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Feasibility Report for

# 2024 PMP Street & Utility Improvements City of Arden Hills

BMI Project No. 0T1.130168

July 2023

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# Certification

## Feasibility Report

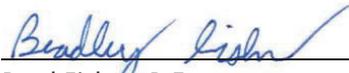
For

2024 PMP Street & Utility Improvements

City of Arden Hills  
Arden Hills, Minnesota  
City Project No. PW-24-0100  
BMI Project No. OT1.130168

July 19, 2023

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.

By:   
\_\_\_\_\_  
Brad Fisher, P.E.  
License No. 56595

Date: July 19, 2023

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## I. INTRODUCTION

The Arden Hills City Council approved a Professional Services Agreement on April 10, 2023 which ordered the preparation of a Feasibility Report for the 2024 Pavement Management Program (PMP) Street & Utility Improvements project. This report will examine the feasibility of proposed improvements to the roadway and utilities within the 2024 PMP project area. The following streets, and the surrounding areas, are proposed for improvements:

- Royal Lane from Norma Avenue to Floral Drive West
- Norma Avenue from Dawn Circle to Briarknoll Drive
- Briarknoll Circle
- Briarknoll Drive from Snelling Avenue North to Norma Avenue
- Norma Avenue from Briarknoll Drive to Colleen Avenue
- James Avenue from Indian Oaks Trail to Colleen Avenue
- McClung Drive from Snelling Avenue North to Colleen Avenue
- Colleen Avenue from McClung Drive to Hamline Avenue North
- Colleen Circle
- Royal Hills Drive from Snelling Avenue North to Arden View Drive
- Arden Vista Court
- Keithson Drive from County State Aid Highway (CSAH) 96 West to 800 feet south of CSAH 96 West

See Figure 1 in Appendix A for the proposed project location map.

This report reviews the existing conditions in the project area and discusses, in detail, the proposed improvements. These proposed street improvements consist of two construction methods, each determined as a result of deteriorating street pavement conditions and proposed improvements to the watermain, sanitary sewer, and storm sewer infrastructure. The first pavement improvement method is the milling and overlaying of the existing roadway pavement with a new wearing course. The second method is the full depth reclamation of the roadway, a process that pulverizes the existing roadway to create a suitable base for new non-wear course and wear course pavement to be installed. The report also provides preliminary cost estimates for the proposed improvements with financing for the project coming from a combination of special assessments, the City's general tax levy, and the City's utility funds.

If the City decides to proceed with the proposed street and utility improvements described in this report, it is anticipated construction would begin in 2024 as shown in the detailed project schedule found on page 12.

## II. BACKGROUND

The city's Capital Improvement Plan (CIP) identifies proposed projects, their associated costs, and funding for a five-year period. The streets evaluated in this report were identified in The City of Arden Hills's 2023 CIP for construction in the year 2024. The project area consists of primarily low-density residential areas with a small amount of land being dedicated as park preserves. The proposed improvements discussed in this report took into consideration the available documents and data related to the project areas, including but not limited to the City of Arden Hills 2040 Comprehensive Plan, record drawings, geotechnical reports, pavement condition index (PCI) ratings, sanitary sewer televising inspections, watermain break and leak history, and field observations conducted by city public works staff.

### III. EXISTING CONDITIONS

#### A. Streets

The streets within the proposed project area are all local residential streets with urban street sections consisting of bituminous pavement and B618 concrete curb and gutter. The roadways provide a drive lane in each direction and parking along most, but not all, curb lines. No parking is allowed along the eastern curb line of Royal Lane adjacent to Floral Park. City records show the roadways were constructed primarily in the 1970's and 1980's with varying levels of maintenance being completed since then.

Table 1 below shows the existing street widths from face of curb to face of curb, approximate right-of-way widths, and the Overall Condition Index (OCI) of the pavements from a 2023 City inspection.

Table 1 – Existing Streets				
Street Name	Location	Street Width	ROW Width	2023 PCI Rating
Royal Lane	Norma Avenue to Floral Drive	34-ft	60-ft	45
Norma Avenue	Dawn Circle to Briarknoll Drive	34-ft	60-ft	20
Briarknoll Drive	Snelling Avenue N to Norma Avenue	34-ft	60-ft	38
Briarknoll Circle	Briarknoll Drive east to cul-de-sac	34-ft	60-ft	38
Norma Avenue	Briarknoll Drive to Colleen Avenue	34-ft	60-ft	41
James Avenue	Indian Oaks Trail to Colleen Avenue	32-ft	60-ft	56
McClung Drive	Snelling Avenue N to Colleen Avenue	34-ft	60-ft	35
Colleen Avenue	McClung Drive to Hamline Avenue	34-ft	60-ft	35
Colleen Circle	Colleen Avenue south to cul-de-sac	32-ft	60-ft	40
Royal Hills Drive	Snelling Avenue N to Arden View Drive	34-ft	60-ft	32
Arden Vista Court	Royal Hills Drive east to cul-de-sac	34-ft	60-ft	38
Keithson Drive	Highway 96 W to the south ~800 feet	34-ft	60-ft	41

The average OCI of the streets' pavements in the project area are generally below 50 with the majority below 40. The bituminous pavement within the study area exhibits wear and distress due to traffic loading as well as typical weathering effects experienced with aged asphalt pavement. The existing pavement contains surface delamination, transverse cracking, longitudinal cracking, some potholing, and some alligator-type cracking. Alligator cracking in pavement is an indicator of potential subgrade problems.

Soil borings and a geotechnical evaluation were completed in the project area by Braun Intertec and the report is included in Appendix E. The existing bituminous pavement thickness ranges from 3.5 to 4 inches with an aggregate base thickness range from 6 to 7 inches. Existing subgrade soils found beneath the aggregate base are predominantly loose to medium dense sandy soils.

## B. Sanitary Sewer

City records show the sanitary sewer system was installed during the various phases of the residential development. The project area is served mainly by polyvinyl chloride (PVC) pipe and a few vitrified clay pipe (VCP) and reinforced concrete pipe (RCP) sanitary sewer mains. The sanitary sewer is part of sewer district M059 and is all 8-inch diameter sanitary sewer, with the exception of James Avenue which is 12-inch diameter. The comprehensive sewer plan does not identify changes in pipe diameter within the project area.

The existing condition of the sanitary sewer system was documented by videotaping of the sewer main. City Public Works staff completed this televised documentation in the spring of 2023. The televising revealed that the pipes were in generally good condition, with approximately nine locations that were identified as needing rehabilitation or repairs.

Some of the defects found in the sanitary sewer were cracked pipes, offset joints, pipe sags, defective service connections and groundwater infiltration at joints. The groundwater infiltration adds to the volume of wastewater being treated and subsequently the wastewater treatment costs. Sags and offset joints can interfere with the flow of sewage, creating a higher maintenance cost.

## C. Watermain

City records indicate that all existing watermain within the project area is Ductile Iron Pipe (DIP), varying in size between 6-inch, 8-inch, or 12-inch diameters. The water main system runs the entire length of the project area and connects to a looped system at most roadway connections. There are a few streets within, or connecting to, the project area that are not part of a looped system, including Arden Vista Court, Colleen Court, Colleen Circle, Briarknoll Circle, Indian Oaks Court, Indian Oaks Trail, Dawn Circle, and Royal Lane.

A review of the City's watermain break historical records did not identify any breaks or leaks in the project area other than isolated leaky valves and bent valve boxes. The existing watermain on James Avenue is 6-inches in diameter but connects to 8-inch diameter watermain to the south on Indian Oaks Trail, 8-inch diameter dead end watermain to the west on Indian Oaks Court, and 12-inch diameter watermain to the north on Colleen Avenue. The smaller diameter on James Avenue constricts the flows beyond James Avenue, particularly to Indian Oaks Court because it is not a looped system.

## D. Storm Sewer

City records indicate that the existing storm sewer within the project area is primarily comprised of RCP and ranges in diameter from 12-inch to 54-inch. The existing drainage pattern within the project area is generally from the exterior project limits to the storm water ponds located around the project area. Drainage is conveyed overland or through storm sewers and discharges into these existing stormwater ponds.

The City's Public Works staff completed inspections of the existing storm sewer and found these pipes to be in good condition, with minor manhole repairs and replacement of existing castings necessary. Storm sewer televising identified four locations with joint separation, cracking, offset joints, and/or pipe sags that will need to be addressed.

## E. Stormwater Ponds

There are various stormwater ponds throughout the project area that provide outlet storage areas to the storm sewer system and overland drainage, as discussed above. Over time, stormwater ponds will collect sediment which reduces their working capacities. Specifically, two of these ponds have been identified by city staff to have significant accumulated sediment. The first pond is located between McClung Drive and Briarknoll Circle, just north of the bituminous trail. The second pond is located south of Colleen Avenue, just west of Hamline Avenue North, however, only a portion of this pond is within city easement (the rest

of the pond is located on private property).

#### F. Trails

The public and City staff identified additional trail and retaining wall scope through the feasibility study process that should be considered for addition to delivery of this project. Trail conditions adjacent to the project area were evaluated in response.

There is an existing bituminous trail system that meanders through various portions of the project. The trails are constructed of bituminous pavement and are generally in a deteriorated condition with significant surface delamination and cracking throughout. The trail connections to the existing streets do not include pedestrian ramps. Portions of the trail system include notably steep grades and there are a few locations that include handrails along the trail. A bituminous curb exists along the west side of the trail, adjacent to 1503 Briarknoll Drive, assumedly to manage drainage patterns. A modular block retaining wall exists along the south side of the trail, approximately behind 1479 Colleen Avenue, which is beginning to tip and is in poor condition.

### IV. PROPOSED IMPROVEMENTS

#### A. Streets

There are two street pavement rehabilitation methods proposed for this project that are based on roadway age, surface deterioration, OCI rating, and subgrade soils. Streets will be rehabilitated with either a full depth reclamation or mill and overlay based on recommendations from the geotechnical report. Full depth reclamation is a process that pulverizes the existing roadway pavement and mixes it with the existing underlying aggregate material to create a new suitable aggregate base material. The reclaim material is graded and recompact for the proposed roadway with excess material being hauled away and 4-inches of new bituminous pavement is installed in two lifts. Mill and overlay is a process that grinds off the top layer of bituminous pavement and 2-inches of new wear course bituminous pavement is installed over the remaining base bituminous pavement.

Based on proposed watermain improvements identified below, James Avenue will require full depth reclamation to accommodate the watermain replacement. This work will also necessitate the removal and replacement of the entire western curb line and select sections of the eastern curb line to accommodate service replacements. The watermain work will require salvaging the reclamation material before installing the new watermain and reinstallation and preparation of the salvaged reclamation material for use as aggregate base in the new street section. Therefore, the end result of the street improvements on James Avenue will be the same as a reclamation and overlay, putting it on the same pavement life cycle as the other full depth reclamation roadways in the neighborhood.

Both rehabilitation methods will include spot curb and gutter replacements, select base pavement repairs, and casting or valve box adjustments to the new pavement grade. The spot curb and gutter replacements will be utilized to address sunken or severely damaged curb throughout the project area that inhibits proper drainage. No driveway work is proposed, except as necessitated by spot curb replacements. All disturbed boulevard areas will be restored with 5-inches of topsoil and new sod or seed and blanket.

Based on the observed weathering and deterioration found in the pavement cores and proposed utility improvements, a 9-inch full depth reclamation is proposed for the following streets:

- Norma Avenue from Dawn Circle to Briarknoll Drive
- Briarknoll Drive from Norma Avenue (west) to Norma Avenue (east)
- Norma Avenue from Briarknoll Drive to Colleen Avenue

- James Avenue from Indian Oaks Trail to Colleen Avenue
- Colleen Avenue from McClung Drive to Hamline Avenue North
- Royal Hills Drive from Snelling Avenue North to Arden View Drive
- Keithson Drive from County State Aid Highway (CSAH) 96 West to 800 feet south of CSAH 96 West

Based on the observed weathering and deterioration found in the pavement cores, a 2-inch mill and overlay is proposed for the following streets:

- Royal Lane from Norma Avenue to Floral Drive West
- Briarknoll Circle
- Briarknoll Drive from Snelling Avenue North to Norma Avenue (west)
- McClung Drive from Snelling Avenue North to Colleen Avenue
- Colleen Circle
- Arden Vista Court

In addition to the street improvements identified above, a new parking area will be installed along the east side of Royal Lane adjacent to Floral Park, just north of Floral Drive West. The curb will be pushed out to the east to accommodate five parallel parking spaces along the park. Signing in the area will be adjusted to make clear where parking is and is not allowed.

See Figure 1 in Appendix A for proposed project layout identifying the limits of each rehabilitation method.

#### B. Sanitary Sewer

Based on the existing sewer pipe age, material type, and televising results, the existing sanitary sewer was found to be in generally good condition. There are a few select defects that are proposed to be rehabilitated as part of the project by means of Cured In Place Pipe (CIPP) sewer lining, sewer pipe grouting, wye replacement, joint sealing, and cementitious manhole lining. Most of the proposed sanitary rehabilitation methods are trenchless which will not disturb the above ground infrastructure as all access to the sewer is through existing manholes along the pipe and all services or laterals will be reopened robotically from within the pipe.

All sanitary sewer manhole castings within the project areas will be replaced and installed to final grade to provide a smooth/drivable street surface in conjunction with the street resurfacing portion of the project. This work will also include the replacement of all concrete adjustment rings and the installation of a chimney seal for each applicable manhole structure to reduce inflow of storm water into the sanitary sewer system. No work on structures outside of the street pavement is proposed.

See Figures 2 and 3 in Appendix A for the proposed utility improvements.

#### C. Watermain

Based on the existing watermain pipe age and size, the existing watermain was found to be in generally good condition. Proposed watermain improvements include the full replacement of the undersized 6-inch diameter watermain along James Avenue with a new 8-inch diameter DIP watermain to connect to the existing 8-inch diameter watermains surrounding James Avenue and specifically provide for better flows to Indian Oaks Court. All hydrants, valves, and fittings will also be replaced within James Avenue. All water service lines on James Avenue are proposed for replacement from the new watermain to the property line with new

1-inch diameter copper pipe to individual residences. Curb stops and boxes will be installed at the ROW where the new service pipe connects to the existing service pipe.

Beyond James Avenue, watermain improvements will include replacement of select leaky gate valves and boxes and adjusting the remaining gate valve boxes within the project pavement areas to final grade to provide a smooth/drivable street surface in conjunction with the street resurfacing portion of the project. Some damaged valve box tops may require replacement.

See Figures 2 and 3 in Appendix A for the proposed utility improvements.

#### D. Storm Sewer

Based on the existing storm sewer age, size, and performance, the existing storm sewer was found to be in generally good condition. Storm sewer improvements will include rehabilitations at select locations including CIPP lining, minor pipe replacement, structure replacements, rings and casting replacement, re-mudding of structures/inverts, drainageway channel re-grading, rip rap replacement/installation, and storm sewer apron improvements. Some of the work identified will be taking place outside of the roadway area in easements that include behind houses. Access to these areas may be difficult and will necessitate tree removal and restoration of temporary access impacts, including private landscaping facilities in some areas.

Stormwater quality improvements will also be implemented to help remove sediments and pollutant loads to the downstream system. This will include the replacement of the last storm sewer structure in the street prior to its outfall into a stormwater pond or drainageway. This structure will be replaced with a new structure that includes a sump and SAFL Baffle to capture sediment from continuing downstream. This will allow city maintenance staff to easily access the structure and vac out accumulated sediment. Work on the storm sewer catch basin structures within the existing concrete curb and gutter will additionally require the spot replacement of the adjacent concrete curb and gutter surrounding the catch basin castings.

Proposed storm sewer improvements on James Avenue include the full replacement of the storm sewer to accommodate the watermain replacement. Additional storm sewer improvements are proposed along the trail adjacent to 4242 Norma Avenue based on a preliminary design provided by city staff. This work is intended to capture sediment south/southeast of the property and route it to the storm sewer system as opposed to following the current overland drainage path that generates stormwater issues at the property. This work will require the removal of several trees in the area to construct the improvements.

Beyond the work identified above, the remaining storm sewer manhole castings within the pavement of the project areas will be adjusted to final grade to provide a smooth/drivable street surface in conjunction with the street resurfacing portion of the project. Some damaged castings may require replacement. This work will include the replacement of all concrete adjustment rings for each applicable manhole structure within the pavement limits.

See Figures 2 and 3 in Appendix A for the proposed utility improvements.

#### E. Stormwater Ponds

The two stormwater ponds identified by city staff to have collected significant sediment accumulation over time which has reduced their working capacities are proposed to be dredged as part of the project. The proposed pond dredging will reestablish the originally designed pond volume. The first pond is located between McClung Drive and Briarknoll Circle, just north of the bituminous trail. The second pond is located south of Colleen Avenue, just west of Hamline Avenue North, however, only a portion of this pond is within

city easement (the rest of the pond is located on private property). It should be noted that only dredging a portion of a pond will likely lead to redistribution of the accumulated sediment from other portions of the pond over time and the entire pond will still require dewatering to perform the work.

Braun Intertec completed pond sediment sampling from the ponds to characterize the in-place sediment (future dredge material). These sediment samples were tested and evaluated in accordance with Minnesota Pollution Control Agency (MPCA) standard procedures as described in Appendix B of Managing Stormwater Sediment BMP Guidance for Municipalities. Based on analytical results from the sampling and testing, excavated stormwater sediments from the identified ponds fall within the Residential/Recreational SRV management category and may be used with no restrictions.

To determine the volume of accumulated sediment, a bathymetric survey was completed for each of the stormwater ponds. This process involves taking measurements at various locations throughout pond to determine the top of sediment and then pushing through the sediment to the approximate original pond bottom. The difference between these measurements provides an estimate of the accumulated sediment volume to be dredged out of the pond. Similar to the backyard storm sewer improvements identified above, access to these ponds is anticipated to necessitate tree removal and restoration of temporary access impacts, including private landscaping facilities in some areas.

See Figure 1 in Appendix A for the proposed project layout identifying the limits of each proposed pond dredging operation. Sediment sampling and an associated report of its findings were completed by Braun Intertec for the ponds and the report is included in Appendix E

## F. Trails

The public and City staff identified additional trail and retaining wall scope through the feasibility study process that should be considered for addition to delivery of this project. Upon review of the existing poor trail conditions, their location, and type of work necessary to make improvements, it is recommended the improvements of trails adjacent be added to the originally proposed and related street improvement scope of the project.

The proposed trail improvements include removal of the existing bituminous pavement and repaving the trails with new bituminous on the existing aggregate base materials. Additionally, the trails will have new concrete pedestrian ramps installed where the trails proposed for rehabilitation intersect roadways in the project area. Beyond the pedestrian ramps, the trails are proposed to be replaced, in kind, matching the existing trail alignments, widths, and elevations. Due to the existing site topography, some segments of these existing trails appear to be quite steep and may not be feasible to improve to strict compliance with Americans with Disabilities Act (ADA) requirements beyond the new concrete pedestrian ramps, consistent with the existing trail system along these recreational trails.

The trail between Norma Avenue and Indian Oaks Court is very narrow, particularly along the west side of the trail. This trail is proposed to be widened to a standardized 6-ft width throughout, matching the southern edge, and will maintain the existing drainage swale over the trail along the backyard lot lines. The bituminous curb along the west side of the trail, adjacent to 1503 Briarknoll Drive, is proposed to be replaced to continue to manage drainage. Existing handrails along portions of the trails are proposed to remain in place. The modular block retaining wall along the south side of the trail, approximately behind 1479 Colleen Avenue, is also proposed to be replaced and improved as part of the project.

See Figure 1 in Appendix A for the proposed project layout identifying the trails to be rehabilitated and the locations of ADA pedestrian ramp improvements. See Figure 3 in Appendix A for the proposed retaining wall and bituminous curb replacements.

## V. STAKEHOLDER COORDINATION

### A. Private Utilities

A private utility coordination meeting will be held with private utility companies that have facilities within the project area to understand the presence of existing overhead or underground facilities and plans for infrastructure upgrades or necessary relocations during the final design phase of the project. Based on the scope of this project primarily being a rehabilitation project, major conflicts are not anticipated but will be verified during the final design process.

### B. Public Involvement

A resident questionnaire was mailed out in April of 2023 to properties within the proposed construction area. The questionnaire provided residents and property owners with an opportunity to provide feedback on the proposed improvements and identify existing information on the project area. The feedback received included a lot of property specific information, but several common themes were also identified from the returned questionnaires. These common themes were used to develop a summary of the survey which includes concerns over the condition of the trail system throughout the neighborhood, concerns over impacts to irrigation systems and dog fences, concerns over how the project will be assessed, requests to minimize construction impacts, issues with the slope of existing driveways and the curb at their driveway entrance, and existing drainage issues. These surveys were considered during the development of this feasibility report and items within the scope of the project were incorporated to address the feedback received. It should be noted that to align with city policy, potential damage to irrigation systems will be repaired as part of the project by the selected contractor, however, potential damage to dog fences is the responsibility of the homeowner to repair.

The resident questionnaire and survey summary can be found in Appendix D.

The second opportunity for public involvement will be at a public open house scheduled for August 8<sup>th</sup>, 2023. Feedback from the open house will be considered and incorporated into the final design as directed by city staff.

A third public informational meeting will be held after the final design is better defined but prior to construction of the project.

## VI. RIGHT-OF-WAY, EASEMENTS, AND PERMITS

All work on the project is anticipated to take place within existing city right-of-way or easements. However, after completing final design, it is possible that temporary easements may be necessary to construct the project. This will be evaluated in detail towards the end of the final design process to identify any temporary easement needs, particularly as it relates to the work beyond the roadways.

The project area is within the jurisdiction of the Rice Creek Watershed District (RCWD) and therefore requires compliance with their rules and regulations. A meeting was held with RCWD staff on June 26<sup>th</sup>, 2023 to understand how their rules and regulations apply to the proposed project. The project falls under the Public Linear Project category for Stormwater Management rules and therefore stormwater management is not required unless the project disturbs greater than one acre of underlying native soils. Being that the project is primarily a rehabilitation project and plans to leave the existing aggregate base and/or reclamation material in place, the disturbance to underlying native soils is currently calculated to be under the one acre threshold and stormwater management permitting is not anticipated. An Erosion & Sediment Control Plan permit will be required through the RCWD associated with the project's erosion control plan.

A Level 1 wetland delineation was conducted during the summer of 2023 to identify the wetlands surrounding the proposed pond dredging operations. Permitting associated with the wetland impacts will be submitted to the appropriate agencies for approval at the conclusion of final design and is expected to meet the conditions for a no low permit associated with the Wetland Conservation Act (WCA) requirements. No additional permitting is required for the dewatering of the ponds associated with the pond dredging work.

Existing, adjacent wetlands and potential associated permitting needs were identified through the feasibility study. After meeting with the RCWD and identifying the proposed scope of work at the storm sewer outfalls as it relates to RCWD’s rules and regulations, it was determined that Level 2 wetland delineations and associated impacts permitting will be required to complete the work. It is recommended the project’s final design scope be modified to complete the necessary delineations to move forward with the proposed backyard storm sewer improvement work, as proposed in this report.

Delineations and necessary permits will be secured during final design. A preliminary list of anticipated permits for construction of the improvements beyond those identified above include the Minnesota Pollution Control Agency (NPDES Construction Stormwater Permit) and the Minnesota Department of Health (Public Watermain Plan Review).

The RCWD reached out after our meeting to inform project staff that the proposed project improvements may be eligible for upcoming grant funding. The grant funding is an annual program put on by the RCWD to help with implementation of stormwater management projects in the RCWD. The funding is intended for projects that provide stormwater quality treatment, runoff volume reductions, peak runoff rate control and/or reductions in groundwater usage. Projects proposed in conjunction with municipal street projects, such as this one, are encouraged. Applications for the 2024 Stormwater Management Grant are expected to open around the end of September and be due around mid-December. The application to the RCWD and grant administration should be considered for addition to delivery of this project.

## VII. ESTIMATED COSTS

Detailed estimates of probable construction costs have been prepared for the improvements described in this Report and are included in Appendix B. All costs are based on anticipated unit prices for the 2024 construction season based on actual bid prices for similar projects. Actual costs will be determined through competitive bids following the final design for the project. All estimated costs also include a 10% contingency and 27% overhead allowance for legal, engineering, administrative, and finance costs. Table 2 contains a summary of the estimated total project costs for all recommended improvements, inclusive of construction costs, contingency, and overhead allowance.

<b>Table 2 – Estimated Total Project Costs</b>				
<b>Proposed Improvements</b>	<b>Reclamation Areas</b>	<b>Mill &amp; Overlay Areas</b>	<b>Trails &amp; Ponds</b>	<b>Total Project Costs</b>
Streets	\$973,600	\$497,500	-	\$1,471,100
Storm Sewer	\$358,100	\$477,200	-	\$835,300
Sanitary Sewer	\$120,200	\$47,100	-	\$167,300
Watermain	\$202,500	\$17,100	-	\$219,600
Trails & Ponds	-	-	\$307,800	\$307,800
<b>Total Project Costs</b>	<b>\$1,654,400</b>	<b>\$1,038,900</b>	<b>\$307,800</b>	<b>\$3,001,100</b>

The estimated total project costs listed in Table 2 include the additional trail improvement scope, additional wetland permitting, and additional application for a potential RCWD grant identified through the feasibility study process. While City standard process includes an estimated percentage-based method of estimating overhead and contingencies, the actual estimated additional trail design, wetland permitting, and grant application costs are \$23,000 and the estimated additional trail construction costs is \$130,000, both of which are accounted for in Table 2.

It is planned to bid the project with multiple bid alternates for the pond dredging work and trail and retaining wall work. This will allow flexibility to include or remove these items from the project based on the actual prices bid by the contractor to complete the work.

## VIII. ASSESSMENTS AND FUNDING

Assessments for street improvement costs are proposed to be levied to benefiting properties as outlined in Minnesota Statute 429 and the City of Arden Hills Assessment Policy. A preliminary assessment roll was compiled for all adjacent benefitting properties per the City's assessment policy and is included in Appendix C. All identified properties were proposed to be assessed at a calculated assessment rate of 50% of the street project costs. The street project costs were split between reclamation improvements and mill & overlay improvements. Each property eligible for assessment was identified as either a reclamation property or a mill and overlay property based on their street address. Assessments for the proposed street improvements were calculated using the Residential Equivalent Unit (REU) method as outlined in the City's assessment policy. The assessable costs for each improvement type were divided by the number of eligible REU's to determine an assessment rate for each improvement type. Calculations for the estimated assessment rates are provided below:

### Reclamation Areas

50% Estimated Street Project Costs = \$486,800

Residential Equivalent Units = 86

Assessment Rate = \$5,660

### Mill & Overlay Areas

50% Estimated Street Project Costs = \$248,750

Residential Equivalent Units = 69

Assessment Rate = \$3,605

The preliminary assessment roll does not assign an REU to properties abutting the street improvements if their property address is for another street that is not receiving the street improvements, regardless of driveway access location, etc. in accordance with the city's assessment policy.

Additionally, the project area includes a few unique property situations as it relates to the city's assessment policy. The 1423 Floral Drive (the Floral Park property owned by the City of Arden Hills), 1445 Floral Drive, and 1465 Floral Drive properties are not included in the preliminary assessment roll. Although they have frontage along Royal Drive which is a project street, in accordance with the assessment policy, their street address is not a project street. Also, these three properties were all assessed as part of the 2018 PMP project, which included Floral Drive. The 4539 Keithson Drive and 1370 Colleen Avenue properties are both identified as 2 REU's in the preliminary assessment roll because their lot sizes are considered subdivisible, in accordance with the city's assessment policy.

The assessment policy indicates “the City Council shall retain the right to review each project on its own merit and to deviate from any portion of the Assessment Policy Manual, as it deems proper. These deviations may occur in unique situations or where application of the policy produces unfair or undesirable results. The residential equivalent assessment rate shall be determined by the City Council.”

See Figures 4 and 5 in Appendix A for the assessable properties map that correlates with the parcel numbers on the preliminary assessment roll.

The project costs for the remaining street costs and for the storm sewer, sanitary sewer, watermain, trail, and pond improvements will be the cost responsibility of the City. Proposed project funding sources are a combination of the City’s Permanent Improvements Revolving (PIR) fund, utility funds, and special assessments for street improvements.

The proposed project assessments and funding summary are based on preliminary estimated project costs for the recommended improvements. These costs may be revised at the time of the final assessment hearing depending on the final design of the project, required right-of-way and/or easements, soil conditions, bids received, and actual work performed. The assessments are proposed to be assessed over a 10-year period at an interest rate to be set by the City Council.

A summary of the funding breakdown is presented in Table 3 below.

<b>Table 3 – Estimated Funding Breakdown</b>	
<b>Funding Source</b>	<b>Project Total Cost</b>
PIR Fund	\$900,700
Assessments	\$735,500
Utility Fund – Sanitary Sewer	\$167,300
Utility Fund – Water	\$219,600
Utility Fund – Surface Water Management	\$978,000
<b>Total</b>	<b>\$3,001,100</b>

## IX. PROJECT SCHEDULE

The proposed project schedule is shown below:

<i>Resident Questionnaire Survey</i> .....	<i>May 26, 2023</i>
<i>Council Work Session for Direction on Preliminary Design*</i> .....	<i>June 20, 2023</i>
Accept Feasibility Report & Order Public Improvement Hearing* .....	July 24, 2023
Public Open House.....	August 8, 2023
Public Improvement Hearing* .....	August 14, 2023
Order Improvements & Authorize Preparation of Plans and Specifications* .....	August 14, 2023
Approve Final Plans & Specifications and Authorize Advertisement for Bids* .....	January, 2024
Bid Opening .....	February, 2024
Accept Bids & Order Assessment Hearing* .....	February, 2024
Assessment Hearing/Adopt Assessment Roll & Award Construction Contract* .....	March, 2024
Public Open House.....	April, 2024
Construction Begins .....	Spring, 2024
Construction Substantial Completion.....	Fall, 2024
City Certifies Assessments to County .....	November, 2024

\* *City Council Meeting*

## X. CONCLUSION

This report has been prepared to investigate the potential for rehabilitating the roadways in the 2024 PMP Street & Utility Improvements project areas and associated work. This report identified the recommended improvements to the infrastructure, provided estimated costs of the recommended improvements, and identified applicable funding to finance the improvements.

