RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

# Feasibility Report

# Lotus Lake Water Quality Improvement Project

Prepared for
Riley Purgatory Bluff Creek Watershed District

February 2024 DRAFT

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# Certifications

I hereby certify that this report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

| | |
|---|---|
| Jennifer Koehler PE #: 47500 | Date |

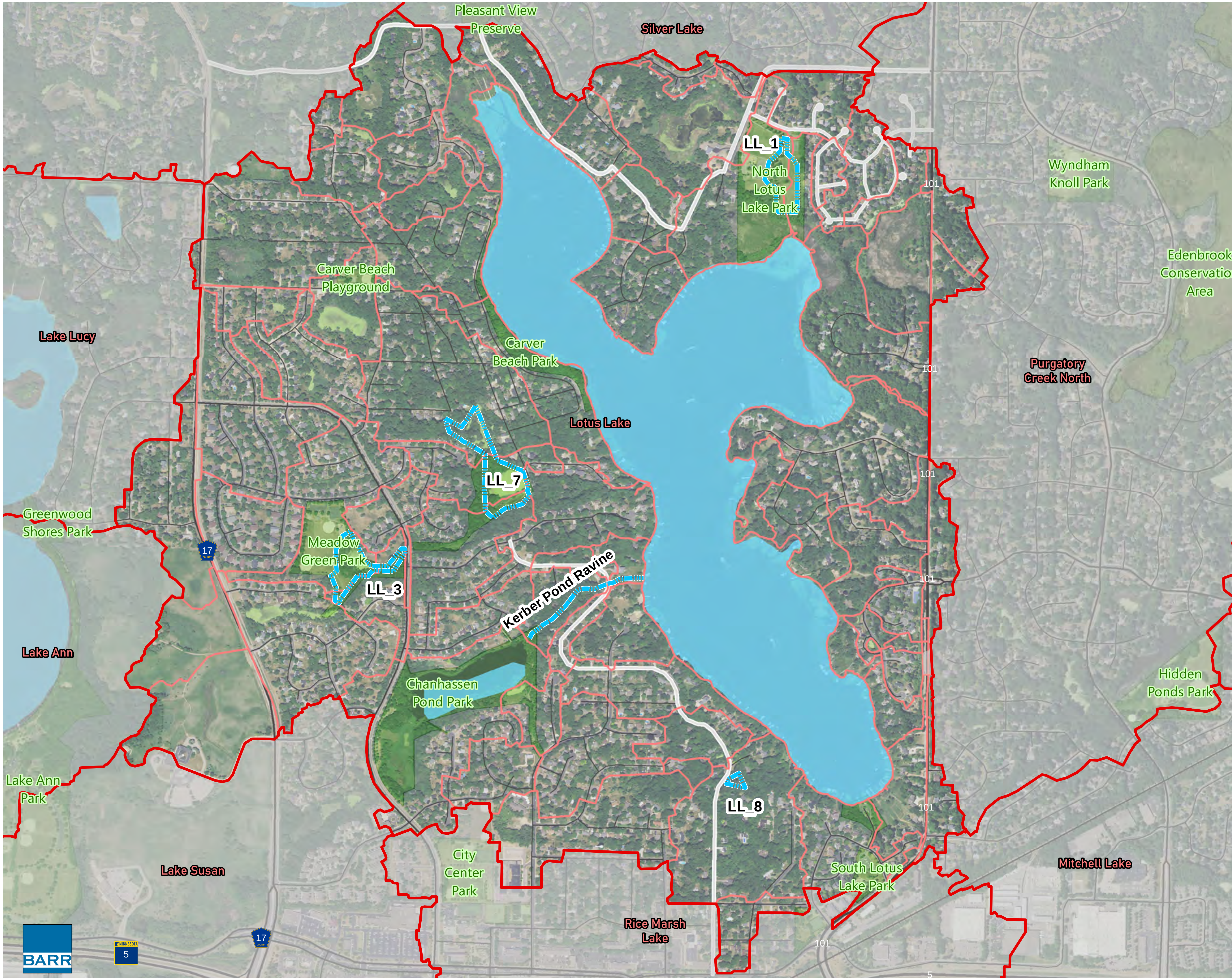
# 1.0 Context and Goals for this Plan

This feasibility report summarizes the potential actions within the Lotus Lake watershed to improve water quality in Lotus Lake, located in the City of Chanhassen, Minnesota.

This includes further review of several BMP locations identified as part of the Lotus Lake Use Attainability Analysis (UAA) (March 2017) as well as the Kerber Pond Ravine Feasibility Study (November 2020).

- BMP LL_1 (subwatershed LL-A3.2) – Stormwater management practice in North Lotus Lake Park
- BMP LL_3 (subwatershed LL-A10.9) – Stormwater management improvements in ravine downstream of stormwater pond in Meadow Green Park
- BMP LL_7 (subwatersheds LL-A10.13, LL-A10.16A, and LL-A10.16B) – Stormwater management practices in/around wetland complex north of Bighorn Drive and west of Carver Beach Road
- BMP LL_8 (subwatershed LL-A7.5) – Stormwater management practice east of Frontier Trail and south of Frontier Court
- Kerber Pond Ravine (subwatershed LL-A9.2) – Stabilization of a 1000-foot-long eroding ravine to protect infrastructure, enhance habitat, and improve the water quality.

Figure 1-1 illustrates the Lotus Lake watershed and drainage patterns of the contributing subwatersheds to each of the BMP locations as well as Kerber Pond and the Kerber Pond Ravine. This report is prepared under the direction of the Board of Managers of the Riley-Purgatory-Bluff Creek Watershed District.




# Lotus Lake Overview: Watersheds and BMP Locations

**FIGURE 1-1**

- Lake/Pond
- Park/Playground
- Preserve/Recreation Area
- Project Area
- Major Subwatersheds
- Lotus Lake Subwatersheds
- City of Chanhassen Upcoming Road Reconstruciton (2023 - 2027)

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RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

Riley Purgatory Bluff Creek Watershed District - Lotus Lake Water Quality Project

## 1.1 Background

The Riley-Purgatory-Bluff Creek Watershed District (RPBCWD or District) was established by the Minnesota Water Resources Board in 1969, acting under authority of the Watershed Law. As charged by the law and the order establishing the District, the general purpose of the District is to protect public health and welfare and to provide for the provident use of natural resources through planning, flood control, and conservation projects.

The District is located in the southwestern portion of the Twin Cities Metropolitan Area, encompassing an area of nearly 50 square miles. There are three major subwatersheds within the District—Riley Creek, with a watershed area of 10.0 square miles; Purgatory Creek (31.4 square miles), and Bluff Creek (5.9 square miles). All three creeks discharge to the Minnesota River. Stormwater management and development were guided by the District's 1973 Overall Plan, revised in May 1996 and February 2011 in accordance with the Metropolitan Surface Water Management Act and Watershed Law (Minnesota Statutes Chapters 103B and 103D). In 2018 the District completed an extensive public and stakeholder engagement process to develop the new 10-year plan, *Planning for the Next Ten Years (2018-2027)* (Riley-Purgatory-Bluff Creek Watershed District, Planning for the Next Ten Years 2018-2027 Watershed Management Plan, 2018), to guide the district.

The District has established 13 goals as targets to achieve the District's Mission of protecting, restoring, and managing water resources within the district. The following goals are supported by this feasibility study and potential restoration project.

- Plan and conduct the District's implementation program to most effectively accomplish its vision with consideration for all stakeholders and resources. (Plan 1)
- Include sustainability and the impacts of climate change in District projects, programs, and planning. (Plan 2)
- Protect, manage, and restore water quality of District lakes and creeks to maintain designated uses. (WQual 1)
- Preserve and enhance the quantity, as well as the functions and values of District wetlands. (WQual 2)

- Preserve and enhance habitat important to fish, waterfowl, and other wildlife. (WQual 3)
- Protect and enhance the ecological function of District floodplains to minimize adverse impacts. (WQuan 1)
- Limit the impact of stormwater runoff on receiving waterbodies. (WQuan 2)

The *2017 Lotus, Silver, Duck, Round, Mitchell, Red Rock Use Attainability Analysis Update; Lake Idlewild and Staring Lake Use Attainability Analysis; and Lower Purgatory Creek Stabilization Study* (Lotus Lake UAA Update) identified watershed best management practices (BMPs) within the Lotus Lake watershed to reduce the phosphorus loading and improve the water quality of Lotus Lake. Based on its project prioritization process that quantitatively considered project benefits and feasibility constraints using nine benefit categories and a total benefit, the District incorporated implementation of the BMPs identified in the Lotus Lake UAA Update into its 2018 Plan (Planning for the Next Ten Years: 2018-2028). This feasibility study has been budgeted for 2022 under the Lotus Lake Watershed Improvement Project (LL_1, LL_3, LL_7, LL_8) line item.

In addition to the District's 10-year plan, the MPCA released the Lower Minnesota River Watershed Total Maximum Daily Load (TMDL) Report (Minnesota Pollution Control Agency, 2020) which incorporates the 2017 UAA modeling and water quality data reported in the 2017 UAA. The TMDL utilizes the UAA to determine pollutant loading to the lake and estimate the required load reductions to meet the water quality goals. The TMDL identified load reductions required for watershed loads, erosion sources, as well as internal loading within the lake. Actions stemming from this TMDL study and the District's management plan were incorporated into the MPCA's Lower Minnesota River Watershed Restoration and Protection Strategy Report (Minnesota Pollution Control Agency, 2020).

The RPBCWD also completed the Kerber Pond Ravine Stabilization Project Feasibility Report in November 2020. Although this ravine was not identified as part of the UAA project for Lotus Lake or specifically listed in the district's 10-year plan, the 10-year plan incorporates adaptive management strategies and flexibility to pursue opportunity projects as they arise. The City of Chanhassen approached the District shortly after the Plan was adopted in 2018 for a potential partnership opportunity project to restore the Kerber Pond ravine and storm sewer connection to Lotus Lake to reduce sediment loads from the ravine to Lotus Lake. The feasibility study evaluated 2 concepts to help address sediment loading observed from this ravine to Lotus Lake. To date, no action has been taken by the City of Chanhassen or the RPBCWD on the recommended concept from this study. Concepts from this feasibility study are included in this report to provide a comprehensive look at all watershed improvement opportunities in the Lotus Lake watershed.

A site visit to each BMP site was conducted in September 2022 with RPBCWD and City of Chanhassen staff to discuss upcoming project/future plans for each site, discuss any recent work completed in these areas, as well as reviewing each site for water quality improvement and ecological enhancement opportunities. These details are outlined subsequent sections of the report.

The RPBCWD has also been looking at in-lake management opportunities including the development of the Lotus Lake Vegetation Management Plan (Barr, 2022). Additionally, the district completed an alum treatment of Lotus Lake in 2019 and is planning for a second alum treatment in 2023.

## Opportunities for Collaboration with City of Chanhassen

The City anticipates work on several road reconstruction projects over the next five years:

- Frontier Trail (2025)
- Pleasant View Road West (2026)
- Pleasant View Road East (2027)
- Fox Hollow Drive Neighborhood (2026)

Based on conversations with the City about the extents and scope of the upcoming projects, Barr estimated the changes in impervious that will occur during each road reconstruction project within the watershed. Pleasantview Road will likely increase from a 28' roadway width to a 39' width (including an 8' trail). Frontier Trail will likely increase from a 28' roadway width to a 36' width (including a 5' sidewalk). Roads within the Fox Hollow Drive neighborhood are not anticipated to change in width but will be fully reconstructed.

Table 1-1 summarizes the change in regulated impervious area and impervious area draining to Lotus Lake.

**Table 1-1 Imperviousness Associated with Upcoming City Road Reconstruction Projects**

| Road Project | Year | Fully Re-constructed Imp (ac) | New Imp (ac) | Total Regulated Imp (ac) | Existing Imp draining to Lotus Lake (ac) | Proposed Imp draining to Lotus Lake (ac) | Total Abstraction Volume (0.55") Required |
|---|---|---|---|---|---|---|---|
| Pleasant View Rd East | 2027 | 3.7 | 1.7 | 5.4 | 2.5 | 3.7 | 0.2 |
| Pleasant View Rd West | 2026 | 2.6 | 1.2 | 3.8 | 0.7 | 1.0 | 0.2 |
| Fox Hollow Neighborhood | 2026 | 5.3 | 0.0 | 5.3 | 4.4 | 0.0 | 0.2 |
| Frontier Trail Reconstruction | 2025 | 4.2 | 1.3 | 5.6 | 3.8 | 5.0 | 0.3 |

Figure 1-1 shows the approximate footprint of the four anticipated road reconstruction projects.

The projects will need to meet the RPBCWD stormwater management requirements. Because reconstruction of these roads aligns with several of the projects evaluated in this report, coordination between the District and the City should continue as the road projects move forward. Some of the reconstruction may present an opportunity to implement the stabilization of Kerber Pond Ravine, and to expand the drainage area receiving treatment from the BMPs evaluated in this report. Additionally, further conversations with the City may discuss alternative road designs to limit the increases in imperviousness.

## 1.2 Vision, Approach and Project Goals

The Lotus Lake UAA and the MPCA's Lower Minnesota River Watershed Total Maximum Daily Load (TMDL) Report concluded that Lotus Lake does not meet the MPCA state water quality standards and does not meet the RPBCWD long-term vision.

This feasibility study focuses on feasibility options to implement projects that reduce the pollutant loading to Lotus Lake, thus improving lake water quality, protecting public infrastructure, and protecting the district's investment in the 2019 Lotus Lake alum treatment. For each BMP location, this study will evaluate the feasibility of the original proposed BMP type as identified in the UAA as well as other potential stormwater BMPs at each location, as appropriate based on site and conveyance characteristics. Opportunities for ecological enhancements in and around the project sites were also considered when identifying opportunities, including increasing ecological diversity, providing a variety of habitat, and improvement to overall ecological function and improved soil health. Although several different BMP concepts were considered for each site, the most feasible and appropriate concepts given site conditions were developed and evaluated as part of this study.

The estimated total suspended solids (TSS) and total phosphorus (TP) pollutant load reductions and engineer's opinion of project costs were determined for each of the feasibility study concepts as well as other potential project benefits include rate control, volume reduction, reduction to flood risk, impacts to trees and total impact area, ecological restoration opportunity, and project visibility/public education.

## 1.3 Lotus Lake Water Quality Goals and Current Lake Conditions

The MPCA lake eutrophication criteria establish water quality standards for lakes based on total phosphorus, chlorophyll a, and Secchi disc transparency (Minnesota Pollution Control Agency, 2017). The standards are based on the geographic location of the water body (and associated ecoregion) and its depth (shallow vs. deep lakes).

Lotus Lake, classified as a deep lake in the North Central Hardwood Forest ecoregion, is listed on the MPCA 303(d) Impaired Waters List for excess nutrients. It has typically exceeded the MPCA water quality standards for total phosphorus and chlorophyll-a concentrations. With regards to Secchi disc transparency, some years the transparency meets the state standards while other years, the transparency does not meet the standards. See Figure 1-2 for summer average water quality graphs for Lotus Lake. The red line represents the MPCA water quality standards for Lotus Lake.

Review of historic water quality data suggests there are no significant water quality improvement or degradation trends present in all three of the parameters for Lotus Lake.

As part of the UAA study and subsequent TMDL study, an in-lake water quality model was used to determine TP load reductions needed to meet the water quality goal for Lotus Lake.

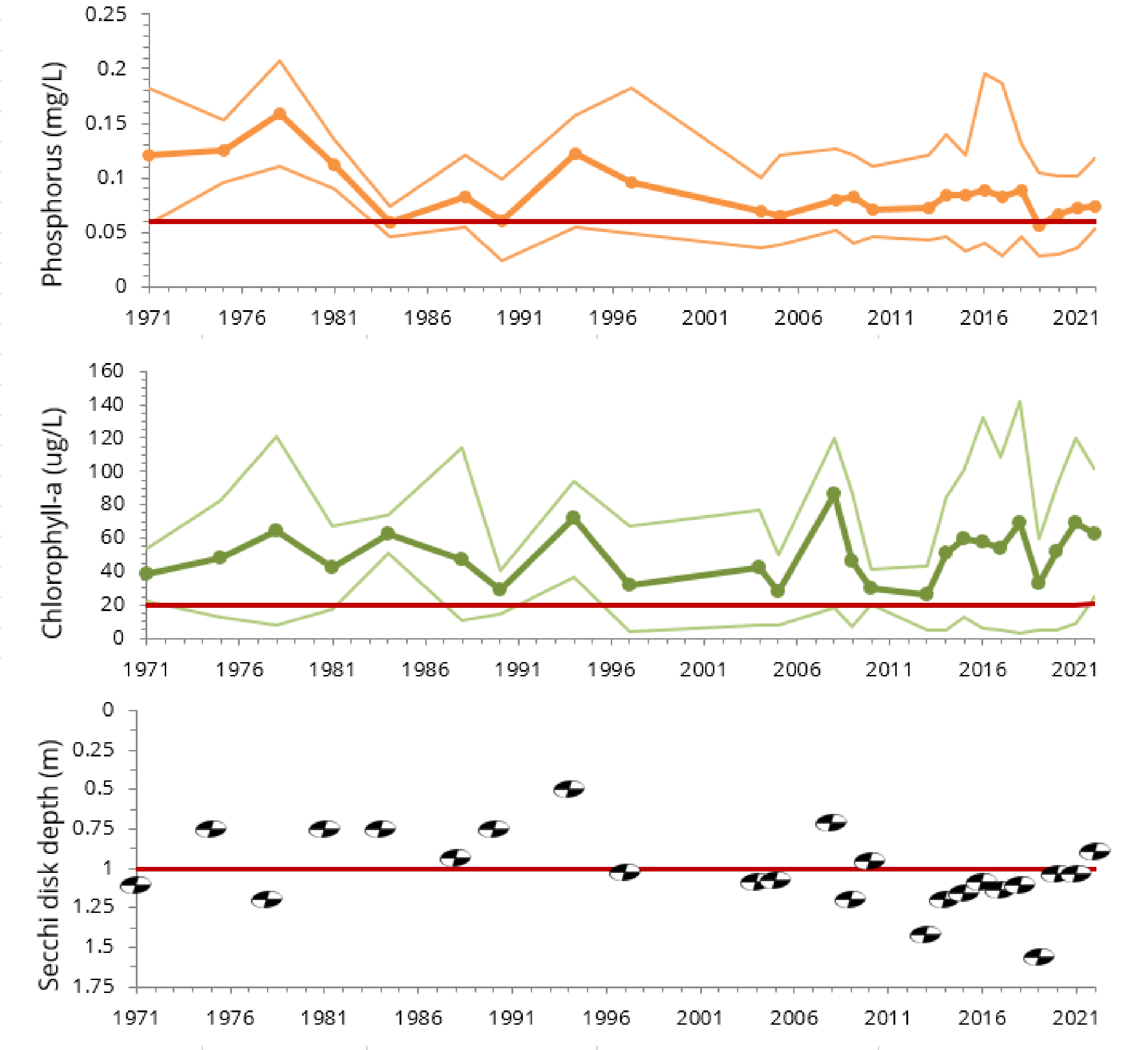



**Figure 1-2 Lotus Lake Water Quality**

Table 1-2 shows the existing conditions TP loads, the TP loading capacity, and the required percent reduction needed to meet the TP goal for both wasteload and load allocations. Also included in the TMDL summary is the Margin of Safety (MOS) included in TMDL analyses. (Minnesota Pollution Control Agency, 2020).

The TMDL relied on the on monitoring data between 2010 and 2015 to determine the 10-year average condition used assess if a waterbody is achieving the water quality goals. Under the 10-year average conditions, Lotus Lake is not meeting the MPCA's total phosphorus or chlorophyll *a* goals for a deep lake of 40 µg/L and 14 µg/L, respectively. Following the 2019 alum treatment in Lotus Lake, the phosphorus levels in 2019 achieved the MPCA's criteria for phosphorus and water clarity but chlorophyll *a* remained above the criteria. The TMDL for Lotus Lake indicated that a total phosphorus load reduction of 47% is needed to achieve the MPCA water quality standards, addressing loads from stormwater runoff, erosion sources, and internal loads.

**Table 1-2 Lotus Lake TMDL to meet MPCA Water Quality Goals**

| | | Existing TP Load | | Allowable TP Load | | Estimated Load Reduction | |
|---|---|---|---|---|---|---|---|
| | | lbs/yr | lbs/day | lbs/yr | lbs/day | lbs/yr | % |
| **TOTAL LOAD** | | **1,140** | **3.123** | **631** | **1.729** | **541** | **47** |
| **Wasteload** | **Total WLA** | **306** | **0.838** | **256** | **0.701** | **50** | **16** |
| | *MnDOT (MS400170)* | *3* | *0.008* | *3* | *0.008* | *0* | *0* |
| | *Carver County (MS400070)* | *2* | *0.005* | *2* | *0.005* | *0* | *0* |
| | *Chanhassen (MS400079)* | *291* | *0.797* | *241* | *0.660* | *50* | *17* |
| | *Eden Prairie (MS400015)* | *7* | *0.019* | *7* | *0.019* | *0* | *0* |
| | *Construction/Industrial SW* | *3* | *0.008* | *3* | *0.008* | *0* | *0* |
| **Load** | **Total LA** | **834** | **2.285** | **343** | **0.940** | **491** | **59** |
| | *Atmospheric deposition* | *88* | *0.241* | *88* | *0.241* | *0* | *0* |
| | *Internal load* | *732* | *2.005* | *247* | *0.677* | *485* | *66* |
| | *Erosion sources* | *7* | *0.019* | *1* | *0.003* | *6* | *86* |
| | *Groundwater* | *7* | *0.019* | *7* | *0.019* | *0* | *0* |
| **MOS (5%)** | | | | **32** | **0.088** | | |

To help address internal phosphorus loads from the lake bottom sediments, the RPBCWD conducted the first dose of an alum treatment of Lotus Lake in September 2018. Although there was some improvement in water quality in Lotus Lake following the first dose of alum, the lake did not response as well as other lakes that had received an alum treatment. The 2021 RPBCWD Annual Water Resources Report further discusses the effectiveness of the first dose of the alum treatment (Riley-Purgatory-Bluff Creek Watershed District, Water Resources Annual Report, 2021).  However, the RPBCWD is planning to conduct the second dose of alum in Lotus Lake in 2024.

