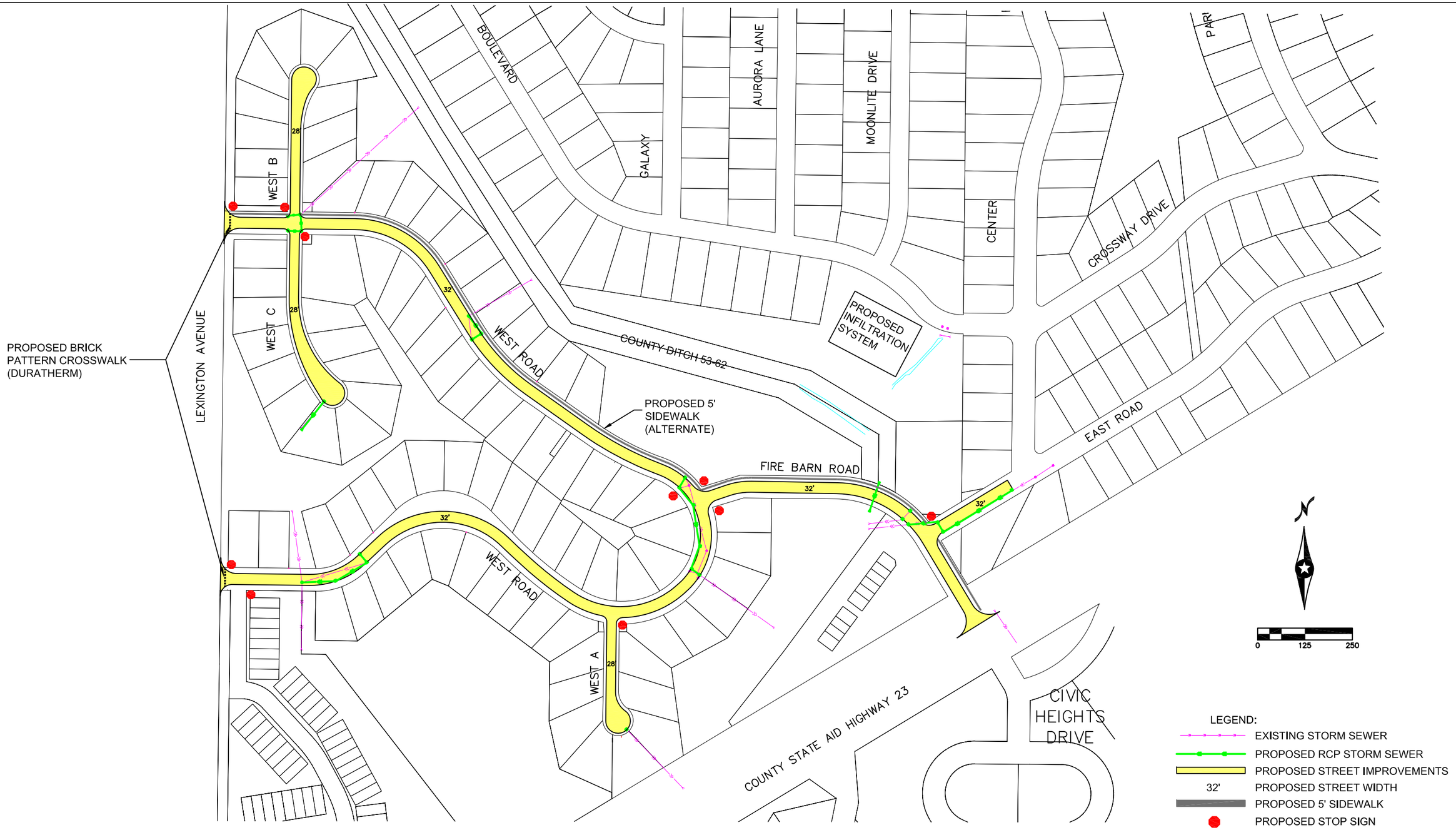
CIRCLE PINES, MINNESOTA

City of CIRCLE PINES

January 22, 2014
WSB Project No.1507-57

FIGURE
3

K:\01507-570\Cad\Exhibits\FIG_03.dwg, SAN-WAT

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IMPROVEMENT PROJECT

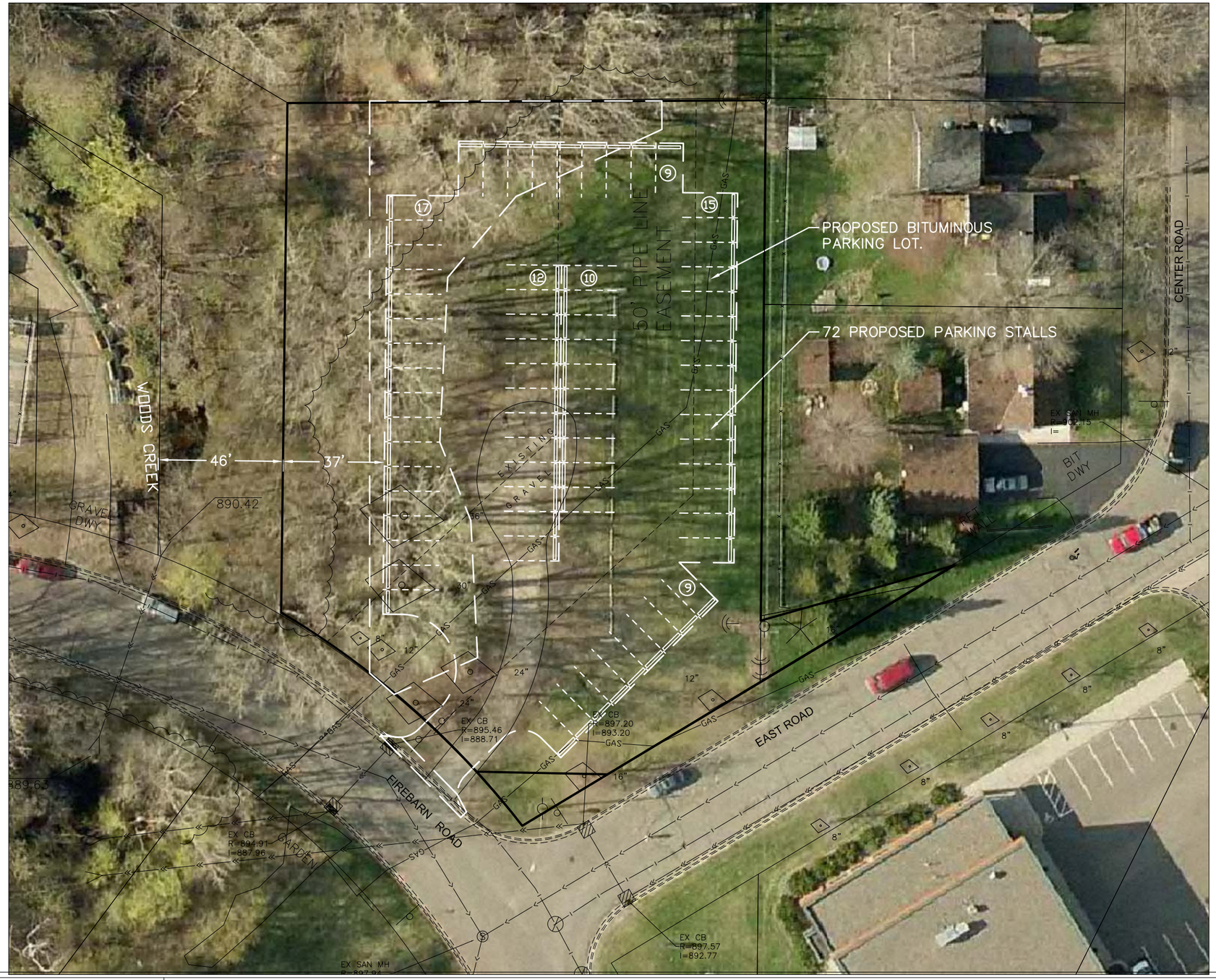
RCP STORM SEWER AND STREET

CIRCLE PINES, MINNESOTA

City of CIRCLE PINES

January 22, 2014
WSB Project No.1507-57

FIGURE
4

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2014 STREET AND UTILITY IMPROVEMENT PROJECT

PARKING ALTERNATE 1

CIRCLE PINES, MINNESOTA

City of CIRCLE PINES

January 22, 2014
WSB Project No.1507-57

FIGURE
5


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2014 STREET AND UTILITY IMPROVEMENT PROJECT

PARKING ALTERNATE 2

CIRCLE PINES, MINNESOTA

City of CIRCLE PINES

January 22, 2014
WSB Project No.1507-57

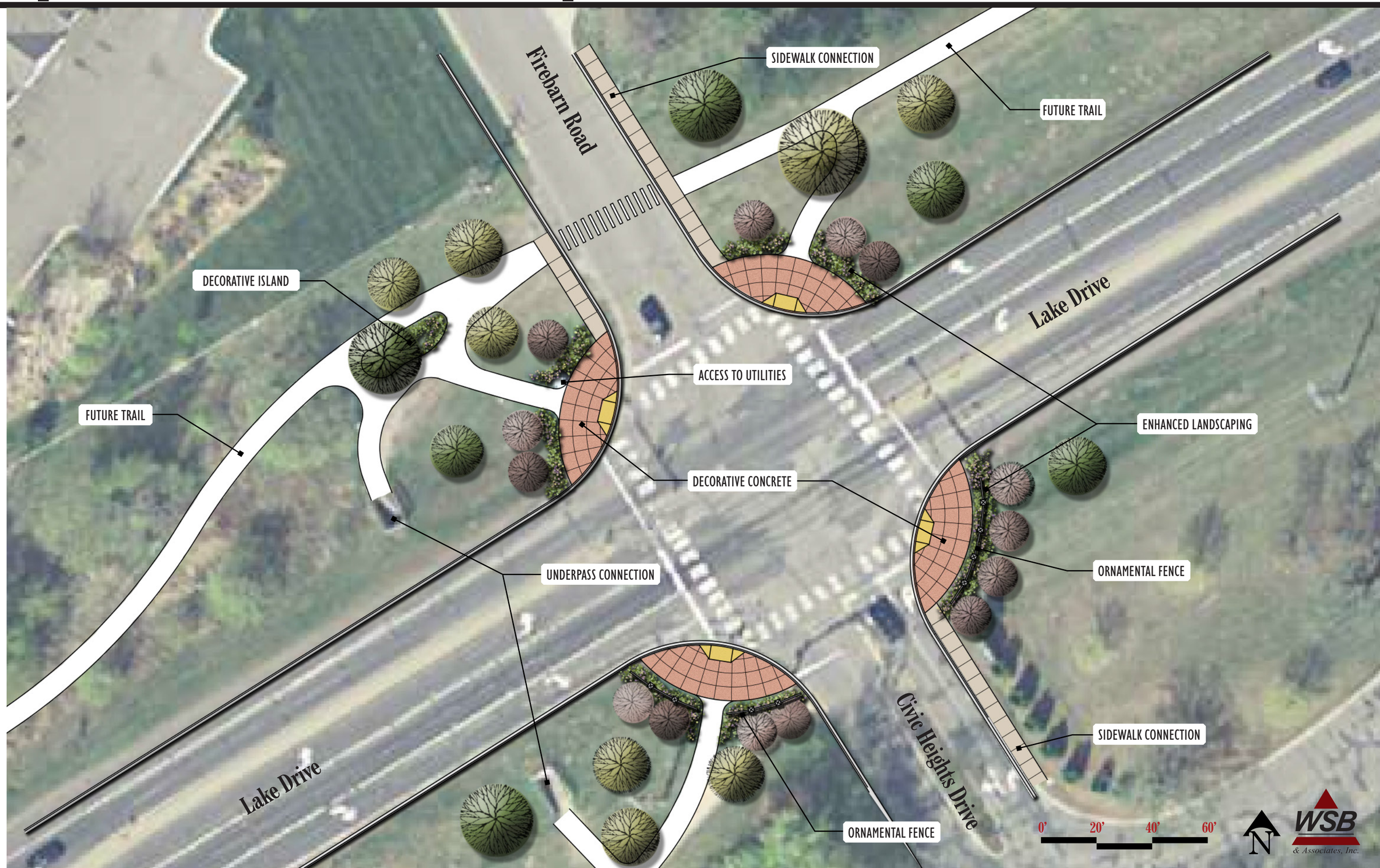
FIGURE
6

K:\01507-570\Cad\Exhibits\Option 2.dwg, 01

# Conceptual Intersection Landscape Enhancements

FIGURE 7

INTERSECTION OF FIREBARN ROAD & LAKE DRIVE

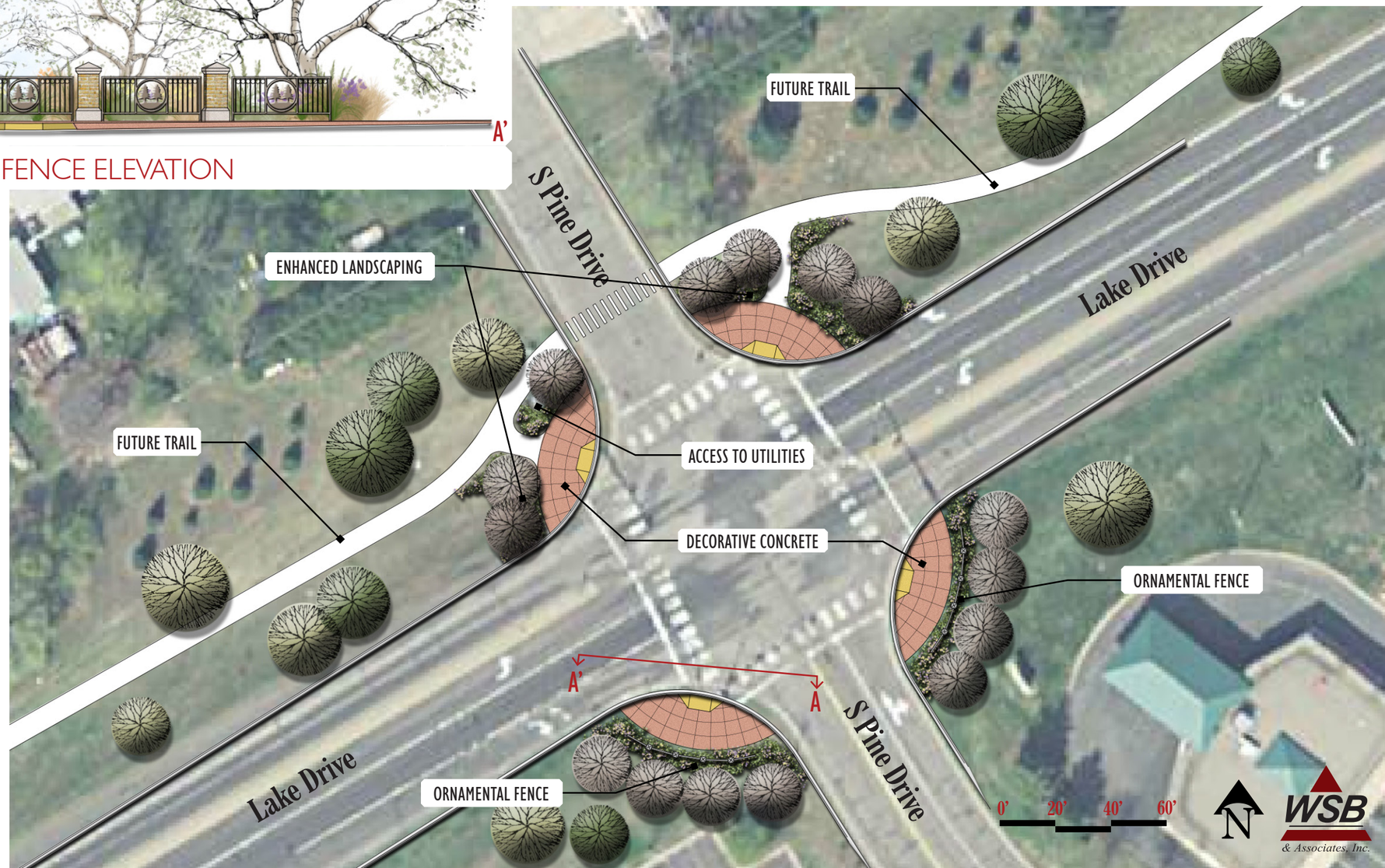


# Conceptual Intersection Landscape Enhancements

FIGURE 8


ORNAMENTAL FENCE ELEVATION

INTERSECTION OF S PINE DRIVE & LAKE DRIVE




WSB & Associates, Inc.