From an engineering standpoint, this project, as proposed, is feasible, cost effective, and necessary and it can best be accomplished by letting competitive bids for the work. It is recommended that the work be done under one contract in order to complete the work in an orderly and efficient manner. The City and the persons assessed will have to determine the economic feasibility of the proposed improvements.

## Appendix A: Figures



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**LEGEND**

	PROJECT AREA
	EXISTING STORM SEWER
	EXISTING WATERMAIN
	PROPOSED WATERMAIN
	PROPOSED SANITARY SEWER PIPE
	PROPOSED STORM SEWER PIPE
	TREE REMOVAL
	REPLACE RINGS AND CASTING
	MUD STRUCTURE/INVERT
	SUMP & SAFI BAFFLE
	REPLACE STRUCTURE
	PROPOSED STRUCTURE
	REPLACE GATE VALVE AND BOX
	REPLACE SANITARY RINGS & CASTING/ADD CHIMNEY SEAL
	GRADE CHANNEL
	ADD RIP RAP
	ADJUST APRON
	REPLACE HYDRANT
	SEWER PIPE GROUTING
	DOCUMENTED CURB PONDING



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**LEGEND**

	PROJECT AREA
	EXISTING STORM SEWER
	EXISTING WATERMAIN
	PROPOSED WATERMAIN
	PROPOSED SANITARY SEWER PIPE
	PROPOSED STORM SEWER PIPE
	TO BE REMOVED
	REPLACE RINGS AND CASTING
	MANHOLE STRUCTURE INVERT
	SUMP & S/SR BAY/TE
	REPLACE STRUCTURE
	PROPOSED STRUCTURE
	REPLACE GATE VALVE AND BOX
	REPLACE SANITARY RINGS & CASTING/ADD CHIMNEY SEAL
	GRADE CHANNEL
	ADD R/SR RMP
	ADJUST APRON
	REPLACE HYDRANT
	SEWER PIPE GROUTING
	DOCUMENTED CURB PONDING



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2024 PMP STREET & UTILITY IMPROVEMENTS  
CITY OF ARDEN HILLS

ASSESSABLE PROPERTIES MAP  
JULY 2023



# Appendix B: Preliminary Cost Estimate

**PRELIMINARY ENGINEER'S ESTIMATE**  
 2024 PMP STREET & UTILITY IMPROVEMENTS  
 CITY OF ARDEN HILLS, MINNESOTA  
 BMI PROJECT NO. 071.130168

**SCHEDULE "A" - BASE BID**

ITEM NO.	SPEC. REF.	DESCRIPTION	NOTES	UNIT	RECLAMATION AREAS			MILL & OVERLAY AREAS			WATER	STREET	STORM	SANITARY	WATER	TRAIL & POND	TOTAL ESTIMATED QUANTITY	ESTIMATED UNIT PRICE	ESTIMATED TOTAL PRICE
					STREET	STORM	SANITARY	STORM	SANITARY	STORM									
1	2021.501	MOBILIZATION		LUMP SUM	0.32	0.12	0.04	0.07	0.17	0.15	0.02	0.01	0.10	1.00	\$100,000.00	\$	28,000.00		
2	2101.502	CLEARING		EACH	0	0	0	0	0	40	0	0	0	0	40.00	\$700.00	\$	28,000.00	
3	2101.502	GRUBBING		EACH	0	0	0	0	0	40	0	0	0	0	40.00	\$250.00	\$	10,000.00	
4	2104.502	REMOVE CASTING		EACH	0	44	0	0	0	28	0	0	0	0	72.00	\$160.00	\$	11,520.00	
5	2104.502	REMOVE GATE VALVE & BOX		EACH	0	0	0	3	0	0	0	4	0	0	7.00	\$350.00	\$	2,450.00	
6	2104.502	REMOVE VALVE BOX	(1)	EACH	0	0	0	0	0	0	0	4	0	0	4.00	\$350.00	\$	1,400.00	
7	2104.502	REMOVE HYDRANT		EACH	0	0	0	1	0	0	0	0	0	0	1.00	\$600.00	\$	600.00	
8	2104.502	REMOVE DRAINAGE STRUCTURE		EACH	0	2	0	0	0	11	0	0	0	0	13.00	\$650.00	\$	7,150.00	
9	2104.502	REMOVE SIGN		EACH	5	0	0	0	0	0	0	0	0	0	5.00	\$200.00	\$	200.00	
10	2104.502	REMOVE SIGN	(2)	EACH	6	0	0	0	0	0	0	0	0	0	6.00	\$110.00	\$	660.00	
11	2104.503	SAVING CONCRETE PAVEMENT (FULL DEPTH)		LIN FT	147	0	0	0	0	0	0	0	0	0	147.00	\$6.00	\$	882.00	
12	2104.503	SAVING BITUMINOUS PAVEMENT (FULL DEPTH)		LIN FT	42	0	0	0	420	0	0	0	0	0	462.00	\$4.00	\$	1,848.00	
13	2104.503	REMOVE WATERMAIN		LIN FT	0	0	0	667	0	0	0	0	0	0	667.00	\$5.00	\$	3,335.00	
14	2104.503	REMOVE SEWER PIPE (STORM)		LIN FT	0	116	0	0	0	20	0	0	0	0	136.00	\$15.00	\$	2,040.00	
15	2104.503	REMOVE CURB & GUTTER		LIN FT	0	0	0	816.76	0	0	0	83.24	0	0	900.00	\$3.00	\$	2,700.00	
16	2104.503	REMOVE CURB & GUTTER (SPOT)	(3)	LIN FT	1666.16	0	0	0	1349.84	0	0	0	0	0	3016.00	\$10.00	\$	30,160.00	
17	2104.503	REMOVE BITUMINOUS CURB		LIN FT	0	0	0	0	0	0	0	0	150	0	150.00	\$4.00	\$	600.00	
18	2104.503	REMOVE RETAINING WALL		LIN FT	0	0	0	0	0	0	0	0	90	0	90.00	\$40.00	\$	3,600.00	
19	2104.504	REMOVE CONCRETE DRIVEWAY PAVEMENT		SQ YD	185	0	0	0	0	0	0	0	0	0	185.00	\$10.00	\$	1,850.00	
20	2104.504	REMOVE CONCRETE PAVEMENT		SQ YD	15	0	0	0	0	0	0	0	0	0	15.00	\$12.00	\$	180.00	
21	2104.504	REMOVE BITUMINOUS DRIVEWAY PAVEMENT		SQ YD	0	0	0	0	10	0	0	0	0	0	10.00	\$8.00	\$	80.00	
22	2104.516	REMOVE BITUMINOUS WALK		SQ FT	0	0	0	0	0	0	0	0	16036	0	16036.00	\$1.50	\$	24,054.00	
23	2104.602	REMOVE SKIMMER WALL		EACH	0	0	0	0	0	1	0	0	0	0	1.00	\$1,000.00	\$	1,000.00	
24	2105.602	GRADE CHANNEL		EACH	0	0	0	0	0	5	0	0	0	0	5.00	\$2,000.00	\$	10,000.00	
25	2106.507	EXCAVATION - COMMON	(EV/1P)	CU YD	119	0	0	0	0	0	0	0	0	0	119.00	\$19.00	\$	2,261.00	
26	2106.507	MUCK EXCAVATION (POND 1)	(EV/1P)	CU YD	0	0	0	0	0	0	0	0	215	0	215.00	\$60.00	\$	12,900.00	
27	2106.507	MUCK EXCAVATION (POND 2)	(EV/1P)	CU YD	0	0	0	0	0	0	0	0	872	0	872.00	\$60.00	\$	52,320.00	
28	2106.507	EXCAVATION - SUBGRADE	(EV/1P)	CU YD	306.07	0	0	0	0	0	0	0	98.83	0	405.00	\$19.00	\$	7,695.00	
29	2106.507	SELECT GRANULAR EMBANKMENT	(CV/1P)	CU YD	50	0	0	0	0	0	0	0	0	0	50.00	\$25.00	\$	1,250.00	
30	2106.507	COMMON EMBANKMENT	(CV/1P)	CU YD	53	0	0	0	0	0	0	0	0	0	53.00	\$10.00	\$	530.00	
31	2106.507	STABILIZING AGGREGATE	(CV/1P)	CU YD	405	0	0	0	0	0	0	0	0	0	405.00	\$35.00	\$	14,175.00	
32	2106.601	POND DEWATERING (POND 1)		LUMP SUM	0	0	0	0	0	0	0	0	1	1.00	\$10,000.00	\$	10,000.00		
33	2106.601	POND DEWATERING (POND 2)		LUMP SUM	0	0	0	0	0	0	0	0	1	1.00	\$15,000.00	\$	15,000.00		
34	2108.504	GEOTEXTILE FABRIC TYPE 7	(P)	SQ YD	2486	0	0	0	0	0	0	0	0	0	2486.00	\$2.70	\$	6,712.20	
35	2112.604	SUBGRADE PREPARATION	(PI/5)	SQ YD	19714	0	0	0	0	0	0	0	0	0	19714.00	\$0.90	\$	17,742.60	
36	2215.604	FULL DEPTH RECLAMATION	(P)	SQ YD	19714	0	0	0	0	0	0	0	0	0	19714.00	\$3.50	\$	68,999.00	
37	2123.610	STREET SWEEPER (WITH PICKUP BROOM)	(4)	HOUR	20	0	0	0	30	0	0	0	0	0	50.00	\$170.00	\$	8,500.00	
38	2123.610	EXPLORATORY EXCAVATION		HOUR	0	12	0	0	0	12	0	0	0	0	24.00	\$800.00	\$	19,200.00	
39	2232.604	MILL BITUMINOUS SURFACE (2.0")	(P)	SQ YD	0	0	0	0	15834	0	0	0	0	0	15834.00	\$2.00	\$	31,668.00	
40	2232.616	MILL AND PATCH BITUMINOUS PAVEMENT	(6)	SQ FT	0	0	0	0	7125	0	0	0	0	0	7125.00	\$3.00	\$	21,375.00	
41	2357.506	BITUMINOUS MATERIAL FOR TACK COAT		GAL	118291	0	0	0	950.09	0	0	0	0	0	2133.00	\$2.50	\$	5,332.50	
42	2360.504	TYPE SP 9.5 WEARING COURSE MIXTURE (2B) 3.0" THICK	(7)	SQ YD	0	0	0	0	10	0	0	0	0	0	10.00	\$65.00	\$	650.00	
43	2360.506	TYPE SP 9.5 WEARING COURSE MIXTURE (2C)		TON	4636.87	0	0	0	1882.13	0	0	0	0	0	6499.00	\$82.00	\$	532,918.00	
44	2411.618	MODULAR BLOCK RETAINING WALL		SQ FT	0	0	0	0	0	0	0	0	357	0	357.00	\$55.00	\$	19,635.00	
45	2501.502	12" RC PIPE APRON	(8)	EACH	0	0	0	0	0	1	0	0	0	0	1.00	\$950.00	\$	950.00	
46	2501.602	TRASH GUARD FOR 54" PIPE APRON	(8)	EACH	0	0	0	0	0	1	0	0	0	0	1.00	\$1,300.00	\$	1,300.00	
47	2502.503	4" PERF TP PIPE DRAIN		LIN FT	0	0	0	0	0	0	0	0	110	0	110.00	\$13.00	\$	1,430.00	
48	2503.503	15" RC PIPE SEWER CLASS V		LIN FT	0	118.2	0	0	0	364.8	0	0	0	0	483.00	\$80.00	\$	38,640.00	
49	2503.601	STORM SEWER BYPASS		LUMP SUM	0	0	0	0	0	1	0	0	0	0	1.00	\$10,000.00	\$	10,000.00	
50	2503.602	CONNECT TO EXISTING STORM SEWER		EACH	0	1	0	0	0	19	0	0	0	0	20.00	\$1,500.00	\$	30,000.00	

**PRELIMINARY ENGINEER'S ESTIMATE**  
 2024 PMP STREET & UTILITY IMPROVEMENTS  
 CITY OF ARDEN HILLS, MINNESOTA  
 BMI PROJECT NO. 071.130168

**SCHEDULE "A" - BASE BID**

ITEM NO.	SPEC. REF.	DESCRIPTION	NOTES	RECLAMATION AREAS			MILL & OVERLAY AREAS			TRAIL & POND			TOTAL ESTIMATED QUANTITY	ESTIMATED UNIT PRICE	ESTIMATED TOTAL PRICE
				STREET	STORM	SANITARY	WATER	STREET	STORM	SANITARY	WATER	STREET			
51	2503.602	CONNECT TO EXISTING MANHOLES (STORM)		0	2	0	0	0	0	0	3	0	5.00	\$2,000.00	\$10,000.00
52	2503.602	PVC WYE		0	0	0	0	0	0	0	0	0	1.00	\$1,500.00	\$1,500.00
53	2503.602	JOINT SEALING SANITARY MANHOLE		0	0	1	0	0	0	0	0	0	1.00	\$700.00	\$700.00
54	2503.602	REINSTATE LATERALS		0	0	4	0	0	0	0	0	0	4.00	\$150.00	\$600.00
55	2503.602	SEWER PIPE GROUTING		0	0	0	0	0	0	0	0	0	8.00	\$500.00	\$4,000.00
56	2503.603	LINING SEWER PIPE 12" (STORM)		0	0	650	0	0	0	0	0	0	650.00	\$55.00	\$35,750.00
57	2503.603	LINING SEWER PIPE 12" (STORM)		0	60	0	0	0	0	380	0	0	440.00	\$75.00	\$33,000.00
58	2503.603	CEMENTITIOUS LINING SANITARY MANHOLE		0	282	0	0	0	0	0	0	0	282.00	\$350.00	\$102,200.00
59	2504.601	TEMPORARY WATER SERVICE		0	0	0	0	0	0	0	0	0	18.00	\$325.00	\$5,850.00
60	2504.602	CONNECT TO EXISTING WATERMAIN		0	0	0	0	0	0	0	0	0	1.00	\$10,000.00	\$10,000.00
61	2504.602	HYDRANT		0	0	0	0	0	0	0	0	0	3.00	\$2,000.00	\$6,000.00
62	2504.602	VALVE BOX		0	0	0	0	0	0	0	0	0	1.00	\$6,000.00	\$6,000.00
63	2504.602	ADJUST VALVE BOX	(1)	0	0	0	0	0	0	0	0	0	4.00	\$800.00	\$3,200.00
64	2505.602	1" CORPORATION STOP		0	0	0	0	0	0	0	0	0	18.00	\$500.00	\$9,000.00
65	2504.602	8" GATE VALVE & BOX		0	0	0	0	0	0	0	0	0	4.00	\$800.00	\$3,200.00
66	2504.602	8" GATE VALVE & BOX		0	0	0	0	0	0	0	0	0	1.00	\$2,600.00	\$2,600.00
67	2504.602	8" GATE VALVE & BOX		0	0	0	0	0	0	0	0	0	3.00	\$3,200.00	\$9,600.00
68	2504.602	1" CURB STOP & BOX	(9)	0	0	0	0	0	0	0	0	0	4.00	\$700.00	\$2,800.00
69	2504.603	1" TYPE K COPPER PIPE		0	0	0	0	0	0	0	0	0	171.00	\$42.00	\$7,182.00
70	2504.603	8" WATERMAIN DUCTILE IRON CL 52		0	0	0	0	0	0	0	0	0	20.00	\$72.00	\$1,440.00
71	2504.603	8" WATERMAIN DUCTILE IRON CL 52		0	0	0	0	0	0	0	0	0	655.00	\$75.00	\$49,125.00
72	2504.604	4" POLYSTYRENE INSULATION		0	0	0	0	0	0	0	0	0	12.00	\$55.00	\$660.00
73	2504.608	DUCTILE IRON FITTINGS		0	0	0	0	0	0	0	0	0	385.00	\$14.00	\$5,390.00
74	2506.502	CASTING ASSEMBLY (SANITARY)	(12)(13)	0	0	31	0	0	0	0	14	0	45.00	\$1,400.00	\$63,000.00
75	2506.502	CASTING ASSEMBLY (STORM)		0	42	0	0	0	0	0	9	0	51.00	\$1,200.00	\$61,200.00
76	2506.502	ADJUST FRAME & RING CASTING (STORM)		2	0	0	0	0	0	0	0	0	3.00	\$650.00	\$1,950.00
77	2506.503	CONSTRUCT DRAINAGE STRUCTURE DESIGN SPECIAL (2X3 CB)		0	4	0	0	0	0	0	8	0	12.00	\$800.00	\$9,600.00
78	2506.503	CONSTRUCT DRAINAGE STRUCTURE DESIGN 48-4020		0	8	0	0	0	0	0	8	0	16.00	\$650.00	\$10,400.00
79	2506.503	CONSTRUCT DRAINAGE STRUCTURE DESIGN 48-4022		0	8	0	0	0	0	0	80	0	88.00	\$650.00	\$57,200.00
80	2506.602	GROUT CATCH BASIN OR MANHOLE		0	16	0	0	0	0	0	9	0	25.00	\$325.00	\$8,125.00
81	2506.602	ADJUST STORM APRON		0	0	0	0	0	0	0	1	0	1.00	\$600.00	\$600.00
82	2506.602	5#61 Baffle		0	4	0	0	0	0	0	6	0	10.00	\$7,500.00	\$75,000.00
83	2511.507	RANDOM RIPRAP CLASS III	(16)	0	0	0	0	0	0	0	135	0	135.00	\$140.00	\$18,900.00
84	2521.518	4" CONCRETE WALK	(7)	0	0	0	0	0	0	0	0	200	200.00	\$7.50	\$1,500.00
85	2521.518	8" CONCRETE WALK	(7)	0	0	0	0	0	0	0	0	400	400.00	\$12.00	\$4,800.00
86	2521.518	3" BITUMINOUS WALK		0	0	0	0	0	0	0	0	0	16036	\$2.50	\$40,090.00
87	2521.602	DRILL & GROUT REINF BAR (EPOXY COATED)		0	0	0	0	0	0	0	0	0	38	\$38.00	\$1,434.00
88	2531.503	CONCRETE CURB & GUTTER DESIGN B618		0	0	0	0	0	0	0	0	0	865.00	\$20.00	\$17,300.00
89	2531.503	CONCRETE CURB & GUTTER DESIGN B616 (SPOT)		1686.16	0	0	0	0	0	0	0	0	3016.00	\$40.00	\$120,640.00
90	2531.503	CONCRETE CURB DESIGN V		0	0	0	0	0	0	0	0	0	120	\$50.00	\$6,000.00
91	2531.504	8" CONCRETE DRIVEWAY PAVEMENT	(7)	165	0	0	0	0	0	0	0	0	165.00	\$80.00	\$13,200.00
92	2531.604	7" CONCRETE VALLEY GUTTER		15	0	0	0	0	0	0	0	0	15.00	\$85.00	\$1,275.00
93	2531.616	TRUNCATED DOWNS		0	0	0	0	0	0	0	0	0	80	\$60.00	\$4,800.00
94	2535.503	BITUMINOUS CURB		0	0	0	0	0	0	0	0	0	150	\$50.00	\$7,500.00
95	2540.602	INSTALL MAILBOX SUPPORT	(2)	6	0	0	0	0	0	0	0	0	6.00	\$250.00	\$1,500.00
96	2563.601	TRAFFIC CONTROL		0.32	0.12	0.04	0.07	0.17	0.01	0.15	0.10	0.10	1.00	\$40,000.00	\$40,000.00
97	2564.518	SIGN PANELS TYPE C	(17)	10	0	0	0	0	0	0	0	0	10.00	\$60.00	\$600.00
98	2564.602	SIGN PANELS TYPE SPECIAL	(17)	6	0	0	0	0	0	0	0	0	6.00	\$280.00	\$1,680.00
99	2571.502	DECIDUOUS TREE 2.5' CAL B&B		0	0	0	0	0	0	0	10	0	10.00	\$650.00	\$6,500.00
100	2572.602	TREE PRUNING	(4)	0	0	0	0	0	0	0	0	30	30.00	\$200.00	\$6,000.00

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 2024 PMP STREET & UTILITY IMPROVEMENTS  
 CITY OF ARDEN HILLS, MINNESOTA  
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ITEM NO.	SPEC. REF.	DESCRIPTION	NOTES	UNIT	RECLAMATION AREAS			MILL & OVERLAY AREAS			TRAIL & POND	TOTAL ESTIMATED QUANTITY	ESTIMATED UNIT PRICE	ESTIMATED TOTAL PRICE
					STREET	STORM	SANITARY	STREET	STORM	SANITARY				
101	2573.501	STABILIZED CONSTRUCTION EXIT		LUMP SUM	1	0	0	0	0	0	0	0	0	\$ 3,000.00
102	2573.502	STORM DRAIN INLET PROTECTION		EACH	41.04	0	0	19.96	0	0	0	61.00	0	\$ 160.00
103	2574.507	COMMON TOPSOIL BORROW	(LV)	CU YD	335.26	0	0	684.74	0	0	0	1020.00	0	\$ 35.00
104	2575.504	SODDING TYPE LAWN		SQ YD	1910	0	0	874	0	0	0	2784.00	0	\$ 88.00
105	2575.504	ROLLED EROSION PREVENTION CATEGORY 20 W/ SEED MIXTURE (XX-)	(1B)	SQ YD	284	0	0	3607	0	0	0	3891.00	0	\$ 4.00
106	2582.518	CROSSWALK MULTI-COMPONENT		SQ FT	240	0	0	0	0	0	0	240.00	0	\$ 35.00
<b>ESTIMATED CONSTRUCTION SUBTOTAL</b>					\$ 695,905.25	\$ 295,336.00	\$ 86,050.00	\$ 144,933.28	\$ 395,144.89	\$ 341,589.00	\$ 33,750.00	\$ 220,302.67	\$ 12,249.72	\$ 2,148,260.30
<b>10% CONTINGENCY</b>					\$ 69,590.52	\$ 29,533.60	\$ 8,605.00	\$ 14,493.33	\$ 39,514.49	\$ 34,158.90	\$ 3,375.00	\$ 22,030.27	\$ 1,224.97	\$ 214,826.03
<b>ESTIMATED CONSTRUCTION TOTAL</b>					\$ 765,495.77	\$ 324,869.60	\$ 94,655.00	\$ 159,426.61	\$ 434,659.38	\$ 375,747.90	\$ 37,125.00	\$ 242,332.94	\$ 13,474.69	\$ 2,363,086.33
<b>27% OVERHEAD</b>					\$ 206,961.00	\$ 76,132.00	\$ 25,557.00	\$ 43,045.00	\$ 105,775.00	\$ 101,452.00	\$ 10,024.00	\$ 65,430.00	\$ 3,636.00	\$ 65,430.00
<b>ESTIMATED PROJECT TOTAL</b>					\$ 972,456.77	\$ 400,999.60	\$ 120,212.00	\$ 202,471.61	\$ 540,434.38	\$ 477,200.00	\$ 47,149.00	\$ 307,762.94	\$ 17,110.69	\$ 3,001,150.30

## Appendix C: Preliminary Assessment Roll

**PRELIMINARY ASSESSMENT ROLL**  
 2024 PMP STREET & UTILITY IMPROVEMENTS  
 CITY OF ARDEN HILLS, MINNESOTA  
 BMI PROJECT NO. 0T1.130168  
 JULY, 2023