Additionally, to more wholistically manage lakes, the RPBCWD is developing aquatic plant management plans for their lakes.  The RPBCWD completed the Lotus Lake Aquatic Vegetation Management Plan in 2023. The aquatic plant community in Lotus Lake is typical of metro area lakes with the littoral zone dominated by native coontail while also having robust populations of the invasive Eurasian Watermilfoil and Curlyleaf Pondweed (Riley-Purgatory-Bluff Creek Watershed District, Lotus Lake Aquatic Vegetation Management Plan, 2023).  These conditions suggest a stressed aquatic plant community that may be limited in its ability to provide critical ecosystem services to Lotus Lake.  Since the aquatic plant community in Lotus Lake is only moderately impacted, the primary approach for improving the aquatic should focus on:

1. minimizing the infestations of Curly-leaf pondweed, Eurasian watermilfoil, and Brittle naiad,
2. improving water clarity to support native aquatic vegetation,
3. establishing nursery areas to protect key native species and promote expansion of native taxa,
4. naturalizing shoreline areas to the maximum extent possible, and
5. maintaining carp densities below established thresholds.

# 2.0 Existing Conditions

## 2.1 Lotus Lake Watershed and Lake Description

Lotus Lake is a headwater lake to Purgatory Creek. Lotus Lake lies entirely within the boundaries of the City of Chanhassen. The watershed area contributing runoff to Lotus Lake is 1,397 acres including the lake surface area of 248 acres. The majority of the Lotus Lake watershed is covered by single family residential land use (65%), including the watersheds to the Kerber Pond ravine and the four sites evaluated.

Lotus Lake has an open-water surface area of approximately 248 acres. The lake is deep, with a maximum depth of approximately 31 feet and mean depth of approximately 16 feet. The outlet of Lotus Lake is a manmade structure that conveys water to Purgatory Creek. The outlet is at elevation of 895.4 feet.

Table 2-1 provides a summary of the physical characteristics for Lotus Lake.

### Table 2-1 Lotus Lake physical parameters

| Lake Characteristic | Lotus Lake |
|---|---|
| Lake MDNR ID | 10-0006-00 |
| MPCA Lake Classification | Deep |
| Water Level Control Elevation (feet) | 895.4 |
| Average Water Elevation (feet) (1) | 895.49 |
| Surface Area (acres) | 248 |
| Mean Depth (feet) | 16 |
| Maximum Depth (feet) | 31 |
| Littoral Area (acres) | 177 |
| Volume (at normal water elevation) (acre-feet) | 2,500 |
| Thermal Stratification Pattern | Dimictic |
| Estimated Residence Time (years) – 2013-2015 climatic Conditions | 2.7 |
| Total Watershed Area | 1,397(2) |
| Subwatershed Area (acres) | 1,397(2) |
| Trophic Status Based on 2019 Growing Season Average Water Quality Data | Hypereutrophic |
| Note(s):<br>(1) Average water elevation 1910-2015.<br>(2) Watershed area includes surface area of lakes. | |

### 2.1.1 Watershed Ecological Condition

Prior to European settlement the watershed of Lotus Lake was forested. This served as a sponge and a filter that slowly released clean and cool runoff to the lake. As settlers moved onto the land, they cleared forest for cropping leaving some woodlands as a source of wood. Agriculture was the dominant land use in the watershed until the 1980's and 1990's when single-family residential development occurred. This resulted in drastic increases of impervious surfaces and lawn which has increased the rate and volume of stormwater runoff, increased pollutant loads reaching the lake, and increased erosion in the ravines draining to Lotus Lake.

Today the watershed consists of suburban neighborhoods and city parks. There are very few biologically diverse areas within the watershed according to the DNR's MN Land Cover Classification System (see Figure 2-1). A few small pockets of altered deciduous woodlands occur on private properties and city parks. Most of the watershed land cover consists of 25 – 50% impervious surface with perennial grasses and sparse trees resulting in an altered hydrology (compared to pre-European settlement time) of increased runoff volume and reduced water quality.

In 2020, RPBCWD recently completed a Lotus Lake shoreline assessment using the MnDNR's Score Your Shore (SYS) tool, a rapid assessment of riparian lake habitat that considers the aquatic, upland (Shoreland), and transition zone (Shoreline) habitats. The habitat elements used in the assessment include trees, shrubs, natural ground cover, wetlands, overhanging wood, wood within the water, docks, and opening in aquatic plant beds.  A score (ranging for 0 to 100) is determined as the sum of three habitat scores, which are equally weighted. The average SYS score for Lotus Lake is 42 indicated most of the lake contain shoreland areas that are degraded, impacting habitat and likely a stress on fish, with the 2017 MnDNR study suggesting scores below 60 impacting fisheries.  The maximum and minimum scores are 93 and 13 respectively.  Given the low score, there is an opportunity to improve the ecological function of the upland, shoreland, and aquatic habitat around Lotus Lake.

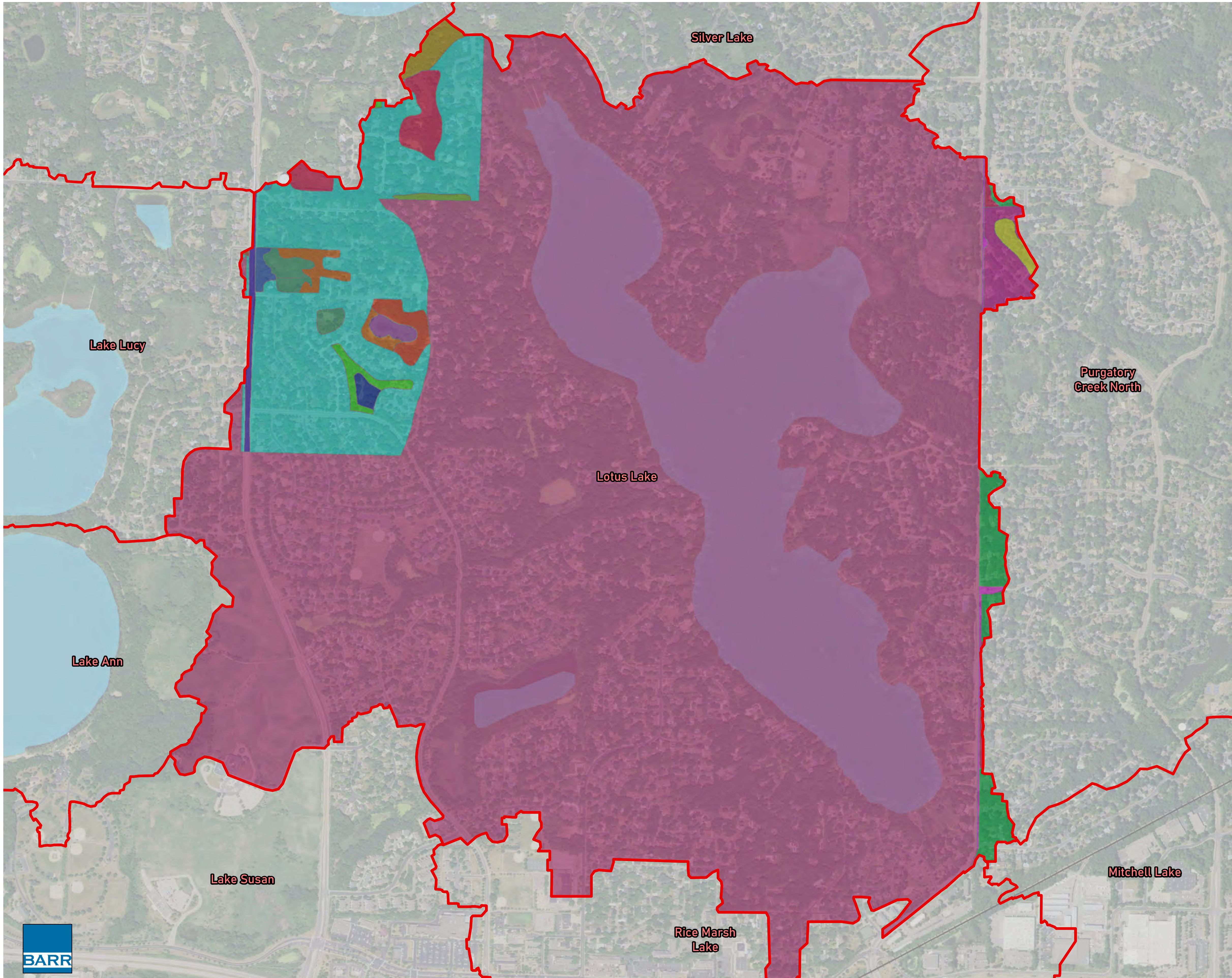
Figure 2-2 provides a spatial representation of the SYS results for the entire Lotus Lake shoreline.

Lake bank erosion is occurring, and soil is being washed into the lake by wave action caused both by wind and by boating. For much of the shoreline the native woodland that once surrounded the lake has been replaced with lawn that reaches to the waterfront. Lawn and areas with aquatic vegetation removed (submergent and emergent) degrade habitat and are easily eroded by wave action, shoreland runoff, and ice action.  The SYS assessment suggests there is room for ecological improvement in the form of shoreline restoration, upland restorations, and aquatic improvements.

Several ravines convey stormwater runoff to Lotus Lake. In some of these ravines, large volumes of runoff have caused erosion and left soils exposed. Additionally, it is difficult for vegetation to establish in the active flow and shaded conditions of these ravines. At some locations, significant movement of sediment by runoff has been observed, resulting in deposits of sediment into Lotus Lake. District staff conduct assessments of the various creeks and ravines within the watershed through its Creek Restoration Action Strategy (CRAS) assessment. The CRAS assessment divides the key categories for prioritizing restoration efforts into two tiers. The first tier represents the characteristics useful to gauge the necessity for a restoration project, and includes the following categories: infrastructure risk, erosion and channel stability, ecological benefit, and water quality. The second tier of categories include those that provide supporting benefits to stream restoration, including watershed benefits, public education, partnership opportunities, and project cost per pound of phosphorus. The most recent Tier-1 CRAS scores for ravines in the Lotus Lake watershed are shown in Figure 2-3, including a recent desktop assessment of the Kerber Pond Ravine by district staff utilizing recent photos from the ravine. Higher Tier-1 CRAS scores indicate a greater need for stream improvements and create initial ratings for "severe," "high," "moderate," and "low" to indicate a priority level for stream projects. Based on the Tier-1 CRAS scores, the ravine at LL_3 and Kerber Pond Ravine have the most degraded condition in the Lotus Lake watershed, with a "high" rating. The ravine downstream of LL_7 is classified as "moderate" and the ravine segment downstream of LL_8 is classified as "low."

# Lotus Lake Watershed: Minnesota Land Cover Classification System

**FIGURE 2-1**




Lake/Pond
Major Subwatersheds

MLCCS
- 11% to 25% impervious cover with deciduous
- 26% to 50% impervious cover with perennial grasses and sparse trees
- 76% to 90% impervious cover
- Altered/non-native deciduous
- Altered/non-native deciduous
- Lowland hardwood forest
- Maple-basswood forest
- Medium-tall grass altered/non-native dominated grassland
- Oak forest
- Oak woodland-brushland
- Other deciduous trees with 11- 25% impervious
- Palustrine open water
- Pavement with 91-100% impervious
- Seasonally flooded altered/non-native dominated emergent vegetation
- Short grasses and mixed trees with 26-50% impervious cover
- Short grasses with sparse tree cover on upland
- Upland soils with planted or maintained
- Upland soils with planted or maintained grasses and sparse tree cover
- undefined

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Feet

RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

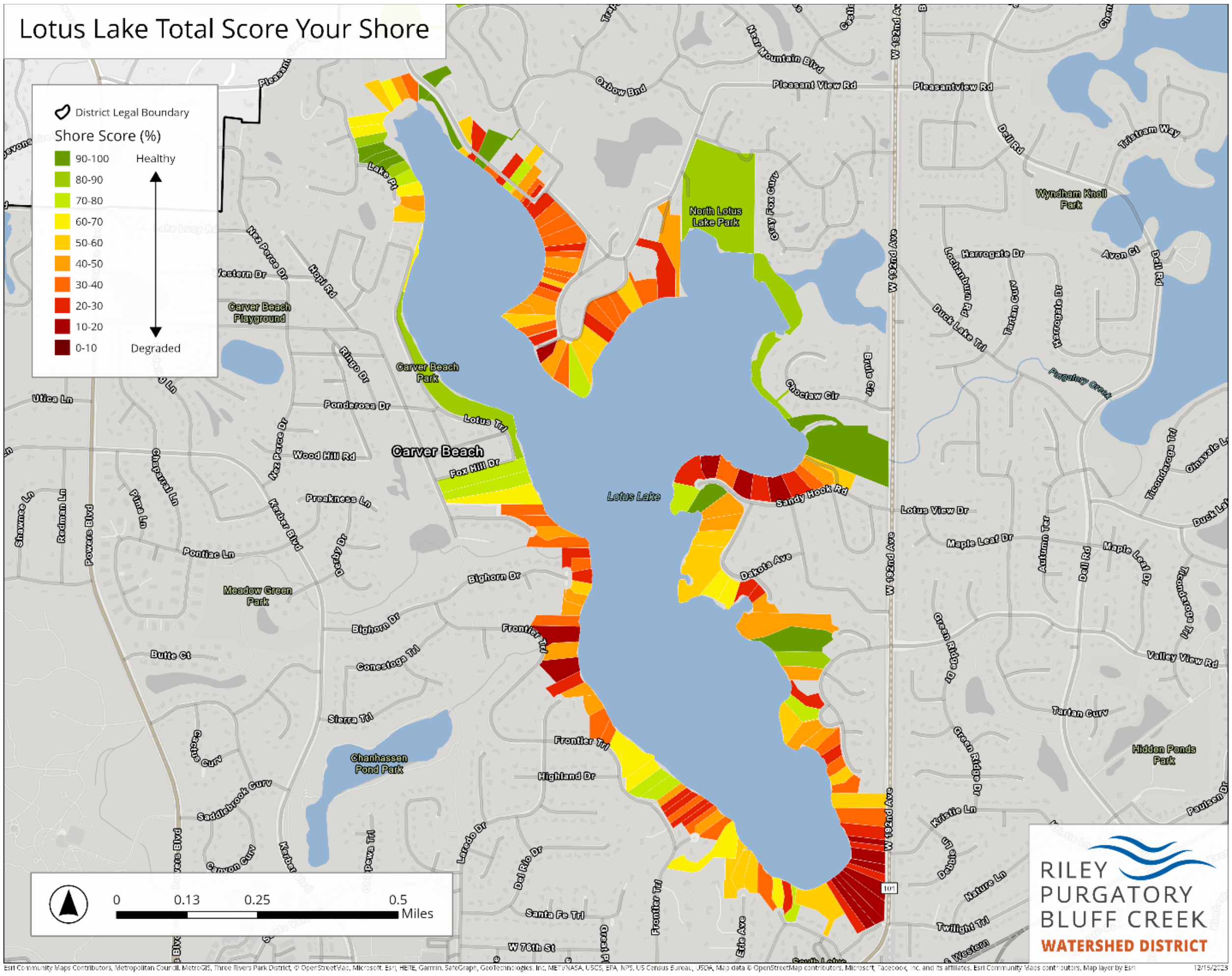
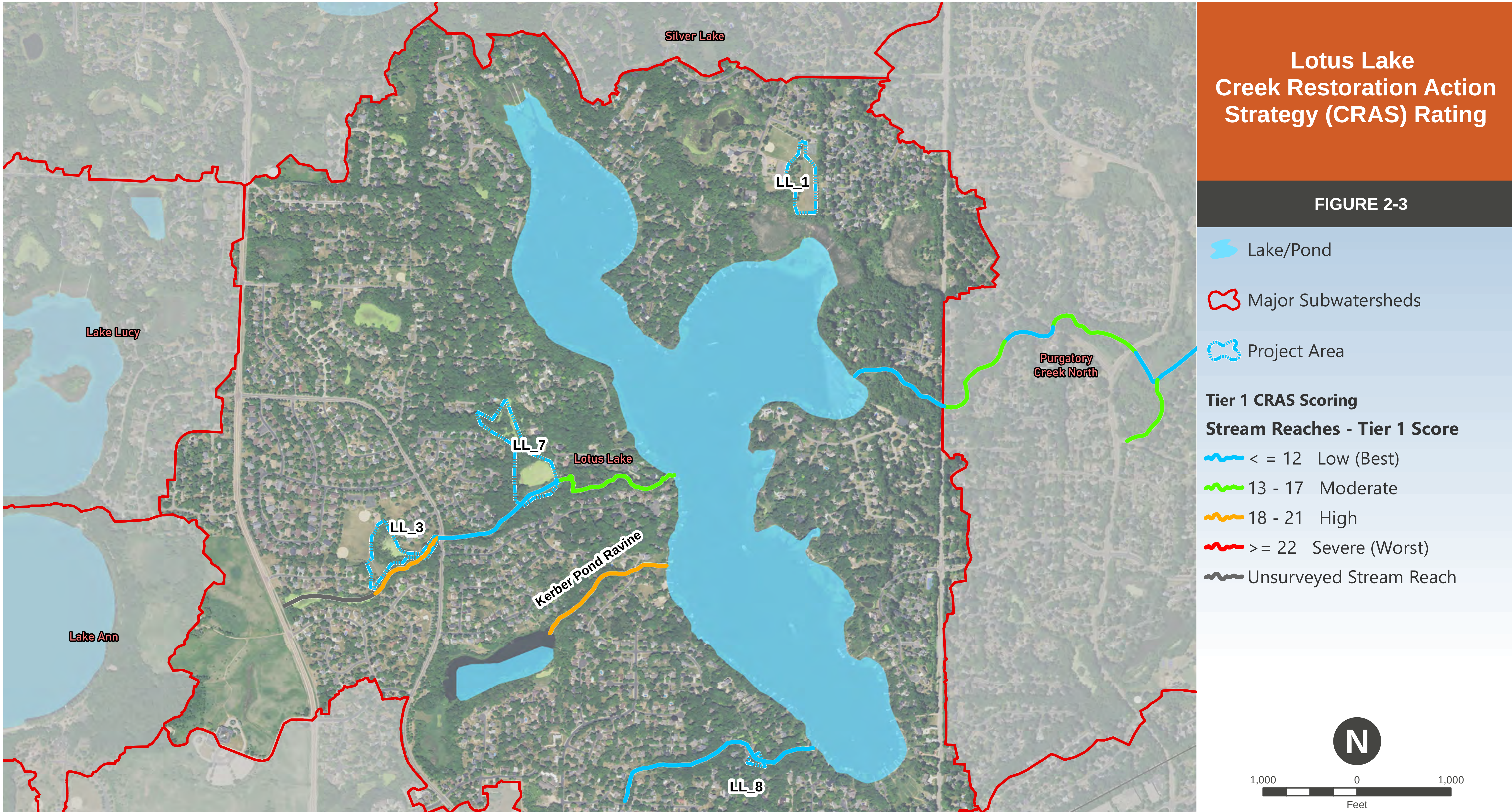



**Figure 2-2 Lotus Lake Score Your Shore Summary**

# Lotus Lake Creek Restoration Action Strategy (CRAS) Rating

FIGURE 2-3

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## 2.2 Desktop Assessments

Watershed and site characterization includes gathering information near the location of the four (4) proposed BMPs within the Lotus Lake watershed (Figure 1-1). This included both desktop and field assessments. Field assessments are further discussed in Section 2.3.

Desktop assessments include compiling, reviewing, and summarizing the following GIS datasets for the various project areas. This information is considered when developing the BMP concepts, estimating project costs, and identifying permitting requirements and project next steps, should the proposed concept be selected.

### 2.2.1 Minnesota Pollution Control Agency's (MPCA) "What's in my Neighborhood?"

Barr reviewed the Minnesota Pollution Control Agency's (MPCA) "What's in my Neighborhood?" database to determine if there is any expected concern for contamination in any of the project areas. While the review yielded no areas of concern in any of the four (4) BMP project areas, based on historic land use, it is possible that there may be some debris in the fill used during development. However, widespread contamination that would impact the proposed projects is not anticipated. Geotechnical investigations, while not conducted as part of the feasibility study, will be conducted as part of any next project phases to identify any conditions that may require special soil management.

### 2.2.2 National Wetlands Inventory and District Wetland Management Classification

Barr reviewed available National Wetlands Inventory (NWI) boundaries and the District's 2022 MNRAM dataset with wetland and management classification levels to determine potential locations where the district's wetland and buffer rule may be triggered.

Three wetlands are located near site LL_1. The south end of the site borders a medium value forested shrub wetland that feeds into a high value emergent wetland along the shore of Lotus Lake. Additionally, to the east of the site is a low value freshwater pond wetland along Gray Fox Curve that receives water from surrounding storm sewer.