# APPENDIX B

## Opinion of Probable Cost

# Opinion of Probable Cost

*WSB Project:* 2014 Street and Utility Improvement Project — *Design By:* BJP
*Project Location:* City of Circle Pines — *Checked By:* JAK
*WSB Project No:* 1507-57 — *Date:* 1/28/2014

| Item No. | MN/DOT Specification No. | Description | Unit | Estimated Total Quantity | Estimated Unit Price | Estimated Total Cost |
|---|---|---|---|---|---|---|
| **A. SURFACE IMPROVEMENTS (West Road, East Road, Fire Barn Road)** | | | | | | |
| 1 | 2021.501 | MOBILIZATION | LUMP SUM | 1 | $45,000.00 | $45,000.00 |
| 2 | 2101.502 | CLEARING | TREE | 50 | $150.00 | $7,500.00 |
| 3 | 2101.507 | GRUBBING | TREE | 50 | $150.00 | $7,500.00 |
| 4 | 2101.511 | CLEARING AND GRUBBING - SHRUB | EACH | 25 | $50.00 | $1,250.00 |
| 5 | 2104.501 | REMOVE CURB AND GUTTER | LIN FT | 11,450 | $2.00 | $22,900.00 |
| 6 | 2104.503 | REMOVE CONCRETE WALK | SQ FT | 2,100 | $1.00 | $2,100.00 |
| 7 | 2104.505 | REMOVE BITUMINOUS PAVEMENT | SQ YD | 21,100 | $1.65 | $34,815.00 |
| 8 | 2104.505 | REMOVE CONCRETE DRIVEWAY PAVEMENT | SQ YD | 1,960 | $5.00 | $9,800.00 |
| 9 | 2104.505 | REMOVE BITUMINOUS DRIVEWAY PAVEMENT | SQ YD | 1,800 | $3.00 | $5,400.00 |
| 10 | 2104.509 | REMOVE SIGN | EACH | 28 | $50.00 | $1,400.00 |
| 11 | 2104.511 | SAWING CONCRETE PAVEMENT (FULL DEPTH) | LIN FT | 960 | $5.00 | $4,800.00 |
| 12 | 2104.513 | SAWING BITUMINOUS PAVEMENT (FULL DEPTH) | LIN FT | 1,150 | $3.00 | $3,450.00 |
| 13 | 2104.523 | SALVAGE MAIL BOX AND SUPPORT | EACH | 90 | $50.00 | $4,500.00 |
| 14 | 2104.601 | SALVAGE AND REINSTALL LANDSCAPE STRUCTURES | LUMP SUM | 1 | $50,000.00 | $50,000.00 |
| 15 | 2105.501 | COMMON EXCAVATION (P) | CU YD | 3,750 | $10.00 | $37,500.00 |
| 16 | 2105.507 | SUBGRADE EXCAVATION (EV) | CU YD | 750 | $13.00 | $9,750.00 |
| 17 | 2105.522 | SELECT GRANULAR BORROW (CV) | CU YD | 750 | $15.00 | $11,250.00 |
| 18 | 2112.501 | SUBGRADE PREPERATION | ROAD STA | 54.0 | $150.00 | $8,100.00 |
| 19 | 2123.610 | STREET SWEEPER (WITH PICKUP BROOM) | HOUR | 20 | $125.00 | $2,500.00 |
| 20 | 2130.501 | WATER | M GALLONS | 40 | $30.00 | $1,200.00 |
| 21 | 2211.501 | AGGREGATE BASE CLASS 5 | TON | 7,400 | $12.00 | $88,800.00 |
| 22 | 2357.502 | BITUMINOUS MATERIAL FOR TACK COAT | GALLON | 940 | $3.00 | $2,820.00 |
| 23 | 2360.501 | TYPE PS 12.5 WEARING COURSE MIXTURE (2,C ) | TON | 1,750 | $64.00 | $112,000.00 |
| 24 | 2360.502 | TYPE SP 12.5 NON WEARING COURSE MIXTURE (2,C ) | TON | 2,350 | $62.00 | $145,700.00 |
| 25 | 2360.503 | TYPE SP 9.5 WEARING COURSE MIXTURE FOR DRIVEWAYS ( | SQ YD | 1,575 | $25.00 | $39,375.00 |
| 26 | 2504.602 | IRRIGATION SYSTEM | EACH | 25 | $250.00 | $6,250.00 |
| 27 | 2521.501 | 4" CONCRETE WALK | SQ FT | 2,100 | $4.00 | $8,400.00 |
| 28 | 2531.501 | CONCRETE CURB & GUTTER DESIGN B618 | LIN FT | 11,200 | $10.00 | $112,000.00 |
| 29 | 2531.507 | 6" CONCRETE DRIVEWAY PAVEMENT | SQ YD | 2,300 | $42.00 | $96,600.00 |
| 30 | 2531.618 | TRUNCATED DOMES | SQ FT | 136 | $32.00 | $4,352.00 |
| 31 | 2540.602 | MAIL BOX (TEMPORARY) | EACH | 100 | $20.00 | $2,000.00 |
| 32 | 2540.602 | MAIL BOX | EACH | 90 | $30.00 | $2,700.00 |
| 33 | 2540.602 | MAIL BOX SUPPORT | EACH | 90 | $150.00 | $13,500.00 |
| 34 | 2563.601 | TRAFFIC CONTROL | LUMP SUM | 1 | $5,000.00 | $5,000.00 |
| 35 | 2564.533 | F & I SIGN PANELS TYPE C | SQ FT | 150.00 | $30.00 | $4,500.00 |
| 36 | 2564.533 | SIGN PANEL TYPE D | EACH | 14 | $250.00 | $3,500.00 |
| 37 | 2564.602 | SALVAGE AND REINSTALL SIGN | EACH | 5 | $150.00 | $750.00 |

# Opinion of Probable Cost

*WSB Project:* 2014 Street and Utility Improvement Project — *Design By:* BJP
*Project Location:* City of Circle Pines — *Checked By:* JAK
*WSB Project No:* 1507-57 — *Date:* 1/28/2014

| Item No. | MN/DOT Specification No. | Description | Unit | Estimated Total Quantity | Estimated Unit Price | Estimated Total Cost |
|---|---|---|---|---|---|---|
| 38 | 2565.602 | PEDESTAL | EACH | 8 | $1,000.00 | $8,000.00 |
| 39 | 2565.602 | REMOVE LOOP DETECTOR | EACH | 4 | $150.00 | $600.00 |
| 40 | 2582.602 | LOOP DETECTOR | EACH | 4 | $1,500.00 | $6,000.00 |
| 41 | 2565.603 | 1.5" NON-METALLIC CONDUIT | LIN FT | 4,400 | $11.00 | $48,400.00 |
| 42 | 2565.603 | 4" NON-METALLIC CONDUIT | LIN FT | 900 | $11.00 | $9,900.00 |
| 43 | 2571.501 | CONIFEROUS TREE 8' HT B&B | TREE | 25 | $300.00 | $7,500.00 |
| 44 | 2571.502 | DECIDUOUS TREE 2.5" CAL B&B | TREE | 25 | $300.00 | $7,500.00 |
| 45 | 2571.505 | DECIDUOUS SHRUB NO 5 CONT | SHRUB | 25 | $100.00 | $2,500.00 |
| 46 | 2573.502 | SILT FENCE, TYPE PREASSEMBLED | LIN FT | 8,100 | $2.00 | $16,200.00 |
| 47 | 2573.602 | TEMPORARY ROCK CONSTRUCTION ENTRANCE | EACH | 4 | $500.00 | $2,000.00 |
| 48 | 2575.505 | SODDING TYPE LAWN (INCL. TOPSOIL & FERT.) | SQ YD | 18,000 | $3.00 | $54,000.00 |
| 49 | 2582.503 | CROSSWALK MARKING-PAINT | SQ FT | 980 | $8.00 | $7,840.00 |
| 50 | 2582.503 | CROSSWALK MARKING-POLY PREFORM (GROUND IN) | SQ FT | 180 | $13.00 | $2,340.00 |
| 51 | 2582.618 | CROSSWALK MARKING-DURATHERM | SQ FT | 800 | $15.00 | $12,000.00 |

| | |
|---|---|
| SUBTOTAL SCHEDULE A - SURFACE IMPROVEMENTS | **$1,103,740.00** |
| + 10% CONTINGENCIES | **$110,400.00** |
| **SUBTOTAL SCHEDULE A - SURFACE IMPROVEMENTS** | **$1,214,140.00** |
| + 25% INDIRECT COST | **$303,500.00** |
| **TOTAL SCHEDULE A - SURFACE IMPROVEMENTS** | **$1,517,600.00** |

# Opinion of Probable Cost

*WSB Project:* 2014 Street and Utility Improvement Project — *Design By:* BJP
*Project Location:* City of Circle Pines — *Checked By:* JAK
*WSB Project No:* 1507-57 — *Date:* 1/28/2014

| Item No. | MN/DOT Specification No. | Description | Unit | Estimated Total Quantity | Estimated Unit Price | Estimated Total Cost |
|---|---|---|---|---|---|---|
| **B. SANITARY SEWER IMPROVEMENTS** | | | | | | |
| 52 | 2104.501 | REMOVE SEWER PIPE (SANITARY) | LIN FT | 4,950 | $2.00 | $9,900.00 |
| 53 | 2104.509 | REMOVE MANHOLE (SANITARY) | EACH | 38 | $350.00 | $13,300.00 |
| 54 | 2104.509 | REMOVE SANITARY SEWER SERVICE | EACH | 90 | $150.00 | $13,500.00 |
| 54 | 2105.601 | DEWATERING | LUMP SUM | 1 | $40,000.00 | $40,000.00 |
| 55 | 2451.602 | GRANULAR FOUNDATION AND/OR BEDDING | CU YD | 150 | $50.00 | $7,500.00 |
| 55 | 2503.601 | SANITARY SEWER BYPASS PUMPING | LUMP SUM | 1 | $5,000.00 | $5,000.00 |
| 56 | 2503.602 | CHIMNEY SEALS | EACH | 38 | $200.00 | $7,600.00 |
| 56 | 2503.602 | 8"X6" PVC WYE | EACH | 90 | $200.00 | $18,000.00 |
| 57 | 2503.602 | CONNECT TO EXISTING SANITARY SEWER | EACH | 2 | $1,000.00 | $2,000.00 |
| 57 | 2503.602 | RECONNECT TO EXISTING SANITARY SEWER SERVICE | EACH | 90 | $200.00 | $18,000.00 |
| 58 | 2503.603 | 6" PVC PIPE SEWER - SDR 26 | LIN FT | 2,950 | $22.00 | $64,900.00 |
| 58 | 2503.603 | 8" PVC PIPE SEWER - SDR 35 | LIN FT | 1,850 | $28.00 | $51,800.00 |
| 59 | 2503.603 | 8" PVC PIPE SEWER - SDR 26 | LIN FT | 680 | $33.00 | $22,440.00 |
| 59 | 2503.603 | 12" PVC PIPE SEWER - SDR 35 | LIN FT | 895 | $38.00 | $34,010.00 |
| 59 | 2503.603 | 12" PVC PIPE SEWER - SDR 26 | LIN FT | 1,325 | $43.00 | $56,975.00 |
| 59 | 2503.603 | TELEVISE SANITARY SEWER | LIN FT | 4,750 | $1.25 | $5,937.50 |
| 60 | 2506.516 | CASTING ASSEMBLY | EACH | 38 | $500.00 | $19,000.00 |
| 61 | 2506.603 | CONST 48" DIA SAN SEWER MANHOLE | LIN FT | 525 | $175.00 | $91,875.00 |
| | | | | | SUBTOTAL SCHEDULE B - SANITARY SEWER IMPROVEMENTS | **$481,740.00** |
| | | | | | + 10% CONTINGENCIES | **$48,200.00** |
| | | | | | **SUBTOTAL SCHEDULE B - SANITARY SEWER IMPROVEMENTS** | **$529,940.00** |
| | | | | | + 25% INDIRECT COST | **$132,500.00** |
| | | | | | **TOTAL SCHEDULE B - SANITARY SEWER IMPROVEMENTS** | **$662,400.00** |

# Opinion of Probable Cost

*WSB Project:* 2014 Street and Utility Improvement Project — *Design By:* BJP
*Project Location:* City of Circle Pines — *Checked By:* JAK
*WSB Project No:* 1507-57 — *Date:* 1/28/2014

| Item No. | MN/DOT Specification No. | Description | Unit | Estimated Total Quantity | Estimated Unit Price | Estimated Total Cost |
|---|---|---|---|---|---|---|
| **C. WATERMAIN IMPROVEMENTS** | | | | | | |
| 62 | 2104.501 | REMOVE WATER MAIN | LIN FT | 5,575 | $3.00 | $16,725.00 |
| 63 | 2104.509 | REMOVE WATER SERVICE AND CURB BOX | EACH | 91 | $100.00 | $9,100.00 |
| 64 | 2104.509 | REMOVE HYDRANT AND VALVE | EACH | 12 | $300.00 | $3,600.00 |
| 65 | 2104.509 | REMOVE GATE VALVE & BOX | EACH | 21 | $150.00 | $3,150.00 |
| 66 | 2451.602 | GRANULAR FOUNDATION AND/OR BEDDING | TON | 50 | $10.00 | $500.00 |
| 67 | 2504.601 | TEMPORARY WATER SERVICE | LUMP SUM | 1 | $30,000.00 | $30,000.00 |
| 68 | 2504.602 | CONNECT TO EXISTING WATER MAIN | EACH | 6 | $1,000.00 | $6,000.00 |
| 69 | 2504.602 | CONNECT TO EXISTING WATER SERVICE | EACH | 91 | $200.00 | $18,200.00 |
| 70 | 2504.602 | 1" CORPORATION STOP | EACH | 91 | $175.00 | $15,925.00 |
| 71 | 2504.602 | 1" CURB STOP & BOX | EACH | 91 | $200.00 | $18,200.00 |
| 72 | 2504.602 | HYDRANT ASSEMBLY | EACH | 14 | $3,000.00 | $42,000.00 |
| 73 | 2504.602 | 6" GATE VALVE AND BOX | EACH | 14 | $1,500.00 | $21,000.00 |
| 74 | 2504.602 | 8" GATE VALVE AND BOX | EACH | 12 | $1,900.00 | $22,800.00 |
| 75 | 2504.602 | 12" GATE VALVE AND BOX | EACH | 3 | $3,000.00 | $9,000.00 |
| 76 | 2504.603 | 1" HDPE SDR 9 WATER SERVICE | LIN FT | 3,500 | $12.00 | $42,000.00 |
| 77 | 2504.603 | 6" WATER MAIN-DUCT IRON CL 52 | LIN FT | 210 | $30.00 | $6,300.00 |
| 78 | 2504.603 | 8" PVC WATER MAIN | LIN FT | 4,730 | $28.00 | $132,440.00 |
| 79 | 2504.603 | 12" PVC WATER MAIN | LIN FT | 535 | $33.00 | $17,655.00 |
| 80 | 2504.604 | 4" POLYSTYRENE INSULATION | SQ YD | 50 | $40.00 | $2,000.00 |
| 81 | 2504.608 | DUCTILE IRON FITTINGS | POUND | 6,500 | $3.00 | $19,500.00 |
| | | | | | SUBTOTAL SCHEDULE C - WATER MAIN IMPROVEMENTS | **$436,100.00** |
| | | | | | + 10% CONTINGENCIES | **$43,600.00** |
| | | | | | **SUBTOTAL SCHEDULE C - WATER MAIN IMPROVEMENTS** | **$479,700.00** |
| | | | | | + 25% INDIRECT COST | **$119,900.00** |
| | | | | | **TOTAL SCHEDULE C - WATER MAIN IMPROVEMENTS** | **$599,600.00** |

# Opinion of Probable Cost

*WSB Project:* 2014 Street and Utility Improvement Project — *Design By:* BJP
*Project Location:* City of Circle Pines — *Checked By:* JAK
*WSB Project No:* 1507-57 — *Date:* 1/28/2014

| Item No. | MN/DOT Specification No. | Description | Unit | Estimated Total Quantity | Estimated Unit Price | Estimated Total Cost |
|---|---|---|---|---|---|---|
| **D. STORM SEWER IMPROVEMENTS** | | | | | | |
| 82 | 2104.501 | REMOVE SEWER PIPE (STORM) | LIN FT | 820 | $4.00 | $3,280.00 |
| 83 | 2104.509 | REMOVE DRAINAGE STRUCTURE | EACH | 23 | $300.00 | $6,900.00 |
| 84 | 2451.609 | GRANULAR FOUNDATION AND/OR BEDDING | CU YD | 150 | $10.00 | $1,500.00 |
| 85 | 2501.511 | 72" CS PIPE CULVERT | LIN FT | 90 | $125.00 | $11,250.00 |
| 86 | 2501.515 | 72" GS PIPE APRON | EACH | 2 | $500.00 | $1,000.00 |
| 87 | 2502.601 | SUBSURFACE INFILTRATION SYSTEM | LUMP SUM | 1 | $200,000.00 | $200,000.00 |
| 88 | 2503.541 | 15" RC PIPE SEWER DESIGN 3006 CLASS V | LIN FT | 590 | $30.00 | $17,700.00 |
| 89 | 2503.541 | 18" RC PIPE SEWER DESIGN 3006 CLASS III | LIN FT | 315 | $32.00 | $10,080.00 |
| 90 | 2503.541 | 21" RC PIPE SEWER DESIGN 3006 CLASS III | LIN FT | 360 | $34.00 | $12,240.00 |
| 90 | 2503.602 | CONNECT TO EXISTING STORM SEWER | EACH | 9 | $1,000.00 | $9,000.00 |
| 91 | 2506.501 | CONSTRUCT DRAINAGE STRUCTURE DESIGN 48-4020 | LIN FT | 105 | $250.00 | $26,250.00 |
| 92 | 2506.501 | CONSTRUCT DRAINAGE STRUCTURE DESIGN 60-4020 | LIN FT | 10 | $325.00 | $3,250.00 |
| 93 | 2506.502 | CONSTRUCT DRAINAGE STRUCTURE DESIGN SPECIAL 1 | EACH | 9 | $1,300.00 | $11,700.00 |
| 93 | 2506.602 | CASTING ASSEMBLY (CATCH BASIN) | EACH | 23 | $550.00 | $12,650.00 |
| 94 | 2573.602 | INLET PROTECTION | EACH | 28 | $350.00 | $9,800.00 |

| | |
|---|---|
| SUBTOTAL SCHEDULE D - STORM SEWER IMPROVEMENTS | **$336,600.00** |
| + 10% CONTINGENCIES | **$33,700.00** |
| **SUBTOTAL SCHEDULE D - STORM SEWER IMPROVEMENTS** | **$370,300.00** |
| + 25% INDIRECT COST | **$92,600.00** |
| **TOTAL SCHEDULE D - STORM SEWER IMPROVEMENTS** | **$462,900.00** |