Parcel # on Map	Parcel ID	Site Address	Owner Name 1	Owner Name 2	Owner Address	City/State/Zip Code	Single-Family REU	Proposed Total Assessment
43	223023220021	4522 KEITHSON DR	JAMES C ANDERSON	JOAN ANDERSON	4522 KEITHSON DR	ARDEN HILLS MN 55112-5785	1	\$ 5,660.00
51	223023220017	4550 KEITHSON DR	TRUOC NHU DO	KIM LANG THI TRAN	4550 KEITHSON DR	ARDEN HILLS MN 55112-5785	1	\$ 5,660.00
80	223023220018	4540 KEITHSON DR	PARVEEN J BHARMAL		4540 KEITHSON DR	ARDEN HILLS MN 55112-5785	1	\$ 5,660.00
83	223023220022	4516 KEITHSON DR	KURT F LAWRENCE	SUSAN C LAWRENCE	4516 KEITHSON DR	ARDEN HILLS MN 55112-5785	1	\$ 5,660.00
210	223023230054	1576 ROYAL HILLS DR	JAMES E OSTLUND	JILL L OSTLUND	1576 ROYAL HILLS DR	ARDEN HILLS MN 55112-3905	1	\$ 5,660.00
266	223023220019	4534 KEITHSON DR	MARK E HELLENDRUNG	KAREN A HELLENDRUNG	4534 KEITHSON DR	ARDEN HILLS MN 55112-5785	1	\$ 5,660.00
267	223023220020	4528 KEITHSON DR	MISKY HILLESTAD	MATTHEW HILLESTAD	4528 KEITHSON DR	ARDEN HILLS MN 55112-5785	1	\$ 5,660.00
290	223023230053	1566 ROYAL HILLS DR	JESSE JOHNSON	JORDAN JOHNSON	1566 ROYAL HILLS DR	SAINT PAUL MN 55112-3905	1	\$ 5,660.00
303	223023230052	1556 ROYAL HILLS DR	EUGENE A CAFFERTY		1556 ROYAL HILLS DR	ARDEN HILLS MN 55112-3905	1	\$ 5,660.00
318	223023230044	1555 ROYAL HILLS DR	WILLIAM P LUDWIG TR	CHERYL LUDWIG TR	1555 ROYAL HILLS DR	ARDEN HILLS MN 55112-3906	1	\$ 5,660.00
331	223023230045	1565 ROYAL HILLS DR	JOHN D WROBEL	GRETCHEN E WROBEL	1565 ROYAL HILLS DR	ARDEN HILLS MN 55112-3906	1	\$ 5,660.00
341	223023220023	4510 KEITHSON DR	JONATHAN P WICKLUND	ALEETA J WICKLUND	4510 KEITHSON DR	ARDEN HILLS MN 55112-5785	1	\$ 5,660.00
361	223023220024	4504 KEITHSON DR	MICHAEL C NELSON	DESIREE M NELSON	4504 KEITHSON DR	ARDEN HILLS MN 55112-5785	1	\$ 5,660.00
364	223023230018	1524 COLLEEN AVE	JENNY FULLER	DAVID FULLER	1524 COLLEEN AVE	NEW BRIGHTON MN 55112-1933	1	\$ 5,660.00
365	223023230011	1531 MCCLUNG DR	NEIL CHAFFEE	ELISSA CHAFFEE	1531 MCCLUNG DR	NEW BRIGHTON MN 55112-1908	1	\$ 5,660.00
376	223023230048	1528 ROYAL HILLS DR	JEFFREY A SORENSEN	KARA L SORENSEN	1528 ROYAL HILLS DR	ARDEN HILLS MN 55112-3905	1	\$ 5,660.00
377	223023230051	1546 ROYAL HILLS DR	ERIC D PRINCE	ROBIN M PRINCE	1546 ROYAL HILLS DR	ARDEN HILLS MN 55112-6352	1	\$ 5,660.00
382	223023230042	4409 ROYAL HILLS DR	KEITH E PALMER	CLAIRE J PALMER	4409 ROYAL HILLS DR	ARDEN HILLS MN 55112-3908	1	\$ 5,660.00
383	223023230043	1535 ROYAL HILLS DR	DAN M LAMATSCH	RITA L LAMATSCH	1535 ROYAL HILLS DR	ARDEN HILLS MN 55112-3906	1	\$ 5,660.00
391	223023220025	4539 KEITHSON DR	IVER SKOG	ERICA SKOG	4539 KEITHSON DR	SAINT PAUL MN 55112-5785	2	\$ 11,320.00
392	223023220012	4527 KEITHSON DR	RICHARD W FOSTER TR		4527 KEITHSON DR	ARDEN HILLS MN 55112-5785	1	\$ 5,660.00
406	223023230049	1532 ROYAL HILLS DR	DANIEL P NORDBY TR	EILEEN A NORDBY TR	1532 ROYAL HILLS DR	ARDEN HILLS MN 55112-3905	1	\$ 5,660.00
410	223023230050	1534 ROYAL HILLS DR	CAROMYR F SILVESTRINI TR		1534 ROYAL HILLS DR	ARDEN HILLS MN 55112-3905	1	\$ 5,660.00
415	223023230012	1523 MCCLUNG DR	GAIL P TELLANDER		1523 MCCLUNG DR	NEW BRIGHTON MN 55112-1908	1	\$ 5,660.00
416	223023230022	1515 COLLEEN AVE	CHRISTOPHER M MANRODT	LISA M MANRODT	1515 COLLEEN AVE	NEW BRIGHTON MN 55112-1932	1	\$ 5,660.00
417	223023230023	1511 COLLEEN AVE	KATHLEEN WOODEN FLANAGAN		1511 COLLEEN AVE	ARDEN HILLS MN 55112-1932	1	\$ 5,660.00
424	223023230025	1479 COLLEEN AVE	DOUGLAS D MOE	JACQUELINE J FRANZWA MOE	1479 COLLEEN AVE	ARDEN HILLS MN 55112-1939	1	\$ 5,660.00
425	223023230001	1520 COLLEEN AVE	MINH DU	MYHANH DU	1520 COLLEEN AVE	ARDEN HILLS MN 55112-1933	1	\$ 5,660.00
426	223023230026	1469 COLLEEN AVE	LYNNE B STOESZ		1469 COLLEEN AVE	ARDEN HILLS MN 55112-1939	1	\$ 5,660.00
427	223023230024	1489 COLLEEN AVE	JANICE F MILLER		1489 COLLEEN AVE	ARDEN HILLS MN 55112-1939	1	\$ 5,660.00
430	223023230029	1565 BRIARKNOLL DR	ADAM HAHN	SABRINA BURN	1565 BRIARKNOLL DR	ARDEN HILLS MN 55112-1978	1	\$ 5,660.00
431	223023230020	1509 COLLEEN AVE	GREGORY R JOHNSON	JANE N JOHNSON	1509 COLLEEN AVE	ARDEN HILLS MN 55112-1996	1	\$ 5,660.00
446	223023230021	1519 MCCLUNG DR	AMY SUE TOLBERT		1519 MCCLUNG DR	NEW BRIGHTON MN 55112-1902	1	\$ 5,660.00
447	223023230015	1496 BRIARKNOLL DR	GARY F HOTTMAN	PATRICIA M HOTTMAN	1496 BRIARKNOLL DR	ARDEN HILLS MN 55112-1975	1	\$ 5,660.00
452	223023220027	4503 KEITHSON DR	DAVID LEE BARTLETT		4503 KEITHSON AVE	NEW BRIGHTON MN 55112-5785	1	\$ 5,660.00
454	223023220030	4509 KEITHSON DR	KEVIN L MILLER	EMILY N MILLER	4509 KEITHSON DR	ARDEN HILLS MN 55112-5785	1	\$ 5,660.00
455	223023220028	4521 KEITHSON DR	JING CHEN	XIAOYI ZHU	4521 KEITHSON DR	ARDEN HILLS MN 55112-5785	1	\$ 5,660.00
461	2230232310026	1359 COLLEEN AVE	SHANE G PETRICH	DENISE J PETRICH	1359 COLLEEN AVE	NEW BRIGHTON MN 55112-1907	1	\$ 5,660.00
462	2230232310025	1367 COLLEEN AVE	JAMES E HINRICHS TR	LINDA K HINRICHS TR	1367 COLLEEN AVE	ARDEN HILLS MN 55112-1907	1	\$ 5,660.00
463	2230232310024	1377 COLLEEN AVE	RICHARD D ANDERSEN	PATRICIA K ANDERSEN	1377 COLLEEN AVE	ARDEN HILLS MN 55112-1907	1	\$ 5,660.00
464	2230232310023	1385 COLLEEN AVE	COLBY S STARKER	SARA L THRASHER	1385 COLLEEN AVE	NEW BRIGHTON MN 55112-1907	1	\$ 5,660.00
465	2230232310020	1413 COLLEEN AVE	MACK FERTIG	LISA FERTIG	1413 COLLEEN AVE	ARDEN HILLS MN 55112-1939	1	\$ 5,660.00
466	2230232310019	1423 COLLEEN AVE	VAN-HA NGUYEN		1423 COLLEEN AVE	ARDEN HILLS MN 55112-1939	1	\$ 5,660.00
467	2230232310018	1431 COLLEEN AVE	JAMES NEWTON	REGINA NEWTON	1431 COLLEEN AVE	ARDEN HILLS MN 55112-1939	1	\$ 5,660.00
468	2230232310021	1403 COLLEEN AVE	ALIREZA FOROOZAN YAZDANI	SUZETTE FOROOZAN YAZDANI	1403 COLLEEN AVE	ARDEN HILLS MN 55112-1939	1	\$ 5,660.00
469	2230232310016	1449 COLLEEN AVE	JUNE CORNELL	DARRYL CORNELL	1449 COLLEEN AVE	ARDEN HILLS MN 55112-1939	1	\$ 5,660.00
470	2230232310017	1441 COLLEEN AVE	MATTHEW BICKFORD	SALLY BICKFORD	1441 COLLEEN AVE	ARDEN HILLS MN 55112-1939	1	\$ 5,660.00
471	2230232310022	1395 COLLEEN AVE	AMANDA J GOKSU	FIKRI GOKSU	1395 COLLEEN AVE	SAINT PAUL MN 55112-1907	1	\$ 5,660.00
473	223023230019	1522 COLLEEN AVE	JOSEPH BAARSCH	JANELLE BAARSCH	1522 COLLEEN AVE	ARDEN HILLS MN 55112-1933	1	\$ 5,660.00
474	2230232310027	1349 COLLEEN AVE	MICHAEL W BOHMAN	PATRICIA L BOHMAN	1349 COLLEEN AVE	ARDEN HILLS MN 55112-1907	1	\$ 5,660.00
513	223023230019	4258 NORMA AVE	GEORGE A KRUSE	JUDITH A KRUSE	4258 NORMA AVE	ST PAUL MN 55112-1987	1	\$ 5,660.00
524	223023230017	4242 NORMA AVE	BRENT D LOWNSBERY	ASHLEY E LOWNSBERY	4242 NORMA AVE	ARDEN HILLS MN 55112-1987	1	\$ 5,660.00
527	223023230016	1486 BRIARKNOLL DR	SAM MOSLEY AVUK		1486 BRIARKNOLL DR	ARDEN HILLS MN 55112-1975	1	\$ 5,660.00
547	223023230002	1516 COLLEEN AVE	TROY SPERBECK	KARSTEN SPERBECK	1516 COLLEEN AVE	ARDEN HILLS MN 55112-1933	1	\$ 5,660.00
567	2230232310028	4286 JAMES AVE	BHIN LLC		2437 RICE ST	ROSEVILLE MN 55113-3706	1	\$ 5,660.00
568	2230232310029	4274 JAMES AVE	DENNIS W BOLDT	KATHLEEN A BOLDT	4274 JAMES AVE	ARDEN HILLS MN 55112-1936	1	\$ 5,660.00
569	2230232310030	4262 JAMES AVE	MIIN MING CHEN	AY UAN LAU CHEN	4262 JAMES AVE	ARDEN HILLS MN 55112-1936	1	\$ 5,660.00
577	2230232310006	1436 COLLEEN AVE	RODERICK N HALE	HELEN L HANSON	1436 COLLEEN AVE	ARDEN HILLS MN 55112-1940	1	\$ 5,660.00
589	2230232310014	1348 COLLEEN AVE	JOHN BOGGS	ASHA BOGGS	1348 COLLEEN AVE	ARDEN HILLS MN 55112-1934	1	\$ 5,660.00
593	2230232310009	1406 COLLEEN AVE	TIMOTHY W NORTHROP	CAROLINE F NORTHROP	1406 COLLEEN AVE	ARDEN HILLS MN 55112-1940	1	\$ 5,660.00
594	2230232310005	1446 COLLEEN AVE	JACK Y CHEW	YEE SIAN CHUA	1446 COLLEEN AVE	ARDEN HILLS MN 55112-1940	1	\$ 5,660.00
597	2230232310008	1414 COLLEEN AVE	SANDRA M LING	CHAD T LING	1414 COLLEEN AVE	ARDEN HILLS MN 55112-1940	1	\$ 5,660.00
599	223023230012	4275 NORMA AVE	JENNIFER R SUTHERLAND	BRIAN L SUTHERLAND	4275 NORMA AVE	ARDEN HILLS MN 55112-1986	1	\$ 5,660.00

**PRELIMINARY ASSESSMENT ROLL**  
 2024 PMP STREET & UTILITY IMPROVEMENTS  
 CITY OF ARDEN HILLS, MINNESOTA  
 BMI PROJECT NO. 0T1.130168  
 JULY, 2023

Parcel # on Map	Parcel ID	Site Address	Owner Name 1	Owner Name 2	Owner Address	City/State/Zip Code	Single-Family REU	Proposed Total Assessment
600	223023320022	4286 NORMA AVE	EILEEN K SCOTT	STEVEN L SCOTT	4286 NORMA AVE	ARDEN HILLS MN 55112-1987	1	\$ 5,660.00
602	223023320013	4283 NORMA AVE	MARK A LOZANO	DAVID E GIBBONS	4283 NORMA AVE	NEW BRIGHTON MN 55112-1986	1	\$ 5,660.00
603	223023320011	4265 NORMA AVE	BRANDON J CARR	EMILY E CARR	4265 NORMA AVE	ARDEN HILLS MN 55112-1986	1	\$ 5,660.00
604	223023320020	4268 NORMA AVE	THEODORE C BLUS	EMILY D BLUS	4268 NORMA AVE	ARDEN HILLS MN 55112-1987	1	\$ 5,660.00
605	223023320021	4276 NORMA AVE	ANNE E HALL	DAVID A HARRINGTON	4276 NORMA AVE	ARDEN HILLS MN 55112-1987	1	\$ 5,660.00
609	223023320023	4292 NORMA AVE	KELLY G LAUDON	ANTHONY C LAUDON	4292 NORMA AVE	ARDEN HILLS MN 55112-1987	1	\$ 5,660.00
617	223023310010	4297 JAMES AVE	LISA FENSKÉ		4297 JAMES AVE	ARDEN HILLS MN 55112-1960	1	\$ 5,660.00
618	223023310004	1458 COLLEEN AVE	MATTHEW CASTILLO PROM	VALERIE AMANDA PROM CASTILLO	1458 COLLEEN AVE	ARDEN HILLS MN 55112-1940	1	\$ 5,660.00
619	223023320014	4293 NORMA AVE	MARY P HOLERUD		4293 NORMA AVE	NEW BRIGHTON MN 55112-1986	1	\$ 5,660.00
621	223023320010	4255 NORMA AVE	GREGORY S MADSEN	ELEANOR M MARAVILLAS	4255 NORMA AVE	ARDEN HILLS MN 55112-1986	1	\$ 5,660.00
622	223023310007	1426 COLLEEN AVE	DAVID P STEWART	DIANE L STEWART	1426 COLLEEN AVE	ARDEN HILLS MN 55112-1940	1	\$ 5,660.00
664	223023310064	1370 COLLEEN AVE	EDWARD A ROBINSON	BETTY A ROBINSON	1370 COLLEEN AVE	ARDEN HILLS MN 55112-1934	2	\$ 11,320.00
669	223023310011	1388 COLLEEN AVE	CHRISTOPHER JOHN OHLAND	JENNIFER LEE DUPIC OHLAND	1388 COLLEEN AVE	ARDEN HILLS MN 55112-1934	1	\$ 5,660.00
676	223023310015	1457 COLLEEN AVE	JO ELLEN WALKER	DANA D GIBSON	1457 COLLEEN AVE	ARDEN HILLS MN 55112-1939	1	\$ 5,660.00
683	223023320045	1503 BRIARKNOLL DR	FRANK P SCHUNA JR	JOANNE M SCHUNA	1503 BRIARKNOLL DR	ARDEN HILLS MN 55112-1978	1	\$ 5,660.00
684	223023320018	4250 NORMA AVE	DAVID CLINE		4250 NORMA AVE	ARDEN HILLS MN 55112-1987	1	\$ 5,660.00
688	223023320027	1503 COLLEEN AVE	ANTHONY T MCGINNITY	ALISON C BELL MCGINNITY	1503 COLLEEN AVE	ARDEN HILLS MN 55112-1996	1	\$ 5,660.00
692	223023230040	4429 ROYAL HILLS DR	JAMES R WESTLUND	PAULA WESTLUND	4429 ROYAL HILLS DR	NEW BRIGHTON MN 55112-3908	1	\$ 5,660.00
694	223023230046	1575 ROYAL HILLS DR	CHRISTOPHER J WINKELS	SHANNON M WINKELS	1575 ROYAL HILLS DR	ARDEN HILLS MN 55112-3906	1	\$ 5,660.00
696	223023230039	4439 ROYAL HILLS DR	JAMES BARD	MIDORI BARD	4439 ROYAL HILLS DR	ARDEN HILLS MN 55112-3908	1	\$ 5,660.00
699	223023230041	4419 ROYAL HILLS DR	HWA CHENG	FEN TSYI CHENG	4419 ROYAL HILLS DR	ARDEN HILLS MN 55112-3908	1	\$ 5,660.00
<b>TOTAL RECLAMATION AREAS</b>								<b>\$ 486,760.00</b>
211	223023230007	1565 MCCLUNG DR	ESTHER M MCCLUNG		17155 FRONT BEACH RD # 704E	PANAMA CITY FL 32413-2376	1	\$ 3,605.00
281	223023230006	1575 MCCLUNG DR	HAROLD M PETERSEN		1575 MCCLUNG DR	ARDEN HILLS MN 55112-1908	1	\$ 3,605.00
282	223023230035	1500 ARDEN VISTA CT	WENDELL A FERGUSON TR	MARY E FERGUSON TR	1500 ARDEN VISTA CT	ARDEN HILLS MN 55112-3903	1	\$ 3,605.00
283	223023230080	1570 MCCLUNG DR	ESTHER M MCCLUNG		17155 FRONT BEACH RD 704C	PANAMA CITY BEACH FL 32413-2370	1	\$ 3,605.00
288	223023230028	1497 ARDEN VISTA CT	JOHN D ZAMOW	DEBORAH A ZAMOW	1497 ARDEN VISTA CT	ARDEN HILLS MN 55112-3902	1	\$ 3,605.00
289	223023230062	1527 ARDEN VISTA CT	BRIAN F MOY	ANGELA L PAN	1527 ARDEN VISTA CT	ARDEN HILLS MN 55112-3904	1	\$ 3,605.00
291	223023230081	0 MCCLUNG DR	JOHN B MCCLUNG		17155 FRONT BEACH RD UNIT 704E	PANAMA CITY BEACH FL 32413-2376	1	\$ 3,605.00
292	223023230031	1518 ARDEN VISTA CT	GILBERT EVANS	JODI EVANS	1518 ARDEN VISTA CT	ARDEN HILLS MN 55112-3903	1	\$ 3,605.00
293	223023230013	1556 MCCLUNG DR	MARK L PIGNATELLO	SUSAN M PIGNATELLO	1556 MCCLUNG DR	ARDEN HILLS MN 55112-1950	1	\$ 3,605.00
302	223023230066	1509 ARDEN VISTA CT	NATHAN J ROLLOFF	HEATHER J ROLLOFF	1509 ARDEN VISTA CT	ARDEN HILLS MN 55112-3904	1	\$ 3,605.00
333	223023230008	1555 MCCLUNG DR	RYAN A JENNER	RACHEL L JENNER	1555 MCCLUNG DR	ARDEN HILLS MN 55112-1908	1	\$ 3,605.00
363	223023230009	1545 MCCLUNG DR	ROBERT L JENSEN	SARA L JENSEN	1545 MCCLUNG DR	ARDEN HILLS MN 55112-1908	1	\$ 3,605.00
366	223023230010	1537 MCCLUNG DR	CAROLIO L FORNERIS		1537 MCCLUNG DR	ARDEN HILLS MN 55112-1908	1	\$ 3,605.00
367	223023230015	1538 MCCLUNG DR	MEGAN MARIE REETZ	WADE MAGNUSON	1538 MCCLUNG DR	ARDEN HILLS MN 55112-1950	1	\$ 3,605.00
368	223023230014	1546 MCCLUNG DR	RICHARD G PAULSEN	MARLENE L PAULSEN	1546 MCCLUNG DR	ARDEN HILLS MN 55112-1950	1	\$ 3,605.00
373	223023230064	1513 ARDEN VISTA CT	BRENDAN J DALY	BETH N KNUTSON	1513 ARDEN VISTA CT	ARDEN HILLS MN 55112-3904	1	\$ 3,605.00
374	223023230063	1517 ARDEN VISTA CT	PAUL J WEBER	CYNTHIA S WEBER	1517 ARDEN VISTA CT	ARDEN HILLS MN 55112-3904	1	\$ 3,605.00
375	223023230065	1511 ARDEN VISTA CT	ROBERT J ZAPOLSKI	SUZANNE R ZAPOLSKI	1511 ARDEN VISTA CT	ARDEN HILLS MN 55112-3904	1	\$ 3,605.00
380	223023230047	1520 ARDEN VISTA CT	RONGSHENG RUAN TR	AIHUA SONG TR	1520 ARDEN VISTA CT	ARDEN HILLS MN 55112-3903	1	\$ 3,605.00
407	223023230030	1479 ARDEN VISTA CT	ROBERT P SCHAFFER	BETH K SCHAFFER	1479 ARDEN VISTA CT	ARDEN HILLS MN 55112-3902	1	\$ 3,605.00
408	223023230029	1487 ARDEN VISTA CT	KEITH S JENSEN	JENNIFER L JENSEN	1487 ARDEN VISTA CT	ARDEN HILLS MN 55112-3902	1	\$ 3,605.00
409	223023230027	1507 ARDEN VISTA CT	JINGYAN ZHANG	SHOUWU GUO	1507 ARDEN VISTA CT	SAINT PAUL MN 55112-3904	1	\$ 3,605.00
411	223023230032	1516 ARDEN VISTA CT	THOMAS E RUBBELKE	KATHY J RUBBELKE	1516 ARDEN VISTA CT	ARDEN HILLS MN 55112-3903	1	\$ 3,605.00
412	223023230038	1470 ARDEN VISTA CT	PAUL J GAM	QUEENIE K GAM	1470 ARDEN VISTA CT	ARDEN HILLS MN 55112-3901	1	\$ 3,605.00
413	223023230033	1514 ARDEN VISTA CT	RICHARD V MORPHEW	PATRICIA B MORPHEW	1514 ARDEN VISTA CT	ARDEN HILLS MN 55112-3903	1	\$ 3,605.00
414	223023230034	1510 ARDEN VISTA CT	LARRY B RICKE	MEGAN K RICKE	1510 ARDEN VISTA CT	ARDEN HILLS MN 55112-3903	1	\$ 3,605.00
423	223023320028	1575 BRIARKNOLL DR	BRETT WALLING	SHANNON WALLING	1575 BRIARKNOLL DR	ARDEN HILLS MN 55112-1575	1	\$ 3,605.00
429	223023320032	1537 BRIARKNOLL CIR	DAVID R EHRENKROOK	BRITTANY H EHRENKROOK	1537 BRIARKNOLL CIR	ARDEN HILLS MN 55112-1981	1	\$ 3,605.00
441	223023230036	1490 ARDEN VISTA CT	BARBARA S BRETT		1490 ARDEN VISTA CT	ARDEN HILLS MN 55112-3901	1	\$ 3,605.00
442	223023230037	1480 ARDEN VISTA CT	LYLE R SALMELA TR	ELAINE D SALMELA TR	1480 ARDEN VISTA CT	NEW BRIGHTON MN 55112-3901	1	\$ 3,605.00
445	223023230016	1528 MCCLUNG DR	LUCAS BRANDT	JESSICA BRANDT	1528 MCCLUNG DR	ARDEN HILLS MN 55112-1950	1	\$ 3,605.00
500	223023320046	1556 BRIARKNOLL DR	ROBERT H OPHAUG	JUDITH A OPHAUG	1556 BRIARKNOLL DR	ARDEN HILLS MN 55112-1977	1	\$ 3,605.00
501	223023320007	4276 COLLEEN CIR	JONATHAN VANBUREN	MARGARET VANBUREN	4276 COLLEEN CIR	ARDEN HILLS MN 55112-1935	1	\$ 3,605.00
528	223023320035	1550 BRIARKNOLL CIR	PATRICK T HAIK	BONNIE L HAIK	1550 BRIARKNOLL CIR	ARDEN HILLS MN 55112-1981	1	\$ 3,605.00
529	223023320050	1546 BRIARKNOLL DR	BRIAN R DESCHNEAU	MICHAEL DESCHNEAU	1546 BRIARKNOLL DR	ARDEN HILLS MN 55112	1	\$ 3,605.00
530	223023320034	1538 BRIARKNOLL CIR	NIKLAS JORVE	CARLIANNE JORVE	1538 BRIARKNOLL CIR	ARDEN HILLS MN 55112-1981	1	\$ 3,605.00
531	223023320004	4287 COLLEEN CIR	MICHAEL R GEORGE	JULIE M GEORGE	4287 COLLEEN CIR	NEW BRIGHTON MN 55112-1935	1	\$ 3,605.00
532	223023320041	1531 BRIARKNOLL DR	WILLIAM J REMES	AMY C REMES	1531 BRIARKNOLL DR	ARDEN HILLS MN 55112-1978	1	\$ 3,605.00
533	223023320042	1523 BRIARKNOLL DR	ROBERT A COREY	JANNICA L GROOM	1523 BRIARKNOLL DR	NEW BRIGHTON MN 55112-1978	1	\$ 3,605.00
534	223023320044	1511 BRIARKNOLL DR	DONALD J SUDDUTH	ANNE E SUDDUTH	1511 BRIARKNOLL DR	ARDEN HILLS MN 55112-1978	1	\$ 3,605.00

**PRELIMINARY ASSESSMENT ROLL**

2024 PMP STREET & UTILITY IMPROVEMENTS  
 CITY OF ARDEN HILLS, MINNESOTA  
 BMI PROJECT NO. OT1.130168  
 JULY, 2023

Parcel # on Map	Parcel ID	Site Address	Owner Name 1	Owner Name 2	Owner Address	City/State/Zip Code	Single-Family REU	Proposed Total Assessment
535	223023320038	1549 BRIARKNOLL DR	JEREMIAH S BECKER	ANDREA R A BECKER	1549 BRIARKNOLL DR	ARDEN HILLS MN 55112-1978	1	\$ 3,605.00
536	223023320048	1552 BRIARKNOLL DR	KATY LEE		1552 BRIARKNOLL DR	ARDEN HILLS MN 55112-1977	1	\$ 3,605.00
537	223023320040	1537 BRIARKNOLL DR	MARK JEDLENSKI	NATALIE A JEDLENSKI	1537 BRIARKNOLL DR	ARDEN HILLS MN 55112-1978	1	\$ 3,605.00
538	223023320049	1548 BRIARKNOLL DR	STEVEN M POUCHER	JOLENE M POUCHER	1548 BRIARKNOLL DR	ARDEN HILLS MN 55112-1977	1	\$ 3,605.00
540	223023320003	4293 COLLEEN CIR	JOHN F ROTH	GINNY L ROTH	4293 COLLEEN CIR	ARDEN HILLS MN 55112-1935	1	\$ 3,605.00
558	223023330009	1467 ROYAL LN	ADAM J DE QUESADA	NICOLE M DE QUESADA	1467 ROYAL LN	SAINT PAUL MN 55112-1983	1	\$ 3,605.00
559	223023330008	1475 ROYAL LN	JOHN P VANVALKENBURG	TAMARA J GERTEN	1475 ROYAL LN	ARDEN HILLS MN 55112-1983	1	\$ 3,605.00
560	223023330007	1483 ROYAL LN	MATTHEW P NEARY	STACY A NEARY	1483 ROYAL LN	NEW BRIGHTON MN 55112-1983	1	\$ 3,605.00
561	223023330006	1491 ROYAL LN	BRYAN FOSS	MICHELLE FOSS	1491 ROYAL LN	ARDEN HILLS MN 55112-1983	1	\$ 3,605.00
563	223023330005	1501 ROYAL LN	BRIAN T SUNESON	PAMELA C SUNESON	1501 ROYAL LN	NEW BRIGHTON MN 55112-3910	1	\$ 3,605.00
578	223023320036	1556 BRIARKNOLL CIR	ROBERT M SUNDBERG	LORI A SUNDBERG	1556 BRIARKNOLL CIR	ARDEN HILLS MN 55112-1981	1	\$ 3,605.00
579	223023320009	4294 COLLEEN CIR	OVE A SUNDBERG	KARI N SUNDBERG	4294 COLLEEN CIR	ARDEN HILLS MN 55112-1935	1	\$ 3,605.00
598	223023320037	1553 BRIARKNOLL DR	CHRISTOPHER M VOSBEEK	LISA K VOSBEEK	1553 BRIARKNOLL DR	ARDEN HILLS MN 55112-1978	1	\$ 3,605.00
601	223023320055	1518 BRIARKNOLL DR	NICHOLAS P WALKER	LEANN MARIE WALKER	1518 BRIARKNOLL DR	NEW BRIGHTON MN 55112-1977	1	\$ 3,605.00
606	223023320053	1528 BRIARKNOLL DR	TIA THAO		1528 BRIARKNOLL DR	ARDEN HILLS MN 55112-1977	1	\$ 3,605.00
610	223023320054	1522 BRIARKNOLL DR	JOSHUA J COLLINS	MELISSA J COLLINS	1522 BRIARKNOLL DR	ARDEN HILLS MN 55112-1977	1	\$ 3,605.00
614	223023320051	1542 BRIARKNOLL DR	BRADLEY J RODDY	SARA J RODDY	1542 BRIARKNOLL DR	ARDEN HILLS MN 55112-1977	1	\$ 3,605.00
615	223023320056	1512 BRIARKNOLL DR	PATRICK STROM	BRIGETTE MILLER	152 BRIARKNOLL DR	ARDEN HILLS MN 55112-1977	1	\$ 3,605.00
620	223023320008	4284 COLLEEN CIR	VICKI S SCHLIEPER	RANDALL S SCHLIEPER	4284 COLLEEN CIR	ARDEN HILLS MN 55112-1935	1	\$ 3,605.00
623	223023320052	1536 BRIARKNOLL DR	LINDA MELOM	TERRY MELOM	1536 BRIARKNOLL DR	ARDEN HILLS MN 55112-1977	1	\$ 3,605.00
667	223023320047	1554 BRIARKNOLL DR	STEPHANIE GIBBS	PATRICK GIBBS	1554 BRIARKNOLL DR	ARDEN HILLS MN 55112-1977	1	\$ 3,605.00
668	223023320043	1517 BRIARKNOLL DR	SHIDHARAN RAMASWAMY	ULRIKE W TSCHIRNER	1517 BRIARKNOLL DR	ARDEN HILLS MN 55112-1978	1	\$ 3,605.00
670	223023320006	4274 COLLEEN CIR	MOLLY B BEHYMER		4274 COLLEEN CIR	NEW BRIGHTON MN 55112-1935	1	\$ 3,605.00
674	223023320039	1543 BRIARKNOLL DR	ALAN LOTH	MICHELE A LOTH	1543 BRIARKNOLL DR	ARDEN HILLS MN 55112-1978	1	\$ 3,605.00
677	223023320033	1531 BRIARKNOLL CIR	RICK S LUK	CATHERINE T H LUK	1531 BRIARKNOLL CIR	ARDEN HILLS MN 55112-1981	1	\$ 3,605.00
678	223023320005	4277 COLLEEN CIR	STEVEN W FIRKUS	JULIE E FIRKUS	4277 COLLEEN CIR	ARDEN HILLS MN 55112-1935	1	\$ 3,605.00
681	223023330019	1498 ROYAL LN	A H ZIAI MEHR	MURIEL OLSON ZIAI MEHR	1498 ROYAL LN	ST PAUL MN 55112-1982	1	\$ 3,605.00
682	223023320031	1547 BRIARKNOLL CIR	ANTHONY C BURBA	CANDACE J BURBA	1547 BRIARKNOLL CIR	ARDEN HILLS MN 55112-1981	1	\$ 3,605.00
685	223023320030	1555 BRIARKNOLL CIR	DAVID W BOLDT	AMANDA F BOLDT	1555 BRIARKNOLL CIR	NEW BRIGHTON MN 55112-1981	1	\$ 3,605.00
<b>TOTAL MILL &amp; OVERLAY AREAS</b>								<b>\$ 248,745.00</b>
<b>TOTAL PROJECT ASSESSMENTS</b>								<b>\$ 735,505.00</b>

## Appendix D: Public Feedback



# RESIDENT SURVEY

Dear Resident/Property Owner:

The City of Arden Hills has initiated the preliminary design phase of the 2024 PMP Street & Utility Improvements Project. The project includes pavement rehabilitation in accordance with the city's Pavement Management Plan, as well as select utility improvements and pond dredging. A project location map is included with this letter, which illustrates the proposed project areas. This resident survey will help us gather information from homeowners that can be incorporated into the final design of this project. Please complete this survey and return it no later than **Friday, May 26, 2023** to share concerns and provide input for the proposed construction areas.

**Mail/drop-off location:** Arden Hills City Hall, 1245 W Highway 96

**Email to Lucas Miller:** [lmiller@cityofardenhills.org](mailto:lmiller@cityofardenhills.org)

**Name:** \_\_\_\_\_ **Address:** \_\_\_\_\_

**Email:** \_\_\_\_\_ **Phone:** \_\_\_\_\_

Property owners are welcome to call or email Lucas Miller if you would like to discuss project specifics and/or your unique property concerns at 651-792-7846 or [lmiller@cityofardenhills.org](mailto:lmiller@cityofardenhills.org). Also, the City does not always know the addresses of rental properties within the proposed construction areas. If you own a property with rental units, please share this information with your tenants.

**Private Facilities**

1. Do you have a private underground facility within the right-of-way, approximately 15-feet from the street? (Circle all that apply)

**Irrigation System    Invisible Dog Fence    Electric Wiring    None    Unsure**

**Other:** \_\_\_\_\_

2. Do you have any above-ground landscaping or other objects such as boulders, statues, or light poles within the right-of-way, approximately 15-feet from the street? If yes, please explain.

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3. Does your home have a sump pump?                      **Yes                      No                      Unsure**

*If your answer above is no, you may skip questions 4 & 5.*



# RESIDENT SURVEY

4. How frequently does your sump pump normally operate? (Circle all that apply)

**Regularly**    **After Rainfall**    **Seasonally**    **Winter**    **Not at all**    **Other:** \_\_\_\_\_

5. Where does your sump pump current discharge? (Circle all that apply)

**Front Yard**    **Back Yard**    **Side Yard**    **Basement**    **Other:** \_\_\_\_\_

6. Do you have any exterior drain tiles or buried roof drains on your property?

**Yes**    **No**    **Unsure**

## Utilities

7. Have you experienced any issues with your sanitary sewer service? If yes, please explain.

---

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8. Have you experienced any issues with your water service? If yes, please explain.

---

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## Pavement/Drainage

9. How would you classify the condition of the roadway pavement?

**Severely Deteriorated**    **Somewhat Deteriorated**    **Fair**    **Good**    **New**

10. Does your property, or the roadway in front of your property, have drainage issues (ponding after significant rainfall, flooding, erosion along the boulevard, etc.)? If yes, please explain.