At Site LL_3, the stormwater pond at Meadow Green Park that discharges into the ravine is classified as a high value forested/shrub wetland.

The wetland complex at Site LL_7 includes five wetlands identified in the NWI: four medium-value freshwater pond wetlands and one medium value forested/shrub wetland.

Based on a desktop review, there are no mapped wetlands within or downstream of Site LL_8. Relevant wetlands at each site are summarized in Table 2-2.

**Table 2-2 Wetland Inventory**

| BMP Site | Wetland Location | NWI Wetland Type | Area (ac) | District MNRAM ID | District Management Classification |
|---|---|---|---|---|---|
| LL_1 | Downstream Off-Site<br>*Borders Project Extent* | Freshwater Emergent Wetland | 0.18 | 1-116-23-001 | Medium |
| | | Freshwater Forested/Shrub Wetland | 1.72 | 1-116-23-001 | Medium |
| | Downstream Off-Site<br>*Between Lotus Lake and Site-Boundary Wetland* | Freshwater Emergent Wetland | 10.20 | 01-116-23-001 | High |
| | Off-Site<br>*East of Project Site, along Gray Fox Curve* | Freshwater Pond | 0.23 | 01-116-23-003 | Low |
| LL_3 | On-Site<br>*Discharges into ravine* | Freshwater Forested/Shrub Wetland | 2.20 | 11-116-23-003 | High |
| LL_7 | On-Site<br>*Upper wetland discharging into lower wetland* | Freshwater Pond | 0.21 | 01-116-23-015 | Medium |
| | | Freshwater Forested/Shrub Wetland | 0.61 | 01-116-23-015 | Medium |
| | | Freshwater Pond | 1.35 | 01-116-23-015 | Medium |
| | Upstream and On-Site<br>*Ravine Discharging into Lower Wetland* | Freshwater Emergent Wetland | 1.32 | 12-116-23-001 | Medium |
| | On-Site<br>*Lower Wetland* | Freshwater Pond | 1.99 | 12-116-23-001 | Medium |
| | On-Site<br>*East Wetland* | Freshwater Pond | 0.46 | 12-116-23-001 | Medium |

### 2.2.3 Threatened and Endangered Species & Environmentally Sensitive Features Review

Barr reviewed the available federal, state, and county databases to determine the potential for adverse impacts to state and federally listed threatened and endangered species. Additionally, the available federal, state, and county databases to determine if any environmentally sensitive features or areas are located within the watershed as well as any critical or threatened habitat were reviewed.

#### *State Listed Species*

Through a license agreement (LA-898) with the MnDNR for access to the Natural Heritage Information System (NHIS) database, a query of the NHIS database was conducted in January 2023 to assess if any rare species could potentially be affected by the proposed project. The NHIS database identified one state listed species known to occur within one mile of the Project areas; the pugnose shiner (Notropis anogenus) and one watchlist species, the rusty patched bumble bee (Bombus affinis).

The pugnose shiner is a state listed threatened fish species. In Minnesota, the pugnose shiner inhabits clear glacial lakes and low gradient small- to-moderate-sized streams with little current, where rooted aquatic plants or muskgrass (Chara spp.) is present. The Project areas do contain small freshwater ponds however these ponds would not be considered suitable habitat for the species due to their sensitivity to turbidity and siltation. Therefore, it is anticipated that the project will not affect the pugnose shiner.

The rusty-patched bumble bee (RPBB) is one of about 21 species of bumble bees in the United States. RPBB have been observed in a variety of habitats, including prairies, woodlands, marshes, agricultural landscapes, and residential parks and gardens, They require areas that support sufficient food, including nectar and pollen from diverse and abundant flowers, as well as undisturbed nesting sites. The project areas are located within the USFWS RPBB High Potential Zone. Meaning that the presence of the RPBB should be presumed within the project areas. RPBCWD will consult with USFWS to determine if any avoidance or minimization measures would be required to avoid adverse effects to the RPBB.

According to GIS data obtained from the MnDNR, there are no Minnesota Biological Survey (MBS) Sites located within one mile of the proposed project areas. Additionally, no state-owned Wildlife Management Areas (WMA), Scientific Natural Areas (SNA), Waterfowl Production Areas (WPA), native plant communities, State conservation easements are present within one mile of the proposed project area.

### *Federally Listed Species*

The United States Fish and Wildlife Service's (USFWS) Information, Planning, and Conservation System (IPaC) website identified two federally listed species potentially occurring in the project area: the northern long-eared bat (Myotis septentrionalis; endangered). In addition to one candidate species, the monarch butterfly (Danaus plexippus) and one proposed endangered species, the tricolored bat (Perimyotis subflavus). No designated critical habitat for any federally listed species is located within the project area.

The northern long-eared bat hibernates in caves during the winter and uses forested areas for roosting and foraging during the bat's active season of April through September. Suitable roost trees for this species have trunks measuring greater than three inches diameter at breast height (DBH) with loose, peeling bark or crevices. Numerous trees exceeding three inches DBH exist in the project area. It is likely the project will require the removal of some trees within the project area. According to the MnDNR, the nearest hibernacula is approximately 9.6 miles southwest of the project areas and no maternity roost trees have been identified within one mile of the proposed project area. To avoid potential direct impacts to the northern long-eared bat is to remove the proposed trees outside of the active season (outside of April—September).

Similarly to the NLEB the tricolored bat hibernates in caves, mines, and tunnels. In the summer, tricolored bats generally roost singly, often in trees. Maternity colonies have not yet been located in Minnesota. Tricolored bats hibernate from October into April. There is no suitable hibernacula located within the project areas. In addition, there are no known roost trees located within one mile of the project areas. Tree clear would be completed during the tricolored bats hibernation period when it would not be present within the Project areas. Therefore, it is anticipated the project would have no effect on the tricolored bat.

As a candidate species the monarch butterfly is not legally protected under the endangered species act and was not considered as part of this review.

### 2.2.4 Cultural Resources

Barr completed a cultural resources literature review of the project area and a one-mile buffer in November 2022. The literature review was directed toward identifying previously recorded archaeological sites, historic structures, and other cultural resources. Barr requested data from the Minnesota State Historic Preservation Office (SHPO) on October 17, 2022 to identify previously recorded archaeological sites and historic architectural resources located within one mile of the project area. The Minnesota OSA Portal for archaeological sites was also reviewed on November 30, 2022.

Data provided by the Minnesota SHPO on October 24, 2022 indicates that no cultural resources have been previously documented within project boundaries. Within one mile of the project area, approximately 120 historic architectural resources have been documented. These consist primarily of houses, but also include a church, school, post office, several bridges, and a dinner theatre. The OSA Portal as well as data from the Minnesota SHPO identified 20 previously recorded archaeological sites within one mile of the project area, including precontact lithic scatter, precontact artifact scatter, historic shipwrecks, and historic ghost towns.

None of the previously recorded cultural resources are located within or directly adjacent to the project area; however, the project area does not appear to have been previously surveyed for cultural resources. If the project constitutes an undertaking subject to Section 106 of the National Historic Preservation Act, additional work to identify significant cultural resources may be required.

### 2.2.5 Public Utility Information

The City of Chanhassen provided the most current (2022) public utility information in GIS format, including storm sewer, sanitary sewer, and water main data. A desktop review of this data was used to inform concept designs at the proposed project sites. Public utility information was reviewed the to consider potential storm sewer routes, site BMP and access locations and define potential construction limits that minimized conflict and inform cost estimates to address utility conflicts.

### 2.2.6 Hydrologic and Hydraulic and Water Quality Modeling

The subwatersheds, hydrologic and hydraulic modeling (PC-SWMM) and water quality models (P8)) previously developed by the District served as the basis to inform watersheds, drainage and flow characteristics, concept designs, project impacts on flow characteristics, and pollutant loading at each of the BMP sites.

The existing PCSWMM and P8 models were updated where appropriate based on a review of drainage structure data provided by the City of Chanhassen. Subcatchments were divided and structures were added where deemed appropriate to evaluate hydraulic conditions at a greater resolution around the project sites.

### 2.2.7 Flow and Water Quality Monitoring Data

Flow and water quality monitoring data from 2021 and 2022 provided by the District for the following two monitoring stations near project sites:

- east of Kerber Blvd just downstream from BMP LL_3 in the existing storm sewer
- Downstream of BMP LL_7, where the outlet system from the LL-7 wetland system discharges into the downstream ravine, downstream of the pe.

Each monitoring station was installed in existing storm sewer pipes. LL-3 is located in the storm sewer downstream of Kerber Blvd. LL-7 is in a culvert downstream of the recreation trail and is conveying direct discharge from the upstream wetlands.

Figure 2-4 shows the location of the two flow/water quality sensors. The LL_7 unit was installed in 2021 and 2022 and the LL_3 unit was only installed in 2022.

Table 2-3 and Table 2-4 summarizes the available water quality data at the two monitoring locations. Monitoring data from both locations show elevated levels of TP and TSS that are higher than would be expected for both typical untreated and treated stormwater runoff from a suburban residential watershed. The concentrations of TP (~0.4-0.5 mg/L on average; 75-80% associated with particulates (non-dissolved fraction)) and TSS (180 mg/L at LL-3; 80-110 mg/L at LL-7) are above what would be expected for the monitoring locations, given that they are downstream from existing ponds/wetlands that should provide some treatment.

Low flows from LL-3 are fully contained within a storm sewer from Kerber Blvd to the small wetland restoration located immediately upstream of the LL-7 monitoring stations (until roughly the 10-20-year event). There would be very few locations where additional flow or pollutant loads would enter the pipe system beyond what was already moving through system as captured at the LL-3 station. This is especially true in 2022 when flows were low and likely fully contained in the storm sewer.

# Water Quality Monitoring Locations

FIGURE 2-4


Lake/Pond
Park/Playground
Project Area
Major Watersheds
Subwatersheds
Monitoring Locations

Stormsewer (Chanhassen)

Structure
Culvert
Storm Sewer

N

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Riley Purgatory Bluff Creek Watershed District - Lotus Lake Water Quality Project

**Table 2-3 2022 Water Quality Monitoring Data at Station LL_3**

| Analyte | Number of Samples | Min | Max | Mean | MPCA Stream Water Quality Standards |
|---|---|---|---|---|---|
| TP (ug/l) | 8 | 195 | 981 | 505 | ≤100 |
| TDP (mg/l) | 5 | 0.034 | 0.178 | 0.117 | N/A |
| OP (mg/l) | 3 | 0.068 | 0.121 | 0.100 | N/A |
| Chl *a* (mg/l) | 3 | 5.3 | 32.0 | 20.9 | ≤18 |
| TSS (mg/l) | 7 | 9.3 | 524.0 | 180.7 | ≤30 |

**Table 2-4 2022 Water Quality Monitoring Data at Station LL_7**

| Analyte | Number of Samples | Min | Max | Mean | MPCA Stream Water Quality Standards |
|---|---|---|---|---|---|
| TP (ug/l) | 10 | 170 | 1010 | 424 | ≤100 |
| TDP (mg/l) | 10 | 0.069 | 0.210 | 0.108 | N/A |
| OP (mg/l) | 6 | 0.008 | 0.078 | 0.053 | N/A |
| Chl *a* (mg/l) | 5 | 3.0 | 37.4 | 14.9 | ≤18 |
| TSS (mg/l) | 8 | 19.3 | 336.0 | 107.5 | ≤30 |

The flows upstream of LL-3 move through an open channel downstream of an existing stormwater pond that the City recently modified. As noted by District staff and as observed by Barr staff in a field visit in the September 2022, there is significant accumulated sediment in the bottom of the channel. This accumulated sediment is above the invert of the storm sewer pipe inlet on the west side of Kerber Blvd (Figure 2-5**Error! Reference source not found.**). District staff needed to clear the sediment from the trash rack/pipe inlet when the monitoring station was installed. Barr staff observed head cutting of the sediment accumulated on the bottom of the channel during the site visit. Therefore, the eroding sediment on the channel bottom is likely the source of the elevated TP and TSS levels observed at the LL-3 monitoring station.

The high levels of TSS and TP at the LL_7 monitoring station suggests that sediment and phosphorus present at the upstream LL_3 monitoring location are not settling out in the wetland complex. The small wetland upstream of the LL-7 monitoring station is small and likely undersized for the contributing area, so settling of sediment is potentially limited, especially with high sediment loads. This is supported by District staff needing to regularly remove vegetation on the trash rack at the outlet from that wetland upstream of the monitoring station (flashy system, lots of flow moving though).

Based on the above information, Barr staff assessed that the elevated sediment and nutrient levels at the LL-7 station are very likely due to the erosion upstream of the LL-3 monitoring station. The water quality results are further discussed by BMP location in Section 0

**Figure 2-5 Accumulated sediment at the storm sewer pipe inlet on the west side of Kerber Blvd (photo taken by RPBCWD, May 04, 2022)**

### 2.2.8 Soil Erosivity and Erosion Conditions

Barr reviewed project sites and downstream channels using available soils data to understand erosion potential, soil conditions, photos for recent inspections and classifications, as well as observations from recent site visits.

Erosion potential and conditions at each of the BMP sites as well as in the downstream channels is summarized in Table 2-5, considering the following data sources:

- United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) SSURGO Soil Survey
- RPBCWD Creek Restoration Action Strategy (CRAS) report
- High-risk erosion areas identified by the RPBCWD

## Table 2-5 SSURGO Soil Type and Erodibility Summary

| BMP Site | Downstream Open Channel | SSURGO Soils Data | | | CRAS Tier 1 Score/Condition | RPBCWD High Risk Erosion Area |
|---|---|---|---|---|---|---|
| | | Location | Soil | Erosivity due to Water | | |
| LL_1 | No, site discharges to wetland adjacent to Lotus Lake | BMP Site | Hamel Loam | Low Erosivity | NA: Discharges to wetland adjacent to Lotus Lake | No |
| | | Downstream Wetland | Houghton and Muskego soils | Low Erosivity | | |
| LL_3 | Yes, open channel feeds into lower wetland at site LL_7 | BMP Site | Lester-Kilkenny loams, 6 to 12 percent slopes | Moderate Erosivity | Upstream of Kerber Blvd: 18 (poor)<br>Downstream of Kerber Blvd: 10 (good) | Yes |
| | | Downstream Channel | Lester-Kilkenny loams, 12 to 18 percent slopes | High Erosivity | | |
| LL_7 | Yes, lower wetland discharges to open channel | BMP Site & Downstream Channel | Hamel loam | Low Erosivity | Downstream of BMP Site: 18 (poor) | Yes, at DS wetland |
| LL_8 | Yes, ravine is currently an open channel | BMP Site | Hamel Loam | Low Erosivity | Downstream of BMP Site: 14 (moderate) | Yes |
| | | Downstream Channel | Lester-Kilkenny loams, 12 to 18 percent slopes | High Erosivity | | |
| Kerber Pond Ravine | Yes, ravine is currently an open channel | Upper Ravine | Kilkenny-Lester loams, 2 to 6 percent slopes | Moderate Erosivity | Full Ravine: 14 (moderate) | Yes |
| | | Middle Ravine | Lester-Kilkenny loams, 12 to 18 percent slopes | High Erosivity | | |
| | | Lower Ravine | Hamel loam | Low Erosivity | | |

Based on the SSURGO data above, the open channels located within and downstream of project areas consist of loam soils. Table 2-6 summarizes the erosive velocity and shear stress values for bare loam soils, as well as vegetated cover.

### Table 2-6 Estimated Erosive Velocity and Shear Stresses in Ravines

| Type of Cover | Estimated Minimum Erosive Velocity[(1)] (ft/sec) | Estimated Minimum Erosive Shear Stress[(1)] (lb/sq ft) |
|---|---|---|
| Sandy Loam soils (bare) | 1.75 | 0.03 – 0.04 |
| Silty Loam soils (bare) | 1.75 – 2.25 | 0.045 – 0.05 |
| Class A turf | 3.7 | 6 – 8 |
| Long native grasses | 1.2 – 1.7 | 4 – 6 |
| Gravel (1") | 0.33 | 2.5 – 5 |
| Riprap (6" d50) | 2.5 | 5 – 10 |
| Riprap (12" d50) | 5.1 | 10 – 13 |
| Notes<br>(1) Selected lining materials representative of cover types expected within the project areas (Fischenich, 2001) | | |

## 2.3 Field Assessments

As part of the feasibility study, Barr conducted two site visits and coordinated field data collection with District Staff. Barr staff visited each proposed BMP site location and provided data review on site-specific soil data collected by District staff.

### 2.3.1 Site Visits

On 9/8/2022, Barr staff visited each project area with both District and City of Chanhassen staff to confirm existing infrastructure, the proposed BMP siting, evaluate overall feasibility, review existing conditions at BMP site and downstream conditions of the anticipated discharge locations, and to document each site area with photos. Additionally, the staff completed a qualitative review of the existing ecological conditions of the general project area including condition of existing native habitat, turf, trees/forest, and other landscape features as well as potential opportunities for ecological improvement.

A second site visit occurred on 5/3/2023 at site LL_3 to confirm accessibility and document the conditions of the ravine post-snowmelt.

Observations of existing conditions for each site visit and a review of ecological conditions are summarized by project area in Section 2.

### 2.3.2 Infiltration Testing

District staff performed infiltration testing at several BMP sites to understand if infiltration would be possible. The Modified Philip Dunne (MPD) infiltrometer tests performed in May and June of 2023 used infiltrometers manufactured by Upstream Technologies.

The infiltrometer test results are summarized in Table 2-7 below as well as Figure 2-6.

**Table 2-7 Preliminary Infiltrometer Results**

| Site | Number of Tests | Lowest Infiltration Capacity (in/hr) | Highest Infiltration Capacity (in/hr) | Average Infiltration Capacity (in/hr)[(2)] |
|---|---|---|---|---|
| LL_1[(1)] | 9 | 1.39 | 14.8 | 5.71 |
| LL_3 | No infiltration testing performed | | | |
| LL_7 | 1 (excluding null results) | 1.65 | 1.65 | 1.65 |
| LL_8 | 2 | 29.7 | 34.7 | 32.1 |
| Kerber Pond Ravine | 3 | 0.005 | 2.88 | 0.574 |

Notes
(1) Future infiltrometer testing required within the proposed BMP footprint at site LL_1
(2) Average capacity based on a screening level analysis. Infiltration capacity will need to be further confirmed with soil borings etc. as part of future design phases.

The results show that infiltration may be possible at some of the sites, especially sites LL_1 and LL_8. Results at site LL_1 were unexpected based on conversation with District and city staff during the site visit that indicated tight clay soils in the area and higher groundwater conditions. These results may be due to the limitations of a MPD Infiltrometer, which can only measure the hydraulic conductivity of the top 50 cm of soil and cannot detect confining layers that may be underneath.

Assessment of BMPs at sites LL_1 and LL_8 included evaluation of infiltration practices. However, geotechnical borings and infiltration testing should be completed as part of final design for any of these practices.

### 2.3.3 Soil/Health Conditions

District staff collected representative soil samples at one of the BMP sites to document pre-project soil health conditions for that site.

RPBCWD staff collected three soil samples at North Lotus Lake Park (BMP site LL_1) on May 9, 2023. Soil testing results were not received from district staff for any of the other BMP sites.

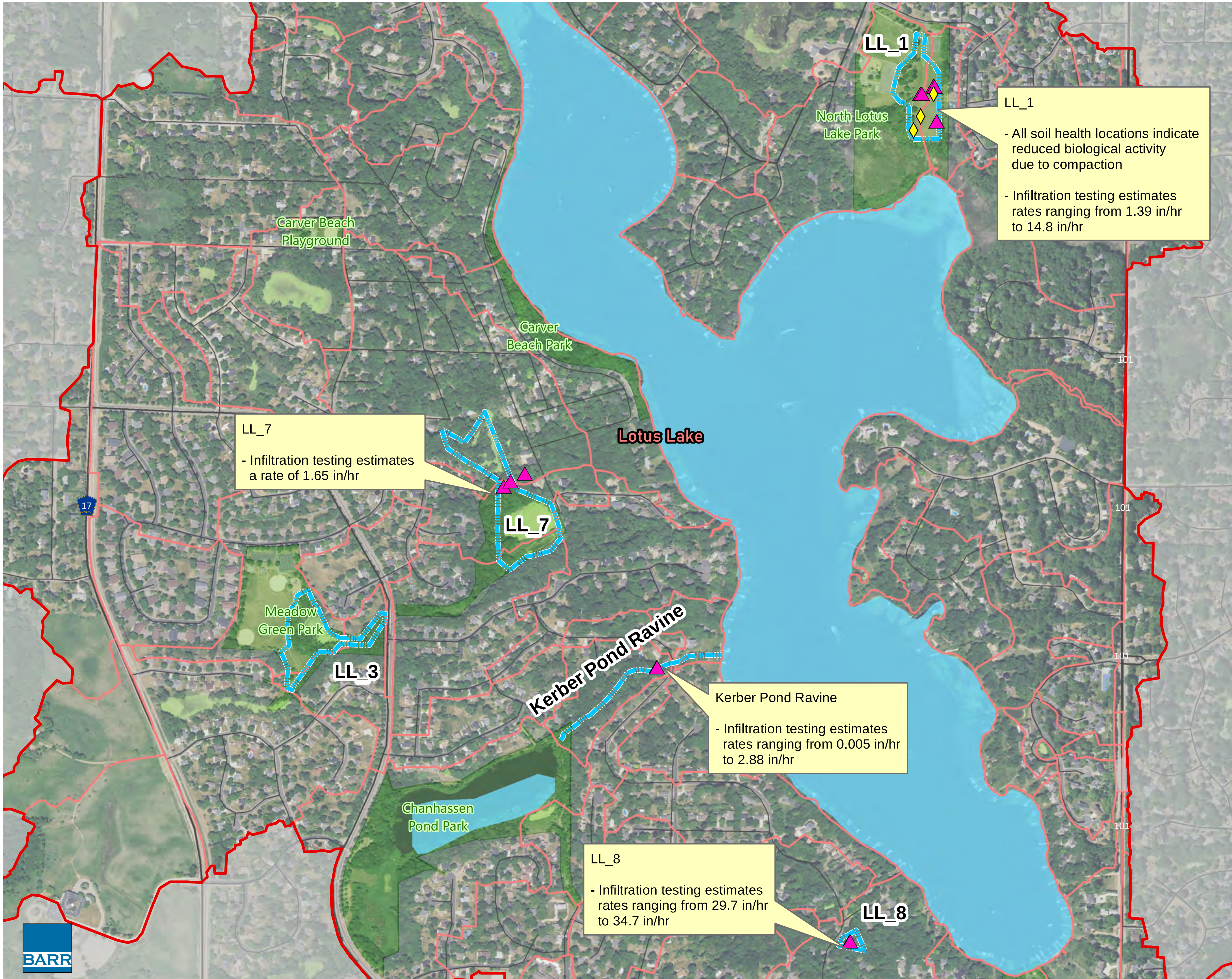
A comprehensive assessment of soil health was conducted by the Cornell Soil Health Laboratory. A summary of the results from this assessment is provided in Table 2-8 and Figure 2-6. In general, the soils are medium to high quality, with soil health impacts due to soil compaction.