# Opinion of Probable Cost

*WSB Project:* 2014 Street and Utility Improvement Project — *Design By:* BJP
*Project Location:* City of Circle Pines — *Checked By:* JAK
*WSB Project No:* 1507-57 — *Date:* 1/28/2014

| Item No. | MN/DOT Specification No. | Description | Unit | Estimated Total Quantity | Estimated Unit Price | Estimated Total Cost |
|---|---|---|---|---|---|---|
| **E. AESTHETIC INTERSECTION IMPROVEMENTS** (Fire Barn Road / Lake Drive / Civic Heights Drive and Pine Drive / Lake Drive) | | | | | | |
| 95 | 2521.618 | CONCRETE WALK | SQ FT | 6,400 | $8.00 | $51,200.00 |
| 96 | 2571.601 | TREES AND SHRUBS | LUMP SUM | 2 | $8,000.00 | $16,000.00 |
| | | | | SUBTOTAL SCHEDULE E - AESTHETIC INTERSECTION IMPROVEMENTS | | **$67,200.00** |
| | | | | + 10% CONTINGENCIES | | **$6,700.00** |
| | | | | **SUBTOTAL SCHEDULE E - AESTHETIC INTERSECTION IMPROVEMENTS** | | **$73,900.00** |
| | | | | + 25% INDIRECT COST | | **$18,500.00** |
| | | | | **TOTAL SCHEDULE E - AESTHETIC INTERSECTION IMPROVEMENTS** | | **$92,400.00** |
| **ALTERNATE 1 - SIDEWALK** | | | | | | |
| 97 | 2101.502 | CLEARING | TREE | 18 | $150.00 | $2,700.00 |
| 98 | 2101.507 | GRUBBING | TREE | 18 | $150.00 | $2,700.00 |
| 99 | 2105.501 | COMMON EXCAVATION | CU YD | 500 | $18.00 | $9,000.00 |
| 100 | 2211.501 | AGGREGATE BASE CLASS 5 | TON | 360 | $13.00 | $4,680.00 |
| 101 | 2521.501 | 4" CONCRETE WALK | SQ FT | 11,000 | $4.00 | $44,000.00 |
| 102 | 2531.618 | TRUNCATED DOMES | SQ FT | 48 | $35.00 | $1,680.00 |
| 103 | 2531.618 | PEDESTRIAN CURB RAMP | EACH | 6 | $400.00 | $2,400.00 |
| 104 | 2557.501 | 5' CHAIN LINK FENCE | LIN FT | 200 | $25.00 | $5,000.00 |
| | | | | SUBTOTAL ALTERNATE 1 - SIDEWALK | | **$72,160.00** |
| | | | | + 10% CONTINGENCIES | | **$7,200.00** |
| | | | | **SUBTOTAL ALTERNATE 1 - SIDEWALK** | | **$79,360.00** |
| | | | | + 25% INDIRECT COST | | **$19,800.00** |
| | | | | **TOTAL ALTERNATE 1 - SIDEWALK** | | **$99,200.00** |

# Opinion of Probable Cost

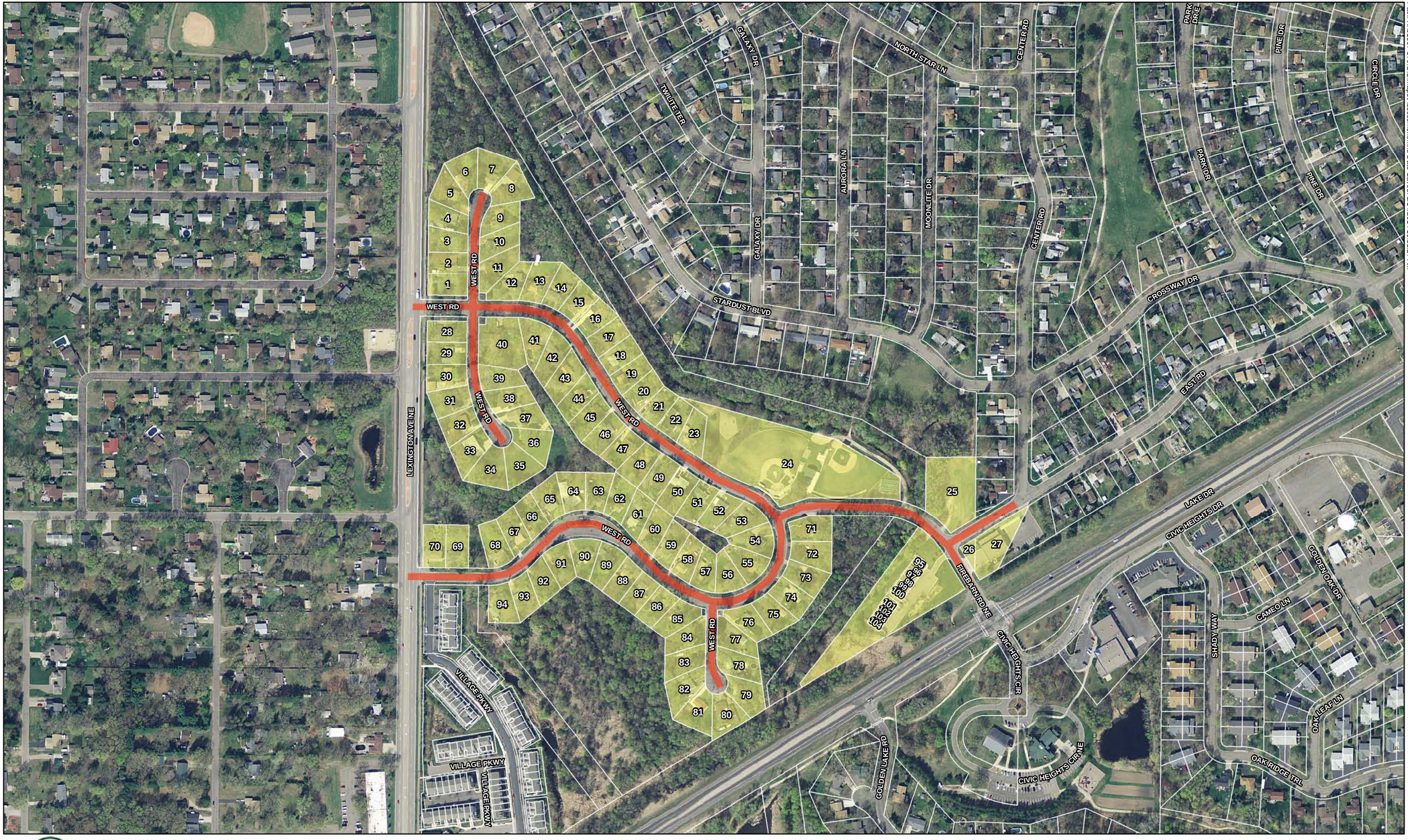
*WSB Project:* 2014 Street and Utility Improvement Project — *Design By:* BJP
*Project Location:* City of Circle Pines — *Checked By:* JAK
*WSB Project No:* 1507-57 — *Date:* 1/28/2014

| Item No. | MN/DOT Specification No. | Description | Unit | Estimated Total Quantity | Estimated Unit Price | Estimated Total Cost |
|---|---|---|---|---|---|---|
| **ALTERNATE 2 - CARL ECK PARK PARKING LOT** | | | | | | |
| 105 | 2101.502 | CLEARING | ACRE | 0.25 | $10,000.00 | $2,500.00 |
| 106 | 2101.507 | GRUBBING | ACRE | 0.25 | $10,000.00 | $2,500.00 |
| 107 | 2105.501 | COMMON EXCAVATION | CU YD | 690 | $10.00 | $6,900.00 |
| 108 | 2211.501 | AGGREGATE BASE CLASS 5 | TON | 910 | $13.00 | $11,830.00 |
| 109 | 2350.501 | TYPE SP 12.5 WEARING COURSE MIXTURE (2,C ) | TON | 515 | $64.00 | $32,960.00 |
| 110 | 2564.603 | 4" SOLID LINE WHITE-EPOXY | LIN FT | 1,400 | $1.25 | $1,750.00 |
| 107 | 2575.505 | SODDING TYPE LAWN (INCL. TOPSOIL & FERT.) | SQ YD | 400 | $3.00 | $1,200.00 |
| | | | | | SUBTOTAL ALTERNATE 2 - CARL ECK PARK PARKING LOT | **$59,640.00** |
| | | | | | + 10% CONTINGENCIES | **$6,000.00** |
| | | | | | **SUBTOTAL ALTERNATE 2 - CARL ECK PARK PARKING LOT** | **$65,640.00** |
| | | | | | + 25% INDIRECT COST | **$16,400.00** |
| | | | | | **TOTAL ALTERNATE 2 - CARL ECK PARK PARKING LOT** | **$82,000.00** |
| **ALTERNATE 3 - FIRE BARN ROAD BUMP OUT PARKING** | | | | | | |
| 108 | 2105.501 | COMMON EXCAVATION | CU YD | 160 | $15.00 | $2,400.00 |
| 109 | 2211.501 | AGGREGATE BASE CLASS 5 | TON | 200 | $12.00 | $2,400.00 |
| 110 | 2350.501 | TYPE SP 12.5 WEARING COURSE MIXTURE (2,C ) | TON | 55 | $64.00 | $3,520.00 |
| 111 | 2350.502 | TYPE SP 12.5 NON WEARING COURSE MIXTURE (2,C ) | TON | 75 | $62.00 | $4,650.00 |
| 112 | 2357.502 | BITUMINOUS MATERIAL FOR TACK COAT | GALLON | 30 | $3.00 | $90.00 |
| 113 | 2531.501 | CONCRETE CURB & GUTTER DESIGN B618 | LIN FT | 40 | $10.00 | $400.00 |
| 114 | 2531.603 | 6" CONCRETE VALLEY GUTTER | LIN FT | 235 | $40.00 | $9,400.00 |
| 115 | 2564.603 | 4" SOLID LINE WHITE-PAINT | LIN FT | 490 | $0.90 | $441.00 |
| 116 | 2564.603 | 4" SOLID LINE WHITE-EPOXY | LIN FT | 490 | $1.25 | $612.50 |
| 117 | 2582.503 | CROSSWALK MARKING-PAINT | SQ FT | 90 | $8.00 | $720.00 |
| 118 | 2582.503 | CROSSWALK MARKING-POLY PREFORM (GROUND IN) | SQ FT | 90 | $13.00 | $1,170.00 |
| | | | | | SUBTOTAL ALTERNATE 3 - FIRE BARN ROAD BUMP OUT PARKING | **$23,910.00** |
| | | | | | + 10% CONTINGENCIES | **$2,400.00** |
| | | | | | **SUBTOTAL ALTERNATE 3 - FIRE BARN ROAD BUMP OUT PARKING** | **$26,310.00** |
| | | | | | + 25% INDIRECT COST | **$6,600.00** |
| | | | | | **TOTAL ALTERNATE 3 - FIRE BARN ROAD BUMP OUT PARKING** | **$32,900.00** |
| | | | | | **GRAND TOTAL** | **$3,549,000.00** |

# APPENDIX C

## Figure 9: Assessment Map ID
## Assessment Roll

Path: K:\01507-570\GIS\Maps\Assessment.mxd Date Saved: 1/14/2014 10:51:27 AM




City of Circle Pines

Street & Improvement Project Area

Assessed Parcels

# 2014 Street and Utility Improvement Project
## Assessed Properties
## City of Circle Pines MN

300 150 0 300 Feet

N

Figure 9
January 28, 2014
WSB Proj No 1507-570

WSB & Associates, Inc.

**Preliminary Assessment Roll**

*WSB Project:* 2014 Street and Utility Improvement Project
*Project Location:* City of Circle Pines
*WSB Project No.:* 1507-57

***Date:*** ***January 28, 2014***

Assessment Policy: $3,950 per unit
Total Surface Improvement Cost: $1,517,600
Unit Assessment: $3,950
Assessable Units: 117
Assessable Surface Improvement Cost: $462,150

| MAP ID | PID | FEE OWNER | PROPERTY ADDRESS | FEE OWNER ADDRESS | UNIT | PROPOSED ASSESSMENT |
|---|---|---|---|---|---|---|
| 1 | 253123230035 | STULC DONALD A | 96 WEST RD | 96 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 2 | 253123230036 | BISSET HAROLD W & KATHLEEN | 94 WEST RD | 94 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 3 | 253123230037 | BECK WILLIS C | 92 WEST RD | 92 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 4 | 253123230038 | ERNE ROGER G & BARBARA J | 90 WEST RD | 90 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 5 | 253123230039 | DETTMAN STEVEN J | 88 WEST RD | 88 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 6 | 253123230040 | JACOBSON ELIZABETH D | 86 WEST RD | 86 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 7 | 253123230041 | ESPESETH DIANE M | 84 WEST RD | 84 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 8 | 253123230042 | SHEA KELLY W | 82 WEST RD | 82 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 9 | 253123230043 | NAPURSKI DONALD R & E C | 80 WEST RD | 80 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 10 | 253123230044 | HABISCH THOMAS R & K P | 78 WEST RD | 78 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 11 | 253123230045 | PERRON JILL M | 76 WEST RD | 76 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 12 | 253123230046 | DUNN JOHN | 74 WEST RD | 74 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 13 | 253123230047 | WAMHOFF MARIDELLE | 72 WEST RD | 31000 FRIENDLY VALLEY RD WASHBURN WI 54891 | 1 | $3,950.00 |
| 14 | 253123230048 | LANSING NEIL J & MARY J K | 70 WEST RD | 70 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 15 | 253123230001 | BREIDENBACH STEFAN J & JANAH W | 68 WEST RD UNIT A | 68A WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 16 | 253123230049 | JENSEN DAWN | 68 WEST RD | 68 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 17 | 253123230050 | JENSEN KEITH | 66 WEST RD | 66 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 18 | 253123230051 | HAVENER MARY E | 64 WEST RD | 64 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 19 | 253123230052 | KOEHLER RAYMOND TRUSTEE & KOEHLER RITA TRUSTEE | 62 WEST RD | 62 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 20 | 253123230053 | SCHLOER THOMAS | 60 WEST RD | 7559 JEANNE DR LINO LAKES MN 55014-0000 | 1 | $3,950.00 |
| 21 | 253123230054 | STEPNICK CHRISTOPHER J | 58 WEST RD | 58 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 22 | 253123230055 | WEBSTER MARK S & MARCIA A | 56 WEST RD | 56 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 23 | 253123230056 | CHASTANET DANIEL | 54 WEST RD | 54 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 24 | 253123240001 | CIRCLE PINES CITY OF | | 200 CIVIC HEIGHTS CIR CIRCLE PINES MN 55014-000C | 10 | $39,500.00 |
| 25 | 253123240089 | CIRCLE PINES CITY OF | | 9201 LEXINGTON AVE N CIRCLE PINES MN 55014-000C | 3 | $11,850.00 |
| 26 | 253123310001 | CIRCLE PINES CITY OF | | 200 CIVIC HEIGHTS CIR CIRCLE PINES MN 55014-000C | 1 | $3,950.00 |
| 27 | 253123240046 | CIRCLE PINES CITY OF | 2 EAST RD | 200 CIVIC HEIGHTS CIR CIRCLE PINES MN 55014-000C | 3 | $11,850.00 |
| 28 | 253123230034 | KROMREY V G & WROBLESKI J G | 87 WEST RD | 87 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 29 | 253123230033 | MEEK SHIRLEY F | 85 WEST RD | 85 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 30 | 253123230032 | SHILTS DAVID | 83 WEST RD | 83 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 31 | 253123230031 | FORSBERG P B & FORSBERG M A | 81 WEST RD | 81 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 32 | 253123230030 | HEILMAN KEITH H & J M | 79 WEST RD | 79 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 33 | 253123230029 | BIEHN LAWRENCE H & D F | 77 WEST RD | 77 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 34 | 253123230028 | CIRCLE PINES CITY OF | | 200 CIVIC HEIGHTS CIR CIRCLE PINES MN 55014-000C | 1 | $3,950.00 |
| 35 | 253123230027 | CIRCLE PINES CITY OF | | 200 CIVIC HEIGHTS CIR CIRCLE PINES MN 55014-000C | 1 | $3,950.00 |
| 36 | 253123230026 | CIRCLE PINES CITY OF | | 200 CIVIC HEIGHTS CIR CIRCLE PINES MN 55014-000C | 1 | $3,950.00 |
| 37 | 253123230025 | JOHNSON DENNIS E & VIOLET A | 69 WEST RD | 69 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 38 | 253123230024 | CHRISTEN ANGELA | 67 WEST RD | 67 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 39 | 253123230023 | ROSSINI DEBORAH | 65 WEST RD | 65 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 40 | 253123230022 | DARMER ERIC | 61 WEST RD | 61 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 41 | 253123230021 | MILLER ROBERT S & SANDRA J | 59 WEST RD | 59 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 42 | 253123230020 | OSTRANDER MARK J & ROXANNE | 57 WEST RD | 57 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 43 | 253123230019 | PETERS DENNIS | 55 WEST RD | 55 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 44 | 253123230018 | WEGSCHEIDER JEROME R & B M | 53 WEST RD | 53 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 45 | 253123230017 | DOWNS BRITT | 51 WEST RD | 9239 GRIGGS AVE LEXINGTON MN 55014-0000 | 1 | $3,950.00 |
| 46 | 253123230016 | PETERSON TOM | 49 WEST RD | 49 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 47 | 253123230015 | YANG LUEY | 47 WEST RD | 47 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 48 | 253123230014 | KRONE RANDY A & BRENDA E | 45 WEST RD | 45 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 49 | 253123230012 | ECKERT SCOTT P & KRISTI S | 43 WEST RD | 43 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 50 | 253123230011 | MEYER KENNETH A & J L | 41 WEST RD | 41 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 51 | 253123230010 | PEDERSON CAROL I | 39 WEST RD | 39 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 52 | 253123230009 | LONNING LINDA | 37 WEST RD | 37 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 53 | 253123230008 | HENDRY CATHERINE M | 35 WEST RD | 35 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |