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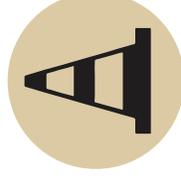


# 2024 PMP STREET & UTILITY IMPROVEMENTS

April 2023 Resident Survey Summary | 66 Respondents



Trail system throughout the neighborhood was noted to be in poor condition and in need of resurfacing



Request to minimize impacts and mitigate crime during construction



Concern over impacts to irrigation systems and dog fences



Several properties experience issues with slopes of driveway entrances



Concern with how the project will be assessed



Number of properties experiencing drainage issues

## Appendix E: Geotechnical Evaluation

# Pavement Evaluation Report

2022 Rehabilitation – Phase 1  
Various City Streets  
Arden Hills, Minnesota

*Prepared for*

## City of Arden Hills

### Professional 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.

*Kevin S. Zalec*

Kevin S. Zalec, PE  
Senior Engineer  
License Number: 47909  
June 23, 2022



June 23, 2022

Project B2204011

Mr. David Swearingen  
City of Arden Hills  
1425 Paul Kirkwold Drive  
Arden Hills, MN 55112

Re: Pavement Evaluation  
2022 Rehabilitation – Phase 1  
Various City Streets  
Arden Hills, Minnesota

Dear Mr. Swearingen:

We are pleased to present this Pavement Evaluation Report for the Arden Hills 2022 Rehabilitation – Phase 1 project in Arden Hills, Minnesota.

Thank you for making Braun Intertec your geotechnical consultant for this project. If you have questions about this report, or if there are other services that we can provide in support of our work to date, please contact Zach Semlak at 651.788.5071 (zsemlak@braunintertec.com) or Kevin Zalec at 952.995.2223 (kzalec@braunintertec.com).

Sincerely,

BRAUN INTERTEC CORPORATION

  
Zachary T. Semlak  
Staff Engineer

  
Kevin S. Zalec, PE  
Senior Engineer

c: M. John Morast, HR Green, Inc.

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Soil Boring Location Sketch	
Log of Boring Sheets ST-1 to ST-7	
Descriptive Terminology of Soil	
Core Photo Log	

## A. Introduction

### A.1. Project Description

This Pavement Evaluation Report addresses the proposed design and construction of the 2022 Street Rehabilitation – Phase 1, located in Arden Hills, Minnesota.

The project will consist of roadway rehabilitation via either a mill-and-overlay or full-depth reclamation (FDR) approach. Streets being evaluated for Phase 1 are Keithson Drive, Arden Vista Court, Royal Hills Drive, McClung Drive, Colleen Avenue, Colleen Circle, Briarknoll Circle, Briarknoll Drive, Norma Lane, Royal Lane, and James Avenue.

**Table 1. Site Aspects and Grading Description**

Aspect	Description
Pavement type(s)	Bituminous (Provided)
Assumed pavement loads	Less than 150,000 Bituminous ESALs (Estimated from publicly available traffic information using the MnDOT State Aid ESAL Forecast Calculator)
Grade changes	Minimal (Assumed; profiles and cross-sections not available at the time of this report)

\*Equivalent 18,000-lb single axle loads based on 20-year design.

We have described our understanding of the proposed construction and site to the extent others reported it to us. Depending on the extent of available information, we may have made assumptions based on our experience with similar projects. If we have not correctly recorded or interpreted the project details, the project team should notify us. New or changed information could require additional evaluation, analyses and/or recommendations.

### A.2. Site Conditions and History

The project area is generally residential and bounded by U.S. Highway 10 to the west, Hamline Avenue to the east, County State Aid Highway (CSAH) 96 to the north, and Floral Drive to the south. Current grades range from elevations of about 977 feet at Boring ST-1 to 908 feet at Boring ST-4. The site contains rolling topography, with a high area located near Highway 96 and Hamline Avenue generally sloping downward south and west with some intermittent high points in between.

### **A.3. Purpose**

The purpose of our pavement evaluation was to assess the condition and thickness of the in-place bituminous pavements and provide rehabilitation recommendations.

### **A.4. Background Information and Reference Documents**

We reviewed the following information:

- Request for Proposals prepared by HR Green, Inc., dated January 16, 2022.
- Miscellaneous Map Series, Map M-178, Surficial Geology, Metropolitan Area, prepared by the Minnesota Geological Survey, dated 2007.
- Traffic data available via the Minnesota Department of Transportation (MnDOT) Traffic Mapping Application, <http://www.dot.state.mn.us/traffic/data/tma.html>.
- Communications with John Morast at HR Green, Inc. regarding the project rehabilitation methods.

### **A.5. Scope of Services**

We performed our scope of services for the project in accordance with our Revised Proposal QTB152078 to John Morast, PE, with HR Green, Inc., dated February 16, 2022, and authorized on February 24, 2022 by the City of Arden Hills. The following list describes the geotechnical tasks completed in accordance with our authorized scope of services.

- Reviewing the background information and reference documents previously cited.
- Staking and clearing the exploration location of underground utilities. We selected and staked the exploration locations. We acquired the surface elevations and locations with GPS technology using the State of Minnesota's permanent GPS base station network. The Soil Boring Location Sketch included in the Appendix shows the approximate locations of the borings and bituminous cores.

- Performing 7 continuous power auger borings to nominal depths of 5 feet below existing grades for the project, however, based on efficiencies in our drilling procedures with concurrent projects, we were able to complete the borings as standard penetration test (SPT) borings, denoted as ST-1 to ST-7. Performing 15 pavement cores with shallow hand auger borings, denoted as C-1 to C-15.
- Preparing this report containing a boring location sketch, logs of soil borings, a summary of the soils encountered, results of laboratory tests, pavement core measurements and photo log, and recommendations for utility and pavement subgrade preparation and the design of utilities and pavements.

Our scope of services did not include environmental services or testing and our geotechnical personnel performing this evaluation are not trained to provide environmental services or testing. We can provide environmental services or testing at your request.

## **B. Results**

### **B.1. Geologic Overview**

A review of the Minnesota Metropolitan Area Geologic Atlas indicates the project area is generally underlain by intermixed loam to sandy-loam textured unsorted sediment associated with the Twin Cities Member (Map Unit "Qnd") and glacial till soils that have deposits that form hummocky, irregular topography (Map Unit "Qnh").

**Figure 1. Project Area Surficial Geology**

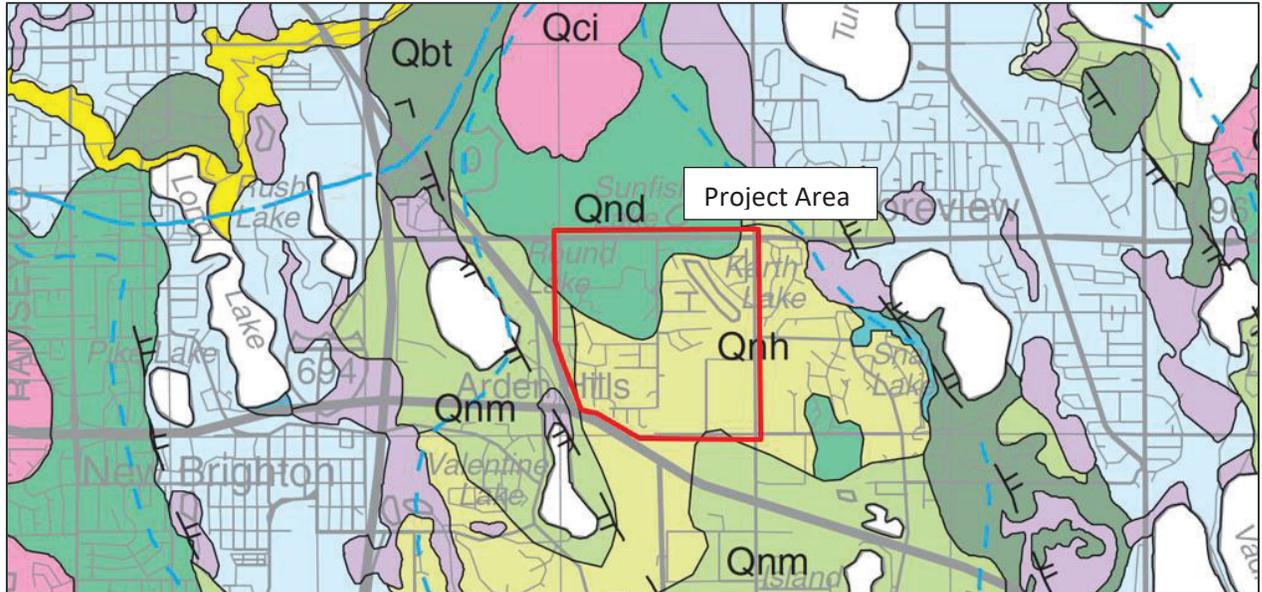


Image extracted from the Metropolitan Area Geologic Atlas, dated 2007.

We based the geologic origins used in this report on the soil types, in-situ and laboratory testing, and available common knowledge of the geological history of the site. Because of the complex depositional history, geologic origins can be difficult to ascertain. We did not perform a detailed investigation of the geologic history for the site.

## **B.2. Boring Results**

Table 2 provides a summary of the bituminous section thicknesses measured from borings and cores returned to the laboratory. Note that aggregate base was observed and measured in the field by the drill and coring crews. We did not perform gradation analysis on the apparent aggregate base material encountered as part of the pavement section and cannot conclusively determine if the encountered material satisfies a particular specification. The aggregate base thicknesses should also be considered approximate, as the transitions between the aggregate base and the underlying subgrade are difficult to discern.

**Table 2. Summary of Pavement Section Thicknesses by Boring/Core Location**

Roadway	Location	Bituminous Thickness (inches)	Apparent Aggregate Base Thickness (inches)	Core Condition
Keithson Drive	ST-1	3	4	---
Arden Vista Court	ST-2	8	4	---
McClung Drive	ST-3	5	6	---
Briarknoll Drive	ST-4	8	10	---
Norma Avenue	ST-5	5	10	---
Colleen Avenue	ST-6	5	7	---
Royal Lane	ST-7	4	7	---
Keithson Drive	C-1	4	8	Good condition.
Royal Hills Drive	C-2	5 3/4	5	Debonded at 3 1/2 inches.
	C-3	6	6	---
	C-4	6	9 1/2	Debonding at chip seal at 2 1/2 inches. Moderate to high stripping.
Arden Vista Court	C-5	6 1/4	5	Good condition.
McClung Drive	C-6	6	16	Slight stripping from 3 1/2 to 6 inches.
Colleen Avenue	C-7	4 3/4	7 1/2	Good condition.
	C-8	4	5	Core moderately to highly stripped throughout. Chip seal debonded at surface. Pavement core may have disintegrated towards to the bottom during coring (possible partial recovery).
Colleen Circle	C-9	4 1/2	7 1/2	Good condition.
Briarknoll Circle	C-10	6 1/4	3 1/2	Good condition.
Briarknoll Drive	C-11	4 1/4	5 1/2	Slight deterioration 1/2 inch below surface.
	C-12	3 3/4	5	Good condition.
Norma Lane	C-13	3 3/4	4	Pavement core may have disintegrated towards to the bottom during coring (possible partial recovery).
Royal Lane	C-14	5 1/2	6	Good condition.
James Avenue	C-15	3 1/2	5	Good condition.

Table 3 provides a summary of the soil boring results, in the general order we encountered the strata. Please refer to the Log of Boring sheets in the Appendix for additional details. The Descriptive Terminology sheet in the Appendix includes definitions of abbreviations used in Table 3.

**Table 3. Subsurface Profile Summary**

Strata	Soil Type - ASTM Classification	Range of Penetration Resistances	Commentary and Details
Pavement section	---	---	<ul style="list-style-type: none"> <li>▪ See Table 2 above.</li> </ul>
Fill	SP-SM, SC, CL	4 to 12 BPF	<ul style="list-style-type: none"> <li>▪ Moisture condition was generally moist.</li> <li>▪ Extended to depths ranging from 4 to 6 feet below existing grades at our boring locations.</li> <li>▪ Poorly-graded sand with silt (SP-SM) encountered only at Borings ST-1, ST-3 and ST-7 (possible sand subbase).</li> </ul>
Glacial Till	SC, CL	3 to 18 BPF	<ul style="list-style-type: none"> <li>▪ Moisture condition generally moist.</li> <li>▪ Color was typically a brown and grayish clayey sand and sandy lean clay.</li> <li>▪ Variable gravel content.</li> </ul>

For simplicity in this report, we define fill to mean existing, uncontrolled or undocumented fill.

### **B.3. Groundwater**

We did not observe groundwater while performing our borings. Groundwater may take days or longer to reach equilibrium in the boreholes and we immediately backfilled the boreholes, in accordance with our scope of work. If the project team identifies a need for more accurate determination of groundwater depth, we can install piezometers. Project planning should anticipate seasonal and annual fluctuations of groundwater.

## **C. Recommendations**

### **C.1. Design and Construction Discussion**

#### **C.1.a. Reuse of On-Site Soils**

The soils encountered within the borings are suitable for reuse as engineered fill. Soils with organic contents greater than 5 percent, if encountered, should not be reused as fill. This may result in the importing of soils to re-establish subgrade elevations.

#### **C.1.b. Pavement Reclamation/Mill and Overlay**

Based on our soil borings and our pavement cores obtained for the project, we have provided recommendations for rehabilitation methods based on the observed core conditions for which streets we recommend the mill-and-overlay approach for rehabilitation. A review of the pavement surface conditions and the suitability for mill-and-overlay was not included in our scope of services, and we assume the City has selected these streets for possible mill-and-overlay rehabilitation due to their surface condition.

Based on our observations of the recovered samples, recommendations for streets that were in poor condition (i.e., disintegrating, stripping or based on depth of debonding) will be noted later in the report for which streets we recommend the FDR approach for rehabilitation. Roads subjected to reclamation will consist of between 4 to 6 inches of bituminous pavement over a variable aggregate base layer. We recommend performing a 9-inch FDR without pre-milling. Based on the measurements from the borings, this generally will avoid subgrade soils through much of the project area; in areas where subgrade may be penetrated due to a thin aggregate base, it appears the underlying soils are generally clayey with some areas that are granular in nature. Areas of clayey subgrade should not be incorporated into the reclaim. Areas consisting of granular subgrade soils can be incorporated into the reclaim. Variation of existing pavement depth and materials should be anticipated.

If reclamation is performed on this project, we recommend frequent sieve analyses, depth checks, asphalt content tests, and other quality control/assurance tests to ensure the proper section with materials meeting the project specifications.

The gradation requirements of MnDOT Specification 3138 (Aggregate for Surface and Base Courses) can be used for the aggregate base. We also suggest that the contractor assume some contingency for

importing clean, crushed rock that can be blended with the reclaimed material to improve the uniformity of the resulting gradation prior to any direct reuse as an aggregate base.

### **C.1.c. Construction Disturbance**

The clayey roadway subgrades will be sensitive to disturbance and strength loss if subjected to repeated vehicle traffic. Subexcavation and recompaction or replacement of subgrade soils may be required if they lose strength or become unstable as a result of construction activity or exposure to moisture.

## **C.2. Subgrade Preparation**

### **C.2.a. Pavement Reclamation and Subgrade Preparation**

For areas to be rehabilitated via FDR, we recommend the following steps for pavement subgrade preparation, understanding the site will generally match existing grades.

1. Pre-mill where recommended, then reclaim the pavement as recommended in Section C.1.b stockpile and/or redistribute excess reclaim material as necessary to construct the new pavement sections.
2. Once the roadway sections are cut to grade, have a geotechnical representative observe the excavated subgrade or top of reclaim material to evaluate if additional subgrade improvements are necessary.
3. Scarify, moisture condition, and surface compact to at least 100 percent of standard Proctor density for fine-grained soils or to the requirements of the MnDOT penetration index method for granular soils.
4. Place pavement engineered fill to grade where required and compact in accordance with Section C.2.b to bottom of pavement section.
5. Test roll the pavement subgrade as described in Section C.2.c.

### **C.2.b. Engineered Fill Materials and Compaction**

If imported material is to be used, Table 4 contains our recommendations for engineered fill. Note that similar materials compared to existing should be used to the degree possible; importing different soils for backfill may create lenses that could trap water and result in differential frost heave and other performance issues. If longitudinal transitions in soil type are required, we recommend tapering them at

a rate of 20H:1V (horizontal:vertical) or flatter. Transitions in the transverse direction, such as at intersections, should be at least 4H:1V.

**Table 4. Recommended Fill and Compaction Specifications\***

Material	Material Specification	Compaction Specification
Subgrade fill	Select Grading Material MnDOT 2106.1.A.6	MnDOT 2106.3.G.1
Below landscaped surfaces, where subsidence is not a concern	Non-Structural Grading Material MnDOT 2106.1.A.8	MnDOT 2106.3.G.2

\*More select soils comprised of MnDOT 3149.2.J.2 Fine Filter Aggregate may be needed to accommodate work occurring in periods of wet or freezing weather.

We recommend placing engineered fill in accordance with MnDOT 2106. We recommend compacting engineered fill in accordance with the MnDOT specifications listed in Table 4. The project documents should specify relative compaction of engineered fill, based on the structure located above the engineered fill, and vertical proximity to that structure.

The project documents should not allow the contractor to use frozen material as engineered fill or to place engineered fill on frozen material. Frost should not penetrate under foundations during construction.

**C.2.c. Pavement Subgrade Test Roll**

After preparing the subgrade as described above and prior to the placement of the aggregate base, we recommend test rolling the subgrade soils with a fully loaded tandem-axle truck in general accordance with MnDOT Specification 2111 (Test Rolling). We also recommend having a geotechnical representative observe the test roll. Areas that fail the test roll likely indicate soft or weak soils that will require additional correction work to support pavements.

We recommend performing a second test roll after the aggregate base material is in place, and prior to placing bituminous pavement.

### C.3. Pavements

#### C.3.a. Reclamation Areas

Based on the observed weathering and deterioration in the pavement cores extracted from Royal Hills Drive, Norma Avenue and Colleen Avenue, we recommend these streets be rehabilitated via FDR. Our scope of services for this project did not include laboratory tests on subgrade soils to determine an R-value for pavement design. Based on our experience with similar soils anticipated at the pavement subgrade elevation, we recommend pavement design assume an R-value of 15. Note the contractor may need to perform limited removal of unsuitable or less suitable soils to achieve this value. Table 5 provides our recommended minimum pavement thickness design.

**Table 5. Recommended Minimum Bituminous Pavement Section**

Material	Thickness (inches)	Designation	Specification
Bituminous Wear	2	SPWEA230B	2360
Bituminous Non-Wear	2	SPWEA230B	
Aggregate Base	5	Class 5 or 6	3138

#### C.3.b. Mill-and-Overlay

The residential roads that we recommend have a mill-and-overlay performed on are: Arden Vista Court, McClung Drive, Colleen Circle, Briarknoll Circle, Briarknoll Drive, Royal Lane, and James Avenue.

We recommend milling the pavement in accordance with MnDOT Specification 2232. The mill depth will vary based on conditions encountered but should be a minimum depth of 2 inches, with a replacement mix meeting SPWEA230B. Pavement depth can vary between the boring and core locations. The contractor may need to adjust the mill depth to account for unexpected conditions such as areas of thin pavement.

The surface condition prior to milling can indicate where deeper repairs to the milled surface may be necessary to improve the life of the overlay. This includes distresses such as severe longitudinal and transverse cracking, alligator/fatigue cracking of any severity, potholes, edge cracking, and similar failures. MnDOT defines these distresses in their surface rating procedure as follows:

- High-severity transverse cracking: Any crack running transverse to the centerline of the roadway with significant adjacent random cracking (12 inches or more apart), have large areas of spalling, missing material and/or potholes.
- High-severity longitudinal cracking: Any crack running parallel to the centerline of the roadway with significant adjacent random cracking (12 inches or more apart), large areas of spalling, missing material and/or potholes.
- Alligator cracking: A series of interconnected cracks forming many-sided, sharp-angled pieces, 6 inches or less in size, typically located in the wheel paths and under concentrated traffic loads.

We recommend an experienced engineer walk the milled surface to delineate areas for these repairs based on conditions exposed by the milling process. We recommend performing the full-depth mill to at least 1 foot beyond the edge of the visible distresses where present.

A mill-and-overlay will normally have a service life of between 12 and 17 years. Over that time maintenance will be required, which may include crack seal, surface treatments, and patching.

### **C.3.c. Pavement Materials and Compaction**

We recommend specifying materials based on those provided in Table 5.

Bituminous pavements should generally meet the requirements of Specification 2360, which includes gyratory tests to evaluate strength and air voids and density tests to evaluate compaction.

We recommend tack coat meeting MnDOT Specification 2357 be placed between the lifts and along vertical faces where paving will match adjacent pavement.

We recommend compacting aggregate base to a minimum of 100 percent of its maximum standard Proctor dry density or to the requirements of the Penetration Index Method as per MnDOT Specification 2211.

### **C.3.d. Performance and Maintenance**

We based the above reconstruction section pavement designs on a 20-year performance life. This is the amount of time before we anticipate the pavement will require major rehabilitation. This performance life assumes routine maintenance, such as seal coating and crack sealing. The actual pavement life will vary depending on variations in weather, traffic conditions and maintenance.

Many conditions affect the overall performance of pavements. Some of these conditions include the environment, loading conditions and the level of ongoing maintenance. Regarding bituminous pavements, it is common to have thermal cracking develop within the first few years of placement and continue throughout the life of the pavement. We recommend developing a regular maintenance plan for filling cracks in pavements to lessen the potential impacts for cold weather distress due to frost heave or warm weather distress due to wetting and softening of the subgrade.

## **D. Procedures**

### **D.1. Penetration Test Borings**

We drilled the penetration test borings with a GeoProbe-mounted core and auger drill equipped with hollow-stem auger. We performed the borings in general accordance with ASTM D6151 taking penetration test samples at 2 1/2-foot intervals in general accordance with ASTM D1586. The boring logs show the actual sample intervals and corresponding depths.

### **D.2. Exploration Logs**

#### **D.2.a. Log of Boring Sheets**

The Appendix includes Log of Boring sheets for our penetration test borings. The logs identify and describe the penetrated geologic materials, and present the results of penetration resistance tests performed. The logs also present the results of groundwater measurements.

We inferred strata boundaries from changes in the penetration test samples and the auger cuttings. Because we did not perform continuous sampling, the strata boundary depths are only approximate. The boundary depths likely vary away from the boring locations, and the boundaries themselves may occur as gradual rather than abrupt transitions.

### **D.2.b. Geologic Origins**

We assigned geologic origins to the materials shown on the logs and referenced within this report, based on: (1) a review of the background information and reference documents cited above, (2) visual classification of the various geologic material samples retrieved during the course of our subsurface exploration, (3) penetration resistance testing performed for the project, and (4) available common knowledge of the geologic processes and environments that have impacted the site and surrounding area in the past.

## **D.3. Material Classification and Testing**

### **D.3.a. Visual and Manual Classification**

We visually and manually classified the geologic materials encountered based on ASTM D2488. The Appendix includes a chart explaining the classification system we used.

## **D.4. Groundwater Measurements**

The drillers checked for groundwater while advancing the penetration test borings, and again after auger withdrawal. We then filled the boreholes or allowed them to remain open for an extended period of observation, as noted on the boring logs.

## **E. Qualifications**

### **E.1. Variations in Subsurface Conditions**

#### **E.1.a. Material Strata**

We developed our evaluation, analyses and recommendations from a limited amount of site and subsurface information. It is not standard engineering practice to retrieve material samples from exploration locations continuously with depth. Therefore, we must infer strata boundaries and thicknesses to some extent. Strata boundaries may also be gradual transitions, and project planning should expect the strata to vary in depth, elevation and thickness, away from the exploration locations.

Variations in subsurface conditions present between exploration locations may not be revealed until performing additional exploration work, or starting construction. If future activity for this project reveals any such variations, you should notify us so that we may reevaluate our recommendations. Such variations could increase construction costs, and we recommend including a contingency to accommodate them.

### **E.1.b. Groundwater Levels**

We made groundwater measurements under the conditions reported herein and shown on the exploration logs, and interpreted in the text of this report. Note that the observation periods were relatively short, and project planning can expect groundwater levels to fluctuate in response to rainfall, flooding, irrigation, seasonal freezing and thawing, surface drainage modifications and other seasonal and annual factors.

## **E.2. Continuity of Professional Responsibility**

### **E.2.a. Plan Review**

We based this report on a limited amount of information, and we made a number of assumptions to help us develop our recommendations. We should be retained to review the geotechnical aspects of the designs and specifications. This review will allow us to evaluate whether we anticipated the design correctly, if any design changes affect the validity of our recommendations, and if the design and specifications correctly interpret and implement our recommendations.

### **E.2.b. Construction Observations and Testing**

We recommend retaining us to perform the required observations and testing during construction as part of the ongoing pavement evaluation. This will allow us to correlate the subsurface conditions exposed during construction with those encountered by the borings and provide professional continuity from the design phase to the construction phase. If we do not perform observations and testing during construction, it becomes the responsibility of others to validate the assumption made during the preparation of this report and to accept the construction-related geotechnical engineer-of-record responsibilities.

### **E.3. Use of Report**

This report is for the exclusive use of the addressed parties. Without written approval, we assume no responsibility to other parties regarding this report. Our evaluation, analyses and recommendations may not be appropriate for other parties or projects.

### **E.4. Standard of Care**

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

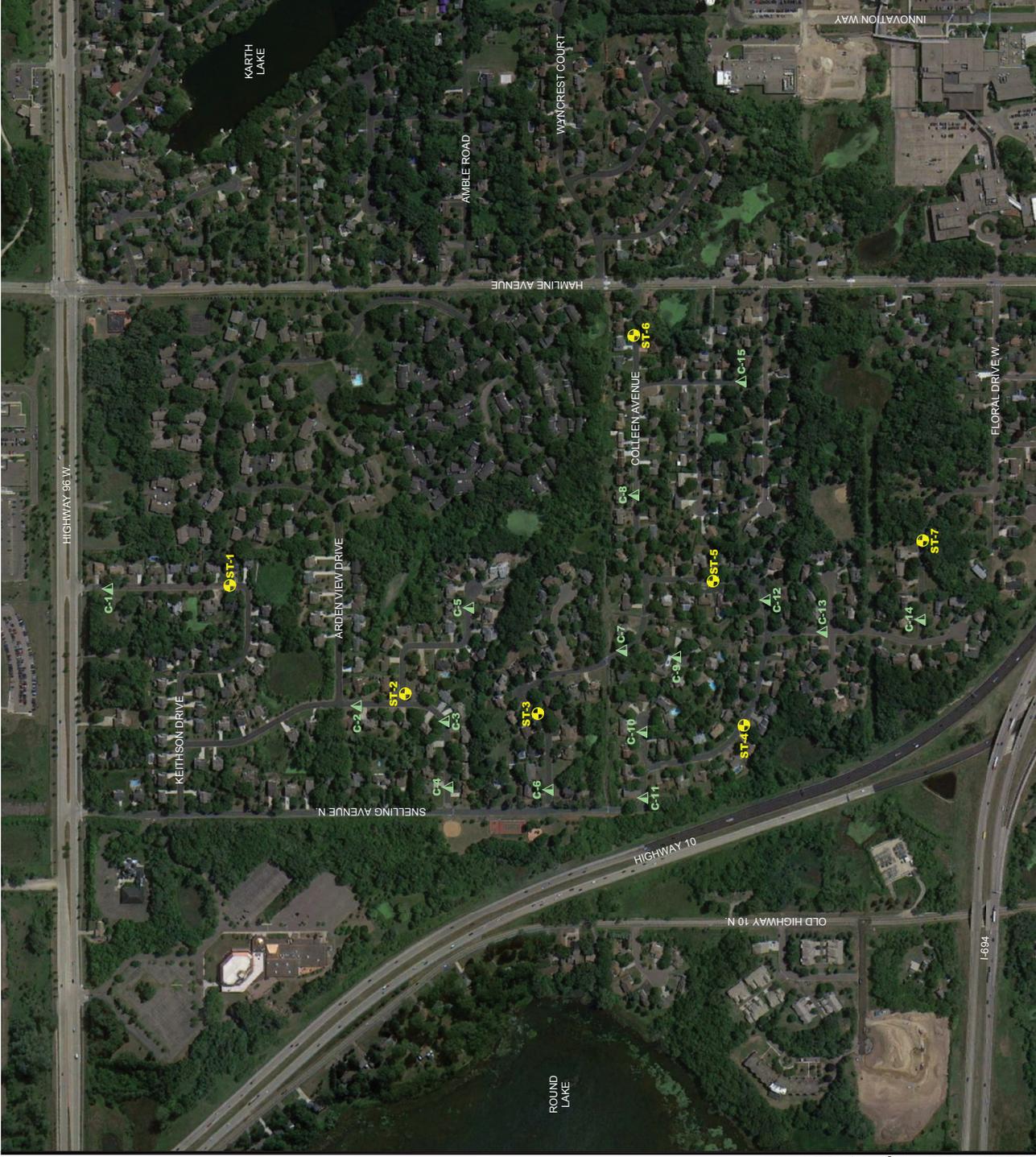
## Appendix



Drawing Information	
Project No:	B2204011
Drawing No:	B2204011
Drawn By:	JAG
Date Drawn:	5/4/22
Checked By:	KZ
Last Modified:	5/17/22

Project Information	
2022 Street Rehabilitation - Phase 1	Various Streets
Arden Hills, Minnesota	