**Table 2-8 Soil Health Results Summary**

| Sample | Overall Quality Score | Comments |
|---|---|---|
| North Lotus Lake Park 1 (ww2423) | 63 (High Quality) | This is a classic loam soil that could be very productive. It receives a high rating yet has significant issues with surface and subsurface compaction which inhibits stormwater infiltration. The biological activity in this soil is limited due to a lack of water and poor exchange of oxygen with the atmosphere that limits soil food web activity. |
| North Lotus Lake Park 2 (ww2424) | 52 (Medium Quality) | This sandy loam soil also has surface and subsoil compaction resulting in reduced stormwater infiltration and increased runoff. Biological activity is greatly reduced even though soil fertility is excellent. |
| North Lotus Lake Park 3 (ww2425) | 51 (Medium Quality) | This loam soil would have a high-quality rating except that the topsoil and subsoil is very compacted. This limits water infiltration and gas exchange with the atmosphere; significantly reducing biological activity and therefore nutrient and water supply to vegetation. |

# Soil Health and Infiltration Testing Locations

FIGURE 2-6




Lake/Pond

Park/Playground

Preserve/Recreation Area

Project Area

Major Subwatersheds

Lotus Lake Subwatersheds

Soil Health Samples (2023)

Infiltration Testing Locations (2023)

* infiltration capacity will need to be confirmed with further geotechnical investigations as part of final design

N

1,000 0

Feet

RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

Riley Purgatory Bluff Creek Watershed District - Lotus Lake Water Quality Project

## 2.4 Project Area Summary

The desktop assessments, site visits, and field data collection each contributed to individual site characterization. The following section provides a summary of the existing hydraulic conditions, ecological conditions, and erosion concerns at each project area. The hydrologic and hydraulic model was used to simulate four design storm events at each site, including the Atlas 14 1-yr, 2-yr, 10-yr, and 100-year, 24-hour events.

### 2.4.1 BMP LL_1

#### *Watershed, Drainage Patterns, and Flow Conditions*

Under existing conditions, there is approximately 58 acres draining to site LL_1 into North Lotus Lake Park. The majority of the watershed is single family residential land use along with the open space covering North Lotus Lake Park. See Figure 2-7 for the project area watersheds and drainage patterns. The existing outlet from site LL_1 is a 24" CMP culvert that drains into the medium-value downstream wetland. There is a trail located above the outlet that can potentially be overtopped during larger rain events.

The peak flow leaving the culvert and overtopping the trail and peak water surface elevation in the park was considered during design and is summarized in Table 2-9.

**Table 2-9 Existing Hydraulic Conditions at LL_1**

| Atlas 14 Design Storm Event | Peak Elevation (ft) | Peak Discharge (cfs) |
|---|---|---|
| 1-year 24-hour | 905.1 | 18 |
| 2-year, 24-hour | 905.3 | 23 |
| 10-year, 24-hour | 905.6 | 42 |
| 100-year, 24-hour | 905.8 | 67 |

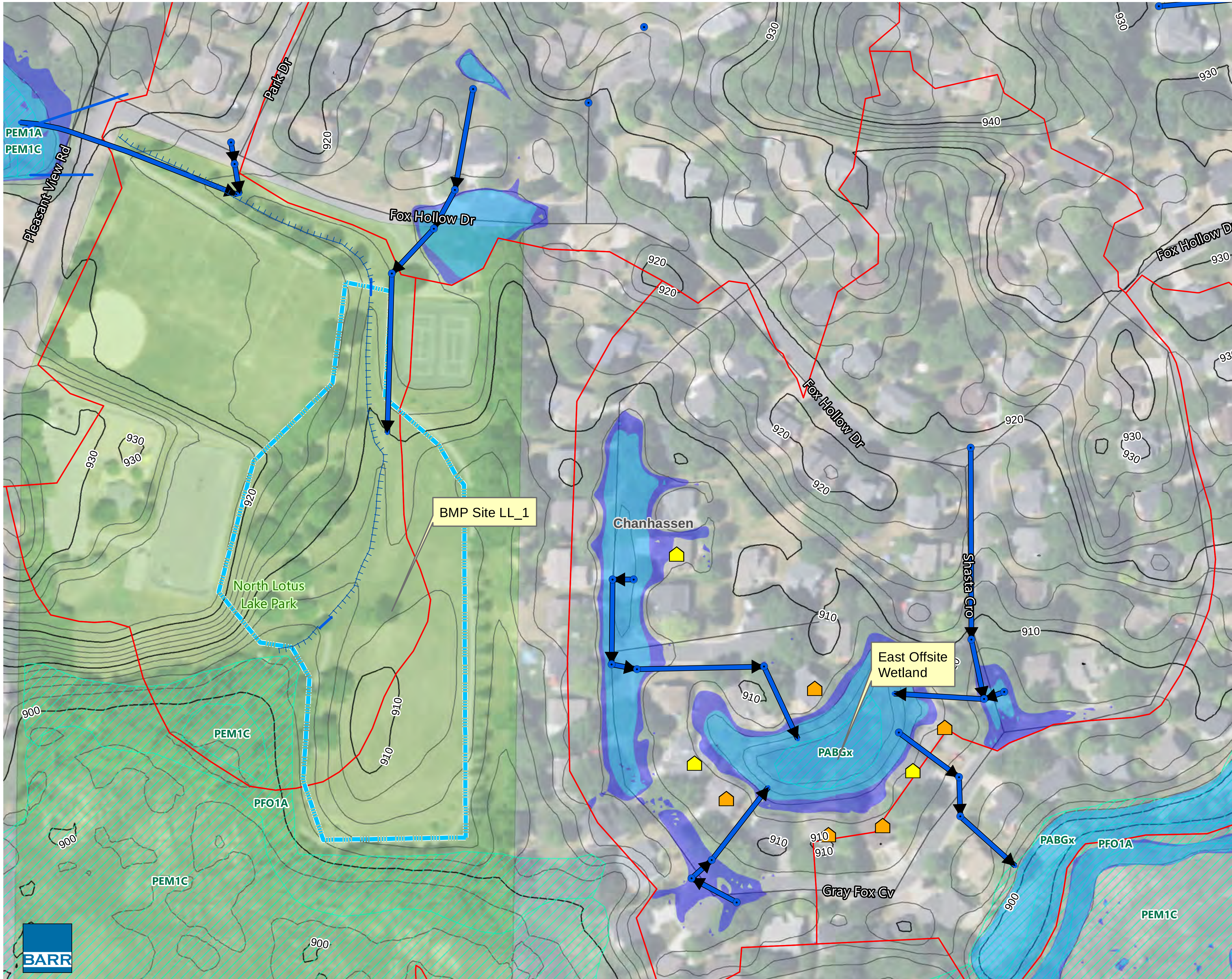
Adjacent to Site LL_1 in the Fox Hill Drive neighborhood is a freshwater pond wetland (referred to as the east offsite wetland) (See Figure 2-8). The wetland was identified during the study as an overloaded stormwater pond that poses a risk of inundation to surrounding properties during extreme rain events, such as the 100- and 500-year events. The design at site LL_1 included considerations of opportunities to lower the peak water surface elevation at the east wetland.


# Existing Site Map: BMP LL_1

FIGURE 2-7

# Potential At-Risk Structures Near LL_1

FIGURE 2-8




- Project Area
- P8 Subwatershed
- Parcel Boundary
- NWI Wetland
- Municipal Boundary

Surface Contours (MN DNR, 2011)
- 10ft contour
- 2ft contour

Stormsewer (Chanhassen)
- Structure
- Drainage Swale (Chanhassen)
- Culvert
- Storm Sewer

Annual Flood Risk
- 1 - 2%
- 0.2 - 1%

Potentially Impacted Structures
- 1% Event
- 0.2% Event

N

100 0 100
Feet

RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

### *Vegetation*

The LL_1 project area within Lotus Lake Park primarily consists of lawn with scattered trees (Figure 2-9). A row of spruce at the southeast border of the park are diseased and declining. The wetland at the south end of the project area is degraded with invasive species such as reed canary grass and common buckthorn. It is surrounded by aspen, green ash, and box elder trees.

**Figure 2-9 Existing Vegetation at Lotus Lake Park**

### *Erosion*

Erosion was not identified as an issue of concern at Site LL_1. The site has well-established vegetation and discharges into a wetland adjacent to Lotus Lake.

## 2.4.2 BMP LL_3

### *Watershed, Drainage Patterns, and Flow Conditions*

The estimated drainage area to site LL_3 is 284 acres, including the watershed to the Meadow Green Park stormwater pond and the ravine between the Meadow Green Pond and Kerber Blvd. The majority of the watershed is single family residential land use. Improvement at Site LL_3 considered the channel in between Meadow Green Park and Kerber Blvd. See Figure 2-10 for the project area watersheds and drainage patterns.

A pond maintenance project was completed in 2021 at the wetland adjacent to Meadow Green Park. The pond was dredged, two inlets were combined into one, and the pond outlet was replaced with an extended detention structure. The hydraulic modeling represents the conditions after the city project. The pond discharges into a natural channel. The outlet from the channel is a 4-foot diameter RCP FES, draining into an overflow structure located just upstream of Kerber Blvd. Flow from the overflow structure enters a 4-foot diameter pipe that is routed underneath Kerber Blvd. Kerber Blvd can potentially be overtopped during extreme rain events.

The existing conditions results, including peak flows, velocities, flow depth, and shear stress for the channel between the Meadow Green Park and Kerber Blvd is summarized in Table 2-10.

### Table 2-10 Existing Hydraulic Conditions in Ravine at LL_3

| Atlas 14 Design Storm Event | Peak Elevation (ft)(1) | Peak Flow (cfs)(2) | Peak Velocity (ft/s) (2) (3) | Peak Depth (ft) (2) | Peak Shear Stress (lbs/sf) (3) |
|---|---|---|---|---|---|
| 1-year, 24-hour | 938.0 | 16 | **3.7** | 1.1 | 1.3 |
| 2-year, 24-hour | 939.9 | 30 | **4.4** | 19 | **2.3** |
| 10-year, 24-hour | 944.9 | 88 | **4.3** | 5.1 | **6.1** |
| 100-year, 24-hour | 950.9 | 284 | **4.4** | 11.0 | **13.2** |

Notes

(1) Peak elevation at storage node downstream from ravine just upstream of Kerber Blvd
(2) Flow, velocity, and depth as measured in the ravine between the Meadow Green Park pond and Kerber Blvd
(3) Based on available SSURGO data and site photos, the predominant exposed soil at LL_3 is likely a sandy loam. Values in bold indicate velocities and shear stresses that exceed the erosive threshold for bare sandy loam soils (1.75 ft/s and 0.03-0.04 lbs/sf) (Fischenich, 2001)

# Existing Site Map: BMP LL_3

FIGURE 2-10

Project Area
P8 Subwatershed
Parcel Boundary
NWI Wetland
Lake/Pond
Municipal Boundary

Surface Contours (MN DNR, 2011)
10ft contour
2ft contour

Stormsewer (Chanhassen)
Structure
Storm Sewer


N
100 0 100
Feet

RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

### *Vegetation*

The LL_3 project area consists of a channel that serves as the outlet form the wetland in Meadow Green Park. Adjacent to the channel are herbaceous plants including jewelweed and reed canary grass (Figure 2-11). The degraded woodland flanking the channel contains some oaks and sugar maples, and consists of common buckthorn, green ash, and box elder.

**Figure 2-11 Existing vegetation within the channel at site LL_3**

### *Erosion*

The existing conditions peak velocities and shear stress levels in Table 2-10 indicate flow conditions in the ravine channel that often exceed the erosion thresholds for the loam soils identified in Table 2-5, especially those that are not stabilized with well-established vegetation.

Additionally, erosion and sediment build-up at the outlet upstream of Kerber Blvd were documented during 2022 and 2023 site visits. During the site visit, Barr staff observed that erosion in the channel appears to be head cutting. Accumulated sediment in the channel bottom suggests recent erosion with a high potential to be carried downstream.

As discussed in Section 2.2.7, the District's water quality monitoring data shows elevated levels of TSS and TP at the LL_3 monitoring site, located in the storm sewer just east of Kerber Blvd. The TP and TSS levels were higher than expected, even for untreated urban runoff from suburban residential areas.

The modeling, site visits, and monitoring data suggest that erosion and sediment movement has recently occurred within the channel and is likely to continue if the channel remains in its present state.

### 2.4.3 BMP LL_7

#### *Watershed, Drainage Patterns, and Flow Conditions*

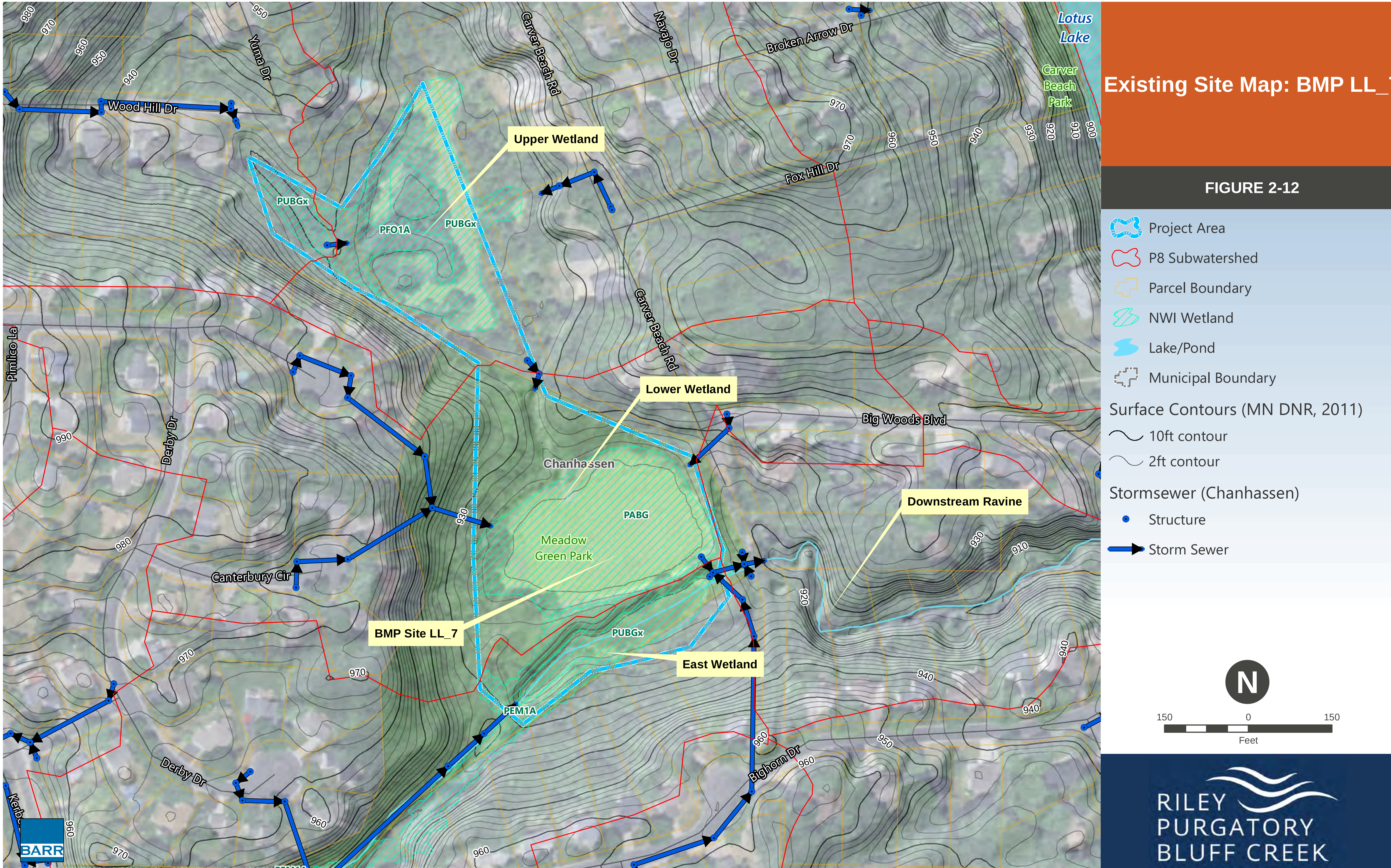
BMP LL_7 is a wetland complex consisting of three separate wetlands: an upper wetland located in subwatershed LL-A10.13, a lower wetland in subwatershed LL-A10.16B, and an east mitigation wetland in subwatershed LL-A10.16A. The watershed draining to the upper wetland is 49.2 acres, the watershed draining to the lower wetland is 15.4 acres, and the watershed draining to the east wetland is 319.5 acres. The total drainage area to the ravine downstream of site LL_7, including areas that are tributary via storm sewer, is 395.9 acres. The downstream ravine discharges to Lotus Lake.  The majority of the watershed is single family residential land use. See Figure 2-12 for the project area watersheds and drainage patterns.

The outlet of the upper wetland is a 2-foot diameter RCP pipe that outlets into the lower wetland. The water in the upper wetland will overtop and flow into the lower wetland at an elevation of 927.1. The outlet from the lower wetland is a 2-foot diameter RCP pipe that connects with the outlet from the east wetland, which is a 1.5-foot diameter RCP pipe. The lower wetland is at risk of overtopping the berm and flowing into the east wetland at an elevation of 924.1 Runoff from the lower wetland and east wetland converge, along with storm sewer coming from the south, into a 4-foot diameter storm sewer pipe that discharges into a channel just upstream of Lotus Lake. During the 1-year-24-hour Atlas 14 event, the lower wetland will overflow into the east wetland before flowing into the downstream ravine.

The existing hydraulic condition in the wetland complex, including peak elevation and peak flows at each of the three wetlands is summarized in Table 2-11.

# Existing Site Map: BMP LL_7

FIGURE 2-12



### Table 2-11 Existing Hydraulic Conditions at LL_7 Wetland Complex

| Atlas 14 Design Storm Event | Upper Wetland | | Lower Wetland | | East Mitigation Wetland | |
|---|---|---|---|---|---|---|
| | Peak Elevation (cfs) | Peak Flow (cfs) | Peak Elevation (cfs) | Peak Flow (cfs) | Peak Elevation (cfs) | Peak Flow (cfs) |
| 1-year, 24-hour | 926.0 | 5 | 922.2 | 5 | 923.5 | 19 |
| 2-year, 24-hour | 926.2 | 7 | 922.4 | 8 | 923.8 | 38 |
| 10-year, 24-hour | 927.2 | 13 | 923.3 | 22 | 926.2 | 338 |
| 100-year, 24-hour | 928.0 | 86 | 926.4 | 91 | 926.4 | 386 |

The existing condition of the ravine downstream from the wetland complex, including the peak flows, velocities, and flow depth are summarized in Table 2-12.

### Table 2-12 Existing Hydraulic Conditions in the Ravine Downstream of LL_7 Wetlands

| Atlas 14 Design Storm Event | Peak Flow (cfs) | Peak Velocity (ft/s) | Peak Depth (ft) | Peak Shear Stress (lbs/sf) |
|---|---|---|---|---|
| 1-year, 24-hour | 27 | **3.2** | 1.4 | **1.2** |
| 2-year, 24-hour | 46 | **3.6** | 1.8 | **1.7** |
| 10-year, 24-hour | 251 | **6.4** | 3.7 | **3.4** |
| 100-year, 24-hour | 428 | **6.5** | 4.8 | **4.1** |

Notes:

(1) Based on available SSURGO data and infiltration testing results, the predominant exposed soil in the ravine downstream of LL_7 is likely a silty loam. Values in bold indicate velocities and shear stresses that exceed the erosive threshold for bare silty loam soils (2.25 ft/s and 0.045-0.05 lbs/sf) (Fischenich, 2001)

The water quality monitoring data summarized in Table 2-4 and discussed in Section 2.2.7 showed elevations levels of TP and TSS at the LL_7 monitoring location. Figure 2-13 below shows a correlation between the TP concentration at monitoring station LL_3 and the TP concentration at monitoring station LL_7 based on sample events conducted on the same dates in 2022. This strong correlation suggests that the water quality of LL_7 is likely influenced by the water quality at LL_3. This is not surprising as the east wetland upstream of LL_7 is undersized relative to the contributing watershed and the pollutant loads from LL_3 are not fully settled out in the east wetland.