| MAP ID | PID | FEE OWNER | PROPERTY ADDRESS | FEE OWNER ADDRESS | UNIT | PROPOSED ASSESSMENT |
|---|---|---|---|---|---|---|
| 54 | 253123320033 | HALLIS SAMUEL L & CLAUDIA A | 33 WEST RD | 33 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 55 | 253123320032 | SHAFER TODD & ANDERSON LAURA | 31 WEST RD | 31 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 56 | 253123320031 | HUGHES EARL | 29 WEST RD | 29 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 57 | 253123320030 | PARSON WILLIAM F & R T | 27 WEST RD | 27 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 58 | 253123320029 | FLOREK DONALD J | 25 WEST RD | 25 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 59 | 253123320028 | DOMINO RUSSELL W & J V | 23 WEST RD | 23 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 60 | 253123320027 | DRAHEIM JOHN & DANIELLE | 21 WEST RD | 21 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 61 | 253123230007 | REDFIELD DELORIS B | 19 WEST RD | 19 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 62 | 253123230006 | PFARR MILDRED LEONA | 17 WEST RD | 17 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 63 | 253123230005 | KRONE MARK & CHERRY RENEE | 15 WEST RD | 15 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 64 | 253123230004 | KLUCK MICHAEL J & J L | 13 WEST RD | 13 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 65 | 253123230003 | KOSKINEN WALFRED A | 11 WEST RD | 11 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 66 | 253123230002 | BUTTERFIELD FRANK | 9 WEST RD | 9 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 67 | 253123320026 | DUVERNAY ELSE MARIA | 7 WEST RD | 7 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 68 | 253123320025 | DEMARS JAMES A & JILL M | 5 WEST RD | 5 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 69 | 253123320024 | POTTHOFF KENNETH T & B J | 3 WEST RD | 3 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 70 | 253123320023 | FIESTER MINDY | 1 WEST RD | 1 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 71 | 253123310026 | GUGGISBERG BASIL A & B L | 52 WEST RD | 52 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 72 | 253123310025 | LANTZ JERRY | 50 WEST RD | 50 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 73 | 253123310024 | JOHNSON LORI A D & JEFFERY L | 48 WEST RD | 48 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 74 | 253123310023 | KAMMIER GREGORY A & ROSE C | 46 WEST RD | 46 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 75 | 253123320022 | MOSS TRAVA E | 44 WEST RD | 44 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 76 | 253123320021 | PECH CAROL A ETAL TRUSTEES | 42 WEST RD | 120 WOODRIDGE LN LINO LAKES MN 55414-0000 | 1 | $3,950.00 |
| 77 | 253123320020 | BROWN ALISA | 40 WEST RD | 40 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 78 | 253123320019 | OKEEFFE JR DAVID P & ROCK A M | 38 WEST RD | 38 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 79 | 253123320018 | MARTIN LORRAINE J | 36 WEST RD | 36 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 80 | 253123320017 | JOHNSON RUSSELL E & P C | 34 WEST RD | 34 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 81 | 253123320016 | BUTTWEILER TIMOTHY | 32 WEST RD | 32 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 82 | 253123320015 | BEIERLEIN EDWARD | 30 WEST RD | 30 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 83 | 253123320014 | BURDINE RICHARD J | 28 WEST RD | 28 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 84 | 253123320013 | ANDERSON MICHAEL | 26 WEST RD | 26 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 85 | 253123320012 | GREGORY RICHARD & KAREN E | 24 WEST RD | 24 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 86 | 253123320011 | PALUMBO NICK | 22 WEST RD | 22 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 87 | 253123320010 | NODES KATHRINA | 20 WEST RD | 20 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 88 | 253123320009 | JOYCE KENNETH M & N M | 18 WEST RD | 18 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 89 | 253123320008 | SAENGER BEVERLY | 16 WEST RD | 16 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 90 | 253123320007 | ULANOWSKI DARIUSZ | 14 WEST RD | 14 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 91 | 253123320006 | KOFFLER DONNA MAE | 12 WEST RD | 12 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 92 | 253123320005 | BOULEY PATRICIA A | 10 WEST RD | 10 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 93 | 253123320004 | MCDONALD BRIAN M & ISLER S R | 8 WEST RD | 8 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 94 | 253123320003 | MOREHOUSE RAYMOND L & G R | 6 WEST RD | 6 WEST RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 95 | 253123310049 | SORENSON WILLIAM | 100 FIREBARN RD | 100 FIREBARN RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 96 | 253123310050 | WHITE HORSE DEVELOPMENT CORPORATION | 102 FIREBARN RD | 9175 107TH ST N STILLWATER MN 55082-0000 | 1 | $3,950.00 |
| 97 | 253123310051 | WHITE HORSE DEVELOPMENT CORP | 104 FIREBARN RD | 9175 107TH ST N STILLWATER MN 55082-0000 | 1 | $3,950.00 |
| 98 | 253123310052 | WHITE HORSE DEVELOPMENT CORP | 106 FIREBARN RD | 9175 107TH ST N STILLWATER MN 55082-0000 | 1 | $3,950.00 |
| 99 | 253123310053 | BRODER KATHY | 108 FIREBARN RD | 108 FIREBARN RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 100 | 253123310054 | TURE GERALD | 110 FIREBARN RD | 110 FIREBARN RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 101 | 253123310055 | HOPKINS EVAN | 112 FIREBARN RD | 112 FIREBARN RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 102 | 253123310056 | LANGLEY WILLIAM | 114 FIREBARN RD | 114 FIREBARN RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 103 | 253123310057 | PARSONS JESSICA | 116 FIREBARN RD | 116 FIREBARN RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| 104 | 253123310058 | HALL HELEN A | 118 FIREBARN RD | 118 FIREBARN RD CIRCLE PINES MN 55014-0000 | 1 | $3,950.00 |
| | | | Total | | 117 | $462,150.00 |

# APPENDIX D

## Geotechnical Report

# REPORT OF GEOTECHNICAL EXPLORATION AND REVIEW

## 2014 Street Reconstruction

West Road, East Road, Firebarn Road, West Roads A, B and C
Circle Pines, Minnesota

Report No. 22-02572

**Date:**

December 11, 2013

**Prepared for:**

City of Circle Pines
c/o WSB and Associates., Inc.
701 Xenia Avenue South – Suite 300
Minneapolis, MN 55416

December 11, 2013

City of Circle Pines
c/o WSB and Associates, Inc.
701 Xenia Avenue South – Suite 300
Shoreview, MN 55126

Attn: Jeremy Koenen, PE

RE: Geotechnical Exploration and Review
2014 Street Reconstruction
West Road, East Road, Firebarn Road, and West Roads A, B C
Circle Pines, Minnesota
Report No. 01-05261

Dear Mr. Koenen:

American Engineering Testing, Inc. (AET) is pleased to present the results of our subsurface exploration program and geotechnical engineering review for your proposed 2014 Street Reconstruction project in Circle Pines, Minnesota. These services were performed according to our proposal to you dated October 14, 2013.

In addition to the pdf electronic version, we are sending four hard copies of the report to you.

Sincerely,

**American Engineering Testing, Inc.**

James D. Miller
Senior Engineering Assistant
Phone: (651) 659-1311
Cell: (612) 685-3311
jmiller@amengtest.com

# Report of Geotechnical Exploration and Review
# 2014 Street Reconstruction
# East Road, Firebarn Road, West Road and West Roads A, B and C
# Circle Pines, Minnesota

Report No. 22-02572

December 11, 2013

Prepared for:

City of Circle Pines
c/o WSB and Associates, Inc.
701 Xenia Avenue South
Minneapolis, MN 55416
Attn: Jeremy Koenen, P.E.

Prepared by:

American Engineering Testing, Inc.
550 Cleveland Avenue North
St. Paul, Minnesota 55114
(651) 659-9001/www.amengtest.com

Authored by:

James D. Miller
Senior Engineering Assistant

Reviewed by:

James C. Rudd, P.E.
Vice President/Principal Engineer

**I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under Minnesota Statute Section 326.02 to 326.15**

**Name: James C. Rudd**

**Date:** 12/12/13 **License #: 13996**

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*Unauthorized use or copying of this document is strictly prohibited by anyone other than the client for the specific project.*

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Report No. 22-02572

# GEOTECHNICAL EXPLORATION AND REVIEW
# FOR
# 2014 STREET RECONSTRUCTION
# CIRCLE PINES, MINNESOTA
# REPORT NO. 22-02572

## 1.0 INTRODUCTION

You are proposing to reconstruct East Road, Firebarn Road, West Road and West Roads A, B and C in Circle Pines, Minnesota. To assist planning and design, you have authorized American Engineering Testing, Inc. (AET) to conduct a subsurface exploration program at the site, conduct soil laboratory testing, and perform a geotechnical engineering review for the project. This report presents the results of the above services, and provides our engineering recommendations based on this data.

## 2.0 SCOPE OF SERVICES

AET's services were performed according to our proposal to you dated October 14, 2013. The proposal was accepted by Mr. Jeremy Koenen of WSB and Associates, Inc. on November 4, 2013. The authorized scope consists of the following:

- Ten standard penetration test borings on the existing streets to depths of 10 to 22 feet.
- Soil laboratory testing (water content).
- Geotechnical engineering analysis based on the gained data and preparation of this report.

These services are intended for geotechnical purposes. The scope is not intended to explore for the presence or extent of environmental contamination.

## 3.0 PROJECT INFORMATION

You are planning to reconstruct East Road, Firebarn Road, West Road and West Roads A, B and C, located between Lexington Avenue and Lake Drive. These street segments are shown on Figure 1 in Appendix A. We assume the new streets will maintain the same grade and width as that which currently exists. Generally, reconstruction will include full replacement of all underground utilities (sewer, water, storm and services). The sanitary sewer line in East Road and in the part of Fire Barn Road, from East Road to Lake Drive, may not be replaced.

The stated information represents our understanding of the proposed construction. This information is an integral part of our engineering review. It is important that you contact us if there are changes from that described so that we can evaluate whether modifications to our recommendations are appropriate.

## 4.0 SUBSURFACE EXPLORATION AND TESTING

### 4.1 Field Exploration Program

The subsurface exploration program conducted for the project consisted of ten standard penetration test borings. The logs of the borings and details of the methods used appear in Appendix A. The logs contain information concerning soil layering, soil classification, geologic description, and moisture condition. Relative density or consistency is also noted for the natural soils, which is based on the standard penetration resistance (N-value).

The boring locations are generally shown on Figure 1 in Appendix A. Surface elevations at the boring locations were measured by WSB and Associates, Inc..

### 4.2 Laboratory Testing

The laboratory test program included seven water content tests. The test results appear on the individual boring logs adjacent to the samples upon which they were performed.

## 5.0 SITE CONDITIONS

### 5.1 Surface Materials

The current streets are bituminous surfaced. The bituminous thickness ranges from 2.0 inches at Boring 10 to 3.75 inches at Borings 5 and 7; with the average thickness of 3.0 inches.

An aggregate base layer exists below the bituminous at all of the boring locations. The base thickness ranges from 1.5 inches at Boring 10 to 8.5 inches at Boring 6; with the average thickness of about 4.4 inches.

### 5.2 Subsurface Soils/Geology

The basic geologic profile consists of fill over coarse (granular) alluvium (alluvium referring to natural soils deposited by water). The coarse alluvium consists of sand (SP), sand with silt (SP-SM) and silty sand (SM), with these soils mostly having a fine grained sand particle size. The fill soils have the same general classification range as the coarse alluvium. Fine alluvial sandy silt (ML) is present near the termination depth of Boring 7.

The profile at Boring 9 varied from the other borings and consisted of about 10½ feet of granular fill over swamp deposits. Coarse alluvial silty sands (SM) and sands with silt (SP-SM) underlie the swamp deposits at a depth of about 24½. The swamp deposits consisted of sapric peat and organic clays.

### 5.3 Ground Water

Ground water entered most of the boreholes during drilling. Ground water was measured at depths of about 7½ to 18½ feet in the borings. The soil types encountered at depths where water was measured in Borings 1 to 3, 6 and 9 are considered relatively fast draining and should provide a fairly reliable indication of the static ground water level at the time of our exploration and at the locations sampled.

Ground water levels fluctuate due to varying seasonal and annual rainfall and snow melt amounts, as well as other factors.

## 6.0 RECOMMENDATIONS

### 6.1 Definitions

Italicized words used in this report have a specific definition or are defined in an ASTM standard. The specific definitions are as follows.

***Top of Subgrade:*** Grade which contacts the bottom of the aggregate base layer.

***Sand Subbase:*** Uniform thickness sand layer placed as the top of subgrade which is intended to improve the frost and drainage characteristics of the pavement system by increasing drainage of excess water in the aggregate base and subbase, by reducing and "bridging" frost heaving, and by reducing thaw weakening effects.

***Critical Subgrade Zone:*** The subgrade portion beneath and within three vertical feet of the top of subgrade. A sand subbase, if placed, would be considered the upper portion of the critical subgrade zone.

***Select Granular Borrow:*** Soils meeting Mn/DOT Specification 3149.2B2. This refers to granular soils which, of the portion passing the 1" sieve, contain less than 12% by weight passing the #200 sieve.

***Test Roll:*** A means of evaluating the near-surface stability of subgrade soils (usually non-granular). Suitability is determined by the depth of rutting or deflection caused by passage of heavy rubber-tired construction equipment, such as a loaded dump truck, over the test area. Yielding of less than 1-inch is normally considered acceptable, although engineering judgment may be applied depending on equipment used, soil conditions present, and/or depth below final grade.

***Unstable Soils:*** Subgrade soils which do not pass a test roll or noticeably deflect under vibratory compaction operations. Unstable soils typically have water content exceeding the "standard optimum water content" defined in ASTM:D698 (Standard Proctor test).

***Organic Soils:*** Soils which have sufficient organic content such that the soils engineering properties are negatively affected (typically 5% or more organic content).

## 6.2 Subgrade Preparation

### *6.2.1 Frost/Drainage Improvement*

Current practice is to incorporate a *sand subbase* layer of *Select Granular Borrow* beneath the aggregate base layer for bituminous pavement systems. The purpose is to provide improved drainage for the aggregate base and upper zone of the subgrade which better controls frost heaving/pop outs and thaw weakening effects. The borings indicate most of the soils already meet a *Select Granular Borrow* specification or is at least close to meeting this specification. Accordingly, we judge that there is no need to import *Select Granular Borrow* for this purpose.

### *6.2.2 Stability Improvement*

The final subgrade should have proper stability within the *critical subgrade zone*. As sandy soils are anticipated following existing pavement removal, we recommend surface compacting the exposed sandy subgrade with a vibratory roller compactor (at least 4 passes with a self-propelled vibratory roller). This process should be observed to evaluate whether *unstable soils* may exist within the subgrade which are buried. If deflections are noted under the compaction process, then there may be a need to subcut unstable silty soils.

*Unstable soils* which are found under the compaction process should either be subcut and replaced, or reworked in-place. If *organic soils* are found to be present, we recommend removing these soils where present within the *critical subgrade zone*.