**Soil Boring  
Location Sketch**



**●** DENOTES APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING

**▲** DENOTES APPROXIMATE LOCATION OF PAVEMENT CORE



See Descriptive Terminology sheet for explanation of abbreviations

<b>Project Number B2204011</b> <b>Geotechnical Evaluation</b> <b>Arden Hills 2022 Rehab - Phase 1</b> <b>Various City Streets</b> <b>Arden Hills, Minnesota</b>					BORING: <b>ST-1</b>		
					LOCATION: See attached sketch		
					NORTHING: 204328	EASTING: 556832	
DRILLER: M. Barber	LOGGED BY: K. Zalec		START DATE: 05/13/22	END DATE: 05/13/22			
SURFACE ELEVATION: 977.3 ft	RIG: GP-1	METHOD: 3 1/4" HSA	SURFACING: Bituminous	WEATHER: Partly sunny, 70°F			
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q <sub>p</sub> tsf	MC %	Tests or Remarks
976.7		PAVEMENT, 3 inches of bituminous over 4 inches of apparent aggregate base					
0.6							
975.3		FILL: POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, with Gravel, brown, moist		2-4-3 (7) 6"			
2.0		FILL: SANDY LEAN CLAY (CL), with Gravel, brown mottled with gray, moist		4-5-5 (10) 4"			
971.3			5				
6.0		END OF BORING					Water not observed while drilling.
		Boring immediately backfilled					
			10				
			15				
			20				
			25				
			30				

See Descriptive Terminology sheet for explanation of abbreviations

<b>Project Number B2204011</b> <b>Geotechnical Evaluation</b> <b>Arden Hills 2022 Rehab - Phase 1</b> <b>Various City Streets</b> <b>Arden Hills, Minnesota</b>					BORING: <b>ST-2</b>		
					LOCATION: See attached sketch		
					NORTHING: 203446	EASTING: 556287	
DRILLER: M. Barber	LOGGED BY: K. Zalec		START DATE: 05/13/22	END DATE: 05/13/22			
SURFACE ELEVATION: 940.5 ft	RIG: GP-1	METHOD: 3 1/4" HSA	SURFACING: Bituminous	WEATHER: Partly sunny, 70°F			
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q <sub>p</sub> tsf	MC %	Tests or Remarks
939.5		PAVEMENT, 8 inches of bituminous over 4 inches of apparent aggregate base					
1.0		FILL: CLAYEY SAND (SC), fine-grained, with Gravel, brown, moist		0-0-5 (5) 4"			
936.5							
4.0		SANDY LEAN CLAY (CL), with Gravel, brown, moist, soft (GLACIAL TILL)	5	1-1-2 (3)			
934.5							
6.0		END OF BORING					
		Boring immediately backfilled					Water not observed while drilling.
			10				
			15				
			20				
			25				
			30				

See Descriptive Terminology sheet for explanation of abbreviations

<b>Project Number B2204011</b> <b>Geotechnical Evaluation</b> <b>Arden Hills 2022 Rehab - Phase 1</b> <b>Various City Streets</b> <b>Arden Hills, Minnesota</b>					BORING: <b>ST-3</b>		
					LOCATION: See attached sketch		
					NORTHING: 202780	EASTING: 556187	
DRILLER: M. Barber	LOGGED BY: K. Zalec		START DATE: 05/13/22	END DATE: 05/13/22			
SURFACE ELEVATION: 927.4 ft	RIG: GP-1	METHOD: 3 1/4" HSA	SURFACING: Bituminous	WEATHER: Partly sunny, 70°F			
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q <sub>p</sub> tsf	MC %	Tests or Remarks
926.5		PAVEMENT, 5 inches of bituminous over 6 inches of apparent aggregate base					
0.9							
925.4		FILL: POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, little Gravel, brown, moist		1-2-3 (5) 8"			
2.0							
923.4		FILL: CLAYEY SAND (SC), fine-grained, trace Gravel, brown mottled with gray, moist					
4.0							
921.4		CLAYEY SAND (SC), fine-grained, trace Gravel, brown, moist, stiff (GLACIAL TILL)	5	3-5-8 (13) 10"			
6.0		END OF BORING					
		Boring immediately backfilled					Water not observed while drilling.
			10				
			15				
			20				
			25				
			30				

See Descriptive Terminology sheet for explanation of abbreviations

<b>Project Number B2204011</b>					<b>BORING: ST-4</b>		
<b>Geotechnical Evaluation</b>					LOCATION: See attached sketch		
<b>Arden Hills 2022 Rehab - Phase 1</b>					NORTHING: 201745 EASTING: 556128		
<b>Various City Streets</b>					START DATE: 05/13/22 END DATE: 05/13/22		
<b>Arden Hills, Minnesota</b>					SURFACING: Bituminous WEATHER: Partly sunny, 70°F		
DRILLER: M. Barber		LOGGED BY: K. Zalec		SURFACE ELEVATION: 908.5 ft		RIG: GP-1	METHOD: 3 1/4" HSA
Elev./Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q <sub>p</sub> tsf	MC %	Tests or Remarks
907.0		PAVEMENT, 8 inches of bituminous over 10 inches of apparent aggregate base					
1.5		FILL: SANDY LEAN CLAY (CL), trace Gravel, gray, moist		4-2-2 (4) 8"			Water not observed while drilling.
904.5		FILL: CLAYEY SAND (SC), fine-grained, with Gravel, gray, moist	5	1-2-2 (4) 5"			
4.0							
902.5		END OF BORING					
6.0		Boring immediately backfilled					
			10				
			15				
			20				
			25				
			30				



See Descriptive Terminology sheet for explanation of abbreviations

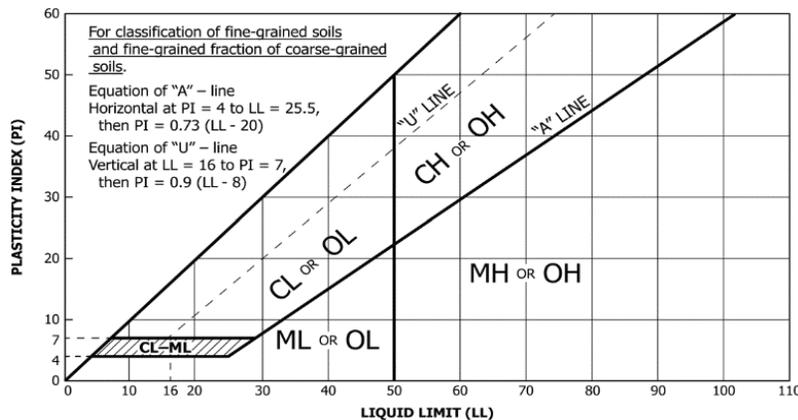
<b>Project Number B2204011</b> <b>Geotechnical Evaluation</b> <b>Arden Hills 2022 Rehab - Phase 1</b> <b>Various City Streets</b> <b>Arden Hills, Minnesota</b>					BORING: <b>ST-6</b>		
					LOCATION: See attached sketch		
					NORTHING: 202298	EASTING: 558088	
DRILLER: M. Barber	LOGGED BY: K. Zalec		START DATE: 05/13/22	END DATE: 05/13/22			
SURFACE ELEVATION: 962.9 ft	RIG: GP-1	METHOD: 3 1/4" HSA	SURFACING: Bituminous	WEATHER: Partly sunny, 70°F			
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q <sub>p</sub> tsf	MC %	Tests or Remarks
961.9		PAVEMENT, 5 inches of bituminous over 7 inches of apparent aggregate base					
1.0		FILL: CLAYEY SAND (SC), fine-grained, with Gravel, gray, moist		4-5-7 (12) 6"			
958.9							
4.0		SANDY LEAN CLAY (CL), bluish gray, moist, stiff (GLACIAL TILL)	5	2-4-5 (9) 8"			
956.9							
6.0		END OF BORING					
		Boring immediately backfilled					
			10				
			15				
			20				
			25				
			30				

See Descriptive Terminology sheet for explanation of abbreviations

<b>Project Number B2204011</b> <b>Geotechnical Evaluation</b> <b>Arden Hills 2022 Rehab - Phase 1</b> <b>Various City Streets</b> <b>Arden Hills, Minnesota</b>					BORING: <b>ST-7</b>		
					LOCATION: See attached sketch		
					NORTHING: 200865	EASTING: 557052	
DRILLER: M. Barber	LOGGED BY: K. Zalec		START DATE: 05/13/22	END DATE: 05/13/22			
SURFACE ELEVATION: 963.8 ft	RIG: GP-1	METHOD: 3 1/4" HSA	SURFACING: Bituminous	WEATHER: Partly sunny, 70°F			
Elev./ Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q <sub>p</sub> tsf	MC %	Tests or Remarks
962.9		PAVEMENT, 4 inches of bituminous over 7 inches of apparent aggregate base					
0.9		FILL: POORLY GRADED SAND with SILT (SP-SM), fine to medium-grained, with Gravel, brown, moist		2-2-3 (5) 6"			
961.8		FILL: SANDY LEAN CLAY (CL), brown, moist					
2.0							
959.8		CLAYEY SAND (SC), fine-grained, gray, moist (GLACIAL TILL)	5	2-2-3 (5) 8"			
4.0							
957.8							
6.0		END OF BORING					
		Boring immediately backfilled					Water not observed while drilling.
			10				
			15				
			20				
			25				
			30				

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests <sup>A</sup>			Soil Classification			
			Group Symbol	Group Name <sup>B</sup>		
Coarse-grained Soils (more than 50% retained on No. 200 sieve)	Gravels (More than 50% of coarse fraction retained on No. 4 sieve)	Clean Gravels (Less than 5% fines <sup>C</sup> )	$C_u \geq 4$ and $1 \leq C_c \leq 3^D$	GW	Well-graded gravel <sup>E</sup>	
		Gravels with Fines (More than 12% fines <sup>C</sup> )	$C_u < 4$ and/or ( $C_c < 1$ or $C_c > 3^D$ )	GP	Poorly graded gravel <sup>E</sup>	
			Fines classify as ML or MH Fines Classify as CL or CH	GM	Silty gravel <sup>EFG</sup>	
		Sands (50% or more coarse fraction passes No. 4 sieve)	Clean Sands (Less than 5% fines <sup>H</sup> )	$C_u \geq 6$ and $1 \leq C_c \leq 3^D$	SW	Well-graded sand <sup>I</sup>
	Sands with Fines (More than 12% fines <sup>H</sup> )		$C_u < 6$ and/or ( $C_c < 1$ or $C_c > 3^D$ )	SP	Poorly graded sand <sup>I</sup>	
			Fines classify as ML or MH Fines classify as CL or CH	SM	Silty sand <sup>FGI</sup>	
					SC	Clayey sand <sup>FGI</sup>
	Fine-grained Soils (50% or more passes the No. 200 sieve)	Silts and Clays (Liquid limit less than 50)	Inorganic	PI > 7 and plots on or above "A" line <sup>J</sup>	CL	Lean clay <sup>KLM</sup>
PI < 4 or plots below "A" line <sup>J</sup>				ML	Silt <sup>KLM</sup>	
Organic			Liquid Limit - oven dried	Liquid Limit - not dried < 0.75	OL	Organic clay <sup>KLMN</sup>
			Liquid Limit - oven dried		OH	Organic silt <sup>KLMN</sup>
Silts and Clays (Liquid limit 50 or more)		Inorganic	PI plots on or above "A" line	CH	Fat clay <sup>KLM</sup>	
			PI plots below "A" line	MH	Elastic silt <sup>KLM</sup>	
		Organic	Liquid Limit - oven dried	Liquid Limit - not dried < 0.75	OH	Organic clay <sup>KLMN</sup>
			Liquid Limit - oven dried		OH	Organic silt <sup>KLMN</sup>
Highly Organic Soils	Primarily organic matter, dark in color, and organic odor		PT	Peat		

- A. Based on the material passing the 3-inch (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.  $C_u = D_{60} / D_{10}$        $C_c = (D_{30})^2 / (D_{10} \times D_{60})$
- E. If soil contains  $\geq 15\%$  sand, add "with sand" to group name.
- F. If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
- G. If fines are organic, add "with organic fines" to group name.
- H. 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
- I. If soil contains  $\geq 15\%$  gravel, add "with gravel" to group name.
- J. If Atterberg limits plot in hatched area, soil is CL-ML, silty clay.
- K. If soil contains 15 to < 30% plus No. 200, add "with sand" or "with gravel", whichever is predominant.
- L. If soil contains  $\geq 30\%$  plus No. 200, predominantly sand, add "sandy" to group name.
- M. If soil contains  $\geq 30\%$  plus No. 200 predominantly gravel, add "gravelly" to group name.
- N. PI  $\geq 4$  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.



Laboratory Tests	
DD	Dry density, pcf
WD	Wet density, pcf
P200	% Passing #200 sieve
MC	Moisture content, %
OC	Organic content, %
$q_p$	Pocket penetrometer strength, tsf
$q_u$	Unconfined compression test, tsf
LL	Liquid limit
PL	Plastic limit
PI	Plasticity index

**Particle Size Identification**

- Boulders..... over 12"
- Cobbles..... 3" to 12"
- Gravel  
Coarse..... 3/4" to 3" (19.00 mm to 75.00 mm)  
Fine..... No. 4 to 3/4" (4.75 mm to 19.00 mm)
- Sand  
Coarse..... No. 10 to No. 4 (2.00 mm to 4.75 mm)  
Medium..... No. 40 to No. 10 (0.425 mm to 2.00 mm)  
Fine..... No. 200 to No. 40 (0.075 mm to 0.425 mm)
- Silt..... No. 200 (0.075 mm) to .005 mm
- Clay..... < .005 mm

**Relative Proportions<sup>L-M</sup>**

- trace..... 0 to 5%
- little..... 6 to 14%
- with.....  $\geq 15\%$

**Inclusion Thicknesses**

- lens..... 0 to 1/8"
- seam..... 1/8" to 1"
- layer..... over 1"

**Apparent Relative Density of Cohesionless Soils**

- Very loose ..... 0 to 4 BPF
- Loose ..... 5 to 10 BPF
- Medium dense..... 11 to 30 BPF
- Dense..... 31 to 50 BPF
- Very dense..... over 50 BPF

**Consistency of Cohesive Soils      Blows Per Foot      Approximate Unconfined Compressive Strength**

- Very soft..... 0 to 1 BPF..... < 0.25 tsf
- Soft..... 2 to 4 BPF..... 0.25 to 0.5 tsf
- Medium..... 5 to 8 BPF..... 0.5 to 1 tsf
- Stiff..... 9 to 15 BPF..... 1 to 2 tsf
- Very Stiff..... 16 to 30 BPF..... 2 to 4 tsf
- Hard..... over 30 BPF..... > 4 tsf

**Moisture Content:**

- Dry:** Absence of moisture, dusty, dry to the touch.
- Moist:** Damp but no visible water.
- Wet:** Visible free water, usually soil is below water table.

**Drilling Notes:**

**Blows/N-value:** Blows indicate the driving resistance recorded for each 6-inch interval. The reported N-value is the blows per foot recorded by summing the second and third interval in accordance with the Standard Penetration Test, ASTM D1586.

**Partial Penetration:** If the sampler could not be driven through a full 6-inch interval, the number of blows for that partial penetration is shown as #/x" (i.e. 50/2"). The N-value is reported as "REF" indicating refusal.

**Recovery:** Indicates the inches of sample recovered from the sampled interval. For a standard penetration test, full recovery is 18", and is 24" for a thinwall/shelby tube sample.

**WOH:** Indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

**WOR:** Indicates the sampler penetrated soil under weight of rods alone; hammer weight and driving not required.

**Water Level:** Indicates the water level measured by the drillers either while drilling (  $\sphericalangle$  ), at the end of drilling (  $\blacktriangledown$  ), or at some time after drilling (  $\blacktriangledown$  ).

**Sample Symbols**

- Standard Penetration Test
- Modified California (MC)
- Auger
- Grab Sample
- Rock Core
- Thinwall (TW)/Shelby Tube (SH)
- Texas Cone Penetrometer
- Dynamic Cone Penetrometer



Core #:	C-1			Project: B2204011 <b>BRAUN</b> INTERTEC
Pavement thickness:	4 inches	Agg base thickness:	8 inches	
Location:	Keithson Drive			
Date:	June 2022			

Notes:



Core #:	C-2			Project: B2204011 <b>BRAUN</b> INTERTEC
Pavement thickness:	5 3/4 inches	Agg base thickness:	5 inches	
Location:	Royal Hills Drive			
Date:	June 2022			

Notes: Debonded at 3 1/2 inches

PHOTO NOT AVAILABLE

Core #:	C-3			<b>BRAUN</b> <b>INTERTEC</b>
Pavement thickness:	6 inches	Agg base thickness:	6 inches	
Location:	Royal Hills Drive			
Date:	November 2021			

Notes: Pavement thickness measured by field staff at time of coring.



Core #:	C-4			<b>BRAUN</b> <b>INTERTEC</b>
Pavement thickness	6 inches	Agg base thickness:	9 1/2 inches	
Location:	Royal Hills Drive			
Date:	June 2022			

Notes: Debonding at chip seal and at 2 1/2 inches. Core appears to have moderate to high stripping.



Core #:	C-5			Project: B2204011 <b>BRAUN</b> INTERTEC
Pavement thickness:	6 1/4 inches	Agg base thickness:	5 inches	
Location:	Arden Vista Court			
Date:	June 2022			
Notes:				



Core #:	C-6			Project: B2204011 <b>BRAUN</b> INTERTEC
Pavement thickness:	6 inches	Agg base thickness:	16 inches	
Location:	McClung Drive			
Date:	June 2022			
Notes:	Slight stripping from 3 1/2 to 6 inches.			



Core #:	C-7			Project: B2204011 <b>BRAUN</b> INTERTEC
Pavement thickness:	4 3/4 inches	Agg base thickness:	7 1/2 inches	
Location:	Colleen Avenue			
Date:	June 2022			
Notes:				



Core #:	C-8			Project: B2204011 <b>BRAUN</b> INTERTEC
Pavement thickness:	4 inches	Agg base thickness:	5 inches	
Location:	Colleen Avenue			
Date:	June 2022			

Notes: Core moderately stripped throughout, chip seal debonded at surface. Actual thickness may be closer to 5".



Core #:	C-9			Project: B2204011 <b>BRAUN</b> <b>INTERTEC</b>
Pavement thickness:	4 1/2 inches	Agg base thickness:	7 1/2 inches	
Location:	Colleen Circle			
Date:	June 2022			

Notes:



Core #:	C-10			Project: B2204011 <b>BRAUN</b> <b>INTERTEC</b>
Pavement thickness	6 1/4 inches	Agg base thickness:	3 1/2 inches	
Location:	Briarknoll Circle			
Date:	June 2022			

Notes:



Core #:	C-11			Project: B2204011 <b>BRAUN</b> <b>INTERTEC</b>
Pavement thickness:	4 1/4 inches	Agg base thickness:	5 1/2 inches	
Location:	Briarknoll Drive			
Date:	June 2022			
Notes: Slight deterioration 1/2" down from surface.				



Core #:	C-12			Project: B2204011 <b>BRAUN</b> <b>INTERTEC</b>
Pavement thickness:	3 3/4 inches	Agg base thickness:	5 inches	
Location:	Briarknoll Drive			
Date:	June 2022			
Notes:				



Core #:	C-13			Project: B2204011 <b>BRAUN</b> INTERTEC
Pavement thickness:	3 3/4 inches	Agg base thickness:	4 inches	
Facility:	Norma Avenue			
Date:	June 2022			

Notes: Pavement disintegrated during coring. Actual thickness may be closer to 4, 4 1/2 inches.



Core #:	C-14			Project: B2204011 <b>BRAUN</b> INTERTEC
Pavement thickness	5 1/2 inches	Agg base thickness:	6 inches	
Facility:	Royal Lane			
Date:	June 2022			

Notes:



Core #:	C-15			Project: B2204011 <b>BRAUN</b> <b>INTERTEC</b>
Pavement thickness:	3 1/2 inches	Agg base thickness:	5 inches	
Facility:	James Avenue			
Date:	June 2022			

Notes:

Core #:	Unused			Project: B2110246 <b>BRAUN</b> <b>INTERTEC</b>
Pavement thickness		Agg base thickness:		
Facility:				
Date:				

Notes:

April 20, 2023

Project B2204011.00

Brad Fisher, PE  
Bolton & Menk, Inc.  
12224 Nicollet Avenue  
Burnsville, MN 55337

Re: Addendum 1 to Geotechnical Evaluation  
Additional Geotechnical Services – Arden Hills 2024 PMP  
James Avenue  
Arden Hills, Minnesota

Dear Mr. Fisher:

This letter serves as Addendum 1 to our Geotechnical Evaluation Report for this project under Project Number B2204011, dated June 23, 2022. This Addendum addresses the results of the most recent borings requested for James Avenue and provides recommendations for utility installation.

## **Background**

Our Geotechnical Evaluation Report for the project provided both full-depth reclamation (FDR) and mill-and-overlay recommendations for the project. For the original project, James Avenue was limited to one pavement core for evaluation. Based on the core thickness and condition, the mill-and-overlay approach was recommended for James Avenue.

## **New Information**

We understand the proposed rehabilitation method on James Avenue in the project area was changed from a mill-and-overlay approach to a full reconstruction due to the City's need to replace the watermain. Two soil borings, denoted as ST-8 and ST-9, were requested to provide additional geotechnical information along James Avenue.

## **Boring Results**

Table 1 provides a summary of the soil boring results; in the general order we encountered the strata. Please refer to the attached Log of Boring sheets for additional details. The attached Descriptive Terminology sheet includes definitions of abbreviations used in Table 1.

AA/EOE

**Table 1. Subsurface Profile Summary**

Strata	Soil Type - ASTM Classification	Range of N-Values	Commentary and Details
Pavement section	---	---	<ul style="list-style-type: none"> <li>▪ Bituminous thickness was 3 1/2 to 4 inches.</li> <li>▪ Apparent Aggregate Base thickness was about 6 to 7 inches.</li> <li>▪ Overall thickness was about 10 to 10 1/2 inches.</li> </ul>
Fill	SC	3 to 8	<ul style="list-style-type: none"> <li>▪ Moisture condition was generally moist.</li> <li>▪ Extended to a depth of about 7 feet below existing grades at each boring location.</li> </ul>
Glacial Till	CL	4 to 14	<ul style="list-style-type: none"> <li>▪ Moisture condition generally moist.</li> <li>▪ Generally in a soft to medium consistency to a depth of 10 to 12 feet.</li> <li>▪ Variable gravel content.</li> </ul>

For simplicity in this report, we define fill to mean existing, uncontrolled or undocumented fill.

## Groundwater

We did not observe groundwater while performing our borings. Groundwater may take days or longer to reach equilibrium in the boreholes and we immediately backfilled the boreholes, in accordance with our scope of work. If the project team identifies a need for more accurate determination of groundwater depth, we can install piezometers. Project planning should anticipate seasonal and annual fluctuations of groundwater.

## Basis for Recommendations

### Reuse of On-Site Soils

The soils encountered within the borings are suitable for reuse as engineered fill. Soils with organic contents greater than 5 percent, if encountered, should not be reused as fill. This may result in the importing of soils to re-establish subgrade elevations.

### Utility Installation and Invert Elevations

We anticipate utility inverts will be generally within 10 feet of existing grades. The soils at anticipated invert elevations generally appear suitable for support of utilities and consist mainly of native glacial till soils. However, soft silts or clays may not be suitable for pipe or structure support when excavated. Additional subcutting may be required to support utilities disturbed by groundwater or construction activities.

## **Utility Installation Recommendations**

### **Utility Subgrade Stabilization**

We anticipate the soils at typical invert elevations will be suitable for utility support. However, if construction encounters unfavorable conditions such as soft or loose soils or perched water at invert grades, the conditions may require some additional subcutting and replacement with sand or crushed rock to prepare a proper subgrade for pipe support. If crushed rock is used as pipe bedding, we recommend wrapping the aggregate in geotextile fabric to prevent the migration of fine-grained materials into the voids of the aggregate.

### **Excavation Oversizing**

If subcutting beneath utilities is required, we recommend extending the excavations outward and downward at a slope of 1H:1V (horizontal:vertical) or flatter to a maximum depth of 2 feet.

### **Excavated Slopes**

Based on the borings, we anticipate the majority of on-site soils in excavations will consist of cohesive till deposits. These soils are typically considered Type B or C Soil under OSHA (Occupational Safety and Health Administration) guidelines. OSHA guidelines indicate unsupported excavations in Type B soils should have a gradient no steeper than 1H:1V, while Type C soils have a gradient no steeper than 1 1/2H:1V. Slopes constructed in this manner may still exhibit surface sloughing. OSHA requires an engineer to evaluate slopes or excavations over 20 feet in depth.

An OSHA-approved qualified person should review the soil classification in the field. Excavations must comply with the requirements of OSHA 29 CFR, Part 1926, Subpart P, "Excavations and Trenches." This document states excavation safety is the responsibility of the contractor. The project specifications should reference these OSHA requirements.

### **Excavation Dewatering**

We recommend removing accumulated water from the excavations. Project planning should include temporary sumps and pumps for excavations in low-permeability soils, such as clays.

### Corrosion Potential

The soil borings indicate the site predominantly consists of clayey soils at anticipated utility invert elevations. We consider the clayey soils to be moderately to highly corrosive to metallic conduits. Where utilities extend through organics or clay soils, we recommend bedding the utilities in sandy soil free of any clay lumps or constructing the utilities with non-corrosive materials.

### Engineered Fill Materials and Compaction

We recommend reuse of the existing site soils for utility trench backfill. Placement should follow the recommendations included in Section C.2 of our original report.

### Pavements

Once the utility trench backfill has been placed and the pavement subgrade prepared as outlined in Section C.2 of the original report, we recommend placing the following pavement section based on the assumed R-value of 15 included in our original report.

**Table 2. Recommended Bituminous Pavement Section**

Material	Thickness (inches)	Designation	Specification
Bituminous Wear	2	SPWEA230B	2360
Bituminous Non-Wear	2	SPWEA230B	
Aggregate Base	6	Class 5 or 6	3138

## Remarks

This Addendum should be attached to and considered a part of our original Geotechnical Evaluation Report. With the exception of any results or recommendations changed by this Addendum, the information contained in our Geotechnical Evaluation Report remains unchanged.

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

If you have any questions about this Addendum, please contact Kevin Zalec at 952.995.2223 (kzalec@braunintertec.com).

Sincerely,

BRAUN INTERTEC CORPORATION

### Professional 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.



Kevin S. Zalec, PE  
Senior Engineer  
License Number: 47909  
April 20, 2023



Matthew P. Ruble, PE  
Vice President, Principal Engineer

### Attachments:

Boring Location Sketch  
Log of Borings ST-8 and ST-9



**Drawing Information**

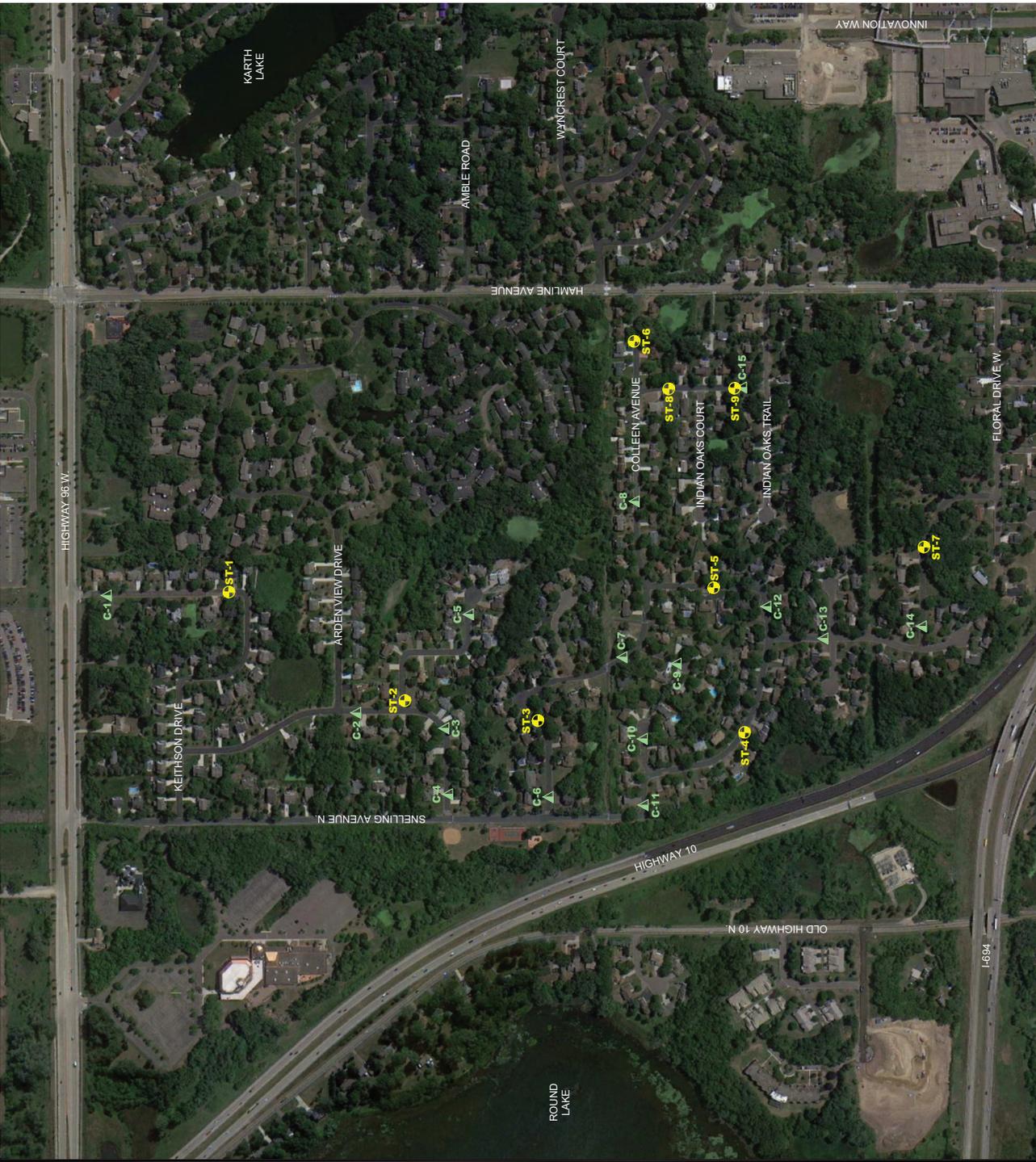
Project No:	B2204011.00
Drawing No:	B2204011
Drawn By:	JAG
Date Drawn:	5/4/22
Checked By:	KZ
Last Modified:	4/14/23

**Project Information**

2022 Street Rehabilitation - Phase 1
Various Streets

Arden Hills, Minnesota

**Soil Boring  
Location Sketch**



- DENOTES APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING
- DENOTES APPROXIMATE LOCATION OF PAVEMENT CORE



See Descriptive Terminology sheet for explanation of abbreviations

<b>Project Number B2204011.00</b>				<b>BORING: ST-8</b>	
<b>Geotechnical Evaluation</b>				LOCATION: See attached sketch	
<b>Arden Hills 2024 PMP</b>				DATUM: NAD 1983 HARN Adj MN Ramsey (US Feet)	
<b>Various City Streets</b>				NORTHING: 202124	EASTING: 557850
<b>Arden Hills, Minnesota</b>				START DATE: 04/11/23	END DATE: 04/11/23
DRILLER: M. Barber	LOGGED BY: K. Zalec	SURFACE ELEVATION: 965.4 ft		RIG: GP-1	METHOD: 3 1/4" HSA
		SURFACING: Bituminous		WEATHER: Clear	

Elev./Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q <sub>p</sub> tsf	MC %	Tests or Remarks
964.6 0.8		PAVEMENT, 3 1/2 inches of bituminous over 7 inches of apparent aggregate base FILL: CLAYEY SAND (SC), fine-grained, with Gravel, brown, moist		2-3-5 (8) 14"		15	P200=48%
958.4 7.0		SANDY LEAN CLAY (CL), little Gravel, brown, moist, soft to stiff, iron oxide staining (GLACIAL TILL)		1-1-2 (3) 14"		16	
				1-1-3 (4) 10"			
				1-2-3 (5) 13"			
		<i>Brown mottled with gray at 12 feet</i>		7-6-8-10 (14) 18"			
950.9 14.5		END OF BORING  Boring immediately backfilled					Water not observed while drilling.