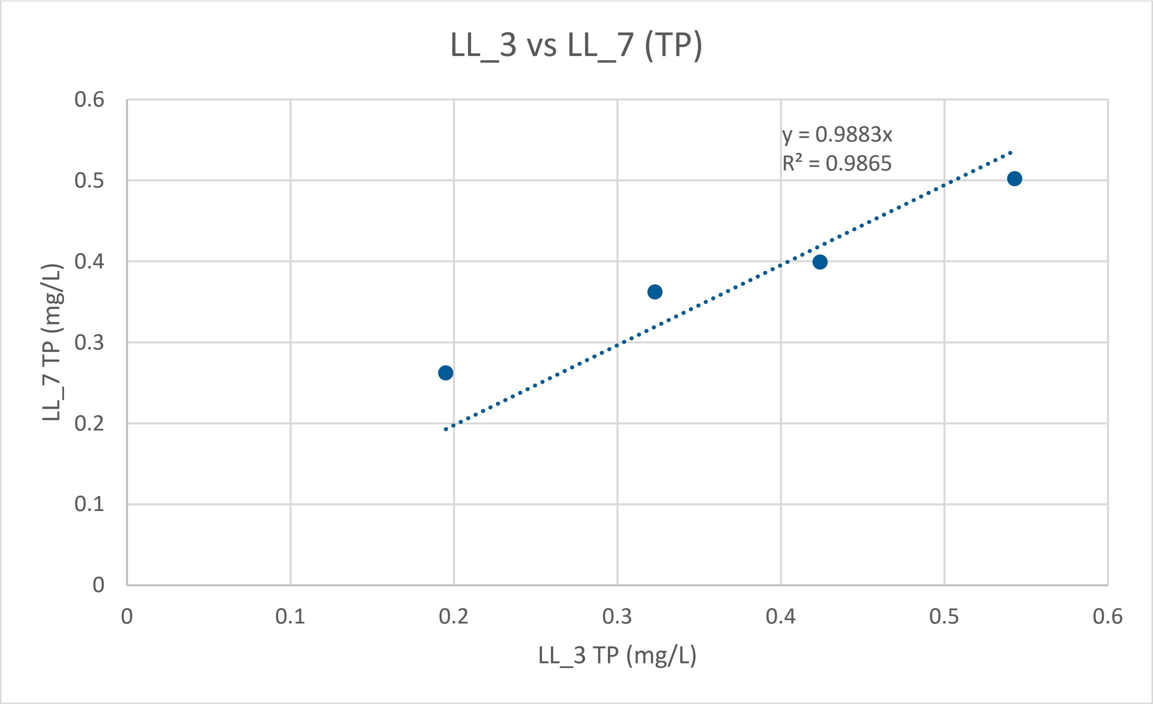



**Figure 2-13 Correlation in TP Concentration between Monitoring Stations LL_3 and LL_7**

### *Vegetation*

The LL_7 project areas is a wetland that had been previously excavated to accommodate stormwater ponding. The excavation had been seeded with native vegetation but not maintained. Some native herbaceous vegetation such as big bluestem grass persist, but invasive species such as Canada thistle and reed canary grass dominate. The pond supports duck weed and pond is surrounded with typical wetland edge species such as black willow, box elder, and green ash.  See Figure 2-14 for existing site vegetation.

**Figure 2-14 Existing vegetation at site LL_7**

#### *Erosion*

Although the wetlands themselves are not at risk of erosion, the existing conditions peak velocities and shear stress levels in Table 2-12 indicate flow conditions in the downstream ravine often exceed the erosion thresholds for loam soil identified on-site and in the ravine, especially those that are not stabilized with well-established vegetation. Additionally, the downstream ravine was rated as poor in the 2021 CRAS scoring. Therefore, the flows leaving the wetland may contribute to erosion downstream, bringing sediment directly into Lotus Lake.

### 2.4.4 BMP LL_8

#### *Watershed, Drainage Patterns, and Flow Conditions*

BMP LL_8 is a ravine on the east side of Frontier Trail that discharges into Lotus Lake. Contributing flows to the ravine include direct runoff from the watershed, as well as flow directed from an upstream wetland north of Frontier Road through a 3.5-foot RCP pipe. Most of the flow comes from the upstream wetlands during the 100-year event. The total estimated drainage area to the site is 109.3 acres. The majority of the watershed is single family residential land use. See Figure 2-15 for the project area watersheds and drainage patterns.

During this feasibility study, the drainage area was subdivided to better understand the direct runoff from Frontier Trail. Frontier Trail is at risk of flooding during extreme rain events.

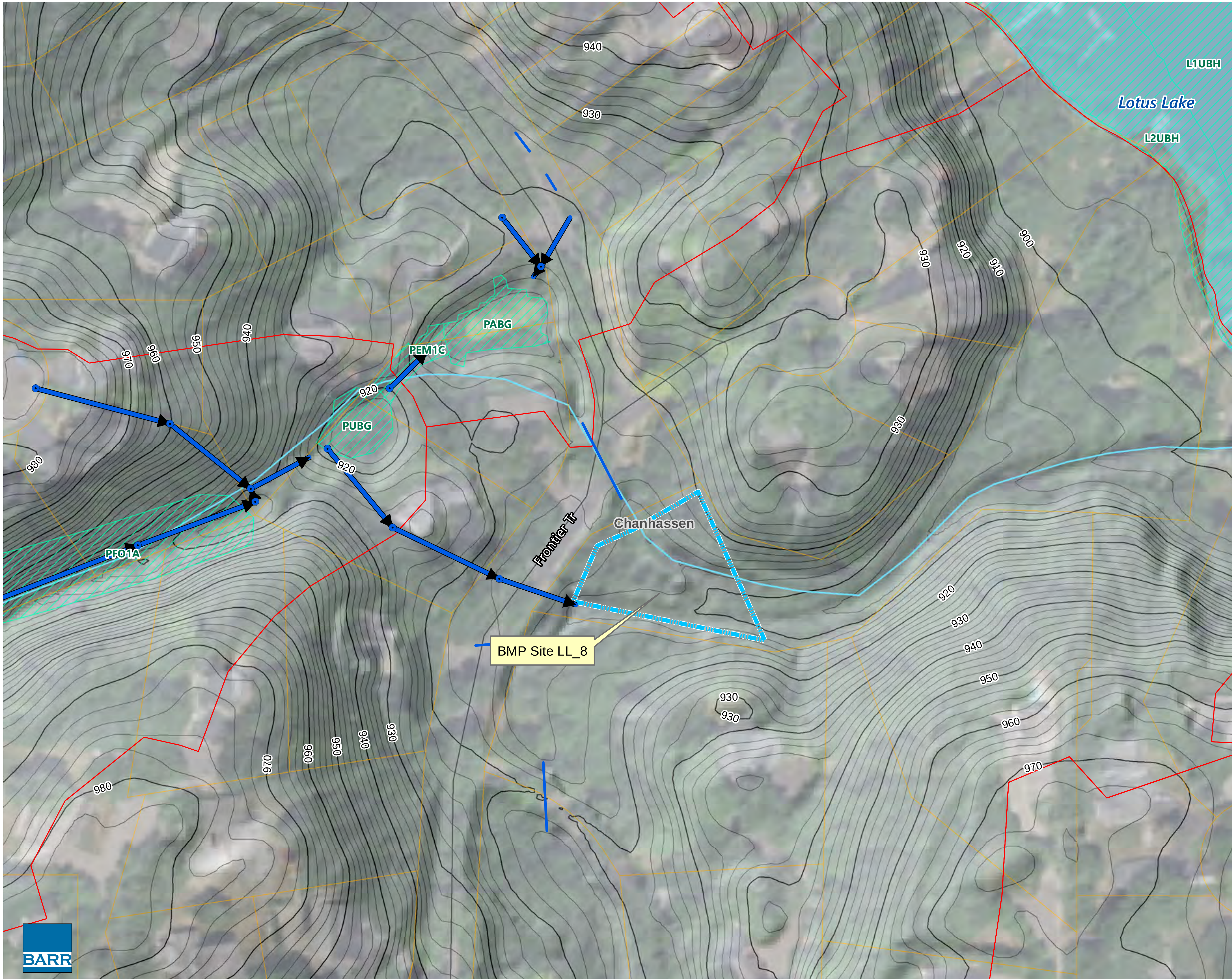
The existing conditions results, including peak flows, velocities, flow depth, and shear stress coming out of the ravine are summarized in Table 2-13.

### Table 2-13 Existing Hydraulic Conditions at LL_8

| Atlas-14 Design Storm Event | Peak Elevation (ft) | Peak Flow (cfs) | Peak Velocity (ft/s) | Peak Flow Depth (ft) | Peak Shear Stress (lbs/sf) |
|---|---|---|---|---|---|
| 1-year, 24-hour | 909.6 | 68 | **4.2** | 1.3 | **0.2** |
| 2-year, 24-hour | 909.8 | 88 | **4.4** | 1.5 | **0.2** |
| 10-year, 24-hour | 910.4 | 158 | **5.0** | 2.0 | **0.3** |
| 100-year, 24-hour | 911.4 | 350 | **5.7** | 2.9 | **0.4** |

Notes

(1) Based on available SSURGO data and infiltration testing results, the predominant exposed soil at LL_8 is likely a sandy loam. Values in bold indicate velocities and shear stresses that exceed the erosive threshold for bare sandy loam soils (1.75 ft/s and 0.03-0.04 lbs/sf) (Fischenich, 2001)




# Existing Site Map: BMP LL_8

**FIGURE 2-15**

- Project Area
- P8 Subwatershed
- Parcel Boundary
- NWI Wetland
- Lake/Pond
- Municipal Boundary

Surface Contours (MN DNR, 2011)

- 10ft contour
- 2ft contour

Stormsewer (Chanhassen)

- Structure
- Culvert
- Storm Sewer

N

100 0 100

Feet

RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

### *Vegetation*

The LL_8 site is a sugar maple woodland. Some invasive species such as reed canary grass and common buckthorn grow, while few native herbaceous species occupy to ground plane.  See Figure 2-16 for photo of existing site vegetation.

**Figure 2-16   Existing Vegetation at Site LL_8**

### *Erosion*

The existing conditions peak velocities and shear stress levels summarized in Table 2-13 indicate flow conditions in the ravine channel that often exceed the erosion thresholds for the loam soils identified in Table 2-5, especially those that are not stabilized with well-established vegetation.  The ravine at the BMP site location has a low risk of erosion due to water based on the SSURGO score; however, as the side slopes steepen downstream of the BMP site, the ravine shifts to a high risk of erosion due to water. The channel received a moderate 2021 CRAS score.

The flow conditions that exceed erosion thresholds for loam soils, as well as the CRAS and SSURGO classifications identified in Table 2-5, demonstrate that there is potential for erosion in the downstream ravine that carries runoff directly to Lotus Lake.

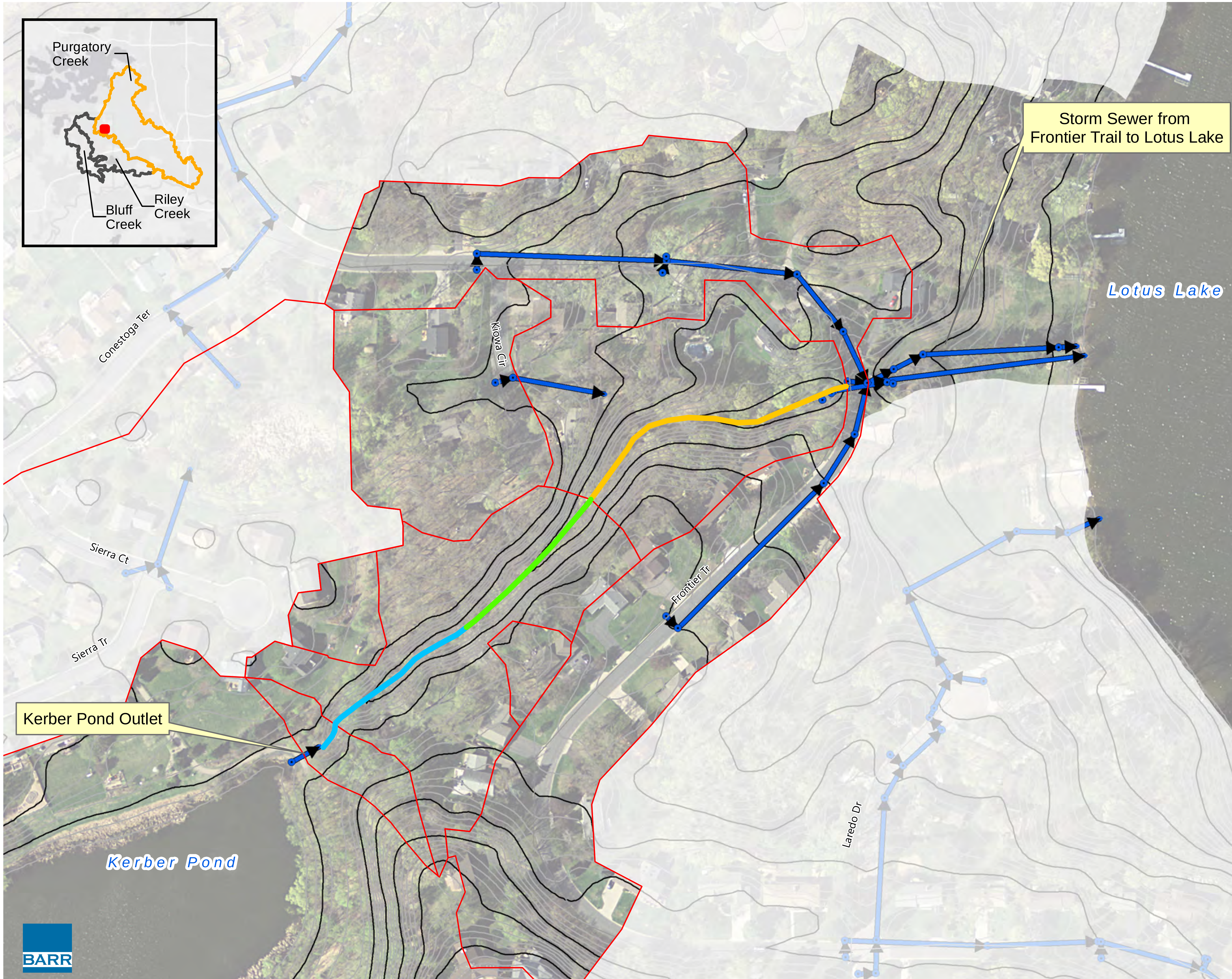
### 2.4.5 Kerber Pond Ravine

A complete summary of details related to the Kerber Pond Ravine watershed, drainage patterns, flow conditions, vegetation, and erosion can be found in the Kerber Pond Ravine Stabilization Feasibility Study (Barr Engineering, 2020). Figure 2-17 shows the existing site conditions at Kerber Pond Ravine.

The total drainage area to Kerber Pond Ravine is 63.3 acres, including the 54.2 acres draining to Kerber Pond and the 9.1 acres of direct drainage to Kerber Pond ravine (between Kerber Pond and Frontier Trail). Additionally, 8 acres are tributary to the storm sewer along Frontier Trail which convey untreated runoff directly into Lotus Lake.

According to the 2020 study, the existing conditions peak velocities and shear stress levels indicate flow conditions in the ravine channel that often exceed the erosion thresholds for loam soils, especially those that are not stabilized with well-established vegetation. The project site consists of sparse herbaceous vegetation with a dense tree canopy over the ravine limiting sunlight penetration to the ravine floor. The slopes to the ravine channel are steep (6-18%) with the slope of the ravine channel profile (in-channel) ranging from 2 to 4%. Because of the slopes, limited light penetration, and channel flows, vegetation is not well established on the slopes or channel banks.

This supports that there is potential for erosion along the Kerber Pond ravine, especially in the upper and middle sections of the ravine. This erosion has been observed during rain events.




# Existing Site Map: Kerber Pond Ravine

## FIGURE 2-17

Ravine Reaches
- LL-9.1
- LL-9.2
- LL-9.3
- Purgatory Creek Watershed
- Subwatersheds

2 Foot Contours, Carver County, 2011
- 10-Foot Contour
- 2-Foot Contour

Storm Sewer (Chanhassen)
- Structure
- Drainage Swale
- Culvert
- Storm Sewer

RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

BARR

*Screen shot of the city provided a video showing of sediment/mud flowing out of the culvert at Frontier Trail.*

**Figure 2-18 Existing Discharge Observed at Kerber Pond Ravine**

# 3.0 Preliminary BMP Screening

Selection of feasible stormwater BMPs occurs by considering a holistic approach that accounts for unique site constraints, operation and maintenance, environmental concerns, effectiveness, and overall cost. Stormwater BMPs can provide stormwater treatment to reduce or limit downstream pollutant loading in several ways.

- Pretreatment: upstream sedimentation, screening, and/or energy dissipation to protect and extend the long-term functionality of the downstream BMP.
- Infiltration: stormwater enters the soil at the source; sediment and pollutants remain onsite.
- Sedimentation: as part of stormwater detention, sediment and non-dissolved (particulate) pollutants settle to the bottom of the water column.
- Filtration: stormwater is routed through a filtering medium to trap sediment and pollutants but allow stormwater to pass through.
- Biofiltration: similar to filtration, but additional pollutant removal is provided by evapotranspiration from the vegetation.
- Chemical Treatment: chemicals are used to target and trap, settle, or breakdown specific pollutants.
- Rate Control: reduces peak flows and velocities that can reduce downstream channel erosion

Two types of BMPs were considered during the preparation of this report: conventional BMPs and manufactured treatment devices (MTDs).

Conventional Stormwater BMPs temporarily store and treat urban stormwater runoff to reduce flooding, remove pollutants, and can also provide ecological benefits and habitat. Conventional BMPs control TSS and TP loadings by slowing stormwater and allowing particles to settle or be filtered in areas before reaching receiving waters. More recently, these conventional BMPs have been modified and enhanced with materials such as iron filings or spent lime to improve removal of not only the pollutants associated with particulates but to also begin addressing the soluble fraction of pollutants (such as phosphorus) that cannot be filtered or settled out of runoff. The MPCA's Minnesota Stormwater Manual provides estimated median pollutant removal percentages for conventional stormwater BMPs as shown in Table 3-1.

While Table 3-1 includes several MTDs for stormwater management, it is not an all-inclusive list. There are many options on the market for stormwater MTDs, although two manufacturers that appear to be most active in Minnesota are Bio Clean Environmental and Contech Engineered Solutions. Manufacturers of stormwater MTDs often subject their devices to third party testing to establish or verify treatment and pollutant removal efficiency. Table 3-1 summarizes median removal efficiencies based on information compiled in the MPCA Minnesota Stormwater Manual.

Although MTDs may also have higher pollutant removals efficiencies, at a more regional scale their total pollutant load removal performance on an average annual basis is often limited by low treatment flow rates when compared to conventional BMPs.

## Table 3-1 Conventional stormwater BMPs and MTD estimated median pollutant removal efficiencies

| Practice | Treatment Type | Pollutant Removal Efficiencies (%) | | | |
|---|---|---|---|---|---|
| | | Total Suspended Solids (TSS) | Total Phosphorus (TP) | Particulate Phosphorus (PP) | Dissolved Phosphorus (DP) |
| Infiltration(1) | Infiltration | 100(2) | 100(2) | 100(2) | 100(2) |
| Biofiltration | Biofiltration | 80 | 44-71 | 80 | 0-60 |
| Sand filter | Filtration | 85 | 50 | 91 | 0 |
| Iron enhanced sand filter | Filtration and Chemical | 85 | 77 | 91 | 60 |
| Dry Swale | Pretreatment | 68 | 44-71 | 80 | 0-60 |
| Wet Swale | Pretreatment | 68 | 0 | 0 | 0 |
| Stormwater Pond(3) | Sedimentation | 84 | 50 | 91 | 0 |
| Stormwater Wetland | Sedimentation and Biofiltration | 73 | 38 | 69 | 0 |
| Permeable Pavement | Infiltration or Filtration | 74 | 45 | 82 | 0 |
| Green Roof | Pretreatment | 85 | 0 | 0 | 0 |
| MTD | Contech Filterra | 89.5 | 69.0 | N/A | N/A |
| MTD | Contech Jellyfish | 86.2 | 75.2 | N/A | N/A |
| MTD | Contech StormFilter using PhosphoSorb Media | 91.6 | 81.5 | N/A | N/A |
| MTD | BioClean Environmental Kraken Filter | 90.6 | 74.5 | N/A | N/A |
| MTD | BioClean Environmental Modular Wetland Systems | 81.9 | 61.3 | N/A | N/A |

(1) BMPs designed to infiltrate stormwater runoff, such as infiltration basins/trenches, bioinfiltration, permeable pavement with no underdrain, tree trenches with no underdrain, and BMPs with raised underdrains.
(2) Pollutant removal is 100 percent for the volume infiltrated and 0 percent for the stormwater bypassing the BMP. For filtered stormwater, see values for the other BMPs in the table.
(3) Dry ponds do not receive credit for volume or pollutant removal.