### *6.2.3 Fill Placement/Compaction*

If new fill is needed to reattain subgrade elevation, it should be placed per the requirements of Mn/DOT Specification 2105.3F1 (Specified Density Method). In ASTM terms, this specification requires soils placed within the *critical subgrade zone* be compacted to a minimum of 100% of

the *standard maximum dry unit weight* defined in ASTM: D698 (Standard Proctor test). A reduced minimum compaction level of 95% of the *standard maximum dry unit weight* can be used below the *critical subgrade zone*.

### 6.3 Estimated R-value

The subgrade soils encountered are estimated to have an R-value of at least 50. These estimates are based on Table 5-3.3(b) within the Mn/DOT *Pavement Manual, 2007,* and on our experience.

#### *6.3.1 Pavement Section Thickness*

The following bituminous pavement design is based on constructing the pavements on the stabilized sands with silt (estimated R-value of 50). The presented designs have been based on "20-year" pavement life design charts.

**Table A – Bituminous Pavement Thickness Design**

| Material | Section Thickness |
|---|---|
| Bituminous Wear | 1.5" |
| Bituminous Base | 2" |
| Class 5 Aggregate Base | 5" |

### 6.4 Utility Support, Bedding, and Backfilling

We judge the existing soils encountered at the majority of the boring locations should provide acceptable utility foundation support with the exception of Firebarn Road (Boring #9 – see section 6.4.1). Differing bedding thicknesses and/or material types may be needed in cases of instability or if water is present. If ground water does appear in the excavation bottom, it is preferred that the excavation be dewatered such that utility installation can take place in non-

standing water conditions. Details regarding utility bedding and utility backfilling can be found on the two attached standard sheets entitled:

- Bedding/Foundation Support of Buried Pipe
- Standard Recommendations for Utility Trench Backfilling

### *6.4.1 Firebarn Road*

Swamp deposits underlie the sand fill at Boring #9. Based on our conversations with Mr. Koenen, we understand the road (and utilities) was constructed in the late 1960's, about 45 years ago. We also understand recent televising indicates the VCP sewer and CIP water have sagged (settled) significantly but continue to function. The settlement was caused by the compression of the swamp layer by the weight of the overlying roadway fill.

Using this information, the understood past time frame, and no plans for grade increases for the roadway, we estimate further settlement (secondary compression) of 1 to 3 inches in twenty years. Additional recommendations regarding bedding and pipe size as follows:

- Provide a 1-foot thick gravel bedding layer be placed beneath the pipe that is entirely enveloped with geotextile fabric.
- The pipe should be entirely surrounded by sand or gravel bedding and account for bells at the pipe joints. Likely need gravel bedding in water table.
- Oversize the pipe diameter to account for future sag/settlement.

## 7.0 CONSTRUCTION CONSIDERATIONS

### 7.1 Excavation Backsloping

If excavation faces are not retained, the excavations should maintain maximum allowable slopes in accordance with *OSHA Regulations (Standards 29 CFR), Part 1926, Subpart P, Excavations*

(can be found on www.osha.gov). Even with the required OSHA sloping, water seepage or surface runoff can potentially induce sideslope erosion or running which could require slope maintenance. Maintaining excavation face slopes in accordance with OSHA requirements should be the responsibility of the contractor, and we recommend the construction documents be prepared as such.

### 7.2 Geotechnical-Related Observation and Testing

The recommendations in this report are based on the subsurface conditions found at our test boring locations. Since the soil conditions can be expected to vary away from the soil boring locations, we recommend on-site observation by a geotechnical engineer/technician during construction to evaluate these potential changes. Soil density and Proctor testing should be performed on new fill placed in order to document that project specifications for compaction have been satisfied.

## 8.0 LIMITATIONS

Within the limitations of scope, budget, and schedule, our services have been conducted according to generally accepted geotechnical engineering practices at this time and location. Other than this, no warranty, either express or implied, is intended.

Important information regarding risk management and proper use of this report is given in Appendix B entitled "Geotechnical Report Limitations and Guidelines for Use."

# BEDDING/FOUNDATION SUPPORT OF BURIED PIPE

## GENERAL

This page addresses soil bedding and foundation support of rigid pipe, such as reinforced concrete, and flexible pipe, such as steel and plastic. This does not address selection of pipe based on loads and allowable deflections, but rather addresses the geotechnical/soil aspects of uniform pipe support. Bedding/foundation support needs relate to local conditions directly beneath and to the sides of the pipe zone, which may be influenced by soft in-situ ground conditions or by soil disturbance due to soil sensitivity or ground water. Bedding relates to granular materials placed directly beneath the bottom of the pipe (usually 4" to 6" thick), which is intended to provide increased support uniformity. We refer to foundation soils as thicker layers of sands and/or gravels (beneath the bedding zone) intended to provide increased foundation strength support, usually needed due to soft, unstable and/or waterbearing conditions.

## GRANULAR BEDDING

With circular pipes, high local loads (approaching point loads) develop if pipes are placed on hard surfaces. Load distribution is improved by placing granular bedding materials beneath the pipe, which are either shaped to match the pipe bottom or are placed without compaction to allow "settling in." The bedding should be placed in such a manner that the pipe will be at the proper elevation and slope when the pipe is laid on the bedding. Common bedding material is defined in Mn/DOT Specification 3149.2F, Granular Bedding. Published documents recommend rigid pipes having a diameter of 12" to 54" be placed on a bedding thickness of 4", which increases to 6" of bedding for pipe diameters ranging from 54" to 72". Beyond a 72" diameter, the bedding thickness can be equal to the pipe outside diameter divided by 12. Typically, the need for bedding under small diameter pipes (less than 12") depends on the pipe designer's specific needs, although in obvious point loads situations (bedrock, cobbles, significant coarse gravel content), bedding is recommended. Note that bedding should also account for larger diameter bells at joints.

## FOUNDATION FILL

Positive uniform strength is usually compromised in soft or unstable trench bottom conditions. In this case, deeper subcuts and foundation fill placement is needed beneath the pipe. In moderate instability conditions, improvement can likely be accomplished with a thicker bedding layer. However, in more significant instability situations, particularly where ground water is present, coarser materials may be needed to provide a stronger foundation. Thicker gravel layers can also be a favorable media from which to dewater. The following materials would be appropriate for stability improvement, with the coarser materials being appropriate for higher instability/ground water cases.

- Fine Filter Aggregate – Mn/DOT Specification 3149.2J
- Coarse Filter Aggregate – Mn/DOT Specification 3149.2H

When using a coarser material which includes significant void space, we highly recommend enveloping the entire gravel layer within a geotextile fabric. The gravel material includes open void space, and the fabric acts as a separator which minimizes the intrusion of fines into the open void space. If an additional granular bedding sand is used above foundation gravel, the fabric would also prevent downward infiltration of bedding sand into the rock void space.

Although it is preferred to not highly compact thin granular bedding zones directly beneath the pipe center, it is desirable to compact the foundation materials to prevent more significant pipe settlement. We recommend foundation fill be compacted to a minimum of 95% of the Standard Proctor density (ASTM:D698). It is not possible to test coarse rock fill, although this material should still be well compacted/ tamped.

Often, pipes entering structures such as catch basins, lift stations, etc., enter the structure at a higher elevation than the structure bottom, and are therefore placed on the structure backfill. Fill beneath these pipes should be considered foundation fill. Depending on the flexibility of the connection design, it may be necessary to increase the minimum compaction level to reduce differential settlements, particularly with thicker fills.

## SIDE FILL SUPPORT

If the pipe designer requires support from the side fill, granular bedding should also be placed along the sides of the pipe. In poor soil conditions, the sand fill may need to be placed laterally up to two pipe diameters on both sides of the pipe. With rigid pipe, compacted sand placement up to the spring line (within the haunch area) is usually sufficient. With flexible pipe, side fill should be placed and compacted at least to the top of the pipe. For positive support, it is very important to properly compact the sands within the haunch area.

# STANDARD RECOMMENDATIONS FOR UTILITY TRENCH BACKFILLING

## GENERAL

Clayey and silty soils are often difficult to compact, as they may be naturally wet or may become wet due to ground water or surface/rain water during construction. Soils will need to be placed within a certain range of water (moisture) content to attain desired compaction levels. Moisture conditioning to within this range can be time consuming, labor intensive, and requires favorable weather.

The degree of compaction and the soil type used for backfill within open cut utility trenches depends on the function of the overlying land surface. Details are as follows:

## ROADWAYS

Where trenches are located below roadways, we recommend using inorganic fill and compacting these soils per Mn/DOT Specification 2105.3F1 (Specified Density Method). This specification requires 100% of the Standard Proctor density in the upper one meter subgrade zone, and 95% below this. Note that this specification includes moisture content range requirements which are important for proper subgrade stability.

Where available soils are wet or of poor quality, it may be possible to use the "Quality Compaction Method" (Mn/DOT Specification 2105.3F2) for soils below the upper one meter subgrade zone if you can tolerate some subsidence. However, a high level of stability is still important within the upper subgrade zone and recommend that the "Specified Density Method" be used in this upper subgrade area. We caution that if backfill soils in the lower trench area are significantly unstable, it may be difficult or even impossible to properly compact soils within the upper one meter subgrade zone. In this case, placing a geotextile fabric directly over the unstable soils can aid in offsetting the instability.

## STRUCTURAL AREAS

If fill is placed beneath or within the significant zone of influence of a structure (typically a 1:1 lateral oversize zone), the soil type and minimum compaction level will need to be evaluated on an individual basis. Because trenches result in variable fill depths over a short lateral distance, higher than normal compaction levels and/or more favorable (sandy) soil fill types may be needed. If this situation exists, it is important that special geotechnical engineering review be performed.

## NON-STRUCTURAL AREAS

In grass/ditch areas, backfill soils should be placed in reasonable lift thicknesses and compacted to a minimum of 90% of the Standard Proctor density (ASTM: D698) and/or per the Mn/DOT "Quality Compaction Method." If lower compaction levels are attained, more noticeable subsidence at the surface can occur. Steep or high slopes require special consideration.

# Appendix A

Report No. 22-02572

Geotechnical Field Exploration and Testing
Boring Log Notes
Unified Soil Classification System
AASHTO Soil Classification System
Figure 1 – Boring Locations
Subsurface Boring Logs

# Appendix A
# Geotechnical Field Exploration and Testing
# Report No. 22-02572

## A.1 FIELD EXPLORATION

The subsurface conditions at the site were explored by drilling and sampling ten standard penetration test borings. The locations of the borings appear on Figure 1, preceding the Subsurface Boring Logs in this appendix.

## A.2 SAMPLING METHODS

### A.2.1 Split-Spoon Samples (SS) - Calibrated to $N_{60}$ Values

Standard penetration (split-spoon) samples were collected in general accordance with ASTM:D1586 with one primary modification. The ASTM test method consists of driving a 2-inch O.D. split-barrel sampler into the in-situ soil with a 140-pound hammer dropped from a height of 30 inches. The sampler is driven a total of 18 inches into the soil. After an initial set of 6 inches, the number of hammer blows to drive the sampler the final 12 inches is known as the standard penetration resistance or N-value. Our method uses a modified hammer weight, which is determined by measuring the system energy using a Pile Driving Analyzer (PDA) and an instrumented rod.

In the past, standard penetration N-value tests were performed using a rope and cathead for the lift and drop system. The energy transferred to the split-spoon sampler was typically limited to about 60% of it=s potential energy due to the friction inherent in this system. This converted energy then provides what is known as an $N_{60}$ blow count.

The most newest drill rigs incorporate an automatic hammer lift and drop system, which has higher energy efficiency and subsequently results in lower N-values than the traditional $N_{60}$ values. By using the PDA energy measurement equipment, we are able to determine actual energy generated by the drop hammer. With the various hammer systems available, we have found highly variable energies ranging from 55% to over 100%. Therefore, the intent of AET=s hammer calibrations is to vary the hammer weight such that hammer energies lie within about 60% to 65% of the theoretical energy of a 140-pound weight falling 30 inches. The current ASTM procedure acknowledges the wide variation in N-values, stating that N-values of 100% or more have been observed. Although we have not yet determined the statistical measurement uncertainty of our calibrated method to date, we can state that the accuracy deviation of the N-values using this method is significantly better than the standard ASTM Method.

### A.2.2 Disturbed Samples (DS)/Spin-up Samples (SU)

Sample types described as ADS@ or ASU@ on the boring logs are disturbed samples, which are taken from the flights of the auger. Because the auger disturbs the samples, possible soil layering and contact depths should be considered approximate.

### A.2.3 Sampling Limitations

Unless actually observed in a sample, contacts between soil layers are estimated based on the spacing of samples and the action of drilling tools. Cobbles, boulders, and other large objects generally cannot be recovered from test borings, and they may be present in the ground even if they are not noted on the boring logs.

Determining the thickness of "topsoil" layers is usually limited, due to variations in topsoil definition, sample recovery, and other factors. Visual-manual description often relies on color for determination, and transitioning changes can account for significant variation in thickness judgment. Accordingly, the topsoil thickness presented on the logs should not be the sole basis for calculating topsoil stripping depths and volumes. If more accurate information is needed relating to thickness and topsoil quality definition, alternate methods of sample retrieval and testing should be employed.

## A.3 CLASSIFICATION METHODS

Soil descriptions shown on the boring logs are based on the Unified Soil Classification (USC) system. The USC system is described in ASTM:D2487 and D2488. Where laboratory classification tests (sieve analysis or Atterberg Limits) have been performed, accurate classifications per ASTM:D2487 are possible. Otherwise, soil descriptions shown on the boring logs are visual-manual judgments. Charts are attached which provide information on the USC system, the descriptive terminology, and the symbols used on the boring logs.

Visual-manual judgment of the AASHTO Soil Group is also noted as a part of the soil description. A chart presenting details of the AASHTO Soil Classification System is also attached.

The boring logs include descriptions of apparent geology. The geologic depositional origin of each soil layer is interpreted primarily by observation of the soil samples, which can be limited. Observations of the surrounding topography, vegetation, and development can sometimes aid this judgment.

## A.4 WATER LEVEL MEASUREMENTS

The ground water level measurements are shown at the bottom of the boring logs. The following information appears under AWater Level Measurements@ on the logs:

- Date and Time of measurement
- Sampled Depth: lowest depth of soil sampling at the time of measurement
- Casing Depth: depth to bottom of casing or hollow-stem auger at time of measurement
- Cave-in Depth: depth at which measuring tape stops in the borehole
- Water Level: depth in the borehole where free water is encountered
- Drilling Fluid Level: same as Water Level, except that the liquid in the borehole is drilling fluid

The true location of the water table at the boring locations may be different than the water levels measured in the boreholes. This is possible because there are several factors that can affect the water level measurements in the borehole. Some of these factors include: permeability of each soil layer in profile, presence of perched water, amount of time between water level readings, presence of drilling fluid, weather conditions, and use of borehole casing.

## A.5 LABORATORY TEST METHODS

### A.5.1 Water Content Tests
Conducted in general accordance with ASTM:D2216.

### A.5.2 Sieve Analysis Tests
Conducted in general accordance with ASTM:D6913, Method A.

## A.6 TEST STANDARD LIMITATIONS

Field and laboratory testing is done in general conformance with the described procedures. Compliance with any other standards referenced within the specified standard is neither inferred nor implied.

## A.7 SAMPLE STORAGE

Unless notified to do otherwise, we routinely retain representative samples of the soils recovered from the borings for a period of 30 days.