See Descriptive Terminology sheet for explanation of abbreviations

<b>Project Number B2204011.00</b>				<b>BORING: ST-9</b>	
<b>Geotechnical Evaluation</b>				LOCATION: See attached sketch	
<b>Arden Hills 2024 PMP</b>				DATUM: NAD 1983 HARN Adj MN Ramsey (US Feet)	
<b>Various City Streets</b>				NORTHING: 201794	EASTING: 557853
<b>Arden Hills, Minnesota</b>				START DATE: 04/11/23	END DATE: 04/11/23
DRILLER: M. Barber	LOGGED BY: K. Zalec		SURFACING: Bituminous		WEATHER: Clear
SURFACE ELEVATION: 967.6 ft	RIG: GP-1	METHOD: 3 1/4" HSA			

Elev./Depth ft	Water Level	Description of Materials (Soil-ASTM D2488 or 2487; Rock-USACE EM 1110-1-2908)	Sample	Blows (N-Value) Recovery	q <sub>p</sub> tsf	MC %	Tests or Remarks
966.8 0.8		PAVEMENT, 4 inches of bituminous over 6 inches of apparent aggregate base FILL: CLAYEY SAND (SC), fine-grained, with Gravel, reddish brown to brown, moist		6-3-5 (8) 14"		13	P200=47%
960.6 7.0		SANDY LEAN CLAY (CL), little Gravel, reddish brown, moist, soft to medium (GLACIAL TILL)	5	2-3-3 (6) 11"		17	
955.6 12.0		LEAN CLAY (CL), reddish brown, moist, stiff (GLACIAL TILL)	10	1-1-3 (4) 12"			
953.1 14.5		END OF BORING  Boring immediately backfilled	15	4-3-6-12 (9) 18"			Water not observed while drilling.
			20				
			25				
			30				

# **Sediment Sampling Report**

Ponds 1, 2, 3  
Colleen Avenue  
Arden Hills, Minnesota

*Prepared for*

**Bolton & Menk, Inc.**

**City of Arden Hills**

May 9, 2023

Project B2204011.00

Mr. Brad Fisher, PE  
Bolton & Menk, Inc.  
12224 Nicollet Avenue  
Burnsville, MN 55337

Re: Sediment (Dredge) Sampling Report  
Ponds 1, 2, 3  
Colleen Avenue  
Arden Hills, Minnesota

Dear Mr. Fisher:

As authorized, Braun Intertec Corporation completed the pond and wetland sediment sampling activities at three stormwater ponds, referred to as Pond 1, Pond 2, and Pond 3, in Arden Hills, Minnesota. The objective of the work was to characterize the in-place sediment (future dredge material) for potential disposal purposes of the sediment across Pond 1 and Pond 2, and in the northern portion of Pond 3. In accordance with your description, the Site was evaluated as a Municipal Separate Storm Sewer System.

## **Sediment Sampling Procedures**

The above-referenced ponds each had a surface area of less than one acre and therefore, required two sample locations per Minnesota Pollution Control Agency (MPCA) guidance. The samples were comprised of sediment composites from the 0- to 5-foot interval (or a shorter interval that was appropriate based on the sediment thickness) from up to three sampling probe locations per analytical sample. The additional probes were conducted in order to create a more representative sample of the sediments that will be dredged from those areas of the pond.

Sample locations and associated composite areas are depicted on Figure 1.

During sampling activities, soil sample textures were evaluated by visual methods as the samples were collected and noted in the field notes. Drilling tools were cleaned prior to and between sampling runs by washing the equipment with a brush and potable water containing trisodium phosphate and rinsing the equipment with deionized water.

The samples were transferred to clean laboratory-supplied containers, preserved in accordance with Braun Intertec Standard Operating Procedures (SOPs) and transported to the laboratory for analysis. Chain of Custody was initiated at the time of sampling and maintained throughout the process.

AA/EOE

## Sample Analytical Parameters

Each of the samples was analyzed for the following parameters:

- Arsenic by SW-846 Environmental Protection Agency (EPA) 6020.
- Copper by SW-846 EPA 6020.
- Polycyclic Aromatic Hydrocarbons (PAHs) listed in Appendix A of MPCA document *Managing Stormwater Sediment, Best Management Practice Guidance for Municipalities*.

## Results

### Sediment Profile

Sediments observed during the completion of the borings consisted primarily of a very soft, grey to black silty muck throughout each of the borings. The muck was approximately 6 inches deep at the accessible locations and was underlain by soils of varying types, ranging from silty sands to clays. No odors or staining were noted in the sediments collected from the borings.

### Sediment Chemistry

Sediment sampling results were compared to MPCA residential/recreational and commercial/industrial soil reference values (SRVs) using the MPCA-prepared table template wq-strm4-79 (Revised 8/5/2021). Please refer to Table 1 for a detailed summary of the analytical results. Please refer to the Quality Control/Quality Assurance section below for a discussion regarding the use of “J” values in the analytical tables. Based on our review of the analytical results:

- Arsenic and copper were detected above the laboratory method reporting limits (MRL) in each of the samples analyzed, but at concentrations below their respective Residential/Recreational SRVs.
- Non-carcinogenic PAHs were detected at concentrations above the laboratory MRL, but at concentrations less than Residential/Recreational SRVs, in five of the six samples analyzed.
- Carcinogenic PAHs were detected at concentrations above the laboratory MRL, but at concentrations less than Residential/Recreational SRVs, in five of the six samples analyzed.

## Summary

While copper, non-carcinogenic PAHs, and carcinogenic PAHs were detected across the Site, none of the samples contained concentrations greater than MPCA SRVs.

## Quality Assurance/Quality Control

Samples were placed in clean, laboratory supplied containers, preserved, labeled, and transported to the Pace laboratory under refrigerated conditions using chain-of-custody procedures. Analyses were performed using EPA or other recognized standard procedures. A quality assessment of field procedures and analytical laboratory reports was performed to evaluate potential effects on data quality used to support project objectives. All applicable Braun Intertec SOPs were followed as prescribed unless otherwise noted in this report.

Due to high moisture content and to provide the highest-resolution results, analytical results were reported to the method detection limit, which introduced “J” flagged results, which are considered estimated concentrations, reported at less than the laboratory reporting limit. The results were reported to the method detection limit, and the data was evaluated using the MPCA standard procedures as described in Appendix B of “Managing Stormwater Sediment BMP Guidance for Municipalities.”

## Recommendations

Based on analytical results from our sampling and testing, excavated stormwater sediments from the Colleen Avenue project area fall within the Residential/Recreational SRV management category and may be used with no restrictions.

## General

Our scope of our work was determined by our understanding of the rules and guidance of the MPCA as they apply to needs of Bolton & Menk, Inc., working on behalf of the City of Arden Hills. Therefore, the scope of work is not represented to conform explicitly to current MPCA written guidance.

We appreciate the opportunity to provide our professional services on this project, and look forward to working with Bolton & Menk, Inc. in the future. Please contact Edward Pencak at 612.500.3752 or [epencak@braunintertec.com](mailto:epencak@braunintertec.com) or Mark Ciampone at 651.487.7015 if you have questions about the report or require additional information.

Sincerely,

BRAUN INTERTEC CORPORATION



Edward S. Pencak  
Project Scientist



Mark A. Ciampone, PG  
Business Unit Leader, Senior Scientist

Attachments:

Table 1: Summary of Sediment Testing Results

Figure 1: Sample Location Sketch

Laboratory Analytical Report

**Table**  
**Summary of Sediment Testing Results**

**Table 1**  
**Sediment Sample Results**  
**Arden Hills, MN**  
**Project B2204011.00**



520 Lafayette Road North  
 St. Paul, MN 55155-4194

**Summary of stormwater pond sediment testing results**

**Municipal Stormwater Program**

wq-strm4-79 (Revised 8/5/21)

Doc Type: Site Sampling Results

**Project name:** Ponds 1-3

**Sample date:** 4/18/2023

Chemical	Reporting limit* mg/kg	Sample locations		Sample locations																																	
		Residential / Recreational SRV mg/kg	Commercial / Industrial SRV mg/kg	Pond-1 E mg/kg	Pond-1 W mg/kg	Pond-2 E mg/kg	Pond-2 W mg/kg	Pond-3 E mg/kg	Pond-3 W mg/kg	Pond-1 E mg/kg		Pond-1 W mg/kg		Pond-2 E mg/kg		Pond-2 W mg/kg		Pond-3 E mg/kg		Pond-3 W mg/kg																	
<b>Metals</b>																																					
Arsenic	Varies	9	9	3.1	4.6	1.5	1.2	1.3	2.7																												
Copper	Varies	2,200	33,000	9.4	20.3	18.5	13.5	9.4	12.4																												
<b>Noncarcinogenic PAHs</b>																																					
Acenaphthene	Varies	450	6,800	<0.0019	<0.0024	<0.0020	<0.0018	<0.0019	<0.0018																												
Acenaphthylene	Varies	na	na	0.0152	<0.0021	<0.0018	<0.0016	<0.0016	<0.0015																												
Anthracene	Varies	2,800	42,000	0.0077	<0.0019	<0.0017	<0.0015	0.024	<0.0014																												
Benzo(g,h,i)perylene	Varies	na	na	0.0982	0.0399	<0.0032	<0.0029	0.108	<0.0028																												
Fluoranthene	Varies	200	2,700	0.222	0.132	<0.0037	0.0329	0.376	0.0233																												
Fluorene	Varies	390	5,800	<0.0019	<0.0024	<0.0020	<0.0018	<0.0019	<0.0018																												
2-Methylnaphthalene	Varies	39	580	<0.0025	<0.0033	<0.0028	<0.0025	<0.0025	<0.0024																												
Naphthalene	Varies	81	280	<0.0026	<0.0034	<0.0029	<0.0026	<0.0027	<0.0025																												
Phenanthrene	Varies	na	na	0.0627	0.0387	<0.0026	<0.0023	0.172	<0.0023																												
Pyrene	Varies	220	3,200	0.170	0.102	<0.0035	0.02	0.287	0.0177																												
<b>Carcinogenic PAHs/ B[a]P Equivalents</b>																																					
	Reporting limit* mg/kg	Potency Equiv. Factor (PEF)		Site Conc. mg/kg	BaP Equiv. Conc. mg/kg	Site Conc. mg/kg	BaP Equiv. Conc. mg/kg	Site Conc. mg/kg	BaP Equiv. Conc. mg/kg	Site Conc. mg/kg	BaP Equiv. Conc. mg/kg	Site Conc. mg/kg	BaP Equiv. Conc. mg/kg	Site Conc. mg/kg	BaP Equiv. Conc. mg/kg	Site Conc. mg/kg	BaP Equiv. Conc. mg/kg	Site Conc. mg/kg	BaP Equiv. Conc. mg/kg	Site Conc. mg/kg	BaP Equiv. Conc. mg/kg	Site Conc. mg/kg	BaP Equiv. Conc. mg/kg	Site Conc. mg/kg	BaP Equiv. Conc. mg/kg	Site Conc. mg/kg	BaP Equiv. Conc. mg/kg										
Benzo[a]anthracene	Varies	0.10		0.077	0.008	0.042	0.004	0.002	0.000	0.002	0.000	0.002	0.000	0.137	0.014	0.007	0.001																				
Benzo[fluoranthenes (total)	Varies	0.10		0.239	0.024	0.106	0.011	0.0047	0.000	0.030	0.003	0.282	0.028	0.019	0.002																						
Benzo[a]pyrene	Varies	1.00		0.079	0.079	0.049	0.049	0.001	0.001	0.001	0.001	0.146	0.146	0.001	0.001																						
Chrysene	Varies	0.01		0.134	0.001	0.061	0.001	0.0014	0.000	0.017	0.000	0.169	0.002	0.013	0.000																						
Dibenzo[a,h]acridine	Varies	0.10		0.002	0.000	0.002	0.000	0.001	0.000	0.001	0.000	0.002	0.000	0.001	0.000																						
Dibenzo[a,h]anthracene	Varies	0.56		0.018	0.010	0.001	0.001	0.001	0.000	0.001	0.000	0.023	0.013	0.001	0.000																						
7H-Dibenzo[c,g]carbazole	Varies	1.00		0.006	0.006	0.007	0.007	0.003	0.003	0.003	0.003	0.006	0.006	0.003	0.003																						
Dibenzo[a,e]pyrene	Varies	1.00		0.039	0.039	0.020	0.020	0.001	0.001	0.001	0.001	0.051	0.051	0.001	0.001																						
Dibenzo[a,h]pyrene	Varies	10.00		0.021	0.212	0.004	0.036	0.002	0.016	0.001	0.014	0.028	0.275	0.001	0.014																						
Dibenzo[a,i]pyrene	Varies	10.00		0.001	0.013	0.002	0.017	0.001	0.008	0.001	0.007	0.016	0.159	0.001	0.007																						
Dibenzo[a,l]pyrene	Varies	10.00		0.002	0.020	0.003	0.026	0.001	0.011	0.001	0.010	0.002	0.020	0.001	0.010																						
7,12 Dimethylbenz-anthracene	Varies	34.00		0.001	0.022	0.001	0.029	0.000	0.012	0.000	0.011	0.001	0.023	0.000	0.011																						
Indeno[1,2,3-c,d]pyrene	Varies	0.10		0.096	0.010	0.042	0.004	0.001	0.000	0.001	0.000	0.116	0.012	0.001	0.000																						
3-Methylcholanthrene	Varies	3.00		0.003	0.010	0.004	0.012	0.002	0.005	0.002	0.005	0.003	0.009	0.002	0.005																						
5-Methylchrysene	Varies	1.00		0.011	0.011	0.002	0.002	0.001	0.001	0.001	0.001	0.002	0.002	0.001	0.001																						
<b>Total B[a]P Equivalents</b>		<b>2*</b>	<b>23</b>	<b>0.464</b>	<b>0.220</b>	<b>0.059</b>	<b>0.054</b>	<b>0.759</b>	<b>0.053</b>																												

\* Based on background threshold value (BTV) since residential/recreational SRV calculated to be below an estimate of ambient background

[+] Per MPCA Guidance document C-R1-05 (Soil Reference Value Technical Support Document, dated April 2022, analytical results are to be rounded to the nearest whole number when compared to whole number BTVs. Concentrations at the BTV are not considered an exceedence, and are flagged with this symbol to show the risk evaluation process.

Less than residential/recreational SRV (suitable for residential land use)

Less than commercial/industrial SRV (suitable for industrial land use)

Exceeds commercial/industrial SRV (must be treated or disposed in a landfill with MPCA approved industrial waste management plan)

Highlight value for "J" flagged data - sample concentration is above method detection limit but below reporting limit

SRV = soil reference value

PAHs = polycyclic aromatic hydrocarbons

B[a]P = benzo[a]pyrene

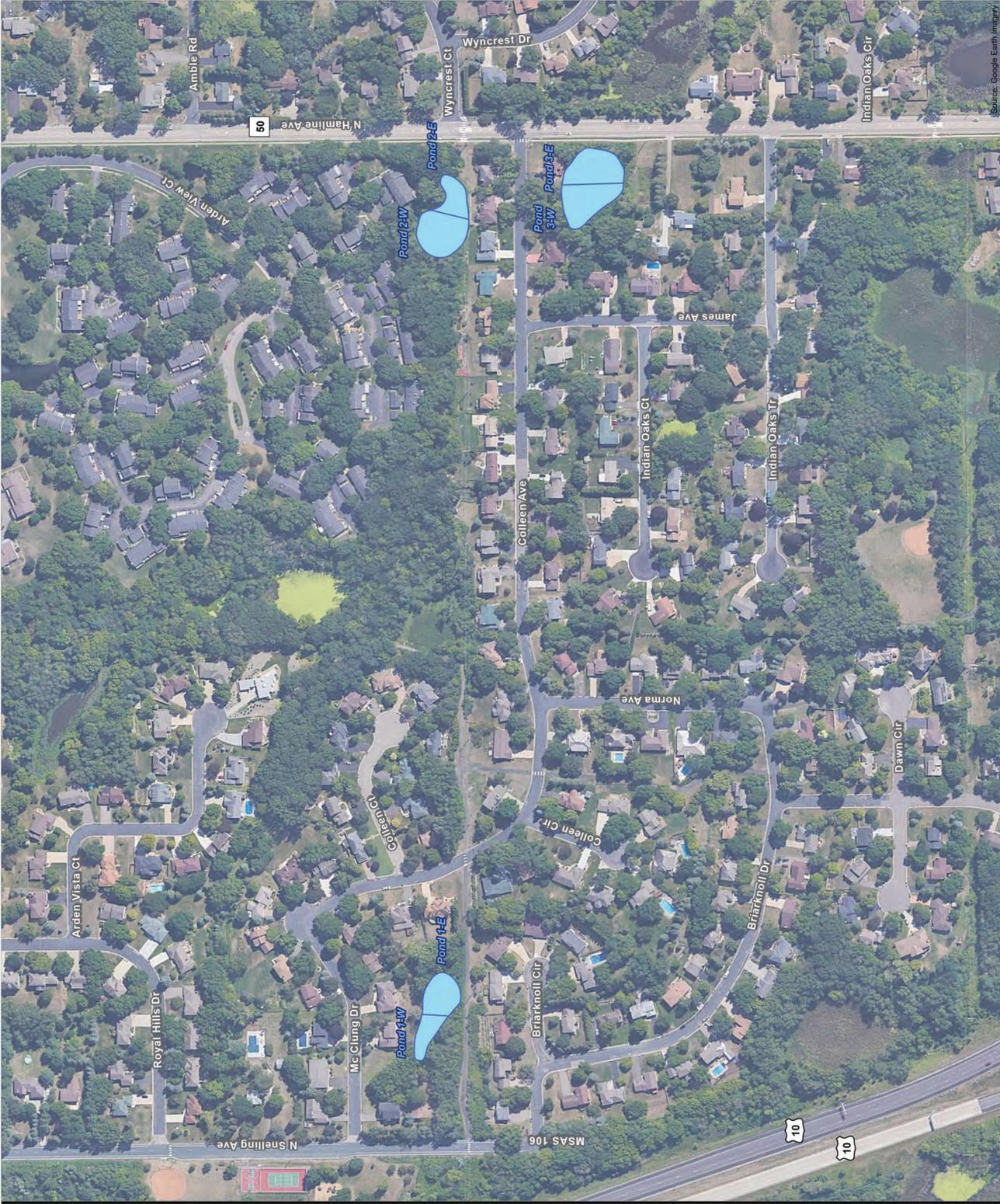
conc. = concentration

\* Reporting limit - insert reporting limit in this column from the lab analytical results reports (converting to mg/kg if necessary)

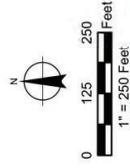
**B[a]P Equivalent** - Each contaminant sample concentration is multiplied by its Potency Equivalency Factor (PEF) to obtain a B[a]P equivalent concentration. All B[a]P equivalent concentrations are summed to calculate the total B[a]P equivalent concentration. For nondetect data, use the procedures outlined in Appendix B of "Managing Stormwater Sediment BMP Guidance For Municipalities". Nondetect results within samples with four or more cPAH detections are reported as the MDL, while nondetect results within samples with three or fewer cPAH detections are reported as 1/2 the MDL.

**Figure 1**  
**Sample Location Sketch**

Approximate Pond Location



Source: Google Earth Imagery



Drawing Information	
Project No:	B2204011.00
Drawing No:	ZS
Sample Location Sketch	ZS
Drawn By:	5/3/2023
Drawn Drawn:	EP
Checked By:	5/3/2023
Last Modified:	

Project Information	
Arden Hills 2024 PMP	

Colleen Avenue  
Arden Hills, Minnesota

**Sample**  
**Location Sketch**



● Sediment Sample



Drawing Information

Project No: B2204011.00  
 Drawing No: ZS  
 Sample Location Sketch  
 Drawn By: 5/3/2023  
 Drawn Drawn: EP  
 Checked By: 5/3/2023  
 Last Modified: EP

Project Information

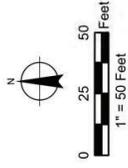
Arden Hills 2024 PMP

Colleen Avenue

Arden Hills, Minnesota

**Sample Location Sketch**

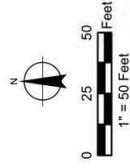
Sheet: 2 of 4  
 Figure 1



● Sediment Sample



Source: Google Earth Imagery



Drawing Information	
Project No:	B2204011.00
Drawing No:	ZS
Sample Location Sketch	
Drawn By:	5/3/2023
Drawn Drawn:	EP
Checked By:	5/3/2023
Last Modified:	

Project Information  
Arden Hills 2024 PMP

Colleen Avenue

Arden Hills, Minnesota

Sample Location Sketch



Source: Google Earth Imagery

● Sediment Sample



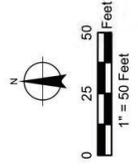
Drawing Information	
Project No:	BZ204011.00
Drawing No:	ZS
Sample Location Sketch	
Drawn By:	5/3/2023
Checked By:	EP
Last Modified:	5/3/2023

Project Information  
 Arden Hills 2024 PMP

Colleen Avenue

Arden Hills, Minnesota

Sample Location Sketch



## Laboratory Analytical Report

May 02, 2023

Edward Pencak  
Braun Intertec  
11001 Hampshire Ave S  
Bloomington, MN 55438

RE: Project: B2204011.00-Revised Report  
Pace Project No.: 10650001

Dear Edward Pencak:

Enclosed are the analytical results for sample(s) received by the laboratory on April 18, 2023. The results relate only to the samples included in this report. Results reported herein conform to the applicable TNI/NELAC Standards and the laboratory's Quality Manual, where applicable, unless otherwise noted in the body of the report.

The test results provided in this final report were generated by each of the following laboratories within the Pace Network:

- Pace Analytical Services - Minneapolis

This report was revised on May 2, 2023 to report the 6020 results for copper and arsenic and update the cPAH analyte list for all Pace samples.

If you have any questions concerning this report, please feel free to contact me.

Sincerely,



Brenna Bloome  
brenna.bloome@pacelabs.com  
(612)607-1700  
Project Manager

Enclosures



## REPORT OF LABORATORY ANALYSIS

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## CERTIFICATIONS

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

---

### **Pace Analytical Services, LLC - Minneapolis MN**

1700 Elm Street SE, Minneapolis, MN 55414

A2LA Certification #: 2926.01

Alabama Certification #: 40770

Alaska Contaminated Sites Certification #: 17-009

Alaska DW Certification #: MN00064

Arizona Certification #: AZ0014

Arkansas DW Certification #: MN00064

Arkansas WW Certification #: 88-0680

California Certification #: 2929

Colorado Certification #: MN00064

Connecticut Certification #: PH-0256

EPA Region 8 Tribal Water Systems+Wyoming DW

Certification #: via MN 027-053-137

Florida Certification #: E87605

Georgia Certification #: 959

GMP+ Certification #: GMP050884

Hawaii Certification #: MN00064

Idaho Certification #: MN00064

Illinois Certification #: 200011

Indiana Certification #: C-MN-01

Iowa Certification #: 368

Kansas Certification #: E-10167

Kentucky DW Certification #: 90062

Kentucky WW Certification #: 90062

Louisiana DEQ Certification #: AI-03086

Louisiana DW Certification #: MN00064

Maine Certification #: MN00064

Maryland Certification #: 322

Michigan Certification #: 9909

Minnesota Certification #: 027-053-137

Minnesota Dept of Ag Approval: via MN 027-053-137

Minnesota Petrofund Registration #: 1240

Mississippi Certification #: MN00064

Missouri Certification #: 10100

Montana Certification #: CERT0092

Nebraska Certification #: NE-OS-18-06

Nevada Certification #: MN00064

New Hampshire Certification #: 2081

New Jersey Certification #: MN002

New York Certification #: 11647

North Carolina DW Certification #: 27700

North Carolina WW Certification #: 530

North Dakota Certification (A2LA) #: R-036

North Dakota Certification (MN) #: R-036

Ohio DW Certification #: 41244

Ohio VAP Certification (1700) #: CL101

Oklahoma Certification #: 9507

Oregon Primary Certification #: MN300001

Oregon Secondary Certification #: MN200001

Pennsylvania Certification #: 68-00563

Puerto Rico Certification #: MN00064

South Carolina Certification #: 74003001

Tennessee Certification #: TN02818

Texas Certification #: T104704192

Utah Certification #: MN00064

Vermont Certification #: VT-027053137

Virginia Certification #: 460163

Washington Certification #: C486

West Virginia DEP Certification #: 382

West Virginia DW Certification #: 9952 C

Wisconsin Certification #: 999407970

Wyoming UST Certification #: via A2LA 2926.01

USDA Permit #: P330-19-00208

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## REPORT OF LABORATORY ANALYSIS

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## SAMPLE SUMMARY

Project: B2204011.00-Revised Report  
Pace Project No.: 10650001

Lab ID	Sample ID	Matrix	Date Collected	Date Received
10650001001	Pond 1-E	Solid	04/18/23 09:50	04/18/23 16:07
10650001002	Pond 1-W	Solid	04/18/23 10:15	04/18/23 16:07
10650001003	Pond 2-W	Solid	04/18/23 11:00	04/18/23 16:07
10650001004	Pond 2-E	Solid	04/18/23 11:20	04/18/23 16:07
10650001005	Pond 3-E	Solid	04/18/23 12:45	04/18/23 16:07
10650001006	Pond 3-W	Solid	04/18/23 13:00	04/18/23 16:07

## REPORT OF LABORATORY ANALYSIS

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### SAMPLE ANALYTE COUNT

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

Lab ID	Sample ID	Method	Analysts	Analytes Reported	Laboratory
10650001001	Pond 1-E	EPA 6020B	NN2	2	PASI-M
		ASTM D2974	JDL	1	PASI-M
		EPA 8270E by SIM	KJ3	27	PASI-M
10650001002	Pond 1-W	EPA 6020B	NN2	2	PASI-M
		ASTM D2974	JDL	1	PASI-M
		EPA 8270E by SIM	KJ3	27	PASI-M
10650001003	Pond 2-W	EPA 6020B	NN2	2	PASI-M
		ASTM D2974	JDL	1	PASI-M
		EPA 8270E by SIM	KJ3	27	PASI-M
10650001004	Pond 2-E	EPA 6020B	NN2	2	PASI-M
		ASTM D2974	JDL	1	PASI-M
		EPA 8270E by SIM	KJ3	27	PASI-M
10650001005	Pond 3-E	EPA 6020B	NN2	2	PASI-M
		ASTM D2974	JDL	1	PASI-M
		EPA 8270E by SIM	KJ3	27	PASI-M
10650001006	Pond 3-W	EPA 6020B	NN2	2	PASI-M
		ASTM D2974	JDL	1	PASI-M
		EPA 8270E by SIM	KJ3	27	PASI-M

PASI-M = Pace Analytical Services - Minneapolis

### REPORT OF LABORATORY ANALYSIS

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## PROJECT NARRATIVE

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

---

**Method:** EPA 6020B

**Description:** 6020B MET ICPMS

**Client:** Braun Intertec Corporation

**Date:** May 02, 2023

**General Information:**

6 samples were analyzed for EPA 6020B by Pace Analytical Services Minneapolis. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

**Hold Time:**

The samples were analyzed within the method required hold times with any exceptions noted below.

**Sample Preparation:**

The samples were prepared in accordance with EPA 3050B with any exceptions noted below.

**Initial Calibrations (including MS Tune as applicable):**

All criteria were within method requirements with any exceptions noted below.

**Continuing Calibration:**

All criteria were within method requirements with any exceptions noted below.

**Internal Standards:**

All internal standards were within QC limits with any exceptions noted below.

**Method Blank:**

All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

**Laboratory Control Spike:**

All laboratory control spike compounds were within QC limits with any exceptions noted below.

**Matrix Spikes:**

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

**Additional Comments:**

## REPORT OF LABORATORY ANALYSIS

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## PROJECT NARRATIVE

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

---

**Method:** EPA 8270E by SIM

**Description:** 8270E MSSV CPAH by SIM

**Client:** Braun Intertec Corporation

**Date:** May 02, 2023

### General Information:

6 samples were analyzed for EPA 8270E by SIM by Pace Analytical Services Minneapolis. All samples were received in acceptable condition with any exceptions noted below or on the chain-of custody and/or the sample condition upon receipt form (SCUR) attached at the end of this report.