For each BMP site, a variety of options for BMPs was considered including both conventional BMPs as well as use of MTDs at a high-level to narrow in on the concepts to be further evaluated.  This screening including consideration of the BMPs as originally identified in the UAA, site conditions and topography, watershed size and flow rates, available footprint and site constraints, opportunities for habitat restoration and ecological improvements, and observations from site visits.

Table 3-2 summarizes considerations for BMP types when selecting the concepts to evaluate further, as summarized in Section 3.

### Table 3-2 Preliminary BMP Screening

| BMP Site | BMPs Considered | Selection Considerations |
|---|---|---|
| LL_1 | Retention (Wet) Pond | From UAA; Appropriate and provides habitat restoration opportunity; Particulate phosphorus removal only; Rate control opportunity; However, City did not want an open pond; No volume abstraction |
| | Infiltration Basin | Appropriate and provides habitat restoration opportunity; Particulate and soluble phosphorus removal; Volume abstraction and rate control opportunity; However, low infiltrating soils and wetter conditions |
| | Biofiltration Basin | Appropriate and provides habitat restoration opportunity, if using draintile; Particulate phosphorus removal only; Rate control opportunity; No volume abstraction |
| | Biofiltration Basin with Iron-Enhanced Sand Filtration | Appropriate and provides habitat restoration opportunity; Particulate and soluble phosphorus removal; Rate control opportunity; No volume abstraction |
| | MTD | Watershed and flow rates too large for most MTD; No volume abstraction or rate control |
| LL_3 | Infiltration Basin | From UAA; City recently completed (2021) dredging the wet pond and replacing the outlet structure at proposed BMP location |
| | Channel & Bank Stabilization | Appropriate and provides habitat restoration opportunity; Particulate phosphorus removal only; No rate control or volume abstraction |
| | MTD | Watershed and flow rates too large for most MTD; No volume abstraction or rate control |
| LL_7 | Extended Detention | Maximize removals in existing wetland/pond storage (upper and lower basin); Particulate phosphorus removal only; Rate Control opportunity; No volume abstraction |
| | Storm Sewer Diversion | Maximize removals in existing wetland/pond storage (lower basin & mitigation wetland area); Particulate phosphorus removal only; Rate Control opportunity; No volume abstraction |
| | Iron-Enhanced Sand Filtration Basin | Wetland areas – cannot fill to function as IESF basin; Watershed and flow rates too large for filtration basin location; Particulate and soluble phosphorus removal; No volume abstraction |
| | Subsurface Iron-Enhanced Sand Filtration | Limited treatment flow rate; May be used in combination with extended detention/reduced discharge rates; Particulate and dissolved phosphorus removal |

| BMP Site | BMPs Considered | Selection Considerations |
| --- | --- | --- |
| | MTD | Watershed and flow rates too large for most MTD; No volume abstraction or rate control |
| LL_8 | Retention (Wet) Pond | From UAA; City recently completed pond dredging project |
| | Retention (Wet) Pond | From UAA; City recently completed pond dredging project; Appropriate and provides habitat restoration opportunity; Particulate phosphorus removal only; Rate control opportunity; No volume abstraction |
| | Infiltration Basin | Appropriate and provides habitat restoration opportunity; Particulate and soluble phosphorus removal; Rate control opportunity; Soils may be conducive to infiltration |
| | MTD | Smaller watershed along road (to be reconstructed) may result in low enough flows for treatment by some MTDs (bypass flows still likely); No volume abstraction or rate control |

# 4.0 BMP Site Conceptual Design Alternatives

The following section outlines the BMP alternatives considered and evaluated at each site. This includes a description of each concept, anticipated hydraulic performance and water quality improvement associated with each concept, and the estimated engineer's opinion of probable cost. Preliminary concept designs were discussed with RPBCWD and City of Chanhassen staff and have incorporated comments and feedback from the various entities.

For the engineer's opinion of probable cost, industry resources for cost estimating provide guidance on cost uncertainty, depending on the level of project design developed (American Society for Testing and Materials, 2019, and Association for the Advancement of Cost Estimating, 2016). The opinions of probable costs for the alternatives evaluated generally correspond to a Class 4 estimate characterized by limited engineering and the use of deterministic estimating methods. As the level of design detail increases, uncertainty is reduced. Class 4 feasibility-level opinions of costs were developed for the various alternatives and options for this project. These were based on limited engineering and the use of parametric models to calculate estimated costs (i.e., making use of order-of-magnitude costs from similar projects) and uncertainty, with an acceptable range of between -30% and +50% of the estimated project cost.

The probable cost estimate also includes an annual operations and maintenance (O&M) cost as well as the annualized principal costs to provide a total annualized project cost, and the total annual cost per pound of phosphorus and per pound of sediment prevented from entering Lotus Lake. The estimated lifespan for each concept was estimated at 30 years.

The principal costs of the proposed concepts reflect:

- Construction cost
- Planning engineering and design
- Permitting
- Legal fees for agreement and easement acquisition
- Construction management
- Contingency

Easements for access and construction will be needed for sites at LL_3 and LL_8. However, we assume that the district does not need to purchase these easements with the only cost being the engineering and legal efforts needed to support the easement acquisition.

Road reconstruction, local storm sewer infrastructure, best management practices needed to achieve regulatory compliance, and other costs associated with the city's road reconstruction project are not included in the concept estimates. Sites LL_1 and LL_7 are located on City property; therefore, no easement costs were included in the concept estimates. Site LL_3 is also located on City property; however, access may be required from adjacent private property. The cost of an access easement is included in the estimates for LL_3 concepts. Site LL_8 is located on private property, but since the site is also located on an existing drainage easement, no additional easements were included in the cost estimates.

The O&M costs of the proposed concepts reflect:

- Site inspections
- Corrective action on active erosion, as needed
- Concept-specific maintenance requirements, as needed

Although there is a point estimate of the engineer's opinion of probable cost, a range of probable costs is reported. The range reflects the level of uncertainty, unknowns, and risk associated with the level of conceptual design completed during feasibility (limited design). Appendix A includes a detailed cost breakdown to determine the Engineer's opinion of probable cost for each concept.

## 4.1 BMP Site LL_1: North Lotus Lake Park

Two conceptual designs for BMP Site LL_1 were considered:

- Concept LL_1a: Iron Enhanced Filtration (or Infiltration) Basin and Habitat Restoration
- Concept LL_1b: Swale with Intermittent Stream, Iron Enhanced Sand Filtration (or Infiltration) Basin and Habitat Restoration

The City of Chanhassen plans to reconstruct Pleasantview Road starting in 2027 and the roads in the Fox Hollow Drive neighborhood starting in 2026. With this redesign, there is an opportunity to reroute some of the existing storm sewer to maximize redirection of stormwater runoff from the Fox Hollow Drive neighborhood to the LL_1 BMP site, instead of toward the existing wetland to the east where there are potentially structures at-risk of flooding. Both conceptual designs propose construction of a storm sewer to route flow from the northern portion of the Fox Hollow Drive neighborhood into the proposed BMP at LL_1. This storm sewer would divert flow away from the existing wetland to the east, where there is concern that adjacent properties are at risk of inundation during extreme rain events, improving the overall resiliency of the stormwater management system, reducing flood risk, and improving water quality.

Additionally, by reducing runoff loads to the existing wetland to the east of site LL_1, it is estimated to increase the pollutant removal capacity of this wetland as well.

Restoration is a significant portion of both concepts, transitioning a large portion of the park's underutilized turf areas to more native plant communities that can provide long-term resiliency of the land scape and reduce reliance on regular mowing of turf. Restoration will focus on oak savanna, shortgrass prairie, and sedge meadow restoration, improving biodiversity, habitat for wildlife, and pollinators as well as hydrologic function.

### 4.1.1 Description of Alternatives

#### 4.1.1.1 LL_1a: Iron Enhanced Filtration (or Infiltration) Basin and Habitat Restoration

- Construction of storm sewer to intercept runoff from Fox Hollow Drive and direct to the BMP at LL_1
- Site grading to create two infiltration or filtration basin cells (based on soil type and infiltration testing performed by District staff).

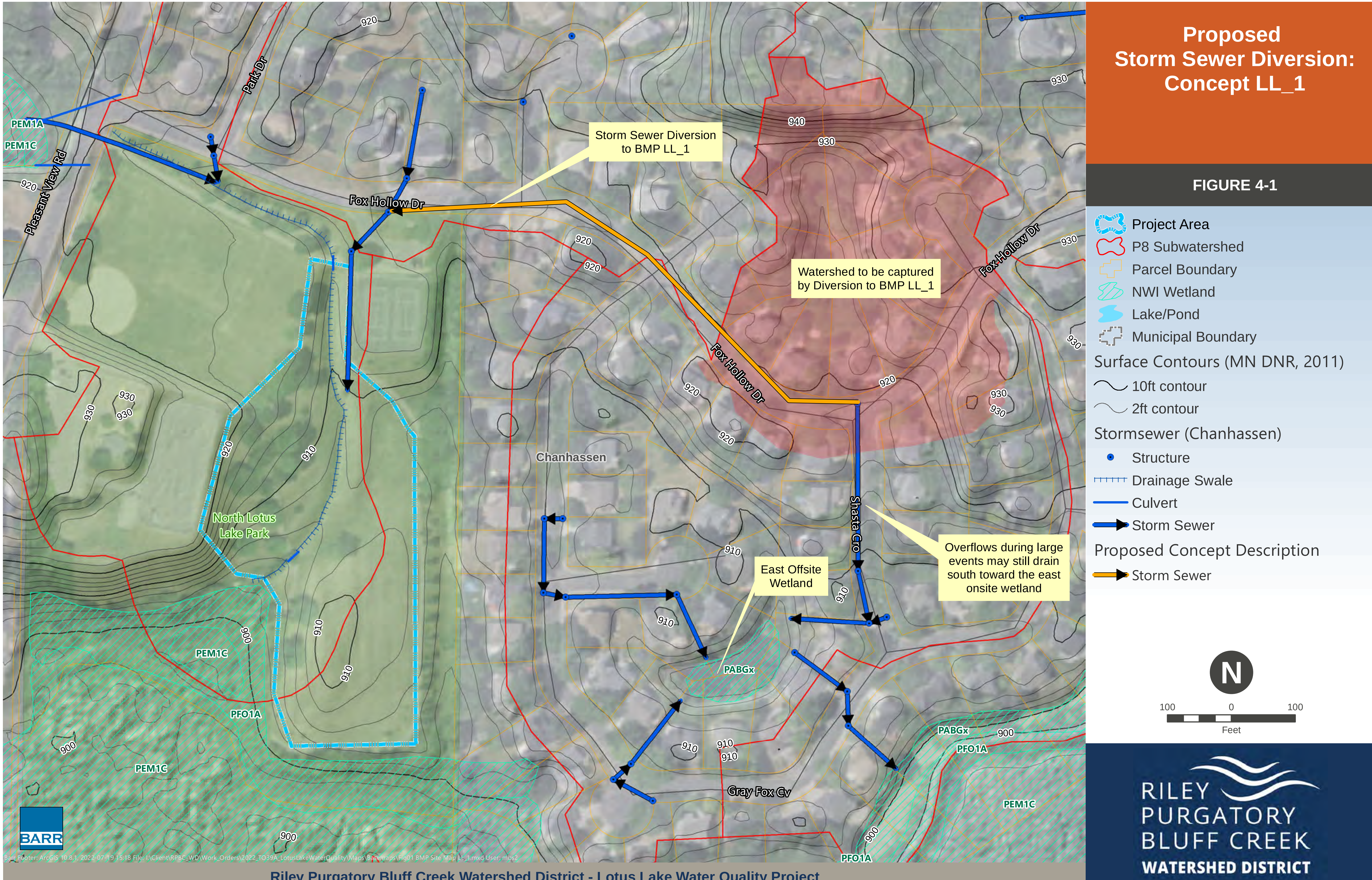
    - For the infiltration concept, an infiltration rate of 0.3 in/hr was assumed
    - For the filtration concept, addition of iron enhanced sand media beneath the basin cells was assumed to facilitate dissolved phosphorus removal in accordance with guidance from the MPCA Stormwater Manual
- Modifying the outlet structure with discharge elevation at 906 ft MSL and trail elevation at 907 ft MSL
- Create basin invert at 904 ft MSL with a water quality volume of 80,413 cf below the outlet structure discharge elevation and additional flood storage of 46,945 cf between the outlet structure discharge elevation and trail overflow
- Restore habitat to improve hydrologic and ecological function, as well as nutrient capture by transitioning a large portion of the park's underutilized turf areas to more native plant communities that can provide long-term resiliency of the land scape and reduce reliance on regular mowing of turf. Restoration will focus on oak savanna, shortgrass prairie, and sedge meadow restoration, improving biodiversity, habitat for wildlife, and pollinators. When compared to Concept LL_1b, this concept will develop a larger footprint of wet meadow area within the proposed bottom, with slightly less passive recreation are available in the restored upland area.
- Include educational experience at North Lotus Lake Park through the design of landscape features including an overlook, artful structures, sculpture, and walking trails through the BMP. Art can draw attention to unseen ecology and intrigue visitors. Education may focus on biodiversity, soil health, or the improved hydrology of green space (converting this compacted lawn to native vegetation).

*Oak savanna.*

- Improve soil health by:
    - **Converting lawn to native prairie, meadow, or savanna vegetation**. When establishing these plant communities the soil could be decompacted and amended as per the District's soil rule. Once the soil is amended and native vegetation established, plant root systems will feed microorganisms and keep the soil porous. Approximately 25% of prairie

roots die each year. When they decompose they leave behind open channels that readily conduct stormwater into the ground. Deep rooted vegetation is an essential component of healthy soil.

- Decompacting existing soils in the lawns outside the project area and establishing bee lawn and organic maintenance regime could be implemented to fuel the soil food web and result in much greater stormwater infiltration. Maintenance would involve fertilizing once per year with an organic fertilizer and mechanical aerating in the fall. Clovers within a bee lawn seed mix would add a nitrifying element. Complete soil recovery and restored stormwater infiltration rates would not be expected without the establishment of deep-rooted native plants, but much improvement would be gained.


Proposed
Storm Sewer Diversion:
Concept LL_1
FIGURE 4-1
Project Area
P8 Subwatershed
Parcel Boundary
NWI Wetland
Lake/Pond
Municipal Boundary
Surface Contours (MN DNR, 2011)
10ft contour
2ft contour
Stormsewer (Chanhassen)
Structure
Drainage Swale
Culvert
Storm Sewer
Proposed Concept Description
Storm Sewer
N
100 0 100
Feet
Storm Sewer Diversion to BMP LL_1
Watershed to be captured by Diversion to BMP LL_1
Overflows during large events may still drain south toward the east onsite wetland
East Offsite Wetland
Fox Hollow Dr
Park Dr
Pleasant View Rd
Shasta Cro
Gray Fox Cv
Chanhassen
North Lotus Lake Park
PEM1A
PEM1C
PFO1A
PABGx
RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT
BARR
Riley Purgatory Bluff Creek Watershed District - Lotus Lake Water Quality Project

**Proposed Concept LL_1a**

**Figure 4-2**


RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

BARR

Riley Purgatory Bluff Creek Watershed District - Lotus Lake Water Quality Project

#### 4.1.1.2 LL_1b: Swale with Intermittent Waterway, Iron Enhanced Sand Filtration (or Infiltration) Basin and Habitat Restoration

- Construction of storm sewer to intercept runoff from Fox Hollow Drive and direct to the BMP at LL_1
- Site grading to create swale with intermittent stream with infiltration or filtration (based on soil type and infiltration testing performed by District staff).
    - For the infiltration concept, an infiltration rate of 0.3 in/hr was assumed
    - For the filtration concept, addition of iron enhanced sand media beneath the swale/intermittent stream was assumed to facilitate dissolved phosphorus removal in accordance with guidance from the MPCA Stormwater Manual
- Modifying the outlet structure with discharge elevation at 906 ft MSL and trail elevation at 908 ft MSL
- Create system invert ranging from 908 to 904 ft MSL, from upstream to downstream, with a water quality volume of 40,206 cf and additional flood storage of 58,238 cf between the outlet structure and trail overflow
- Restore habitat to improve hydrologic and ecological function, as well as nutrient capture by transitioning a large portion of the park's underutilized turf areas to more native plant communities that can provide long-term resiliency of the land scape and reduce reliance on regular mowing of turf. Restoration will focus on oak savanna, shortgrass prairie, and sedge meadow restoration, improving bio diversity, habitat for wildlife, and pollinators. When compared to Concept LL_1a, this concept will develop a smaller footprint of wet meadow area within the proposed BMP, with more passive recreation space available in the restored upland area.
- As mentioned above, education and engagement can be accomplished through design that takes visitors into BMPs with structures such as steppingstones or boardwalks. Interpretational signage is less effective in community parks where new visitors rarely visit. Instead, artful bridges, spillways, and waterways can engage visitors and bring them to the present to experience water.
- Soil health would also be improved as described in the last bullet point of option LL_1a above.

*Proposed Concept LL_1b*

*Figure 4-3*


- Contour
- Primary trail
- Secondary trail
- Water interaction experience
- Interpretive art feature
- Artful structures
- Stormwater filtration facility
- Savanna Prairie restoration
- Bee Lawn
- proposed Evergreen Tree
- Existing Tree
- Proposed BMP extents
- P8 Subwatershed
- Parcel Boundary
- NWI Wetland
- Lake/Pond
- Municipal Boundary
- 10ft contour (MN DNR, 2011)
- 2ft contour (MN DNR, 2011)
- Structure (Chanhassen)
- Storm Sewer (Chanhassen)

N

10001 00

Feet

RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

BARR

### 4.1.2 Anticipated Hydraulic Performance

Table 4-1 below summarizes the hydraulic performance of concept LL_1a and concept LL_1b in relation to existing conditions. Peak elevations are higher than existing in all scenarios because the trail elevation, which serves as the emergency overflow in both existing and proposed conditions, was raised to maximize treatment volume. Both concepts reduce peak discharges from the site at and below the 10-year event. Results show no impacts to upstream watersheds or surrounding infrastructure.

**Table 4-1 Summary of Peak Flows and Elevations**

| Atlas-14 Design Storm Event | Existing | | LL_1a | | LL_1b | |
|---|---|---|---|---|---|---|
| | Peak Elevation (ft) | Peak Discharge (cfs) | Peak Elevation (ft) | Peak Discharge (cfs) | Peak Elevation (ft) | Peak Discharge (cfs) |
| 1-year, 24-hour | 905.1 | 18 | 906.3 | 1 | 907.0 | 5 |
| 2-year, 24-hour | 905.3 | 23 | 906.6 | 2 | 907.4 | 8 |
| 10-year, 24-hour | 905.6 | 42 | 907.1 | 22 | 908.0 | 23 |
| 100-year, 24-hour | 905.8 | 67 | 907.2 | 63 | 908.2 | 66 |

Notes:
(1) Assumes no infiltration/filtration occurring during peak storm events

Table 4-2 highlights the impacts of directing runoff from approximately 4.8 acres of the northern portion of the Fox Hollow Drive neighborhood away from the existing wetland to the east and into the LL_1 BMP site. This summary includes the estimated peak water surface elevations in the neighborhood and impact on the number of potentially at-risk structures during the Atlas 14 100-year, 24-hour and 500-year, 24-hour design storm events. The 500-year event is estimated to be similar to the expected mid-century event. By directing some watershed runoff away from the off-site wetland to the east, it is75stimateed that the number of at-risk of inundation during the 100-year event will be reduced from 3 to 1. And during the 500-year event, the number of at-risk structures will be reduced from 9 to 6. Figure 4-1 illustrates the proposed diversion.

**Table 4-2 Impact of Diversion on Structures At-Risk of Inundation Around Pond**

| PCSWMM Subwatershed Name | Atlas-14 100-yr 24-hr Event | | | | Atlas-14 500-yr 24-hour Event | | | |
|---|---|---|---|---|---|---|---|---|
| | Peak Water Surface Elevation (ft) | | # of Potentially Impacted Structures | | Peak Water Surface Elevation (ft) | | # of Potentially Impacted Structures | |
| | Existing | Proposed | Existing | Proposed | Existing | Proposed | Existing | Proposed |
| LL-A3.2B (road intersection/ cul-du-sac) | 907.0 | 906.9 | 1 | 0 | 907.6 | 907.5 | 1 | 1 |
| LL-A4.2 (wetland) | 906.2 | 905.6 | 2 | 1 | 906.9 | 906.7 | 8 | 5 |
| **Total** | -- | -- | **3** | **1** | -- | -- | **9** | **6** |

### 4.1.3 Anticipated Water Quality Improvements

P8 modeling results for pollutant removals of the above conceptual designs are summarized in Table 4-3.

**Table 4-3 Estimated Sediment and Total Phosphorus Removal at Site LL_1 by Concept**

| Alternative | Description | Sediment Load Reduction (1)(3) (lbs/yr) | TP Load Reduction (2)(3) (lbs/yr) | Volume Reduction (ac-ft/yr) |
|---|---|---|---|---|
| LL-1a | Two Filtration Cells with IESF | 3958 | 13.7 | 0 |
| LL-1a | Two Infiltration Cells | 3958 | 17.2 | 33.8 |
| LL-1b | Intermittent Stream with IESF | 3586 | 12.0 | 0 |
| LL-1b | Intermittent Stream with Infiltration | 3586 | 15.2 | 30.0 |

Note(s):
(1) Sediment load reduction under existing and proposed conditions estimated in P8
(2) TP estimated based on conversion factor for iron-enhanced sand presented in *Minnesota Stormwater Manual: Calculating credits for iron enhanced sand filter* (accessed January 2023)
(3) Reductions include the sum of enhanced performance of the east wetland and the total amount removed by the LL_1 BMP

Both concepts LL_1a and LL_1b offer significant pollutant load reductions for both TSS and TP. Concept LL_1a has a larger water quality volume and higher pollutant removals than concept LL_1b. Additionally, the infiltration concepts provide more TP removal than the filtration concepts and also provide for volume reduction.