# BORING LOG NOTES

## DRILLING AND SAMPLING SYMBOLS

| Symbol | Definition |
|---|---|
| AR: | Sample of material obtained from cuttings blown out the top of the borehole during air rotary procedure. |
| B, H, N: | Size of flush-joint casing |
| CAS: | Pipe casing, number indicates nominal diameter in inches |
| COT: | Clean-out tube |
| DC: | Drive casing; number indicates diameter in inches |
| DM: | Drilling mud or bentonite slurry |
| DR: | Driller (initials) |
| DS: | Disturbed sample from auger flights |
| DP: | Direct push drilling; a 2.125 inch OD outer casing with an inner 1½ inch ID plastic tube is driven continuously into the ground. |
| FA: | Flight auger; number indicates outside diameter in inches |
| HA: | Hand auger; number indicates outside diameter |
| HSA: | Hollow stem auger; number indicates inside diameter in inches |
| LG: | Field logger (initials) |
| MC: | Column used to describe moisture condition of samples and for the ground water level symbols |
| N (BPF): | Standard penetration resistance (N-value) in blows per foot (see notes) |
| NQ: | NQ wireline core barrel |
| PQ: | PQ wireline core barrel |
| RDA: | Rotary drilling with compressed air and roller or drag bit. |
| RDF: | Rotary drilling with drilling fluid and roller or drag bit |
| REC: | In split-spoon (see notes), direct push and thin-walled tube sampling, the recovered length (in inches) of sample. In rock coring, the length of core recovered (expressed as percent of the total core run). Zero indicates no sample recovered. |
| SS: | Standard split-spoon sampler (steel; 1.5" is inside diameter; 2" outside diameter); unless indicated otherwise |
| SU | Spin-up sample from hollow stem auger |
| TW: | Thin-walled tube; number indicates inside diameter in inches |
| WASH: | Sample of material obtained by screening returning rotary drilling fluid or by which has collected inside the borehole after "falling" through drilling fluid |
| WH: | Sampler advanced by static weight of drill rod and hammer |
| WR: | Sampler advanced by static weight of drill rod |
| 94mm: | 94 millimeter wireline core barrel |
| ▼: | Water level directly measured in boring |
| ▽: | Estimated water level based solely on sample appearance |

## TEST SYMBOLS

| Symbol | Definition |
|---|---|
| CONS: | One-dimensional consolidation test |
| DEN: | Dry density, pcf |
| DST: | Direct shear test |
| E: | Pressuremeter Modulus, tsf |
| HYD: | Hydrometer analysis |
| LL: | Liquid Limit, % |
| LP: | Pressuremeter Limit Pressure, tsf |
| OC: | Organic Content, % |
| PERM: | Coefficient of permeability (K) test; F - Field; L - Laboratory |
| PL: | Plastic Limit, % |
| $q_p$: | Pocket Penetrometer strength, tsf (approximate) |
| $q_c$: | Static cone bearing pressure, tsf |
| $q_u$: | Unconfined compressive strength, psf |
| R: | Electrical Resistivity, ohm-cms |
| RQD: | Rock Quality Designation of Rock Core, in percent (aggregate length of core pieces 4" or more in length as a percent of total core run) |
| SA: | Sieve analysis |
| TRX: | Triaxial compression test |
| VSR: | Vane shear strength, remolded (field), psf |
| VSU: | Vane shear strength, undisturbed (field), psf |
| WC: | Water content, as percent of dry weight |
| %-200: | Percent of material finer than #200 sieve |

## STANDARD PENETRATION TEST NOTES

**(Calibrated Hammer Weight)**

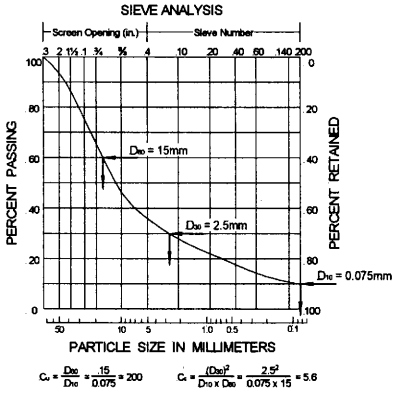
The standard penetration test consists of driving a split-spoon sampler with a drop hammer (calibrated weight varies to provide $N_{60}$ values) and counting the number of blows applied in each of three 6" increments of penetration. If the sampler is driven less than 18" (usually in highly resistant material), permitted in ASTM: D1586, the blows for each complete 6" increment and for each partial increment is on the boring log. For partial increments, the number of blows is shown to the nearest 0.1' below the slash.

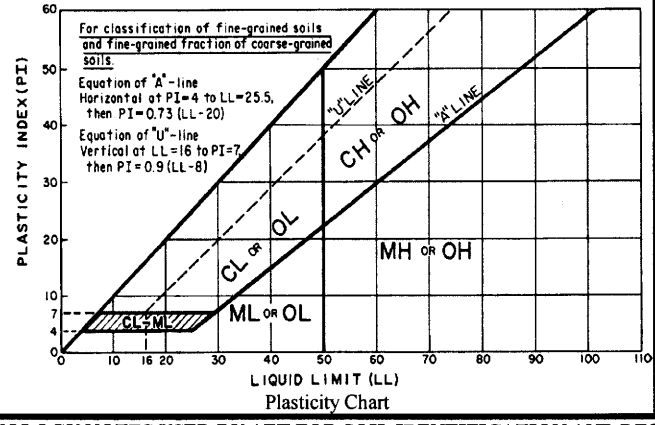
The length of sample recovered, as shown on the "REC" column, may be greater than the distance indicated in the N column. The disparity is because the N-value is recorded below the initial 6" set (unless partial penetration defined in ASTM: D1586 is encountered) whereas the length of sample recovered is for the entire sampler drive (which may even extend more than 18").

# UNIFIED SOIL CLASSIFICATION SYSTEM
## ASTM Designations: D 2487, D2488

**AMERICAN ENGINEERING TESTING, INC.**

| Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A] | | | | Soil Classification: Group Symbol | Soil Classification: Group Name[B] |
|---|---|---|---|---|---|
| Coarse-Grained Soils More than 50% retained on No. 200 sieve | Gravels More than 50% coarse fraction retained on No. 4 sieve | Clean Gravels Less than 5% fines[C] | Cu≥4 and 1≤Cc≤3[E] | GW | Well graded gravel[F] |
| | | | Cu<4 and/or 1>Cc>3[E] | GP | Poorly graded gravel[F] |
| | | Gravels with Fines more than 12% fines[C] | Fines classify as ML or MH | GM | Silty gravel[F,G,H] |
| | | | Fines classify as CL or CH | GC | Clayey gravel[F,G,H] |
| | Sands 50% or more of coarse fraction passes No. 4 sieve | Clean Sands Less than 5% fines[D] | Cu≥6 and 1≤Cc≤3[E] | SW | Well-graded sand[I] |
| | | | Cu<6 and/or 1>Cc>3[E] | SP | Poorly-graded sand[I] |
| | | Sands with Fines more than 12% fines[D] | Fines classify as ML or MH | SM | Silty sand[G,H,I] |
| | | | Fines classify as CL or CH | SC | Clayey sand[G,H,I] |
| Fine-Grained Soils 50% or more passes the No. 200 sieve (see Plasticity Chart below) | Silts and Clays Liquid limit less than 50 | inorganic | PI>7 and plots on or above "A" line[J] | CL | Lean clay[K,L,M] |
| | | | PI<4 or plots below "A" line[J] | ML | Silt[K,L,M] |
| | | organic | Liquid limit–oven dried / Liquid limit – not dried <0.75 | OL | Organic clay[K,L,M,N] / Organic silt[K,L,M,O] |
| | Silts and Clays Liquid limit 50 or more | inorganic | PI plots on or above "A" line | CH | Fat clay[K,L,M] |
| | | | PI plots below "A" line | MH | Elastic silt[K,L,M] |
| | | organic | Liquid limit–oven dried / Liquid limit – not dried <0.75 | OH | Organic clay[K,L,M,P] / Organic silt[K,L,M,Q] |
| Highly organic soil | | | Primarily organic matter, dark in color, and organic in odor | PT | Peat[R] |



Plasticity Chart

### Notes

[A]Based on the material passing the 3-in (75-mm) sieve.

[B]If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C]Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

[D]Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E]$Cu = D_{60}/D_{10}$, $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$

[F]If soil contains ≥15% sand, add "with sand" to group name.

[G]If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H]If fines are organic, add "with organic fines" to group name.

[I]If soil contains ≥15% gravel, add "with gravel" to group name.

[J]If Atterberg limits plot is hatched area, soils is a CL-ML silty clay.

[K]If soil contains 15 to 29% plus No. 200 add "with sand" or "with gravel", whichever is predominant.

[L]If soil contains ≥30% plus No. 200, predominantly sand, add "sandy" to group name.

[M]If soil contains ≥30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N]PI≥4 and plots on or above "A" line.

[O]PI<4 or plots below "A" line.

[P]PI plots on or above "A" line.

[Q]PI plots below "A" line.

[R]Fiber Content description shown below.

## ADDITIONAL TERMINOLOGY NOTES USED BY AET FOR SOIL IDENTIFICATION AND DESCRIPTION

**Grain Size**

| Term | Particle Size |
|---|---|
| Boulders | Over 12" |
| Cobbles | 3" to 12" |
| Gravel | #4 sieve to 3" |
| Sand | #200 to #4 sieve |
| Fines (silt & clay) | Pass #200 sieve |

**Gravel Percentages**

| Term | Percent |
|---|---|
| A Little Gravel | 3% - 14% |
| With Gravel | 15% - 29% |
| Gravelly | 30% - 50% |

**Consistency of Plastic Soils**

| Term | N-Value, BPF |
|---|---|
| Very Soft | less than 2 |
| Soft | 2 - 4 |
| Firm | 5 - 8 |
| Stiff | 9 - 15 |
| Very Stiff | 16 - 30 |
| Hard | Greater than 30 |

**Relative Density of Non-Plastic Soils**

| Term | N-Value, BPF |
|---|---|
| Very Loose | 0 - 4 |
| Loose | 5 - 10 |
| Medium Dense | 11 - 30 |
| Dense | 31 - 50 |
| Very Dense | Greater than 50 |

**Moisture/Frost Condition** (MC Column)

D (Dry): Absense of moisture, dusty, dry to touch.

M (Moist): Damp, although free water not visible. Soil may still have a high water content (over "optimum").

W (Wet/ Waterbearing): Free water visible intended to describe non-plastic soils. Waterbearing usually relates to sands and sand with silt.

F (Frozen): Soil frozen

**Layering Notes**

Laminations: Layers less than ½" thick of differing material or color.

Lenses: Pockets or layers greater than ½" thick of differing material or color.

**Peat Description**

| Term | Fiber Content (Visual Estimate) |
|---|---|
| Fibric Peat: | Greater than 67% |
| Hemic Peat: | 33 – 67% |
| Sapric Peat: | Less than 33% |

**Organic Description (if no lab tests)**

Soils are described as *organic*, if soil is not peat and is judged to have sufficient organic fines content to influence the Liquid Limit properties. *Slightly organic* used for borderline cases.

**Root Inclusions**

With roots: Judged to have sufficient quantity of roots to influence the soil properties.

Trace roots: Small roots present, but not judged to be in sufficient quantity to significantly affect soil properties.

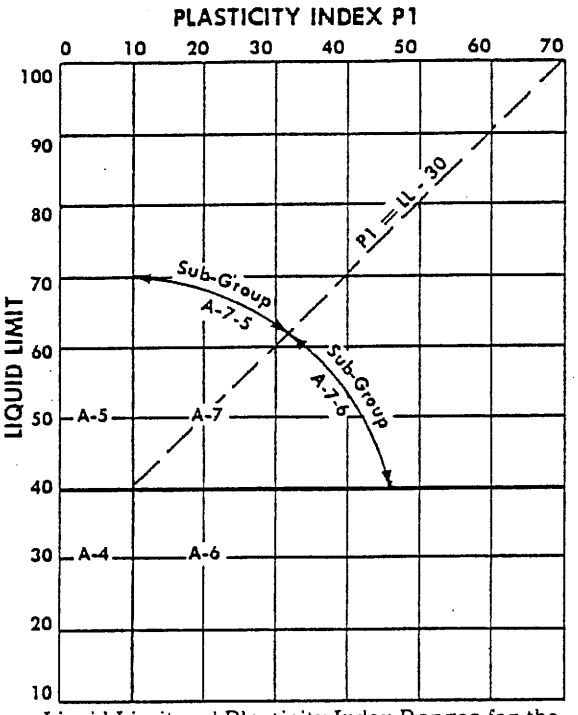
# AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS
# SOILS CLASSIFICATION SYSTEM

### Classification of Soils and Soil-Aggregate Mixtures

| General Classification | Granular Materials (35% or less passing No. 200) | | | | | | | Silt-Clay Materials (More than 35% passing No. 200) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Group Classification | A-1 | | | A-2 | | | | | | | A-7 |
| | A-1-a | A-1-b | A-3 | A-2-4 | A-2-5 | A-2-6 | A-2-7 | A-4 | A-5 | A-6 | A-7-5, A-7-6 |
| Sieve Analysis, Percent passing: | | | | | | | | | | | |
| No. 10 (2.00 mm) | 50 max. | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... |
| No. 40 (0.425 mm) | 30 max. | 50 max. | 51 min. | .... | .... | .... | .... | .... | .... | .... | .... |
| No. 200 (0.075 mm) | 15 max. | 25 max. | 10 max. | 35 max. | 35 max. | 35 max. | 35 max. | 36 min. | 36 min. | 36 min. | 36 min. |
| Characteristics of Fraction passing No.40 (0.425 mm) | | | | | | | | | | | |
| Liquid limit | .... | | .... | 40 max. | 41 min. | 40 max. | 41 min. | 40 max. | 41 min. | 40 max. | 41 min. |
| Plasticity index | 6 max. | | N.P. | 10 max. | 10 max. | 11 min. | 11 min. | 10 max. | 10 max. | 11 min. | 11 min. |
| Usual Types of Significant Constituent Materials | Stone Fragments, Gravel and Sand | | Fine Sand | Silty or Clayey Gravel and Sand | | | | Silty Soils | | Clayey Soils | |
| General Rating as Subgrade | Excellent to Good | | | | | | | Fair to Poor | | | |

The placing of A-3 before A-2 is necessary in the "left to right elimination process" and does not indicate superiority of A-3 over A-2.

Plasticity index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30



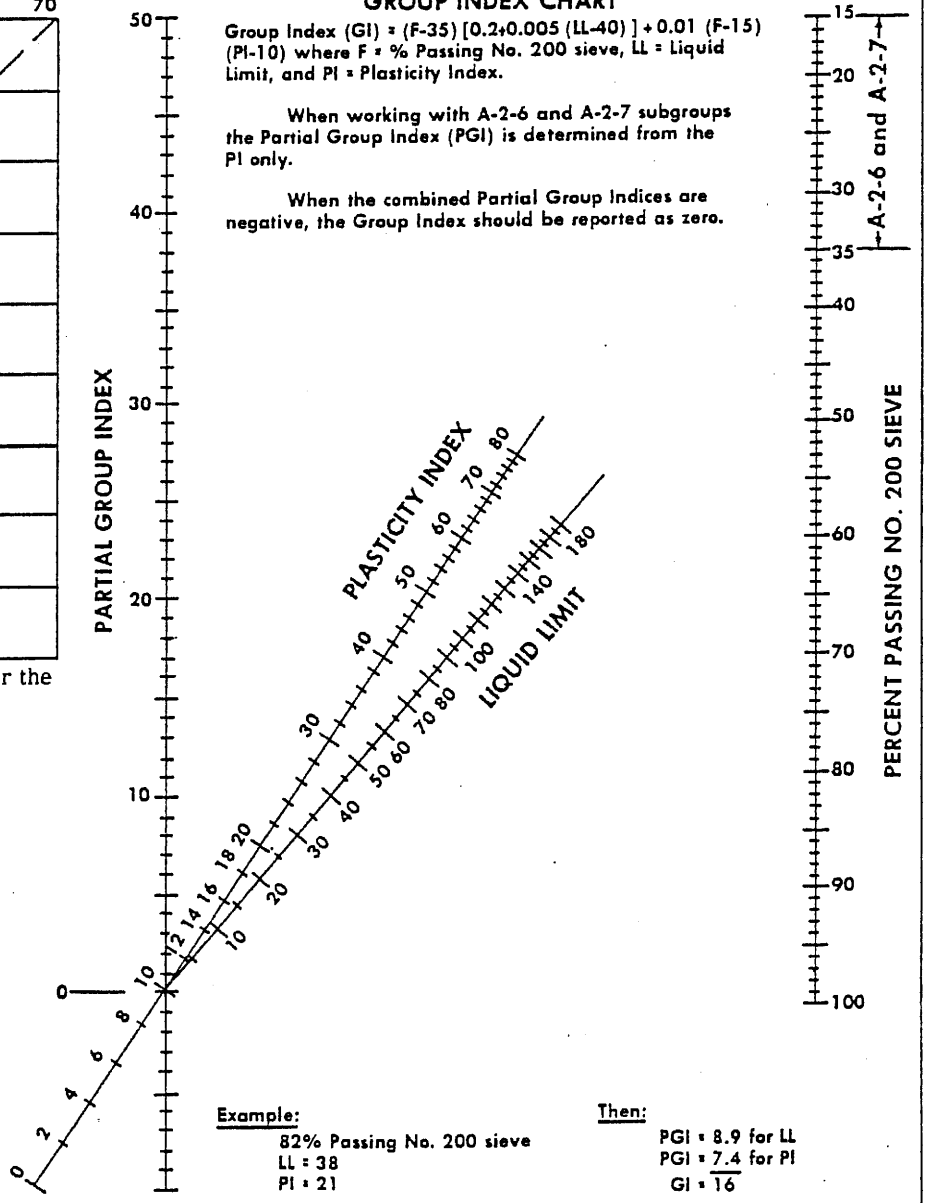

Liquid Limit and Plasticity Index Ranges for the A-4, A-5, A-6 and A-7 Subgroups

## GROUP INDEX CHART

Group Index (GI) = (F-35) [0.2+0.005 (LL-40)] + 0.01 (F-15) (PI-10) where F = % Passing No. 200 sieve, LL = Liquid Limit, and PI = Plasticity Index.

When working with A-2-6 and A-2-7 subgroups the Partial Group Index (PGI) is determined from the PI only.

When the combined Partial Group Indices are negative, the Group Index should be reported as zero.




Example:

82% Passing No. 200 sieve
LL = 38
PI = 21

Then:

PGI = 8.9 for LL
PGI = 7.4 for PI
GI = 16

### Definitions of Gravel, Sand, and Silt-Clay

The terms "gravel," "coarse sand," "fine sand," and "silt-clay," as determinable from the minimum test data required in this classification arrangement and as used in subsequent word descriptions, are defined as follows:

GRAVEL—Material passing sieve with 3-in. square openings and retained on the No. 10 sieve.