L2: Analyte recovery in the laboratory control sample (LCS) was below QC limits. Results for this analyte in associated samples may be biased low.

- Pond 1-E (Lab ID: 10650001001)
- Pond 1-W (Lab ID: 10650001002)
- Pond 2-E (Lab ID: 10650001004)
- Pond 2-W (Lab ID: 10650001003)
- Pond 3-E (Lab ID: 10650001005)
- Pond 3-W (Lab ID: 10650001006)

### Hold Time:

The samples were analyzed within the method required hold times with any exceptions noted below.

### Sample Preparation:

The samples were prepared in accordance with EPA 3546 with any exceptions noted below.

### Initial Calibrations (including MS Tune as applicable):

All criteria were within method requirements with any exceptions noted below.

### Continuing Calibration:

All criteria were within method requirements with any exceptions noted below.

### Internal Standards:

All internal standards were within QC limits with any exceptions noted below.

### Surrogates:

All surrogates were within QC limits with any exceptions noted below.

### Method Blank:

All analytes were below the report limit in the method blank, where applicable, with any exceptions noted below.

### Laboratory Control Spike:

All laboratory control spike compounds were within QC limits with any exceptions noted below.

### Matrix Spikes:

All percent recoveries and relative percent differences (RPDs) were within acceptance criteria with any exceptions noted below.

QC Batch: 876844

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 10650001001

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- MS (Lab ID: 4623734)

## REPORT OF LABORATORY ANALYSIS

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## PROJECT NARRATIVE

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

---

**Method:** EPA 8270E by SIM

**Description:** 8270E MSSV CPAH by SIM

**Client:** Braun Intertec Corporation

**Date:** May 02, 2023

QC Batch: 876844

A matrix spike and/or matrix spike duplicate (MS/MSD) were performed on the following sample(s): 10650001001

M1: Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

- 7,12-Dimethylbenz(a)anthracene
- Chrysene
- Fluoranthene
- Pyrene
- MSD (Lab ID: 4623735)
  - 7,12-Dimethylbenz(a)anthracene
  - Chrysene
  - Fluoranthene
  - Pyrene

### Additional Comments:

Analyte Comments:

QC Batch: 876844

N2: The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A complete list of accreditations/certifications is available upon request.

- BLANK (Lab ID: 4623732)
  - Benzo(a)fluoranthenes (Total)
- LCS (Lab ID: 4623733)
  - Benzo(a)fluoranthenes (Total)
- MS (Lab ID: 4623734)
  - Benzo(a)fluoranthenes (Total)
- MSD (Lab ID: 4623735)
  - Benzo(a)fluoranthenes (Total)
- Pond 1-E (Lab ID: 10650001001)
  - Benzo(a)fluoranthenes (Total)
- Pond 1-W (Lab ID: 10650001002)
  - Benzo(a)fluoranthenes (Total)
- Pond 2-E (Lab ID: 10650001004)
  - Benzo(a)fluoranthenes (Total)
- Pond 2-W (Lab ID: 10650001003)
  - Benzo(a)fluoranthenes (Total)
- Pond 3-E (Lab ID: 10650001005)
  - Benzo(a)fluoranthenes (Total)
- Pond 3-W (Lab ID: 10650001006)
  - Benzo(a)fluoranthenes (Total)

This data package has been reviewed for quality and completeness and is approved for release.

## REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

**Sample: Pond 1-E**      **Lab ID: 10650001001**      Collected: 04/18/23 09:50      Received: 04/18/23 16:07      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
<b>6020B MET ICPMS</b>									
Analytical Method: EPA 6020B    Preparation Method: EPA 3050B									
Pace Analytical Services - Minneapolis									
Arsenic	3.1	mg/kg	0.69	0.20	1	04/23/23 06:34	04/24/23 18:13	7440-38-2	
Copper	9.4	mg/kg	1.4	0.42	1	04/23/23 06:34	04/24/23 18:13	7440-50-8	
<b>Dry Weight / %M by ASTM D2974</b>									
Analytical Method: ASTM D2974									
Pace Analytical Services - Minneapolis									
Percent Moisture	28.9	%	0.10	0.10	1		04/20/23 11:41		N2
<b>8270E MSSV CPAH by SIM</b>									
Analytical Method: EPA 8270E by SIM    Preparation Method: EPA 3546									
Pace Analytical Services - Minneapolis									
Acenaphthene	<1.9	ug/kg	13.8	1.9	1	04/21/23 13:20	04/27/23 15:54	83-32-9	
Acenaphthylene	15.2	ug/kg	13.8	1.6	1	04/21/23 13:20	04/27/23 15:54	208-96-8	
Anthracene	7.7J	ug/kg	13.8	1.5	1	04/21/23 13:20	04/27/23 15:54	120-12-7	
Benzo(a)anthracene	76.7	ug/kg	13.8	3.8	1	04/21/23 13:20	04/27/23 15:54	56-55-3	
Benzo(a)pyrene	79.0	ug/kg	13.8	1.8	1	04/21/23 13:20	04/27/23 15:54	50-32-8	
Benzo(g,h,i)perylene	98.2	ug/kg	13.8	2.9	1	04/21/23 13:20	04/27/23 15:54	191-24-2	
Benzofluoranthenes (Total)	239	ug/kg	41.5	8.5	1	04/21/23 13:20	04/27/23 15:54		N2
Chrysene	134	ug/kg	13.8	2.5	1	04/21/23 13:20	04/27/23 15:54	218-01-9	M1
Dibenz(a,h)acridine	<1.6	ug/kg	13.8	1.6	1	04/21/23 13:20	04/27/23 15:54	226-36-8	
Dibenz(a,h)anthracene	18.2	ug/kg	13.8	1.1	1	04/21/23 13:20	04/27/23 15:54	53-70-3	
Dibenzo(a,e)pyrene	38.5	ug/kg	13.8	1.6	1	04/21/23 13:20	04/27/23 15:54	192-65-4	
Dibenzo(a,h)pyrene	21.2	ug/kg	13.8	2.8	1	04/21/23 13:20	04/27/23 15:54	189-64-0	
Dibenzo(a,i)pyrene	<1.3	ug/kg	13.8	1.3	1	04/21/23 13:20	04/27/23 15:54	189-55-9	
Dibenzo(a,l)pyrene	<2.0	ug/kg	13.8	2.0	1	04/21/23 13:20	04/27/23 15:54	191-30-0	L2
7H-Dibenzo(c,g)carbazole	<5.7	ug/kg	13.8	5.7	1	04/21/23 13:20	04/27/23 15:54	194-59-2	
7,12-Dimethylbenz(a)anthracene	<0.66	ug/kg	13.8	0.66	1	04/21/23 13:20	04/27/23 15:54	57-97-6	M1
Fluoranthene	222	ug/kg	13.8	3.3	1	04/21/23 13:20	04/27/23 15:54	206-44-0	M1
Fluorene	<1.9	ug/kg	13.8	1.9	1	04/21/23 13:20	04/27/23 15:54	86-73-7	
Indeno(1,2,3-cd)pyrene	96.2	ug/kg	13.8	1.3	1	04/21/23 13:20	04/27/23 15:54	193-39-5	
3-Methylcholanthrene	<3.2	ug/kg	13.8	3.2	1	04/21/23 13:20	04/27/23 15:54	56-49-5	L2
5-Methylchrysene	11.3J	ug/kg	13.8	1.8	1	04/21/23 13:20	04/27/23 15:54	3697-24-3	
2-Methylnaphthalene	<2.5	ug/kg	13.8	2.5	1	04/21/23 13:20	04/27/23 15:54	91-57-6	
Naphthalene	<2.6	ug/kg	13.8	2.6	1	04/21/23 13:20	04/27/23 15:54	91-20-3	
Phenanthrene	62.7	ug/kg	13.8	2.4	1	04/21/23 13:20	04/27/23 15:54	85-01-8	
Pyrene	170	ug/kg	13.8	3.2	1	04/21/23 13:20	04/27/23 15:54	129-00-0	M1
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	77	%	46-125		1	04/21/23 13:20	04/27/23 15:54	321-60-8	
p-Terphenyl-d14 (S)	84	%	69-125		1	04/21/23 13:20	04/27/23 15:54	1718-51-0	

## REPORT OF LABORATORY ANALYSIS

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## ANALYTICAL RESULTS

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

**Sample: Pond 1-W**      **Lab ID: 10650001002**      Collected: 04/18/23 10:15      Received: 04/18/23 16:07      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
<b>6020B MET ICPMS</b>									
Analytical Method: EPA 6020B    Preparation Method: EPA 3050B									
Pace Analytical Services - Minneapolis									
Arsenic	<b>4.6</b>	mg/kg	0.87	0.25	1	04/23/23 06:34	04/24/23 18:16	7440-38-2	
Copper	<b>20.3</b>	mg/kg	1.7	0.53	1	04/23/23 06:34	04/24/23 18:16	7440-50-8	
<b>Dry Weight / %M by ASTM D2974</b>									
Analytical Method: ASTM D2974									
Pace Analytical Services - Minneapolis									
Percent Moisture	<b>45.1</b>	%	0.10	0.10	1		04/20/23 11:41		N2
<b>8270E MSSV CPAH by SIM</b>									
Analytical Method: EPA 8270E by SIM    Preparation Method: EPA 3546									
Pace Analytical Services - Minneapolis									
Acenaphthene	<b>&lt;2.4</b>	ug/kg	18.0	2.4	1	04/21/23 13:20	04/27/23 17:24	83-32-9	
Acenaphthylene	<b>&lt;2.1</b>	ug/kg	18.0	2.1	1	04/21/23 13:20	04/27/23 17:24	208-96-8	
Anthracene	<b>&lt;1.9</b>	ug/kg	18.0	1.9	1	04/21/23 13:20	04/27/23 17:24	120-12-7	
Benzo(a)anthracene	<b>42.0</b>	ug/kg	18.0	4.9	1	04/21/23 13:20	04/27/23 17:24	56-55-3	
Benzo(a)pyrene	<b>49.2</b>	ug/kg	18.0	2.3	1	04/21/23 13:20	04/27/23 17:24	50-32-8	
Benzo(g,h,i)perylene	<b>39.9</b>	ug/kg	18.0	3.8	1	04/21/23 13:20	04/27/23 17:24	191-24-2	
Benzofluoranthenes (Total)	<b>106</b>	ug/kg	53.9	11.1	1	04/21/23 13:20	04/27/23 17:24		N2
Chrysene	<b>61.1</b>	ug/kg	18.0	3.3	1	04/21/23 13:20	04/27/23 17:24	218-01-9	
Dibenz(a,h)acridine	<b>&lt;2.0</b>	ug/kg	18.0	2.0	1	04/21/23 13:20	04/27/23 17:24	226-36-8	
Dibenz(a,h)anthracene	<b>&lt;1.4</b>	ug/kg	18.0	1.4	1	04/21/23 13:20	04/27/23 17:24	53-70-3	
Dibenzo(a,e)pyrene	<b>19.8</b>	ug/kg	18.0	2.0	1	04/21/23 13:20	04/27/23 17:24	192-65-4	
Dibenzo(a,h)pyrene	<b>&lt;3.6</b>	ug/kg	18.0	3.6	1	04/21/23 13:20	04/27/23 17:24	189-64-0	
Dibenzo(a,i)pyrene	<b>&lt;1.7</b>	ug/kg	18.0	1.7	1	04/21/23 13:20	04/27/23 17:24	189-55-9	
Dibenzo(a,l)pyrene	<b>&lt;2.6</b>	ug/kg	18.0	2.6	1	04/21/23 13:20	04/27/23 17:24	191-30-0	L2
7H-Dibenzo(c,g)carbazole	<b>&lt;7.4</b>	ug/kg	18.0	7.4	1	04/21/23 13:20	04/27/23 17:24	194-59-2	
7,12-Dimethylbenz(a)anthracene	<b>&lt;0.86</b>	ug/kg	18.0	0.86	1	04/21/23 13:20	04/27/23 17:24	57-97-6	
Fluoranthene	<b>132</b>	ug/kg	18.0	4.3	1	04/21/23 13:20	04/27/23 17:24	206-44-0	
Fluorene	<b>&lt;2.4</b>	ug/kg	18.0	2.4	1	04/21/23 13:20	04/27/23 17:24	86-73-7	
Indeno(1,2,3-cd)pyrene	<b>42.1</b>	ug/kg	18.0	1.7	1	04/21/23 13:20	04/27/23 17:24	193-39-5	
3-Methylcholanthrene	<b>&lt;4.1</b>	ug/kg	18.0	4.1	1	04/21/23 13:20	04/27/23 17:24	56-49-5	L2
5-Methylchrysene	<b>&lt;2.3</b>	ug/kg	18.0	2.3	1	04/21/23 13:20	04/27/23 17:24	3697-24-3	
2-Methylnaphthalene	<b>&lt;3.3</b>	ug/kg	18.0	3.3	1	04/21/23 13:20	04/27/23 17:24	91-57-6	
Naphthalene	<b>&lt;3.4</b>	ug/kg	18.0	3.4	1	04/21/23 13:20	04/27/23 17:24	91-20-3	
Phenanthrene	<b>38.7</b>	ug/kg	18.0	3.1	1	04/21/23 13:20	04/27/23 17:24	85-01-8	
Pyrene	<b>102</b>	ug/kg	18.0	4.1	1	04/21/23 13:20	04/27/23 17:24	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	83	%	46-125		1	04/21/23 13:20	04/27/23 17:24	321-60-8	
p-Terphenyl-d14 (S)	86	%	69-125		1	04/21/23 13:20	04/27/23 17:24	1718-51-0	

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### ANALYTICAL RESULTS

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

**Sample: Pond 2-W**      **Lab ID: 10650001003**      Collected: 04/18/23 11:00      Received: 04/18/23 16:07      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
<b>6020B MET ICPMS</b>									
Analytical Method: EPA 6020B    Preparation Method: EPA 3050B									
Pace Analytical Services - Minneapolis									
Arsenic	1.2	mg/kg	0.69	0.20	1	04/23/23 06:34	04/24/23 18:25	7440-38-2	
Copper	13.5	mg/kg	1.4	0.42	1	04/23/23 06:34	04/24/23 18:25	7440-50-8	
<b>Dry Weight / %M by ASTM D2974</b>									
Analytical Method: ASTM D2974									
Pace Analytical Services - Minneapolis									
Percent Moisture	29.4	%	0.10	0.10	1		04/20/23 11:41		N2
<b>8270E MSSV CPAH by SIM</b>									
Analytical Method: EPA 8270E by SIM    Preparation Method: EPA 3546									
Pace Analytical Services - Minneapolis									
Acenaphthene	<1.8	ug/kg	13.6	1.8	1	04/21/23 13:20	04/27/23 17:54	83-32-9	
Acenaphthylene	<1.6	ug/kg	13.6	1.6	1	04/21/23 13:20	04/27/23 17:54	208-96-8	
Anthracene	<1.5	ug/kg	13.6	1.5	1	04/21/23 13:20	04/27/23 17:54	120-12-7	
Benzo(a)anthracene	<3.7	ug/kg	13.6	3.7	1	04/21/23 13:20	04/27/23 17:54	56-55-3	
Benzo(a)pyrene	<1.7	ug/kg	13.6	1.7	1	04/21/23 13:20	04/27/23 17:54	50-32-8	
Benzo(g,h,i)perylene	<2.9	ug/kg	13.6	2.9	1	04/21/23 13:20	04/27/23 17:54	191-24-2	
Benzo(a)fluoranthene (Total)	29.8J	ug/kg	40.7	8.3	1	04/21/23 13:20	04/27/23 17:54		N2
Chrysene	17.2	ug/kg	13.6	2.5	1	04/21/23 13:20	04/27/23 17:54	218-01-9	
Dibenz(a,h)acridine	<1.5	ug/kg	13.6	1.5	1	04/21/23 13:20	04/27/23 17:54	226-36-8	
Dibenz(a,h)anthracene	<1.1	ug/kg	13.6	1.1	1	04/21/23 13:20	04/27/23 17:54	53-70-3	
Dibenzo(a,e)pyrene	<1.5	ug/kg	13.6	1.5	1	04/21/23 13:20	04/27/23 17:54	192-65-4	
Dibenzo(a,h)pyrene	<2.7	ug/kg	13.6	2.7	1	04/21/23 13:20	04/27/23 17:54	189-64-0	
Dibenzo(a,i)pyrene	<1.3	ug/kg	13.6	1.3	1	04/21/23 13:20	04/27/23 17:54	189-55-9	
Dibenzo(a,l)pyrene	<1.9	ug/kg	13.6	1.9	1	04/21/23 13:20	04/27/23 17:54	191-30-0	L2
7H-Dibenzo(c,g)carbazole	<5.6	ug/kg	13.6	5.6	1	04/21/23 13:20	04/27/23 17:54	194-59-2	
7,12-Dimethylbenz(a)anthracene	<0.65	ug/kg	13.6	0.65	1	04/21/23 13:20	04/27/23 17:54	57-97-6	
Fluoranthene	32.9	ug/kg	13.6	3.3	1	04/21/23 13:20	04/27/23 17:54	206-44-0	
Fluorene	<1.8	ug/kg	13.6	1.8	1	04/21/23 13:20	04/27/23 17:54	86-73-7	
Indeno(1,2,3-cd)pyrene	<1.3	ug/kg	13.6	1.3	1	04/21/23 13:20	04/27/23 17:54	193-39-5	
3-Methylcholanthrene	<3.1	ug/kg	13.6	3.1	1	04/21/23 13:20	04/27/23 17:54	56-49-5	L2
5-Methylchrysene	<1.7	ug/kg	13.6	1.7	1	04/21/23 13:20	04/27/23 17:54	3697-24-3	
2-Methylnaphthalene	<2.5	ug/kg	13.6	2.5	1	04/21/23 13:20	04/27/23 17:54	91-57-6	
Naphthalene	<2.6	ug/kg	13.6	2.6	1	04/21/23 13:20	04/27/23 17:54	91-20-3	
Phenanthrene	<2.3	ug/kg	13.6	2.3	1	04/21/23 13:20	04/27/23 17:54	85-01-8	
Pyrene	20.0	ug/kg	13.6	3.1	1	04/21/23 13:20	04/27/23 17:54	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	78	%	46-125		1	04/21/23 13:20	04/27/23 17:54	321-60-8	
p-Terphenyl-d14 (S)	73	%	69-125		1	04/21/23 13:20	04/27/23 17:54	1718-51-0	

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### ANALYTICAL RESULTS

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

**Sample: Pond 2-E**      **Lab ID: 10650001004**      Collected: 04/18/23 11:20      Received: 04/18/23 16:07      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
<b>6020B MET ICPMS</b>									
Analytical Method: EPA 6020B    Preparation Method: EPA 3050B									
Pace Analytical Services - Minneapolis									
Arsenic	1.5	mg/kg	0.75	0.21	1	04/23/23 06:34	04/24/23 18:28	7440-38-2	
Copper	18.5	mg/kg	1.5	0.46	1	04/23/23 06:34	04/24/23 18:28	7440-50-8	
<b>Dry Weight / %M by ASTM D2974</b>									
Analytical Method: ASTM D2974									
Pace Analytical Services - Minneapolis									
Percent Moisture	35.7	%	0.10	0.10	1		04/20/23 11:41		N2
<b>8270E MSSV CPAH by SIM</b>									
Analytical Method: EPA 8270E by SIM    Preparation Method: EPA 3546									
Pace Analytical Services - Minneapolis									
Acenaphthene	<2.0	ug/kg	15.3	2.0	1	04/21/23 13:20	04/27/23 18:24	83-32-9	
Acenaphthylene	<1.8	ug/kg	15.3	1.8	1	04/21/23 13:20	04/27/23 18:24	208-96-8	
Anthracene	<1.7	ug/kg	15.3	1.7	1	04/21/23 13:20	04/27/23 18:24	120-12-7	
Benzo(a)anthracene	<4.2	ug/kg	15.3	4.2	1	04/21/23 13:20	04/27/23 18:24	56-55-3	
Benzo(a)pyrene	<1.9	ug/kg	15.3	1.9	1	04/21/23 13:20	04/27/23 18:24	50-32-8	
Benzo(g,h,i)perylene	<3.2	ug/kg	15.3	3.2	1	04/21/23 13:20	04/27/23 18:24	191-24-2	
Benzo(a)fluoranthene (Total)	<9.4	ug/kg	45.8	9.4	1	04/21/23 13:20	04/27/23 18:24		N2
Chrysene	<2.8	ug/kg	15.3	2.8	1	04/21/23 13:20	04/27/23 18:24	218-01-9	
Dibenz(a,h)acridine	<1.7	ug/kg	15.3	1.7	1	04/21/23 13:20	04/27/23 18:24	226-36-8	
Dibenz(a,h)anthracene	<1.2	ug/kg	15.3	1.2	1	04/21/23 13:20	04/27/23 18:24	53-70-3	
Dibenzo(a,e)pyrene	<1.7	ug/kg	15.3	1.7	1	04/21/23 13:20	04/27/23 18:24	192-65-4	
Dibenzo(a,h)pyrene	<3.1	ug/kg	15.3	3.1	1	04/21/23 13:20	04/27/23 18:24	189-64-0	
Dibenzo(a,i)pyrene	<1.5	ug/kg	15.3	1.5	1	04/21/23 13:20	04/27/23 18:24	189-55-9	
Dibenzo(a,l)pyrene	<2.2	ug/kg	15.3	2.2	1	04/21/23 13:20	04/27/23 18:24	191-30-0	L2
7H-Dibenzo(c,g)carbazole	<6.3	ug/kg	15.3	6.3	1	04/21/23 13:20	04/27/23 18:24	194-59-2	
7,12-Dimethylbenz(a)anthracene	<0.73	ug/kg	15.3	0.73	1	04/21/23 13:20	04/27/23 18:24	57-97-6	
Fluoranthene	<3.7	ug/kg	15.3	3.7	1	04/21/23 13:20	04/27/23 18:24	206-44-0	
Fluorene	<2.0	ug/kg	15.3	2.0	1	04/21/23 13:20	04/27/23 18:24	86-73-7	
Indeno(1,2,3-cd)pyrene	<1.5	ug/kg	15.3	1.5	1	04/21/23 13:20	04/27/23 18:24	193-39-5	
3-Methylcholanthrene	<3.5	ug/kg	15.3	3.5	1	04/21/23 13:20	04/27/23 18:24	56-49-5	L2
5-Methylchrysene	<1.9	ug/kg	15.3	1.9	1	04/21/23 13:20	04/27/23 18:24	3697-24-3	
2-Methylnaphthalene	<2.8	ug/kg	15.3	2.8	1	04/21/23 13:20	04/27/23 18:24	91-57-6	
Naphthalene	<2.9	ug/kg	15.3	2.9	1	04/21/23 13:20	04/27/23 18:24	91-20-3	
Phenanthrene	<2.6	ug/kg	15.3	2.6	1	04/21/23 13:20	04/27/23 18:24	85-01-8	
Pyrene	<3.5	ug/kg	15.3	3.5	1	04/21/23 13:20	04/27/23 18:24	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	79	%	46-125		1	04/21/23 13:20	04/27/23 18:24	321-60-8	
p-Terphenyl-d14 (S)	90	%	69-125		1	04/21/23 13:20	04/27/23 18:24	1718-51-0	

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### ANALYTICAL RESULTS

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

**Sample: Pond 3-E**      **Lab ID: 10650001005**      Collected: 04/18/23 12:45      Received: 04/18/23 16:07      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
<b>6020B MET ICPMS</b>									
Analytical Method: EPA 6020B    Preparation Method: EPA 3050B									
Pace Analytical Services - Minneapolis									
Arsenic	1.3	mg/kg	0.73	0.21	1	04/23/23 06:34	04/24/23 18:30	7440-38-2	
Copper	9.4	mg/kg	1.5	0.44	1	04/23/23 06:34	04/24/23 18:30	7440-50-8	
<b>Dry Weight / %M by ASTM D2974</b>									
Analytical Method: ASTM D2974									
Pace Analytical Services - Minneapolis									
Percent Moisture	31.5	%	0.10	0.10	1		04/20/23 12:26		N2
<b>8270E MSSV CPAH by SIM</b>									
Analytical Method: EPA 8270E by SIM    Preparation Method: EPA 3546									
Pace Analytical Services - Minneapolis									
Acenaphthene	<1.9	ug/kg	13.9	1.9	1	04/21/23 13:20	04/27/23 18:54	83-32-9	
Acenaphthylene	<1.6	ug/kg	13.9	1.6	1	04/21/23 13:20	04/27/23 18:54	208-96-8	
Anthracene	24.0	ug/kg	13.9	1.5	1	04/21/23 13:20	04/27/23 18:54	120-12-7	
Benzo(a)anthracene	137	ug/kg	13.9	3.8	1	04/21/23 13:20	04/27/23 18:54	56-55-3	
Benzo(a)pyrene	146	ug/kg	13.9	1.8	1	04/21/23 13:20	04/27/23 18:54	50-32-8	
Benzo(g,h,i)perylene	108	ug/kg	13.9	2.9	1	04/21/23 13:20	04/27/23 18:54	191-24-2	
Benzo(a)fluoranthene (Total)	282	ug/kg	41.7	8.6	1	04/21/23 13:20	04/27/23 18:54		N2
Chrysene	169	ug/kg	13.9	2.5	1	04/21/23 13:20	04/27/23 18:54	218-01-9	
Dibenz(a,h)acridine	<1.6	ug/kg	13.9	1.6	1	04/21/23 13:20	04/27/23 18:54	226-36-8	
Dibenz(a,h)anthracene	23.1	ug/kg	13.9	1.1	1	04/21/23 13:20	04/27/23 18:54	53-70-3	
Dibenzo(a,e)pyrene	50.8	ug/kg	13.9	1.6	1	04/21/23 13:20	04/27/23 18:54	192-65-4	
Dibenzo(a,h)pyrene	27.5	ug/kg	13.9	2.8	1	04/21/23 13:20	04/27/23 18:54	189-64-0	
Dibenzo(a,i)pyrene	15.9	ug/kg	13.9	1.3	1	04/21/23 13:20	04/27/23 18:54	189-55-9	
Dibenzo(a,l)pyrene	<2.0	ug/kg	13.9	2.0	1	04/21/23 13:20	04/27/23 18:54	191-30-0	L2
7H-Dibenzo(c,g)carbazole	<5.7	ug/kg	13.9	5.7	1	04/21/23 13:20	04/27/23 18:54	194-59-2	
7,12-Dimethylbenz(a)anthracene	<0.67	ug/kg	13.9	0.67	1	04/21/23 13:20	04/27/23 18:54	57-97-6	
Fluoranthene	376	ug/kg	13.9	3.4	1	04/21/23 13:20	04/27/23 18:54	206-44-0	
Fluorene	<1.9	ug/kg	13.9	1.9	1	04/21/23 13:20	04/27/23 18:54	86-73-7	
Indeno(1,2,3-cd)pyrene	116	ug/kg	13.9	1.3	1	04/21/23 13:20	04/27/23 18:54	193-39-5	
3-Methylcholanthrene	<3.2	ug/kg	13.9	3.2	1	04/21/23 13:20	04/27/23 18:54	56-49-5	L2
5-Methylchrysene	18.7	ug/kg	13.9	1.8	1	04/21/23 13:20	04/27/23 18:54	3697-24-3	
2-Methylnaphthalene	<2.5	ug/kg	13.9	2.5	1	04/21/23 13:20	04/27/23 18:54	91-57-6	
Naphthalene	<2.7	ug/kg	13.9	2.7	1	04/21/23 13:20	04/27/23 18:54	91-20-3	
Phenanthrene	172	ug/kg	13.9	2.4	1	04/21/23 13:20	04/27/23 18:54	85-01-8	
Pyrene	287	ug/kg	13.9	3.2	1	04/21/23 13:20	04/27/23 18:54	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	85	%	46-125		1	04/21/23 13:20	04/27/23 18:54	321-60-8	
p-Terphenyl-d14 (S)	89	%	69-125		1	04/21/23 13:20	04/27/23 18:54	1718-51-0	

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## ANALYTICAL RESULTS

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

**Sample: Pond 3-W**      **Lab ID: 10650001006**      Collected: 04/18/23 13:00      Received: 04/18/23 16:07      Matrix: Solid

*Results reported on a "dry weight" basis and are adjusted for percent moisture, sample size and any dilutions.*