In addition to the estimated water quality improvements, restoration provides opportunity to restore/create new habitat and improve ecological function within the park and educate and engage the community and park users.

### 4.1.4 Engineer's Opinion of Probable Cost

Table 4-4 below summarizes the probable cost for alternatives LL_1a and LL_1b.

Maintenance requirements for both concept LL_1a and LL_1b include several inspections of the pretreatment infrastructure, basin and outlet structure throughout the year, including inspections following rain events greater than 2-inches and monthly inspections during the growing season.

As previously mentioned, the City of Chanhassen will be fully reconstructing Pleasantview Road and the roads in the Fox Hollow Drive neighborhood in the next few years. It was assumed that any storm sewer and catch basins in the roadways and any diversions from the roadway project are not part of the project cost.

**Table 4-4 LL_1 Engineer's Opinion of Probable Cost**

| Alternative: | | LL_1a | | LL_1b | |
|---|---|---|---|---|---|
| | | Filtration | Infiltration | Filtration | Infiltration |
| Point Estimate | | $1,439,000 | $1,295,000 | $1,378,000 | $1,333,000 |
| Cost Range | Low | $1,008,000 | $907,000 | $965,000 | $934,000 |
| | High | $2,159,000 | $1,943,000 | $2,067,000 | $2,000,000 |
| 30-Year Annualized Project Cost | | $47,967 | $43,167 | $45,933 | $44,433 |
| 30-Year Annualized O&M | | $34,202 | $34,202 | $30,794 | $30,094 |
| Total 30-Year Annualized Cost | | $82,169 | $77,369 | $76,727 | $74,527 |
| Annual TP Removal Cost ($/lb TP/yr) | | $6000 | $4500 | $6400 | $4900 |
| Annual TSS Removal Cost ($/lb TSS/yr) | | $21 | $20 | $21 | $21 |

### 4.1.5 Wetland and Upland Impacts

Based on available information, the proposed modification site LL_1 will not fall within a mapped wetland area. However, the work will occur directly upstream from a wetland mapped as a national wetlands inventory (NWI) wetland. A MnRAM assessment previously completed by RPBCWD determined the wetland is classified as medium-value, and the 40-foot average, 20-foot minimum buffer requirement may apply to the project area. However, this disturbance is not anticipated to change the wetland type, functions, or wildlife habitat.

Additionally, concepts LL_1a and LL_1b propose flow diversion away from the identified east offsite wetland, which has a low management class. The diversion of flow away from the wetland will improve the pollutant removal efficiency within the wetland and decrease the flood risk of surrounding structures around the wetland and in the neighborhood.

The City of Chanhassen is the wetland permitting authority responsible for administering the Wetland Conservation Act (WCA) for this project.

Existing trees on the western slope of the park would be preserved.  However, some tree removal may be recommended within the park area, especially the diseased spruce that were identify on the eastern edge of the project areas. While preliminary tree removals were estimated as part of this study, the exact numbers of tree removal would be quantified during final design and replacement of trees can be discussed as part of the restoration plan.

### 4.1.6 Regulatory Approval

Because the work for both concepts at LL_1 is expected to be outside the extents of the downstream wetland and Lotus Lake, approval under the Wetland Conservation Act (WCA), the United States Army Corps of Engineers (USACE) wetland permits or require an MnDNR public waters permit for work below the ordinary high-water level (OHWL) of public waters is not expected.

The City of Chanhassen earth work permit will be required for any project that disturbs or hauls between 50 CY and 1000 CY of soil/ground or any amount of material if it changes drainage patterns.

The MPCA regulates the National Pollutant Discharge Elimination System (NPDES) stormwater permitting program. A NPDES construction stormwater permit is required for construction projects disturbing 1 acre or more of soil.  The MPCA will also require a stormwater pollution prevention plan (SWPPP). The estimated disturbance limits for this concept exceed 1 acre and will require an MPCA NPDES construction stormwater permit and SWPPP.

RPBCWD regulates the control of floodwater to ensure the preservation of floodplains and flood storage areas, improve water quality, preserve vegetation, alleviate identified erosion problems, ensure the preservation of wetland and creek buffers, and prevent erosion of shorelines and stream banks. A RPBCWD permit will be required, although the applicable rules will depend on the final site design and configuration. It is anticipated that a permit for Rule B – Floodplain Management and Drainage Alterations, Rule C – Erosion and Sediment Control, Rule D – Wetland and Creek Buffers, Rule F – Shoreline and Streambank Stabilization, and Rule J – Stormwater Management may be required.

#### 4.1.7 Affected Property Owners

Site LL_1 is located fully within City of Chanhassen North Lotus Lake Park property. The impact to city park property would include clearing select trees, removal of some brush, excavation, installation of stabilization measures, site restoration, and buffer designations. Potential redirection of storm sewer will also occur on City of Chanhassen property. All of the work associated with the proposed concepts is anticipated to be able to be completed within City of Chanhassen property or the existing drainage and utility easement areas, so no additional easements are anticipated.

The RPBCWD will need to enter into a cooperative agreement with the City to define the roles of each partner during the project development, construction, and maintenance periods.  During construction, the likely construction entrance would be constructed off Pleasantview Rd through the park parking lot. An alternate access route could be via the parking lot off Fox Hollow Drive.

## 4.2 BMP Site LL_3: Meadow Green Park Channel

Three conceptual designs for BMP Site LL_3 were considered:

- Concept LL_3a:  Channel Stabilization with Rock Check Dam

- Concept LL_3b: Channel Stabilization with Outlet Modification
- Concept LL_3c: Channel Stabilization with Outlet Modification and Upstream Bank Stabilization

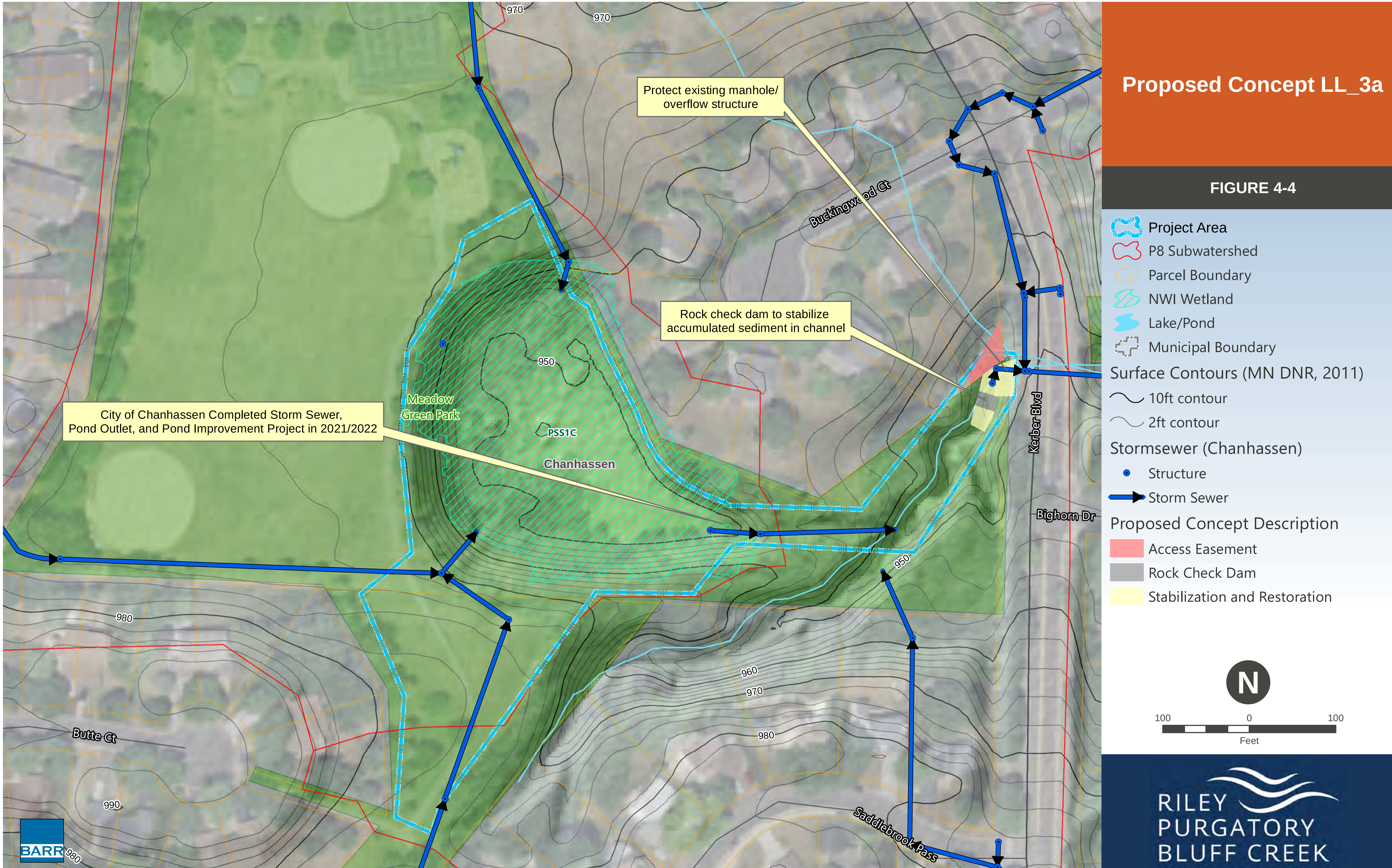
### 4.2.1 Description of Alternatives

#### 4.2.1.1 LL_3a: Channel Stabilization with Rock Check Dam

- Construction of Rock Check Dam at elevation 940 ft MSL to stabilize the movement of sediment accumulated in the channel and prevention of further headcutting along the channel bottom
- To improve the infiltration capacity of the woodland soils flanking the channel, removal of invasive species (primarily buckthorn) and seeding of native woodland grasses and wildflowers would improve biodiversity, soil health, and stormwater infiltration.

# Proposed Concept LL_3a

FIGURE 4-4

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Barr Footer: ArcGIS 10.8.1, 2022-07-19 13:48 File: I:\Client\RPBC_WD\Work_Orders\2022_TO39A_LotusLakeWaterQuality\Maps\Basemaps\Fig02 BMP Site Map LL_3.mxd User: mbs2

#### 4.2.1.2 LL_3b: Channel Stabilization with Outlet Modification

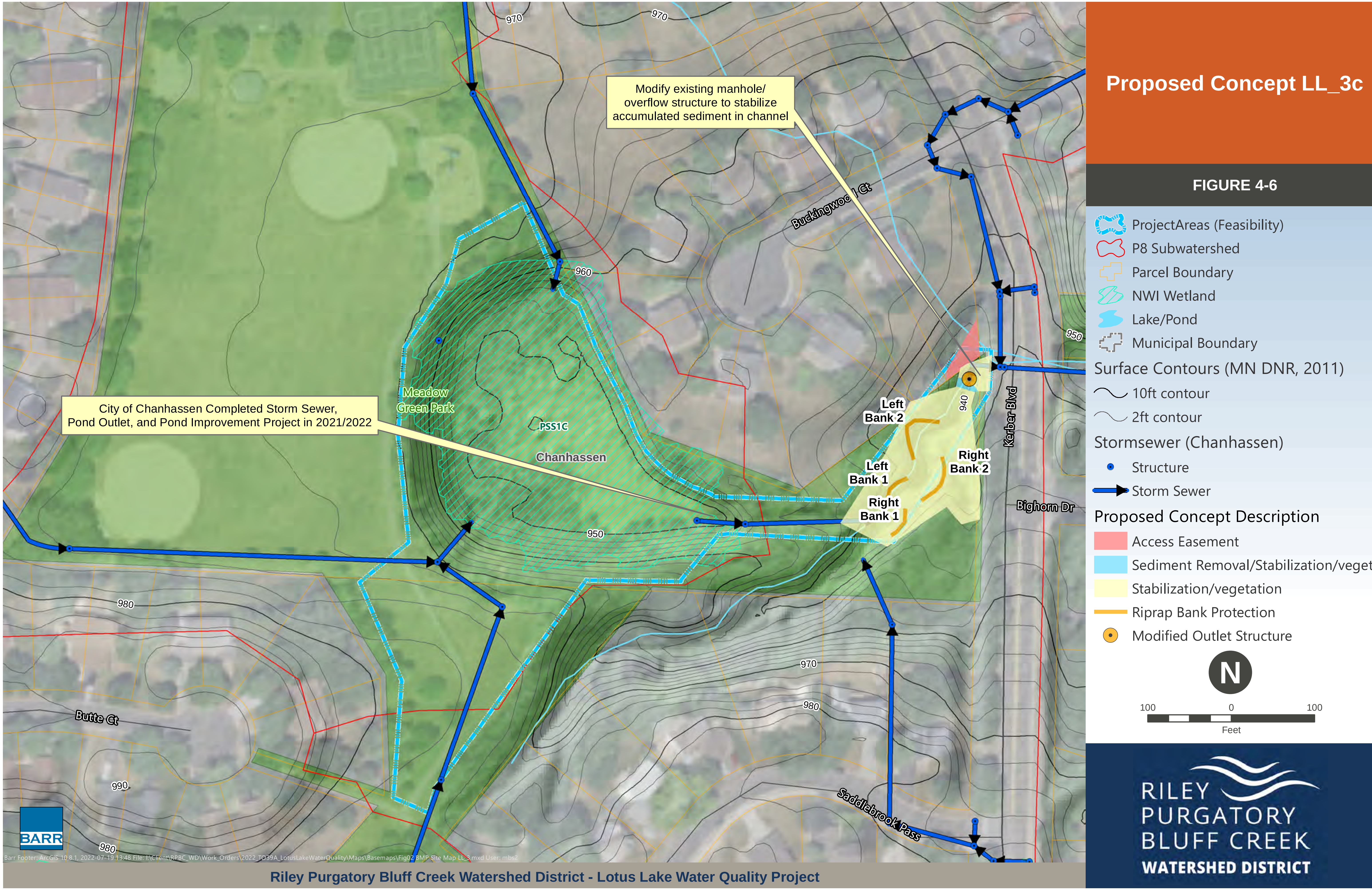
- Modification of the existing outlet manhole west of Kerber Boulevard to stabilize the movement of sediment accumulated in the channel and prevention of further headcutting along the channel bottom
    - Bulkhead existing outlet pipe at downstream end of ravine
    - Modify manhole to include 10 ft weir at elevation 941 ft MSL (slightly above top of existing sediment accumulation)
- To improve the infiltration capacity of the woodland soils flanking the channel, removal of invasive species (primarily buckthorn) and seeding of native woodland grasses and wildflowers would improve biodiversity, soil health, and stormwater infiltration.


FIGURE 4-5

Proposed Concept LL_3b

#### 4.2.1.3 LL_3c: Channel Stabilization with Outlet Modification and Upstream Bank Stabilization

- Modification of the existing outlet manhole west of Kerber Boulevard to stabilize the movement of sediment accumulated in the channel and prevention of further headcutting along the channel bottom
    - Bulkhead existing outlet pipe at downstream end of ravine
    - Modify manhole to include 10 ft weir at elevation 941 ft MSL (slightly above top of existing sediment accumulation)
- Stabilization of eroding channel banks on outer bends with rip rap in upstream channel between the outlet from the Meadow Green Park Pond and the outlet west Kerber Boulevard
    - This approach was selected due to narrow channel, steep banks, and minimize disturbance extents and tree removals
- To improve the infiltration capacity of the woodland soils flanking the channel, removal of invasive species (primarily buckthorn) and seeding of native woodland grasses and wildflowers would improve biodiversity, soil health, and stormwater infiltration.

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### 4.2.2 Anticipated Hydraulic Performance

Table 4-5 summarizes the anticipated hydraulic performance of the outlet structure at Site LL_3 as well as the upstream ravine. Peak velocity in the ravine is significantly reduced for all storm events in concept LL_3a and concept LL_3b. Additionally, the concepts results in no increase in peak elevation at the outlet structure for the 100-year 24-hour event. The current level on design shows peak discharges increasing minimally during the 100-year 24-hour event (~2 cfs) for the proposed concepts.

### Table 4-5 Hydraulic Performance at Site LL_3

| Atlas-14 Design Storm Event | Location | | Existing | LL_3a | LL_3b | LL_3c |
|---|---|---|---|---|---|---|
| 1-Year 24-Hour | Outlet Structure | Peak Elevation (ft) | 938.0 | 940.4 | 941.6 | 941.6 |
| | Upstream Ravine | Peak Discharge (cfs) | 16 | 16 | 16 | 16 |
| | | Peak Velocity (ft/s) | **3.7** | 1.3 | 0.8 | 0.8 |
| | | Peak Depth (ft) | 1.1 | 1.9 | 2.5 | 2.5 |
| | | Peak Shear (lbs/sf) | **1.3** | **2.2** | **3.1** | **3.1** |
| 2-Year 24-Hour | Outlet Structure | Peak Elevation (ft) | 939.9 | 940.6 | 942.0 | 942.0 |
| | Upstream Ravine | Peak Discharge (cfs) | 30 | 30 | 30 | 30 |
| | | Peak Velocity (ft/s) | **4.3** | **1.9** | 1.2 | 1.2 |
| | | Peak Depth (ft) | 1.9 | 2.3 | 2.9 | 2.9 |
| | | Peak Shear (lbs/sf) | **2.2** | **2.7** | **3.5** | **3.5** |
| 10-Year 24-Hour | Outlet Structure | Peak Elevation (ft) | 944.9 | 944.9 | 944.9 | 944.9 |
| | Upstream Ravine | Peak Discharge (cfs) | 88 | 88 | 88 | 88 |
| | | Peak Velocity (ft/s) | **4.3** | 1.6 | 1.4 | 1.4 |
| | | Peak Depth (ft) | 5.1 | 5.1 | 5.1 | 5.1 |
| | | Peak Shear (lbs/sf) | **6.1** | **6.1** | **6.1** | **6.1** |
| 100-Year 24-Hour | Outlet Structure | Peak Elevation (ft) | 950.9 | 950.9 | 950.9 | 950.9 |
| | Upstream Ravine | Peak Discharge (cfs) | 284 | 286 | 286 | 286 |
| | | Peak Velocity (ft/s) | **4.4** | **1.8** | 1.3 | 1.3 |
| | | Peak Depth (ft) | 11.0 | 11.0 | 11.1 | 11.1 |
| | | Peak Shear (lbs/sf) | **13.2** | **13.2** | **13.4** | **13.4** |

Notes

(1) Based on available SSURGO data and site photos, the predominant exposed soil at LL_3 is likely a sandy loam. Values in bold indicate velocities and shear stresses that exceed the erosive threshold for bare sandy loam soils (1.75 ft/s and 0.03-0.04 lbs/sf) (Fischenich, 2001)

### 4.2.3 Anticipated Water Quality Improvements

Although P8 models are commonly used to estimate watershed pollutant loads and pollutant removals by stormwater best management practices (BMPs), the model cannot quantify sediment and pollutant loads resulting from stream bank and in-channel erosion processes. This feasibility study used the same methodology as in the 2020 Kerber Pond Ravine Feasibility Study to quantify existing erosion rates at the site, and to quantify the impact of a lower erosion rate (through stabilization) on pollutant loading to the downstream channel.

The existing stream bank erosion rate (in units of feet per year) for the channel was estimated based on a field assessment method known as the Bank Assessment for Non-Point Source Consequences of Sediment (BANCS) model (Rosgen (2006)).

The BANCS model uses two erosion-estimation tools to develop risk ratings for the Bank Erosion Hazard Index (BEHI) and Near-Bank Stress (NBS).

- The BEHI rating evaluates the susceptibility of a segment of stream bank to erosion as a result of multiple processes: surface erosion, fluvial entrainment, and mass erosion (wasting).
- The NBS rating characterizes the energy distribution against a segment of stream bank; disproportionate energy distribution in the near-bank region can accelerate bank erosion.

The BEHI and NBS estimation tools were applied using channel information from available LiDAR data, site visit and field notes, and photos of the channel between the Meadow Green Park outlet and Kerber Blvd for each segment of the channel potentially contributing sediment downstream. Table 4-6 summarizes the BEHI and NBS ratings along the Meadow Green Park channel.

### Table 4-6 Estimated Bank Erosion Hazard Index (BEHI) and Near-Bank Stress (NBS) along Meadow Green Park Channel

| Location | Length of Eroding Bank (ft) | BEHI | NBS |
|---|---|---|---|
| Right Bank US | 39 | High | Low |
| Left Bank US | 38 | High | Low |
| Right Bank DS | 65 | High | Low |
| Left Bank DS | 83 | High | Moderate |
| Right Bank Headcut | 100 | High | Low |

The BEHI/NBS estimated erosion rate for each segment of the ravine was compared to the typical erosion ranges presented in the Streambank Erosion section of the Natural Resource Conservation Service (NRCS), Wisconsin Field Office Technical Guide (August 2015). The BEHI/NBS estimated erosion indices for the Meadow Green Parch channel reaches were compared to the NRCS guidance, falling within the moderately erosive category and the upper and lower bounds for this classification were used to establish the range in the estimated sediment and total phosphorus load reductions for each segment along the channel.