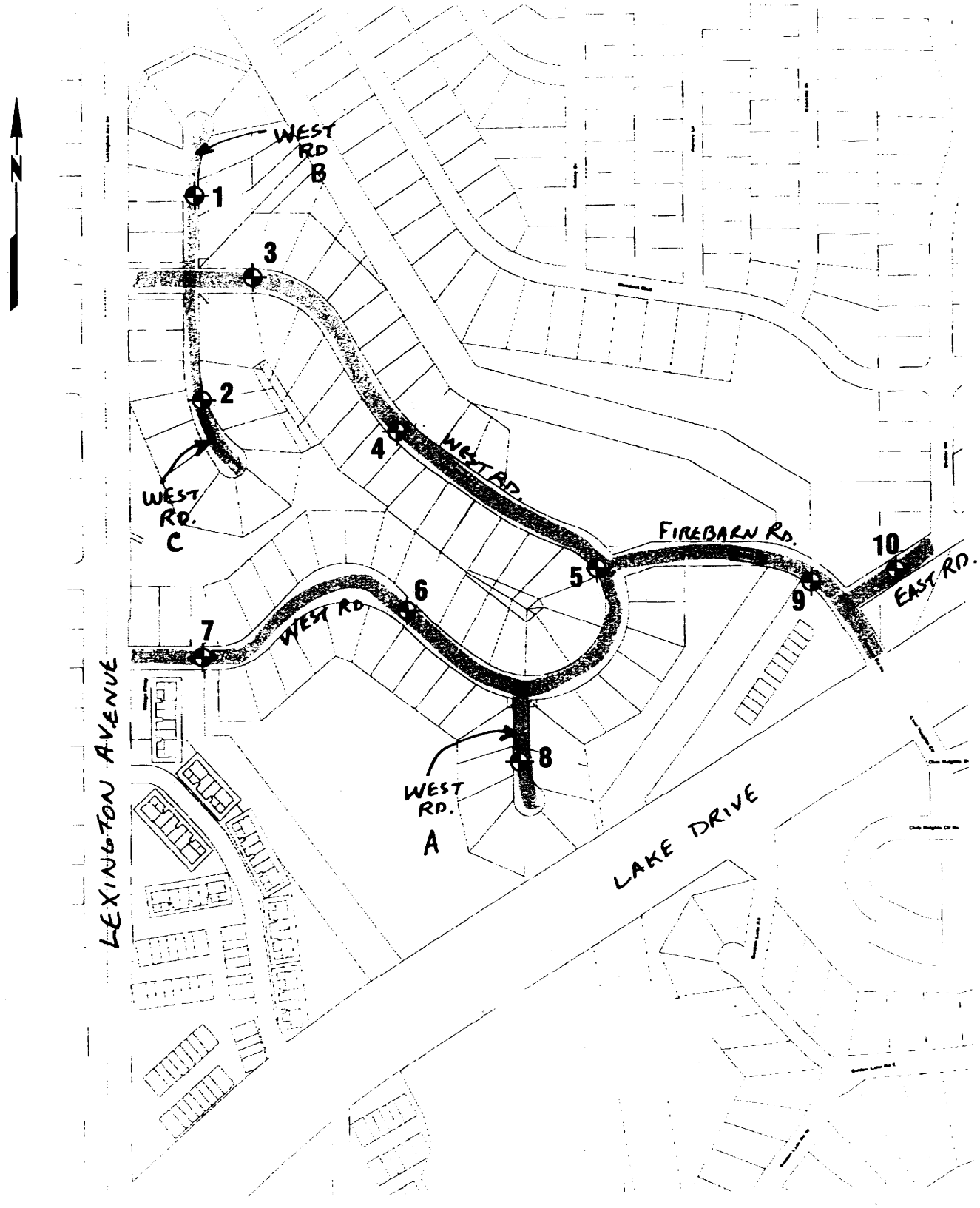
COARSE SAND—Material passing the No. 10 sieve and retained on the No. 40 sieve.

FINE SAND—Material passing the No. 40 sieve and retained on the No. 200 sieve.

COMBINED SILT AND CLAY—Material passing the No. 200 sieve.

BOULDERS (retained on 3-in. sieve) should be excluded from the portion of the sample to which the classification is applied, but the percentage of such material, if any, in the sample should be recorded.

The term "silty" is applied to fine material having plasticity index of 10 or less and the term "clayey" is applied to fine material having plasticity index of 11 or greater.




| | | | | |
|---|---|---|---|---|
| AMERICAN ENGINEERING TESTING, INC. | PROJECT: 2014 STREET RECONSTRUCTION CIRCLE PINES, MINNESOTA | | | AET NO. 22-02572 |
| | SUBJECT: BORING LOCATION SKETCH | | | DATE December 10, 2013 |
| | SCALE NONE | BY JDM | CHECKED BY JDM | FIGURE 1 |

AMERICAN ENGINEERING TESTING, INC.

# SUBSURFACE BORING LOG

AET JOB NO: **22-02572** LOG OF BORING NO. **B-1 (p. 1 of 1)**

PROJECT: **2014 Street and Utility Reconstruction; Circle Pines, MN**

| DEPTH IN FEET | SURFACE ELEVATION: 906.7 MATERIAL DESCRIPTION | GEOLOGY | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS WC | DEN | LL | PL | %-#200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2.5" Bituminous pavement | FILL | | | SU | | | | | | |
| 1 | 3.75" FILL, sand with silt and gravel, brown (A-1-b) | | 21 | M | SS | 16 | | | | | |
| 2 | FILL, mostly sand with silt, light brown, a little black (A-3) | | | | | | | | | | |
| 3 | | | 5 | M | SS | 18 | | | | | |
| 4 | | | | | | | | | | | |
| 5 | FILL, mostly sand with silt, a little gravel, trace roots, light brown, a little brown (A-3) | | | | | | | | | | |
| 6 | SAND, fine grained, light brown, moist, loose (SP) (A-3) | COARSE ALLUVIUM | 7 | M | SS | 18 | | | | | |
| 7 | SAND, fine grained, light brown and brown, moist, medium dense, lenses and laminations of fine sand with silt (SP) (A-3) | | | | | | | | | | |
| 8 | | | 14 | M | SS | 20 | | | | | |
| 9 | | | | | | | | | | | |
| 10 | SAND, fine grained, light grayish brown, a little light brown to light brownish gray, moist to around 12' then waterbearing, loose (SP) (A-3) | | 9 | M | SS | 20 | | | | | |
| 11 | | | | | | | | | | | |
| 12 | | | | ▼ | | | | | | | |
| 13 | | | 10 | W | SS | 16 | | | | | |
| 14 | **END OF BORING** | | | | | | | | | | |

| DEPTH: DRILLING METHOD | WATER LEVEL MEASUREMENTS | | | | | | | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|---|---|---|---|---|---|---|---|---|
| **0-12' 3.25" HSA** | DATE | TIME | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL | |
| | **11/18/13** | **1:10** | **14.0** | **12.0** | **12.7** | | **None** | |
| | **11/18/13** | **1:16** | **14.0** | **12.0** | **12.4** | | **12.3** | |
| BORING COMPLETED: **11/18/13** | | | | | | | | |
| DR: **SS** LG: **CD** Rig: **1C** | | | | | | | | |

AET_CORP 22-02572.GPJ AET+CPT+WELL.GDT 12/11/13

AMERICAN ENGINEERING TESTING, INC.

# SUBSURFACE BORING LOG

AET JOB NO: **22-02572** LOG OF BORING NO. **B-2 (p. 1 of 1)**

PROJECT: **2014 Street and Utility Reconstruction; Circle Pines, MN**

| DEPTH IN FEET | SURFACE ELEVATION: 909.6 MATERIAL DESCRIPTION | GEOLOGY | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS WC | DEN | LL | PL | %-#200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3" Bituminous pavement | FILL | | | SU | | | | | | |
| 1 | 4.5" FILL, sand with silt and gravel, brown (A-1-b) | | 26 | M | SS | 16 | | | | | |
| 2 | FILL, mostly sand with silt, a little sand, light brownish gray, a little light brown and brown (A-3) | | | | | | | | | | |
| 3 | | | 12 | M | SS | 22 | | | | | |
| 4 | | | | | | | | | | | |
| 5 | SILTY SAND, fine grained, brown, moist, loose (SM) (A-2-4) | COARSE ALLUVIUM | | | | | | | | | |
| 6 | SAND WITH SILT, fine grained, light brown to light brownish gray, moist, loose to medium dense (SP-SM) (A-3) | | 9 | M | SS | 16 | | | | | |
| 7 | | | | | | | | | | | |
| 8 | | | 10 | M | SS | 20 | | | | | |
| 9 | | | | | | | | | | | |
| 10 | | | | | | | | | | | |
| 11 | | | 15 | M | SS | 16 | | | | | |
| 12 | SAND, trace roots, fine grained, light brownish gray, a little brown, moist, loose, laminations of fine sand with silt (SP) (A-3) | | | | | | | | | | |
| 13 | | | 8 | M | SS | 20 | | | | | |
| 14 | | | | | | | | | | | |
| 15 | SAND, fine grained, light brownish gray, a little gray, moist to around 15', then waterbearing, medium dense (SP) | | | ▼ | | | | | | | |
| 16 | | | 14 | M/W | SS | 16 | | | | | |
| | **END OF BORING** | | | | | | | | | | |

| DEPTH: DRILLING METHOD | WATER LEVEL MEASUREMENTS | | | | | | | NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG |
|---|---|---|---|---|---|---|---|---|
| **0-14½' 3.25" HSA** | DATE | TIME | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL | |
| | **11/18/13** | **2:10** | **16.5** | **14.5** | **15.3** | | **15.2** | |
| | **11/18/13** | **2:15** | **16.5** | **14.5** | **15.3** | | **15.2** | |
| BORING COMPLETED: **11/18/13** | | | | | | | | |
| DR: **SS** LG: **CD** Rig: **1C** | | | | | | | | |

AET_CORP 22-02572.GPJ AET+CPT+WELL.GDT 12/10/13

AMERICAN ENGINEERING TESTING, INC.

# SUBSURFACE BORING LOG

AET JOB NO: **22-02572** LOG OF BORING NO. **B-3 (p. 1 of 1)**

PROJECT: **2014 Street and Utility Reconstruction; Circle Pines, MN**

| DEPTH IN FEET | SURFACE ELEVATION: 908.5 MATERIAL DESCRIPTION | GEOLOGY | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS WC | DEN | LL | PL | %-#200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3" Bituminous pavement | FILL | | | SU | | | | | | |
| 1 | 3.5" FILL, sand with silt and gravel, brown (A-1-b) | | 24 | M | SS | 16 | | | | | |
| 2 | FILL, mostly sand with silt, pieces of bituminous, light brown and brown, a little light brownish gray (A-3) | | | | | | | | | | |
| 3 | | | 8 | M | SS | 22 | | | | | |
| 4 | | | | | | | | | | | |
| 5 | | | | | | | | | | | |
| 6 | | | 4 | M | SS | 24 | | | | | |
| 7 | | | | | | | | | | | |
| 8 | SAND WITH SILT, fine grained, trace roots, light brown, moist, medium dense (SP-SM) (A-3) | COARSE ALLUVIUM | 12 | M | SS | 22 | | | | | |
| 9 | | | | | | | | | | | |
| 10 | | | | | | | | | | | |
| 11 | | | 12 | M | SS | 24 | | | | | |
| 12 | | | | | | | | | | | |
| 13 | SAND WITH SILT, fine grained, light brownish gray, moist, medium dense (SP-SM) (A-3) | | 14 | M | SS | 22 | | | | | |
| 14 | | | | ▼ | | | | | | | |
| 15 | SAND, fine grained, light brownish gray, waterbearing, medium dense (SP) (A-3) | | 22 | W | SS | 20 | | | | | |
| 16 | **END OF BORING** | | | | | | | | | | |

| DEPTH: DRILLING METHOD | WATER LEVEL MEASUREMENTS | | | | | | |
|---|---|---|---|---|---|---|---|
| **0-14½' 3.25" HSA** | DATE | TIME | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |
| | **11/18/13** | **3:05** | **16.5** | **14.5** | **14.7** | | **None** |
| | **11/18/13** | **3:11** | **16.5** | **14.5** | **14.5** | | **14.7** |
| BORING COMPLETED: **11/18/13** | | | | | | | |
| DR: **SS** LG: **CD** Rig: **1C** | | | | | | | |

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP 22-02572.GPJ AET+CPT+WELL.GDT 12/10/13

AMERICAN ENGINEERING TESTING, INC.

# SUBSURFACE BORING LOG

AET JOB NO: **22-02572** LOG OF BORING NO. **B-4 (p. 1 of 1)**

PROJECT: **2014 Street and Utility Reconstruction; Circle Pines, MN**

| DEPTH IN FEET | SURFACE ELEVATION: 908.2 MATERIAL DESCRIPTION | GEOLOGY | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS WC | DEN | LL | PL | %-#200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3.5" Bituminous pavement | FILL | | | SU | | | | | | |
| 1 | 5.5" SAND WITH SILT AND GRAVEL, dark brown and brown (A-1-b) | | 17 | M | SS | 14 | | | | | |
| 2 | FILL, mostly sand with silt, light brown, a little gray (A-3) | | | | | | | | | | |
| 3 | | | 6 | M | SS | 14 | | | | | |
| 4 | SAND WITH SILT, fine grained, light brown, a little gray, moist, very loose (SP-SM) (A-3) | COARSE ALLUVIUM | | | | | | | | | |
| 5 | | | 11 | M | SS | 14 | | | | | |
| 6 | | | | | | | | | | | |
| 7 | SAND, fine grained, light grayish brown, moist, medium dense (SP) (A-3) | | | | | | | | | | |
| 8 | | | 11 | M | SS | 14 | | | | | |
| 9 | | | | | | | | | | | |
| 10 | SAND WITH SILT, fine grained, light grayish brown, a little brown, moist, dense (SP-SM) (A-3) | | 12 | M | SS | 12 | | | | | |
| 11 | | | | | | | | | | | |
| 12 | SILTY SAND, fine grained, light brownish gray, moist, loose, laminations of fine sand with silt (SM) (A-2-4) | | | | | | | | | | |
| 13 | | | 10 | M | SS | 14 | | | | | |
| 14 | | | | | | | | | | | |
| 15 | SAND WITH SILT, fine grained, light brownish gray, moist, medium dense (SP-SM) (A-3) | | 15 | M | SS | 14 | | | | | |
| 16 | **END OF BORING** | | | | | | | | | | |

| DEPTH: DRILLING METHOD | WATER LEVEL MEASUREMENTS | | | | | | |
|---|---|---|---|---|---|---|---|
| | DATE | TIME | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |
| **0-14½' 3.25" HSA** | **11/19/13** | **2:30** | **16.0** | **14.5** | **15.2** | | **None** |
| | | | | | | | |
| BORING COMPLETED: **11/19/13** | | | | | | | |
| DR: **DTS** LG: **TM** Rig: **1C** | | | | | | | |

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP 22-02572.GPJ AET+CPT+WELL.GDT 12/10/13

AMERICAN ENGINEERING TESTING, INC.

# SUBSURFACE BORING LOG

AET JOB NO: **22-02572** LOG OF BORING NO. **B-5 (p. 1 of 1)**

PROJECT: **2014 Street and Utility Reconstruction; Circle Pines, MN**

SURFACE ELEVATION: **908.2**

| DEPTH IN FEET | MATERIAL DESCRIPTION | GEOLOGY | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS WC | DEN | LL | PL | %-#200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3.75" Bituminous pavement | FILL | | | SU | | | | | | |
| 1 | 4" FILL, sand with silt and gravel, dark brown and brown (A-1-b) | | 16 | M | SS | 14 | | | | | |
| 2 | FILL, mostly sand with silt, brown and light brownish gray (A-3) | COARSE ALLUVIUM | | | | | | | | | |
| 3 | SAND WITH SILT, light brown and light brownish gray, moist, loose (SP-SM) (A-3) | | 7 | M | SS | 12 | | | | | |
| 4 | | | | | | | | | | | |
| 5 | | | 5 | M | SS | 12 | | | | | |
| 6 | | | | | | | | | | | |
| 7 | SILTY SAND, fine grained, brown, a little light brown and light brownish gray, lenses and laminations of fine sand with silt (SM) (A-2-4) | | | | | | | | | | |
| 8 | | | 4 | M | SS | 12 | | | | | |
| 9 | | | | | | | | | | | |
| 10 | | | 5 | M | SS | 12 | | | | | |
| 11 | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | 5 | M | SS | 12 | | | | | |
| 14 | SAND WITH SILT, fine grained, light brownish gray, moist, loose (SP-SM) (A-3) | | | | | | | | | | |
| 15 | | | 6 | M | SS | 14 | | | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | | | | | | | | |
| 18 | SILTY SAND, fine grained, brownish gray, wet, dense (SM) (A-2-4) | | | ▼ | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 21 | | | 34 | W | SS | 16 | | | | | |
| 22 | **END OF BORING** | | | | | | | | | | |

| DEPTH: DRILLING METHOD | WATER LEVEL MEASUREMENTS | | | | | | |
|---|---|---|---|---|---|---|---|
| | DATE | TIME | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |
| **0-20' 3.25" HSA** | **11/19/13** | **1:40** | **22.0** | **20.0** | **21.0** | | **18.5** |
| | | | | | | | |
| BORING COMPLETED: **11/19/13** | | | | | | | |
| DR: **DTS** LG: **TM** Rig: **1C** | | | | | | | |

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP 22-02572.GPJ AET+CPT+WELL.GDT 12/10/13

AMERICAN ENGINEERING TESTING, INC.