Parameters	Results	Units	PQL	MDL	DF	Prepared	Analyzed	CAS No.	Qual
<b>6020B MET ICPMS</b>									
Analytical Method: EPA 6020B    Preparation Method: EPA 3050B									
Pace Analytical Services - Minneapolis									
Arsenic	2.7	mg/kg	0.68	0.19	1	04/23/23 06:34	04/24/23 18:33	7440-38-2	
Copper	12.4	mg/kg	1.4	0.41	1	04/23/23 06:34	04/24/23 18:33	7440-50-8	
<b>Dry Weight / %M by ASTM D2974</b>									
Analytical Method: ASTM D2974									
Pace Analytical Services - Minneapolis									
Percent Moisture	26.6	%	0.10	0.10	1		04/20/23 12:26		N2
<b>8270E MSSV CPAH by SIM</b>									
Analytical Method: EPA 8270E by SIM    Preparation Method: EPA 3546									
Pace Analytical Services - Minneapolis									
Acenaphthene	<1.8	ug/kg	13.2	1.8	1	04/21/23 13:20	04/27/23 19:23	83-32-9	
Acenaphthylene	<1.5	ug/kg	13.2	1.5	1	04/21/23 13:20	04/27/23 19:23	208-96-8	
Anthracene	<1.4	ug/kg	13.2	1.4	1	04/21/23 13:20	04/27/23 19:23	120-12-7	
Benzo(a)anthracene	6.6J	ug/kg	13.2	3.6	1	04/21/23 13:20	04/27/23 19:23	56-55-3	
Benzo(a)pyrene	<1.7	ug/kg	13.2	1.7	1	04/21/23 13:20	04/27/23 19:23	50-32-8	
Benzo(g,h,i)perylene	<2.8	ug/kg	13.2	2.8	1	04/21/23 13:20	04/27/23 19:23	191-24-2	
Benzofluoranthenes (Total)	19.4J	ug/kg	39.7	8.1	1	04/21/23 13:20	04/27/23 19:23		N2
Chrysene	13.1J	ug/kg	13.2	2.4	1	04/21/23 13:20	04/27/23 19:23	218-01-9	
Dibenz(a,h)acridine	<1.5	ug/kg	13.2	1.5	1	04/21/23 13:20	04/27/23 19:23	226-36-8	
Dibenz(a,h)anthracene	<1.0	ug/kg	13.2	1.0	1	04/21/23 13:20	04/27/23 19:23	53-70-3	
Dibenzo(a,e)pyrene	<1.5	ug/kg	13.2	1.5	1	04/21/23 13:20	04/27/23 19:23	192-65-4	
Dibenzo(a,h)pyrene	<2.7	ug/kg	13.2	2.7	1	04/21/23 13:20	04/27/23 19:23	189-64-0	
Dibenzo(a,i)pyrene	<1.3	ug/kg	13.2	1.3	1	04/21/23 13:20	04/27/23 19:23	189-55-9	
Dibenzo(a,l)pyrene	<1.9	ug/kg	13.2	1.9	1	04/21/23 13:20	04/27/23 19:23	191-30-0	L2
7H-Dibenzo(c,g)carbazole	<5.5	ug/kg	13.2	5.5	1	04/21/23 13:20	04/27/23 19:23	194-59-2	
7,12-Dimethylbenz(a)anthracene	<0.63	ug/kg	13.2	0.63	1	04/21/23 13:20	04/27/23 19:23	57-97-6	
Fluoranthene	23.3	ug/kg	13.2	3.2	1	04/21/23 13:20	04/27/23 19:23	206-44-0	
Fluorene	<1.8	ug/kg	13.2	1.8	1	04/21/23 13:20	04/27/23 19:23	86-73-7	
Indeno(1,2,3-cd)pyrene	<1.3	ug/kg	13.2	1.3	1	04/21/23 13:20	04/27/23 19:23	193-39-5	
3-Methylcholanthrene	<3.0	ug/kg	13.2	3.0	1	04/21/23 13:20	04/27/23 19:23	56-49-5	L2
5-Methylchrysene	<1.7	ug/kg	13.2	1.7	1	04/21/23 13:20	04/27/23 19:23	3697-24-3	
2-Methylnaphthalene	<2.4	ug/kg	13.2	2.4	1	04/21/23 13:20	04/27/23 19:23	91-57-6	
Naphthalene	<2.5	ug/kg	13.2	2.5	1	04/21/23 13:20	04/27/23 19:23	91-20-3	
Phenanthrene	<2.3	ug/kg	13.2	2.3	1	04/21/23 13:20	04/27/23 19:23	85-01-8	
Pyrene	17.7	ug/kg	13.2	3.0	1	04/21/23 13:20	04/27/23 19:23	129-00-0	
<b>Surrogates</b>									
2-Fluorobiphenyl (S)	85	%	46-125		1	04/21/23 13:20	04/27/23 19:23	321-60-8	
p-Terphenyl-d14 (S)	92	%	69-125		1	04/21/23 13:20	04/27/23 19:23	1718-51-0	

## REPORT OF LABORATORY ANALYSIS

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**QUALITY CONTROL DATA**

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

QC Batch: 876659 Analysis Method: EPA 6020B  
 QC Batch Method: EPA 3050B Analysis Description: 6020B Solids UPD5  
 Laboratory: Pace Analytical Services - Minneapolis  
 Associated Lab Samples: 10650001001, 10650001002, 10650001003, 10650001004, 10650001005, 10650001006

METHOD BLANK: 4622737 Matrix: Solid  
 Associated Lab Samples: 10650001001, 10650001002, 10650001003, 10650001004, 10650001005, 10650001006

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
Arsenic	mg/kg	<0.14	0.50	0.14	04/24/23 17:13	
Copper	mg/kg	<0.30	0.99	0.30	04/24/23 17:13	

LABORATORY CONTROL SAMPLE: 4622738

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Arsenic	mg/kg	48.7	50.2	103	80-120	
Copper	mg/kg	48.7	53.6	110	80-120	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 4622739 4622740

Parameter	Units	10649835001		MS		MSD		% Rec		RPD	Max RPD	Qual
		Result	Conc.	Spike Conc.	Result	Result	% Rec	% Rec	Limits			
Arsenic	mg/kg	3.2	51.6	51.6	55.2	56.0	101	102	75-125	1	20	
Copper	mg/kg	16.5	51.6	51.6	75.6	72.6	115	109	75-125	4	20	

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**REPORT OF LABORATORY ANALYSIS**

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### QUALITY CONTROL DATA

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

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QC Batch:	876562	Analysis Method:	ASTM D2974
QC Batch Method:	ASTM D2974	Analysis Description:	Dry Weight / %M by ASTM D2974
		Laboratory:	Pace Analytical Services - Minneapolis

Associated Lab Samples: 10650001001, 10650001002, 10650001003, 10650001004

---

SAMPLE DUPLICATE: 4622365

Parameter	Units	10650001004 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	35.7	33.8	5	30	N2

---

SAMPLE DUPLICATE: 4622467

Parameter	Units	10650002001 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	34.5	33.6	3	30	N2

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### REPORT OF LABORATORY ANALYSIS

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**QUALITY CONTROL DATA**

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

QC Batch: 876566

Analysis Method: ASTM D2974

QC Batch Method: ASTM D2974

Analysis Description: Dry Weight / %M by ASTM D2974

Laboratory: Pace Analytical Services - Minneapolis

Associated Lab Samples: 10650001005, 10650001006

SAMPLE DUPLICATE: 4622369

Parameter	Units	10650001005 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	31.5	33.0	5	30	N2

SAMPLE DUPLICATE: 4622370

Parameter	Units	10650012007 Result	Dup Result	RPD	Max RPD	Qualifiers
Percent Moisture	%	13.5	13.6	0	30	N2

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**REPORT OF LABORATORY ANALYSIS**

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### QUALITY CONTROL DATA

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

QC Batch: 876844 Analysis Method: EPA 8270E by SIM  
QC Batch Method: EPA 3546 Analysis Description: 8270E Solid PAH by SIM MSSV  
Laboratory: Pace Analytical Services - Minneapolis

Associated Lab Samples: 10650001001, 10650001002, 10650001003, 10650001004, 10650001005, 10650001006

METHOD BLANK: 4623732 Matrix: Solid

Associated Lab Samples: 10650001001, 10650001002, 10650001003, 10650001004, 10650001005, 10650001006

Parameter	Units	Blank Result	Reporting Limit	MDL	Analyzed	Qualifiers
2-Methylnaphthalene	ug/kg	<1.8	10.0	1.8	04/27/23 15:24	
3-Methylcholanthrene	ug/kg	<2.3	10.0	2.3	04/27/23 15:24	
5-Methylchrysene	ug/kg	<1.3	10.0	1.3	04/27/23 15:24	
7,12-Dimethylbenz(a)anthracene	ug/kg	<0.48	10.0	0.48	04/27/23 15:24	
7H-Dibenzo(c,g)carbazole	ug/kg	<4.1	10.0	4.1	04/27/23 15:24	
Acenaphthene	ug/kg	<1.3	10.0	1.3	04/27/23 15:24	
Acenaphthylene	ug/kg	<1.2	10.0	1.2	04/27/23 15:24	
Anthracene	ug/kg	<1.1	10.0	1.1	04/27/23 15:24	
Benzo(a)anthracene	ug/kg	<2.7	10.0	2.7	04/27/23 15:24	
Benzo(a)pyrene	ug/kg	<1.3	10.0	1.3	04/27/23 15:24	
Benzo(g,h,i)perylene	ug/kg	<2.1	10.0	2.1	04/27/23 15:24	
Benzo(a)fluoranthene (Total)	ug/kg	<6.2	30.0	6.2	04/27/23 15:24	N2
Chrysene	ug/kg	<1.8	10.0	1.8	04/27/23 15:24	
Dibenz(a,h)acridine	ug/kg	<1.1	10.0	1.1	04/27/23 15:24	
Dibenz(a,h)anthracene	ug/kg	<0.79	10.0	0.79	04/27/23 15:24	
Dibenzo(a,e)pyrene	ug/kg	<1.1	10.0	1.1	04/27/23 15:24	
Dibenzo(a,h)pyrene	ug/kg	<2.0	10.0	2.0	04/27/23 15:24	
Dibenzo(a,i)pyrene	ug/kg	<0.97	10.0	0.97	04/27/23 15:24	
Dibenzo(a,l)pyrene	ug/kg	<1.4	10.0	1.4	04/27/23 15:24	
Fluoranthene	ug/kg	<2.4	10.0	2.4	04/27/23 15:24	
Fluorene	ug/kg	<1.3	10.0	1.3	04/27/23 15:24	
Indeno(1,2,3-cd)pyrene	ug/kg	<0.97	10.0	0.97	04/27/23 15:24	
Naphthalene	ug/kg	<1.9	10.0	1.9	04/27/23 15:24	
Phenanthrene	ug/kg	<1.7	10.0	1.7	04/27/23 15:24	
Pyrene	ug/kg	<2.3	10.0	2.3	04/27/23 15:24	
2-Fluorobiphenyl (S)	%	83	46-125		04/27/23 15:24	
p-Terphenyl-d14 (S)	%	95	69-125		04/27/23 15:24	

LABORATORY CONTROL SAMPLE: 4623733

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
2-Methylnaphthalene	ug/kg	300	251	84	70-130	
3-Methylcholanthrene	ug/kg	300	96.4	32	70-130	L2
5-Methylchrysene	ug/kg	300	272	91	70-130	
7,12-Dimethylbenz(a)anthracene	ug/kg	300	216	72	70-130	
7H-Dibenzo(c,g)carbazole	ug/kg	300	279	93	70-130	
Acenaphthene	ug/kg	300	247	82	70-130	
Acenaphthylene	ug/kg	300	245	82	70-130	
Anthracene	ug/kg	300	253	84	70-130	

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### REPORT OF LABORATORY ANALYSIS

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### QUALITY CONTROL DATA

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

LABORATORY CONTROL SAMPLE: 4623733

Parameter	Units	Spike Conc.	LCS Result	LCS % Rec	% Rec Limits	Qualifiers
Benzo(a)anthracene	ug/kg	300	259	86	70-130	
Benzo(a)pyrene	ug/kg	300	274	91	70-130	
Benzo(g,h,i)perylene	ug/kg	300	289	96	70-130	
Benzo(a,h)anthracene (Total)	ug/kg	900	884	98	70-130	N2
Chrysene	ug/kg	300	264	88	70-130	
Dibenz(a,h)acridine	ug/kg	300	302	101	70-130	
Dibenz(a,h)anthracene	ug/kg	300	299	100	70-130	
Dibenzo(a,e)pyrene	ug/kg	300	270	90	70-130	
Dibenzo(a,h)pyrene	ug/kg	300	294	98	70-130	
Dibenzo(a,i)pyrene	ug/kg	300	245	82	70-130	
Dibenzo(a,l)pyrene	ug/kg	300	92.2	31	70-130	L2
Fluoranthene	ug/kg	300	266	89	70-130	
Fluorene	ug/kg	300	260	87	70-130	
Indeno(1,2,3-cd)pyrene	ug/kg	300	294	98	70-130	
Naphthalene	ug/kg	300	246	82	70-130	
Phenanthrene	ug/kg	300	266	89	70-130	
Pyrene	ug/kg	300	263	88	70-130	
2-Fluorobiphenyl (S)	%			84	46-125	
p-Terphenyl-d14 (S)	%			95	69-125	

MATRIX SPIKE & MATRIX SPIKE DUPLICATE: 4623734 4623735

Parameter	Units	MS		MSD		MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
		10650001001 Result	Spike Conc.	Spike Conc.	Conc.								
2-Methylnaphthalene	ug/kg	<2.5	404	421	421	325	342	81	81	70-130	5	30	
3-Methylcholanthrene	ug/kg	<3.2	404	421	421	309	358	76	85	70-130	15	30	
5-Methylchrysene	ug/kg	11.3J	404	421	421	358	374	86	86	70-130	4	30	
7,12-Dimethylbenz(a)anthracene	ug/kg	<0.66	404	421	421	148	120	37	29	70-130	21	30	M1
7H-Dibenzo(c,g)carbazole	ug/kg	<5.7	404	421	421	413	425	102	101	70-130	3	30	
Acenaphthene	ug/kg	<1.9	404	421	421	343	352	85	84	70-130	3	30	
Acenaphthylene	ug/kg	15.2	404	421	421	338	347	80	79	70-130	2	30	
Anthracene	ug/kg	7.7J	404	421	421	346	358	84	83	70-130	3	30	
Benzo(a)anthracene	ug/kg	76.7	404	421	421	367	396	72	76	70-130	7	30	
Benzo(a)pyrene	ug/kg	79.0	404	421	421	399	428	79	83	70-130	7	30	
Benzo(g,h,i)perylene	ug/kg	98.2	404	421	421	399	418	75	76	70-130	5	30	
Benzo(a,h)anthracene (Total)	ug/kg	239	1210	1260	1260	1160	1210	76	77	70-130	4	30	N2
Chrysene	ug/kg	134	404	421	421	369	400	58	63	70-130	8	30	M1
Dibenz(a,h)acridine	ug/kg	<1.6	404	421	421	395	403	98	96	70-130	2	30	
Dibenz(a,h)anthracene	ug/kg	18.2	404	421	421	392	406	93	92	70-130	4	30	
Dibenzo(a,e)pyrene	ug/kg	38.5	404	421	421	359	372	79	79	70-130	3	30	
Dibenzo(a,h)pyrene	ug/kg	21.2	404	421	421	402	421	94	95	70-130	5	30	
Dibenzo(a,i)pyrene	ug/kg	<1.3	404	421	421	373	394	92	94	70-130	5	30	
Dibenzo(a,l)pyrene	ug/kg	<2.0	404	421	421	291	339	72	81	70-130	15	30	
Fluoranthene	ug/kg	222	404	421	421	412	465	47	58	70-130	12	30	M1

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### QUALITY CONTROL DATA

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

Parameter	Units	4623734		4623735		MS Result	MSD Result	MS % Rec	MSD % Rec	% Rec Limits	RPD	Max RPD	Qual
		10650001001 Result	MS Spike Conc.	MSD Spike Conc.	MS Result								
Fluorene	ug/kg	<1.9	404	421	348	362	86	86	70-130	4	30		
Indeno(1,2,3-cd)pyrene	ug/kg	96.2	404	421	408	435	77	80	70-130	6	30		
Naphthalene	ug/kg	<2.6	404	421	319	324	79	77	70-130	2	30		
Phenanthrene	ug/kg	62.7	404	421	366	389	75	77	70-130	6	30		
Pyrene	ug/kg	170	404	421	394	444	56	65	70-130	12	30	M1	
2-Fluorobiphenyl (S)	%						85	84	46-125				
p-Terphenyl-d14 (S)	%						92	89	69-125				

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### REPORT OF LABORATORY ANALYSIS

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## QUALIFIERS

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

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### DEFINITIONS

DF - Dilution Factor, if reported, represents the factor applied to the reported data due to dilution of the sample aliquot.

ND - Not Detected at or above adjusted reporting limit.

TNTC - Too Numerous To Count

J - Estimated concentration above the adjusted method detection limit and below the adjusted reporting limit.

MDL - Adjusted Method Detection Limit.

PQL - Practical Quantitation Limit.

RL - Reporting Limit - The lowest concentration value that meets project requirements for quantitative data with known precision and bias for a specific analyte in a specific matrix.

S - Surrogate

1,2-Diphenylhydrazine decomposes to and cannot be separated from Azobenzene using Method 8270. The result for each analyte is a combined concentration.

Consistent with EPA guidelines, unrounded data are displayed and have been used to calculate % recovery and RPD values.

LCS(D) - Laboratory Control Sample (Duplicate)

MS(D) - Matrix Spike (Duplicate)

DUP - Sample Duplicate

RPD - Relative Percent Difference

NC - Not Calculable.

SG - Silica Gel - Clean-Up

U - Indicates the compound was analyzed for, but not detected.

N-Nitrosodiphenylamine decomposes and cannot be separated from Diphenylamine using Method 8270. The result reported for each analyte is a combined concentration.

Reported results are not rounded until the final step prior to reporting. Therefore, calculated parameters that are typically reported as "Total" may vary slightly from the sum of the reported component parameters.

Pace Analytical is TNI accredited. Contact your Pace PM for the current list of accredited analytes.

TNI - The NELAC Institute.

### ANALYTE QUALIFIERS

L2 Analyte recovery in the laboratory control sample (LCS) was below QC limits. Results for this analyte in associated samples may be biased low.

M1 Matrix spike recovery exceeded QC limits. Batch accepted based on laboratory control sample (LCS) recovery.

N2 The lab does not hold NELAC/TNI accreditation for this parameter but other accreditations/certifications may apply. A complete list of accreditations/certifications is available upon request.

## REPORT OF LABORATORY ANALYSIS

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### QUALITY CONTROL DATA CROSS REFERENCE TABLE

Project: B2204011.00-Revised Report

Pace Project No.: 10650001

Lab ID	Sample ID	QC Batch Method	QC Batch	Analytical Method	Analytical Batch
10650001001	Pond 1-E	EPA 3050B	876659	EPA 6020B	877121
10650001002	Pond 1-W	EPA 3050B	876659	EPA 6020B	877121
10650001003	Pond 2-W	EPA 3050B	876659	EPA 6020B	877121
10650001004	Pond 2-E	EPA 3050B	876659	EPA 6020B	877121
10650001005	Pond 3-E	EPA 3050B	876659	EPA 6020B	877121
10650001006	Pond 3-W	EPA 3050B	876659	EPA 6020B	877121
10650001001	Pond 1-E	ASTM D2974	876562		
10650001002	Pond 1-W	ASTM D2974	876562		
10650001003	Pond 2-W	ASTM D2974	876562		
10650001004	Pond 2-E	ASTM D2974	876562		
10650001005	Pond 3-E	ASTM D2974	876566		
10650001006	Pond 3-W	ASTM D2974	876566		
10650001001	Pond 1-E	EPA 3546	876844	EPA 8270E by SIM	877142
10650001002	Pond 1-W	EPA 3546	876844	EPA 8270E by SIM	877142
10650001003	Pond 2-W	EPA 3546	876844	EPA 8270E by SIM	877142
10650001004	Pond 2-E	EPA 3546	876844	EPA 8270E by SIM	877142
10650001005	Pond 3-E	EPA 3546	876844	EPA 8270E by SIM	877142
10650001006	Pond 3-W	EPA 3546	876844	EPA 8270E by SIM	877142

### REPORT OF LABORATORY ANALYSIS

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# CHAIN-OF-CUSTODY Analytical Request Document

Chain-of-Custody is a LEGAL DOCUMENT - Complete all relevant fields

Company: Braun-Intertec  
 Address: 11001 Highway Ave S, Blountville  
 Report To: Edward Pencak  
 Copy To: \_\_\_\_\_

LAB USE ONLY - Affix  
 Container Preservat  
**ALL SI**  
 10650001

## WO#: 10650001



Customer Project Name/Number: B202011.00  
 Billing Information: SAME  
 Email To: EPencak@braun-intertec.com  
 Site Collection Info/Address: \_\_\_\_\_

State: MN County/City: Adrian Hills Time Zone Collected: [ ] PT [ ] MT [ ] CT [ ] ET  
 Site/Facility ID #: \_\_\_\_\_ Compliance Monitoring? [ ] Yes [ ] No  
 Purchase Order #: \_\_\_\_\_ DW PWS ID #: \_\_\_\_\_  
 Quote #: \_\_\_\_\_ DW Location Code: \_\_\_\_\_  
 Turnaround Date Required: STAND Immediately Packed on Ice: [X] Yes [ ] No  
 Rush: [ ] Same Day [ ] Next Day [ ] 2 Day [ ] 3 Day [ ] 4 Day [ ] 5 Day (Expedite Charges Apply)  
 Field Filtered (if applicable): [ ] Yes [ ] No  
 Analysis: \_\_\_\_\_

\* Matrix Codes (Insert in Matrix box below): Drinking Water (DW), Ground Water (GW), Wastewater (WW), Product (P), Soil/Solid (SL), Oil (OL), Wipe (WP), Air (AR), Tissue (TS), Bioassay (B), Vapor (V), Other (OT)

Customer Sample ID	Matrix *	Comp / Grab	Collected (or Composite Start)		Composite End	Res Cl	# of Ctns
			Date	Time			
Pond 1-E	SL	Comp	4/18/23	9:30	4/18/23 9:50	3	3
Pond 1-W				10:00			
Pond 2-W				10:45			
Pond 2-W-E				11:00			
Pond 3-E				11:20			
Pond 3-W				12:30			
				12:45			
				13:00			

Analyses: Asenic (Copper 6020)  
Copper (6020)  
Copper Moisture  
MPCA Extended List PAB

Lab Profile/Line: 44149

Lab Sample Receipt Checklist:

Custody Seals Present/Intact	Y	N	NA
Custody Signatures Present	Y	N	NA
Collector Signature Present	Y	N	NA
Bottles Intact	Y	N	NA
Correct Bottles	Y	N	NA
Sufficient Volume	Y	N	NA
Vials - Headspace Acceptable	Y	N	NA
USDA Regulated Soils	Y	N	NA
Samples in Holding Time	Y	N	NA
Residual Chlorine Present	Y	N	NA
Cl Strips:			
Sample pH Acceptable	Y	N	NA
pH Strips:			
Sulfide Present	Y	N	NA
Lead Acetate Strips:			

LAB USE ONLY:  
 Lab Sample # / Comments:

Customer Remarks / Special Conditions / Possible Hazards:	Type of Ice Used: Wet Blue Dry None	SHORT-HOLDS PRESENT (<72 hours): Y N N/A	Lab Tracking #: <b>2849023</b>
Customer Remarks / Special Conditions / Possible Hazards:	Packing Material Used:	Samples received via: FEDEX UPS Client Courier Pace Courier	MTJL LAB USE ONLY
Relinquished by/Company: (Signature) <u>Edward Pencak</u>	Date/Time: <u>4/18/23 11:37</u>	Received by/Company: (Signature) <u>Pace</u>	Table #: _____
Relinquished by/Company: (Signature) _____	Date/Time: _____	Received by/Company: (Signature) _____	Accturn: _____
Relinquished by/Company: (Signature) _____	Date/Time: <u>4/18/23 16:07</u>	Received by/Company: (Signature) <u>Wanda</u>	Template: _____
			Prelogin: _____
			PM: _____
			PB: _____
Lab Sample Temperature Info:	Temp Blank Received: <u>Y</u> NA	Therm ID #: _____	Cooler 1 Temp Upon Receipt: <u>4.6</u> °C
			Cooler 1 Therm Corr. Factor: _____ °C
			Cooler 1 Corrected Temp: _____ °C
			Comments: _____
Trip Blank Received: Y N NA	HCL MeOH TSP Other	Non Conformance(s): YES / NO	Page: _____ of: _____

Effective Date: 4/14/2023

Sample Condition Upon Receipt	Client Name: <u>Brann Intertec</u>	Project #: _____	WO#: 10650001
Courier: <input type="checkbox"/> FedEx <input type="checkbox"/> UPS <input type="checkbox"/> USPS <input type="checkbox"/> Client <input checked="" type="checkbox"/> Pace <input type="checkbox"/> Speedee <input type="checkbox"/> Commercial		PM: BGB Due Date: 05/03/23 CLIENT: Braun-BLM	
Tracking Number: _____		See Exceptions ENV-FRM-MIN4-0142	

Custody Seal on Cooler/Box Present? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Seals Intact? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Biological Tissue Frozen? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Packing Material: <input type="checkbox"/> Bubble Wrap <input checked="" type="checkbox"/> Bubble Bags <input type="checkbox"/> None <input type="checkbox"/> Other	Temp Blank? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Type of Ice: <input checked="" type="checkbox"/> Wet <input type="checkbox"/> Blue <input type="checkbox"/> Dry <input type="checkbox"/> None
Thermometer: <input type="checkbox"/> T1 (0461) <input checked="" type="checkbox"/> T2 (0436) <input type="checkbox"/> T3 (0459) <input type="checkbox"/> T4 (0402) <input type="checkbox"/> T5 (0178) <input type="checkbox"/> T6 (0235) <input checked="" type="checkbox"/> T7 (0042) <input type="checkbox"/> T8 (0775) <input type="checkbox"/> T9 (0727) <input type="checkbox"/> 01339252/1710	Type of Ice: <input type="checkbox"/> Melted	

Did Samples Originate in West Virginia? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	Were All Container Temps Taken? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A
Temp should be above freezing to 6 °C	Average Corrected Temp (no temp blank only): _____ °C
Correction Factor: <u>t0.2</u> Cooler temp Read w/Temp Blank: <u>3.9</u> °C	<input type="checkbox"/> See Exceptions ENV-FRM-MIN4-0142 <input type="checkbox"/> 1 Container
Cooler Temp Corrected w/temp blank: <u>4.1</u> °C	

USDA Regulated Soil: ( N/A, water sample/other: \_\_\_\_\_) Date/Initials of Person Examining Contents: ECY-19-23

Did samples originate in a quarantine zone within the United States: AL, AR, AZ CA, FL, GA, ID, LA, MS, NC, NM, NY, OK, OR, SC, TN, TX, or VA (check maps)?  Yes  No

Did samples originate from a foreign source (internationally, including Hawaii and Puerto Rico)?  Yes  No

If Yes to either question, fill out a Regulated Soil Checklist (ENV-FRM-MIN4-0154) and include with SCUR/COC paperwork.

Location (Check one): <input type="checkbox"/> Duluth <input checked="" type="checkbox"/> Minneapolis <input type="checkbox"/> Virginia	COMMENTS
Chain of Custody Present and Filled Out? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	1.
Chain of Custody Relinquished? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	2.
Sampler Name and/or Signature on COC? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	3.
Samples Arrived within Hold Time? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	4. If fecal: <input type="checkbox"/> <8 hrs <input type="checkbox"/> >8 hr, <24 <input type="checkbox"/> No
Short Hold Time Analysis (<72 hr)? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	5. <input type="checkbox"/> Fecal Coliform <input type="checkbox"/> HPC <input type="checkbox"/> Total Coliform/E.coli <input type="checkbox"/> BOD/cBOD <input type="checkbox"/> Hex Chrom <input type="checkbox"/> Turbidity <input type="checkbox"/> Nitrate <input type="checkbox"/> Nitrite <input type="checkbox"/> Orthophos <input type="checkbox"/> Other _____
Rush Turn Around Time Requested? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	6.
Sufficient Sample Volume? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	7.
Correct Containers Used? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	8.
-Pace Containers Used? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
Containers Intact? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	9.
Field Filtered Volume Received for Dissolved Tests? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	10. Is sediment visible in the dissolved container? <input type="checkbox"/> Yes <input type="checkbox"/> No
Is sufficient information available to reconcile the samples to the COC? Matrix: <input type="checkbox"/> Water <input checked="" type="checkbox"/> Soil <input type="checkbox"/> Oil <input type="checkbox"/> Other	11. If no, write ID/Date/Time of container below: <input type="checkbox"/> See Exceptions ENV-FRM-MIN4-0142
All containers needing acid/base preservation have been checked? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	12. Sample # <input type="checkbox"/> NaOH <input type="checkbox"/> HNO3 <input type="checkbox"/> H2SO4 <input type="checkbox"/> Zinc Acetate
All containers needing preservation are found to be in compliance with EPA recommendation? (HNO3, H2SO4, <2pH, NaOH >9 Sulfide, NaOH>10 Cyanide) <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Positive for Residual Chlorine? <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> See Exceptions ENV-FRM-MIN4-0142
Exceptions: VOA, Coliform, TOC/DOC Oil and Grease, DRO/8015 (water) and Dioxins/PFAS (*If adding preservative to a container, it must be added to associated field and equipment blanks--verify with PM first.) <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	pH Paper Lot # Residual Chlorine 0-6 Roll 0-6 Strip 0-14 Strip
Headspace in Methyl Mercury Container? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	13.
Extra labels present on soil VOA or WIDRO containers? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	14. <input type="checkbox"/> See Exceptions ENV-FRM-MIN4-0142
Headspace in VOA Vials (greater than 6mm)? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	
3 Trip Blanks Present? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	15.
Trip Blank Custody Seals Present? <input type="checkbox"/> Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> N/A	Pace Trip Blank Lot # (if purchased): _____

CLIENT NOTIFICATION/RESOLUTION

Person Contacted: \_\_\_\_\_ Date/Time: \_\_\_\_\_

Comments/Resolution: \_\_\_\_\_

Project Manager Review: Brenna Bloome Date: 04/20/2023

NOTE: Whenever there is a discrepancy affecting North Carolina compliance samples, a copy of this form will be sent to the North Carolina DEHNR Certification Office (i.e., out of hold, incorrect preservative, out of temp, incorrect containers).

Labeled By: EL Line: 3



Document Name: Service Center Transfer Checklist  
 Document Number: ENV-FRM-MIN4-0135 Rev.02

Document Revised: 06Apr2021  
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 Pace Analytical Services - Minneapolis

## Service Center Transfer Checklist

Service Center: MPLS  BLM  AZ  MT

Client:

**Destination Lab:**

MPLS  Duluth  National  Other

Received w/ Custody Seal? Yes  No

Custody Seal Intact? Yes  No

Temperature °C: Temp Read  Corr. Factor  Corr. Temp

IR Gun:   Samples on ice, in cool down

Rush  Short Hold  N/A

Containers Intact? Yes  No

Repacked and Re-Iced? Yes  No

Notes:

**No Temp Blank Section**

Read Temp	Corr. Temp	Avg. Temp

4/18/23  
 ASJ