# SUBSURFACE BORING LOG

AET JOB NO: **22-02572** LOG OF BORING NO. **B-6 (p. 1 of 1)**

PROJECT: **2014 Street and Utility Reconstruction; Circle Pines, MN**

| DEPTH IN FEET | SURFACE ELEVATION: 908.2 MATERIAL DESCRIPTION | GEOLOGY | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS WC | DEN | LL | PL | %-#200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2.75" Bituminous pavement | FILL | | | SU | | | | | | |
| 1 | 8.5" FILL, mostly sand with silt, a little gravel, brown, a little dark brown (A-2-4) | | 30 | M | SS | 14 | | | | | |
| 2 | FILL, mixture of sand with silt and silty sand, light brown, a little brown and dark brown (A-3) | | | | | | | | | | |
| 3 | | | 11 | M | SS | 12 | | | | | |
| 4 | SAND WITH SILT, light brown, moist, very loose (SP-SM) (possible fill) (A-3) | COARSE ALLUVIUM OR FILL | | | | | | | | | |
| 5 | | | 3 | M | SS | 12 | | | | | |
| 6 | | | | | | | | | | | |
| 7 | SILTY SAND, fine grained, light brown, a little gray, moist, very loose, laminations of fine sand (SM) (A-2-4) | COARSE ALLUVIUM | | | | | | | | | |
| 8 | | | 2 | M | SS | 14 | | | | | |
| 9 | SAND WITH SILT, fine grained, light brown, a little brown and light brownish gray, moist, very loose (SP-SM) (A-3) | | | | | | | | | | |
| 10 | | | 3 | M | SS | 14 | | | | | |
| 11 | | | | | | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | 3 | M | SS | 14 | | | | | |
| 14 | SAND WITH SILT, fine grained, brownish gray, a little brown, moist, loose (SP-SM) (A-3) | | | | | | | | | | |
| 15 | | | 10 | M | SS | 14 | | | | | |
| 16 | | | | | | | | | | | |
| 17 | | | | ▼ | | | | | | | |
| 18 | SAND, fine grained, light brownish gray, waterbearing, medium dense (SP) (A-3) | | | | | | | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | 17 | W | SS | 16 | | | | | |
| 21 | **END OF BORING** | | | | | | | | | | |

| DEPTH: DRILLING METHOD | WATER LEVEL MEASUREMENTS | | | | | | |
|---|---|---|---|---|---|---|---|
| | DATE | TIME | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |
| **0-19½' 3.25" HSA** | **11/19/13** | **10:01** | **21.0** | **19.5** | **18.6** | | **17.6** |
| | | | | | | | |
| BORING COMPLETED: **11/19/13** | | | | | | | |
| DR: **DTS** LG: **TM** Rig: **1C** | | | | | | | |

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP 22-02572.GPJ AET+CPT+WELL.GDT 12/10/13

AMERICAN ENGINEERING TESTING, INC.

# SUBSURFACE BORING LOG

AET JOB NO: **22-02572** LOG OF BORING NO. **B-7 (p. 1 of 1)**

PROJECT: **2014 Street and Utility Reconstruction; Circle Pines, MN**

| DEPTH IN FEET | SURFACE ELEVATION: 905.0 MATERIAL DESCRIPTION | GEOLOGY | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS WC | DEN | LL | PL | %-#200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 3.75" Bituminous pavement | FILL | | | SU | | | | | | |
| 1 | 3.5" FILL, mostly silty sand, a little gravel, sand with silt and organic clay, brown, a little black (A-2-4) | | 25 | M | SS | 14 | | | | | |
| 2 | FILL, mixture of silty sand with silt, a little silt, brown, a little light brownish gray (A-2-4) | | | | | | | | | | |
| 3 | | | 7 | M | SS | 14 | | | | | |
| 4 | | | | | | | | | | | |
| 5 | | | 2 | M | SS | 14 | | | | | |
| 6 | | | | | | | | | | | |
| 7 | SAND, trace roots, fine grained, light brownish gray, a little brown, moist, medium dense to loose, a lens of fine sand with silt around 10½' (SP) (A-3) | COARSE ALLUVIUM | | | | | | | | | |
| 8 | | | 11 | M | SS | 14 | | | | | |
| 9 | | | | | | | | | | | |
| 10 | | | 9 | M | SS | 12 | | | | | |
| 11 | | | | | | | | | | | |
| 12 | SILTY SAND, fine grained, brownish gray, wet, very loose (SM) (A-4) | | | ▼ | | | | | | | |
| 13 | | | 2 | W | SS | 14 | | | | | |
| 14 | | | | | | | | | | | |
| 15 | SANDY SILT, brownish gray, wet, very loose (ML) (A-4) | FINE ALLUVIUM | 1 | W | SS | 16 | 24 | | | | |
| 16 | **END OF BORING** | | | | | | | | | | |

| DEPTH: DRILLING METHOD | WATER LEVEL MEASUREMENTS | | | | | | |
|---|---|---|---|---|---|---|---|
| **0-14½' 3.25" HSA** | DATE | TIME | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |
| | **11/19/13** | **9:11** | **13.5** | **112.0** | **12.3** | | **12.2** |
| | **11/19/13** | **9:16** | **16.0** | **14.5** | **13.7** | | **13.7** |
| BORING COMPLETED: **11/19/13** | | | | | | | |
| DR: **DTS** LG: **TM** Rig: **1C** | | | | | | | |

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP 22-02572.GPJ AET+CPT+WELL.GDT 12/10/13

AMERICAN ENGINEERING TESTING, INC.

# SUBSURFACE BORING LOG

AET JOB NO: **22-02572** LOG OF BORING NO. **B-8 (p. 1 of 1)**

PROJECT: **2014 Street and Utility Reconstruction; Circle Pines, MN**

| DEPTH IN FEET | SURFACE ELEVATION: **908.5 approx.** MATERIAL DESCRIPTION | GEOLOGY | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS WC | DEN | LL | PL | %-#200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 2.75" Bituminous pavement | FILL | | | SU | | | | | | |
| 1 | 5" FILL, sand with silt and gravel, brown (A-1-b) | | 23 | M | SS | 14 | | | | | |
| 2 | FILL, mixture of silty sand and sand with silt, brown and light brown (A-2-4) | | | | | | | | | | |
| 3 | | | 10 | M | SS | 12 | | | | | |
| 4 | SILTY SAND, fine grained, brown, moist, very loose (SM) (A-2-4) | COARSE ALLUVIUM | | | | | | | | | |
| 5 | | | 3 | M | SS | 12 | | | | | |
| 6 | | | | | | | | | | | |
| 7 | SAND WITH SILT, fine grained, light brown, a little brown, moist, loose (SP-SM) | | | | | | | | | | |
| 8 | | | 10 | M | SS | 12 | | | | | |
| 9 | SILTY SAND, fine grained, brown, moist, medium dense (SM) (A-2-4) | | | | | | | | | | |
| 10 | | | 12 | M | SS | 12 | | | | | |
| 11 | | | | | | | | | | | |
| 12 | SILTY SAND, fine grained, brown, a little light gray and brown, moist, medium dense to loose, lenses and laminations of fine sand and sandy silt (SM) (A-2-4) | | | | | | | | | | |
| 13 | | | 11 | M | SS | 12 | | | | | |
| 14 | | | | | | | | | | | |
| 15 | | | 10 | M | SS | 12 | | | | | |
| 16 | **END OF BORING** | | | | | | | | | | |

| DEPTH: DRILLING METHOD | WATER LEVEL MEASUREMENTS | | | | | | |
|---|---|---|---|---|---|---|---|
| | DATE | TIME | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |
| **0-14½' 3.25" HSA** | **11/19/13** | **10:37** | **16.0** | **14.5** | **15.0** | | **None** |
| | | | | | | | |
| BORING COMPLETED: **11/19/13** | | | | | | | |
| DR: **DTS** LG: **TM** Rig: **1C** | | | | | | | |

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP 22-02572.GPJ AET+CPT+WELL.GDT 12/10/13

AMERICAN ENGINEERING TESTING, INC.

# SUBSURFACE BORING LOG

AET JOB NO: **22-02572** LOG OF BORING NO. **B-9 (p. 1 of 2)**

PROJECT: **2014 Street and Utility Reconstruction; Circle Pines, MN**

SURFACE ELEVATION: **895.6**

| DEPTH IN FEET | MATERIAL DESCRIPTION | GEOLOGY | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS WC | DEN | LL | PL | %-#200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 3" Bituminous pavement | FILL | | | SU | | | | | | |
| 1 | 4" FILL, sand with silt and gravel, dark brown and brown (A-1-b) | | 23 | M | SS | 14 | | | | | |
| 2 | FILL, mostly sand with silt, a little silty sand, brown, a little grayish brown (A-3 and A-2-4) | | | | | | | | | | |
| 3 | | | 11 | M | SS | 12 | | | | | |
| 4 | | | | | | | | | | | |
| 5 | FILL, mostly sand with silt, brown, grayish brown, dark brown and gray (A-3) (petroleum-type odor) | | 4 | M | SS | 12 | | | | | |
| 6 | | | | | | | | | | | |
| 7 | | | | ▼ | | | | | | | |
| 8 | | | 5 | M | SS | 12 | | | | | |
| 9 | | | | | | | | | | | |
| 10 | | | 6 | M | SS | 14 | 190 | | | | |
| 11 | SAPRIC PEAT, black, a little gray, laminations of fine sand (PT) (A-8) | SWAMP DEPOSIT | | | | | | | | | |
| 12 | | | | | | | | | | | |
| 13 | | | 4 | M | SS | 6 | 209 | | | | |
| 14 | | | | | | | | | | | |
| 15 | | | 2 | M | SS | 14 | 212 | | | | |
| 16 | | | | | | | | | | | |
| 17 | ORGANIC CLAY, trace roots, black, very soft (OH) (A-8) | | | | | | | | | | |
| 18 | | | 1 | M | SS | 20 | 248 | | | | |
| 19 | | | | | | | | | | | |
| 20 | | | | | | | | | | | |
| 21 | | | 1 | M | SS | 24 | 412 | | | | |

| DEPTH: DRILLING METHOD | WATER LEVEL MEASUREMENTS | | | | | | |
|---|---|---|---|---|---|---|---|
| | DATE | TIME | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |
| **0-29½' 3.25" HSA** | **11/19/13** | **11:37** | **8.5** | **7.0** | **7.5** | | **7.3** |
| | **11/19/13** | **12:15** | **31.0** | **29.5** | **21.0** | | **18.6** |
| BORING COMPLETED: **11/19/13** | | | | | | | |
| DR: **DTS** LG: **TM** Rig: **1C** | | | | | | | |

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP 22-02572.GPJ AET+CPT+WELL.GDT 12/10/13

AMERICAN ENGINEERING TESTING, INC.

# SUBSURFACE BORING LOG

AET JOB NO: **22-02572** LOG OF BORING NO. **B-9 (p. 2 of 2)**

PROJECT: **2014 Street and Utility Reconstruction; Circle Pines, MN**

| DEPTH IN FEET | MATERIAL DESCRIPTION | GEOLOGY | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | WC | DEN | LL | PL | %-#200 |
| 23 | ORGANIC CLAY, trace roots, black, very soft (OH) (A-8) *(continued)* | | 0 | M | SS | 24 | 296 | | | | |
| 24 | | | | | | | | | | | |
| 25 | SILTY SAND, dark brownish gray, wet, loose (SM) (A-2-4) (petroleum-type odor) | COARSE ALLUVIUM | 9 | M | SS | 18 | | | | | |
| 26 | | | | | | | | | | | |
| 27 | | | | | | | | | | | |
| 28 | SAND WITH SILT, fine grained, gray, waterbearing, medium dense (SP-SM) (A-3) | | | | | | | | | | |
| 29 | | | | | | | | | | | |
| 30 | | | 14 | W | SS | 18 | | | | | |
| 31 | **END OF BORING** | | | | | | | | | | |

AET_CORP 22-02572.GPJ AET+CPT+WELL.GDT 12/10/13

AMERICAN ENGINEERING TESTING, INC.

# SUBSURFACE BORING LOG

AET JOB NO: **22-02572** LOG OF BORING NO. **B-10 (p. 1 of 1)**

PROJECT: **2014 Street and Utility Reconstruction; Circle Pines, MN**

| DEPTH IN FEET | SURFACE ELEVATION: 899.3 MATERIAL DESCRIPTION | GEOLOGY | N | MC | SAMPLE TYPE | REC IN. | FIELD & LABORATORY TESTS WC | DEN | LL | PL | %-#200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2" Bituminous pavement | FILL | | | SU | | | | | | |
| 1 | 1.5" FILL, sand with silt and gravel, brown (A-1-b) | | 19 | M | SS | 14 | | | | | |
| | FILL, mostly silty sand, brown (A-2-4) | | | | | | | | | | |
| 2 | FILL, mostly sand with silt, light brown (A-3) | | | | | | | | | | |
| 3 | FILL, mostly silty sand, brown (A-2-4) | | 14 | M | SS | 12 | | | | | |
| 4 | | | | | | | | | | | |
| | SAND WITH SILT, fine grained, light brownish gray, moist, loose (SP-SM) (A-3) | COARSE ALLUVIUM | | | | | | | | | |
| 5 | | | 8 | M | SS | 14 | | | | | |
| 6 | | | | | | | | | | | |
| 7 | SILTY SAND, fine grained, brownish gray, moist to around 9½' then wet, medium dense to loose (SM) (A-2-4) | | | | | | | | | | |
| 8 | | | 13 | M | SS | 12 | | | | | |
| 9 | | | | | | | | | | | |
| 10 | | | 7 | W | SS | 12 | | | | | |
| 11 | **END OF BORING** | | | | | | | | | | |

| DEPTH: | DRILLING METHOD |
|---|---|
| **0-9½'** | **3.25" HSA** |

WATER LEVEL MEASUREMENTS

| DATE | TIME | SAMPLED DEPTH | CASING DEPTH | CAVE-IN DEPTH | DRILLING FLUID LEVEL | WATER LEVEL |
|---|---|---|---|---|---|---|
| **11/19/13** | **11:11** | **11.0** | **9.5** | **9.9** | | **9.8** |
| | | | | | | |

BORING COMPLETED: **11/19/13**

DR: **DTS** LG: **TM** Rig: **1C**

NOTE: REFER TO THE ATTACHED SHEETS FOR AN EXPLANATION OF TERMINOLOGY ON THIS LOG

AET_CORP 22-02572.GPJ AET+CPT+WELL.GDT 12/10/13

# Appendix B

Report No. 22-02572

Geotechnical Report Limitations and Guidelines for Use

# Appendix B
# Geotechnical Report Limitations and Guidelines for Use
# Report No. 22-02572

## B.1 REFERENCE

This appendix provides information to help you manage your risks relating to subsurface problems which are caused by construction delays, cost overruns, claims, and disputes. This information was developed and provided by ASFE[1], of which, we are a member firm.

## B.2 RISK MANAGEMENT INFORMATION

### B.2.1 Geotechnical Services are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. And no one, not even you, should apply the report for any purpose or project except the one originally contemplated.

### B.2.2 Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

### B.2.3 A Geotechnical Engineering Report is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typically factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, always inform your geotechnical engineer of project changes, even minor ones, and request an assessment of their impact. Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.

### B.2.4 Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. Do not rely on a geotechnical engineering report whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. Always contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

1 ASFE, 8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733: www.asfe.org

**B.2.5 Most Geotechnical Findings Are Professional Opinions**
Site exploration identified subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ, sometimes significantly, from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

**B.2.6 A Report's Recommendations Are Not Final**
Do not overrely on the construction recommendations included in your report. Those recommendations are not final, because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual subsurface conditions revealed during construction. The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.

**B.2.7 A Geotechnical Engineering Report Is Subject to Misinterpretation**
Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

**B.2.8 Do Not Redraw the Engineer's Logs**
Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, but recognize that separating logs from the report can elevate risk.

**B.2.9 Give Contractors a Complete Report and Guidance**
Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, but preface it with a clearly written letter of transmittal. In the letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

**B.2.10 Read Responsibility Provisions Closely**
Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their report. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. Read these provisions closely. Ask questions. Your geotechnical engineer should respond fully and frankly.

**B.2.11 Geoenvironmental Concerns Are Not Covered**
The equipment, techniques, and personnel used to perform a geoenvironmental study differ significantly from those used to perform a geotechnical study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. Unanticipated environmental problems have led to numerous project failures. If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. Do not rely on an environmental report prepared for someone else.