The ravine stabilization benefits (load reductions) estimated sediment and total phosphorus loads, and the ravine stabilization benefits (load reductions) are shown in Table 4-7, along with the load reductions estimated from P8 modeling of the 2021 Pond Improvement Project. Each concept at site LL_3 aims to prevent sediment in the channel from entering the storm sewer beneath Kerber Blvd, and therefore each achieve the same load reduction.

### Table 4-7 Estimated Sediment and Total Phosphorus Removal at Site LL_3 by Concept

| Alternative | Description | Sediment Load Reduction (1) (lbs/yr) | TP Load Reduction (2) (lbs/yr) |
|---|---|---|---|
| | 2021 Pond Improvement Project(3) | 3,157 | 8.0 |
| LL-3a | Rock Check Dam | 2,560<br>(2,250-9,990) | 2.13<br>(1.13-5.00) |
| LL-3b | Outlet Modification | 2,560<br>(2,250-9,990) | 2.13<br>(1.13-5.00) |
| LL-3c | Outlet Modification and Bank Stabilization | 2,560<br>(2,250-9,990) | 2.13<br>(1.13-5.00) |

Note(s):
(1) High and low erosion estimates were based on comparison with the BEHI/NBS erosion rate point estimate in combination with the table in the Streambank Erosion section of the WI NRCS Field Office Technical Guide (Wisconsin Natural Resources Conservation Service, 2015). Erosion under existing conditions was estimated based on field visits.
(2) 2021 Pond Improvement Project load reductions calculated in P8

### 4.2.4 Engineer's Opinion of Probable Cost

Table 4-8 below outlines the Engineer's Opinion of Probable Cost for the three alternatives considered at Site LL_3.

### Table 4-8 Site LL_3 Engineer's Opinion of Probable Cost

| Alternative: | | LL_3a | LL_3b | LL_3c |
|---|---|---|---|---|
| Point Estimate | | $53,000 | $65,000 | $150,000 |
| Cost Range | Low | $38,000 | $46,000 | $105,000 |
| | High | $80,000 | $98,000 | $225,000 |
| 30-Year Annualized Project Cost | | $1,767 | $2,167 | $5,000 |
| 30-Year Annualized O&M | | $500 | $500 | $1000 |
| Total 30-Year Annualized Cost | | $2,767 | $2,667 | $6,000 |
| Annual TP Removal Cost ($/lb TP/yr) | | $1,100 | $1,300 | $2,800 |
| Annual TSS Removal Cost ($/lb TSS/yr) | | $1 | $1 | $2 |

### 4.2.5 Wetland and Upland Impacts

The stormwater pond located upstream from the project site in Meadow Green Park is mapped as a national wetlands inventory (NWI) wetland and classified as a high value wetland by the District. The channel is mapped in City of Chanhassen's 2016 MNRAM Wetland Inventory as a Manage-1 seasonally flooded basin. Both alternatives will not increase the peak water surface elevation in the upstream wetland or in the upstream ravine during the 100-year event.

A wetland delineation and MnRAM assessment should be performed along the channel between the Meadow Green Park Pond outlet and Kerber Boulevard to determine if wetlands are present.

The extents of disturbance for LL_3a would be larger than for LL_3b for the access and installation of the rock-check dam. LL_3c has the largest extent of disturbance because the concept includes additional stabilization of the upstream channel. This concept may also include the most significant tree removals.

Exact numbers of tree removal would be quantified during final design and replacement of trees can be discussed as part of the restoration plan. The area also has many downed trees currently laying over the existing channel that would need to be removed for construction.

### 4.2.6 Regulatory Approval

Neither the NWI or the District wetland (MnRAM) layer maps the channel within the project extents as wetland. However, the City of Chanhassen's wetland mapping indicates that the channel within the LL_3 area is a Type 1/Manage 1 wetland. Although a wetland delineation has not been completed yet, the proposed work may occur in a wetland area. If wetlands are identified in the LL_3 channel area with a future delineation, approval under WCA will be required and the districts wetland buffer rule would apply. It is not anticipated to change the wetland type, functions, or wildlife habitat. City of Chanhassen is the wetland permitting authority for this project, administering the Wetland Conservation Act (WCA).

In addition to the wetland delineation, a United States Army Corps of Engineers (USACE) jurisdictional determination should be completed as part of a future project. It is unclear if the USACE would have jurisdiction over this area as there is a segment of storm sewer downstream between Lotus Lake and this area.  If the wetland would be determined to be jurisdictional, the project may require USACE permits.

The channel between the Meadow Green Park Pond outlet and Kerber Boulevard is mapped as an MnDNR public watercourse.  An MnDNR public waters permit for work may be required, depending on the type of work and contributing watershed area (which is less than 5 square miles).

The City of Chanhassen earth work permit will be required for any project that disturbs or hauls between 50 CY and 1000 CY of soil/ground or any amount of material if it changes drainage patterns.

The MPCA regulates the National Pollutant Discharge Elimination System (NPDES) stormwater permitting program. A NPDES construction stormwater permit is required for construction projects disturbing 1 acre or more of soil.  The MPCA will also require a stormwater pollution prevention plan (SWPPP). The estimated disturbance limits for each LL_3 concept is not expected to exceed 1 acre, and it will not require a MPCA NPDES construction stormwater permit and SWPPP.

RPBCWD regulates the control of floodwater to ensure the preservation of floodplains and flood storage areas, improve water quality, preserve vegetation, alleviate identified erosion problems, ensure the preservation of wetland and creek buffers, and prevent erosion of shorelines and stream banks. A RPBCWD permit will be required, although the applicable rules will depend on the final site design and configuration. It is anticipated that a permit for Rule B – Floodplain Management and Drainage Alterations, Rule C – Erosion and Sediment Control, Rule D – Wetland and Creek Buffers, Rule F – Shoreline and Streambank Stabilization, and Rule J – Stormwater Management may be required.

### 4.2.7 Affected Property Owners

The majority of the work associated with the proposed LL_3 concepts will be able to be completed within City of Chanhassen Meadow Green Park property, existing right of way, or withing the existing drainage and utility easement areas.  However, impacts are anticipated to the private property to the north (751 Buckingwood Ct.) for access to the channel perform the work and for future maintenance.

The impacts from the concept could include clearing and grubbing and removal of select trees, installation of stabilization measures in the channel (e.g. rock check dam) and/or modifications to the outlet structure, addition of rip rap at toe of eroding slopes to stabilize the outer bends in the channel upstream, and site restoration.

The RPBCWD will need to enter into a cooperative agreement with the City to define the roles of each partner during the project development, construction, and maintenance periods. During construction, the likely construction entrance would be constructed off Kerber Blvd through the very south end of the backyard at 751 Buckingwood Ct. The District would need to acquire an easement with the property owners of this property to establish the access route to the channel.

## 4.3 BMP Site LL_7: Stormwater Management at Wetlands in Meadow Green Park

Five conceptual designs within the wetland complex at BMP Site LL_7 were considered including:

- Concept LL_7a: Upper Wetland Extended Detention
- Concept LL_7b: Lower Wetland Extended Detention
- Concept LL_7c: Lower Wetland Extended Detention & Enhanced Filtration
- Concept LL_7d: Diversion Pipe and Lower Wetland Extended Detention
- Concept LL_7e: Diversion Pipe, Lower Wetland Extended Detention, & Enhanced Filtration

The concepts all focus on extended detention to help maximize water quality treatment and reductions in peak discharges during the more frequent events. This extended detention does not change the normal water levels in the wetlands or impact the total flood storage volumes within the wetland complex.

In advance of the implementation of any of the alternatives, additional water quality sampling would be recommended collecting water quality samples on the lower wetland in the project area to understand the existing water quality of the wetland and to understand if internal loading is a concern from this wetland.

Additionally, during conversations with District and city staff, there was mention of concern about the geotechnical stability of the berm between the lower wetland and the east wetland as there have been past issues with the berm during high flows. Again, in advance of any project, collection geotechnical borings are needed to understand the current conditions of the existing berm in order to identify any additional design modifications that may be needed for berm stability.

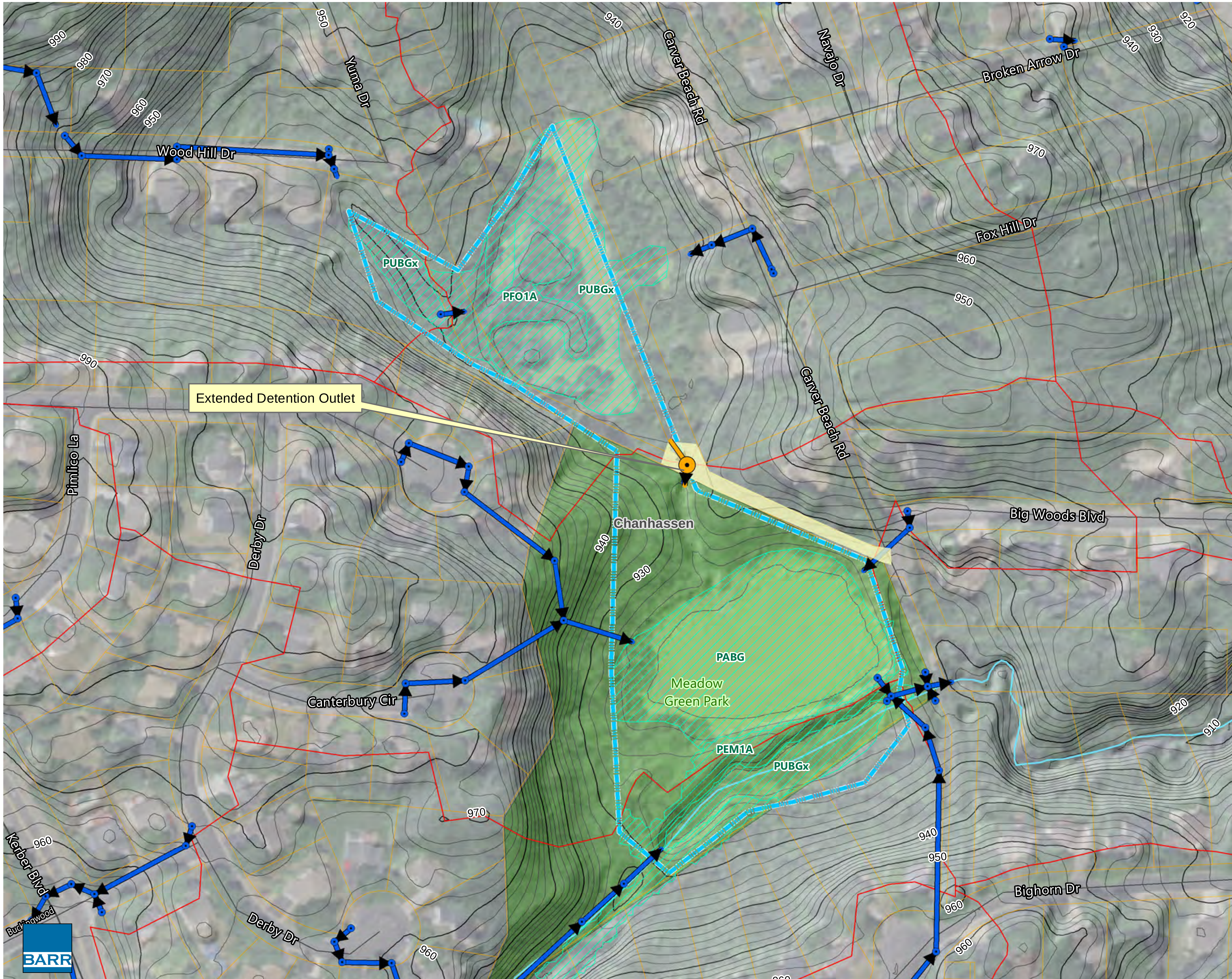
### 4.3.1 Description of Alternatives

#### 4.3.1.1 LL_7a: Upper Wetland Extended Detention

- Extended detention outlet modification at the Upper Wetland
    - 12″ Orifice at elevation 924.71 ft MSL (same elevation as existing outlet pipe)
    - 7′ Weir at elevation 926.5 ft MSL
    - Overflow at trail at elevation 927.1 ft MSL (same elevation as existing trail)
- Any disturbed areas are to be improved for soil health (decompacted and amended) and then vegetated in appropriate wet meadow or prairie vegetation.

# Proposed Concept LL_7a

FIGURE 4-7

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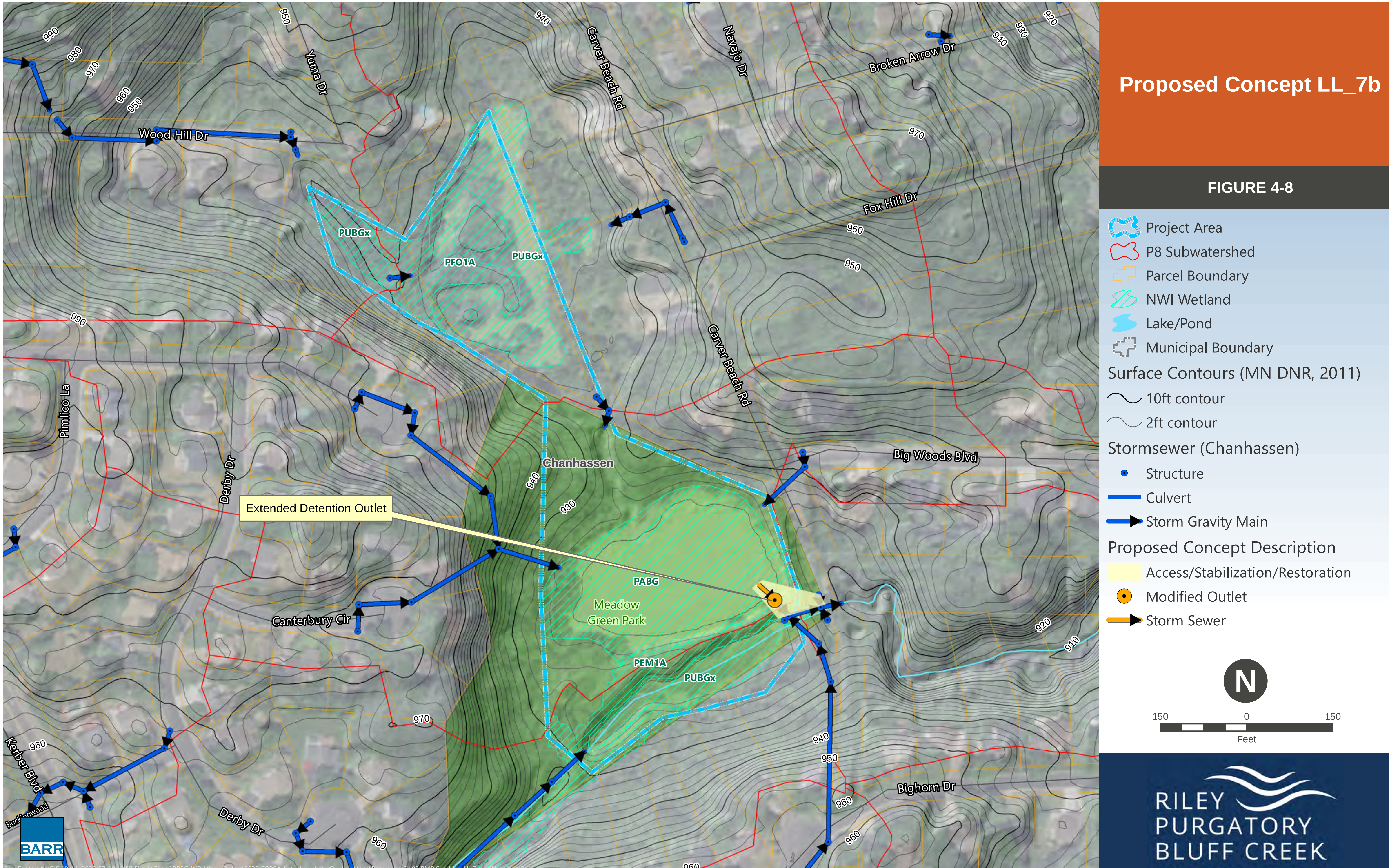
#### 4.3.1.2 LL_7b: Lower Wetland Extended Detention

- Extended detention outlet modification at the Lower Wetland
    - 10″ Orifice at elevation 921.22 ft MSL (same elevation as existing outlet pipe)
    - 4′ Weir height at 922.7 ft MSL
    - Overflow at 924.1 ft MSL to east wetland
    - Overflow at 925.7 ft MSL
- Modifications (if needed) to berm on south edge of lower wetland
- Any disturbed areas are to be improved for soil health (decompacted and amended) and then vegetated in appropriate wet meadow or prairie vegetation.

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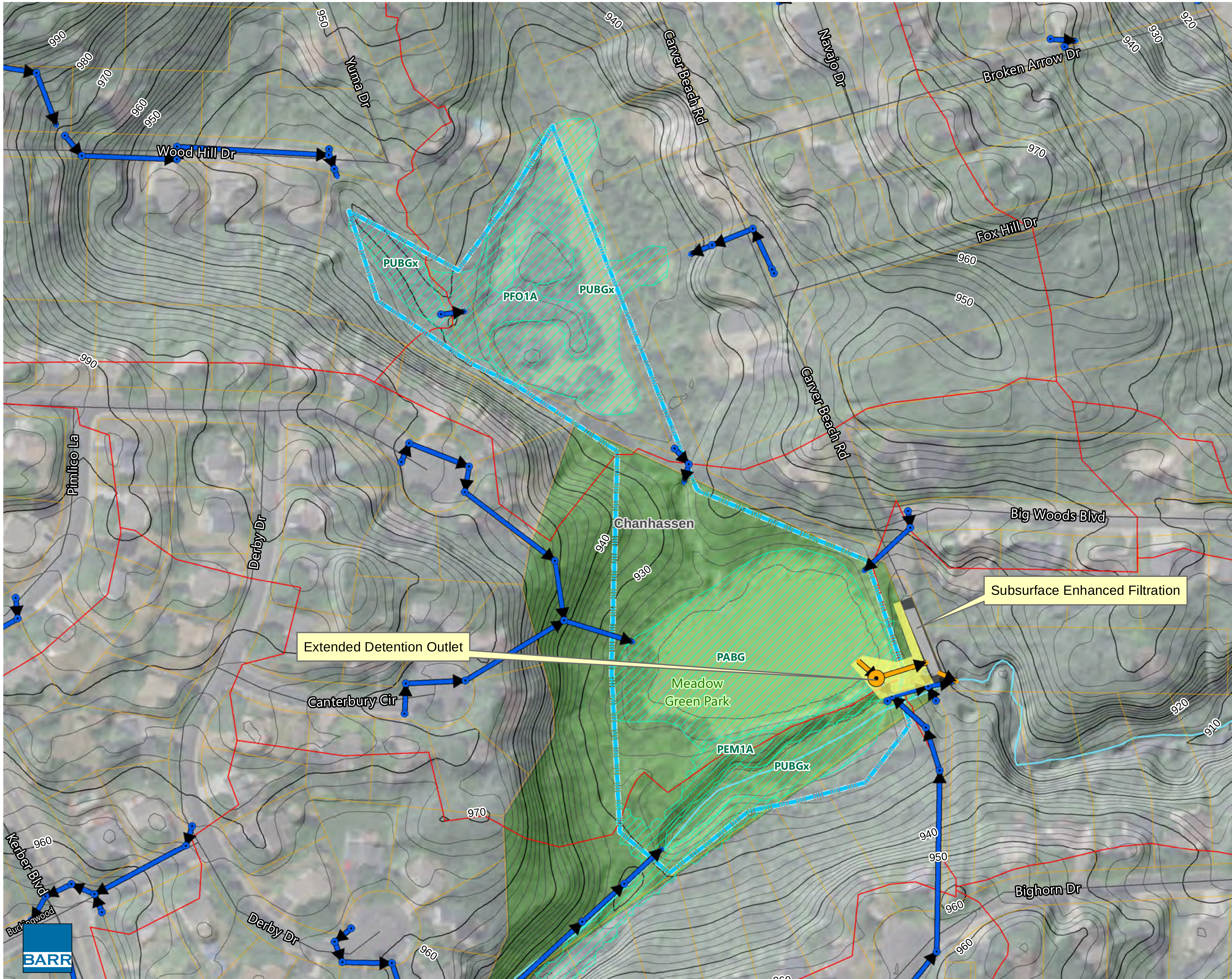
#### 4.3.1.3 LL_7c: Lower Wetland Extended Detention & Enhanced Filtration

- Extended detention outlet modification at the Lower Wetland (as outlined above)
- Subsurface Iron-Enhanced Sand Filter at outlet from Lower Wetland
    - 1,600 square-foot filter with an assumed 0.15 cfs flow rate
- Modifications (if needed) to berm on south edge of lower wetland
- Any disturbed areas are to be improved for soil health (decompacted and amended) and then vegetated in appropriate wet meadow or prairie vegetation.

# Proposed Concept LL_7c

**FIGURE 4-9**




Project Area
P8 Subwatershed
Parcel Boundary
NWI Wetland
Lake/Pond
Municipal Boundary

Surface Contours (MN DNR, 2011)
10ft contour
2ft contour

Stormsewer (Chanhassen)
Structure
Storm Sewer

Proposed Concept Description
Access/Stabilization/Restoration
Pavement
Subsurface Filtration/Pavement
Modified Outlet
Storm Sewer

N

150 0 150
Feet

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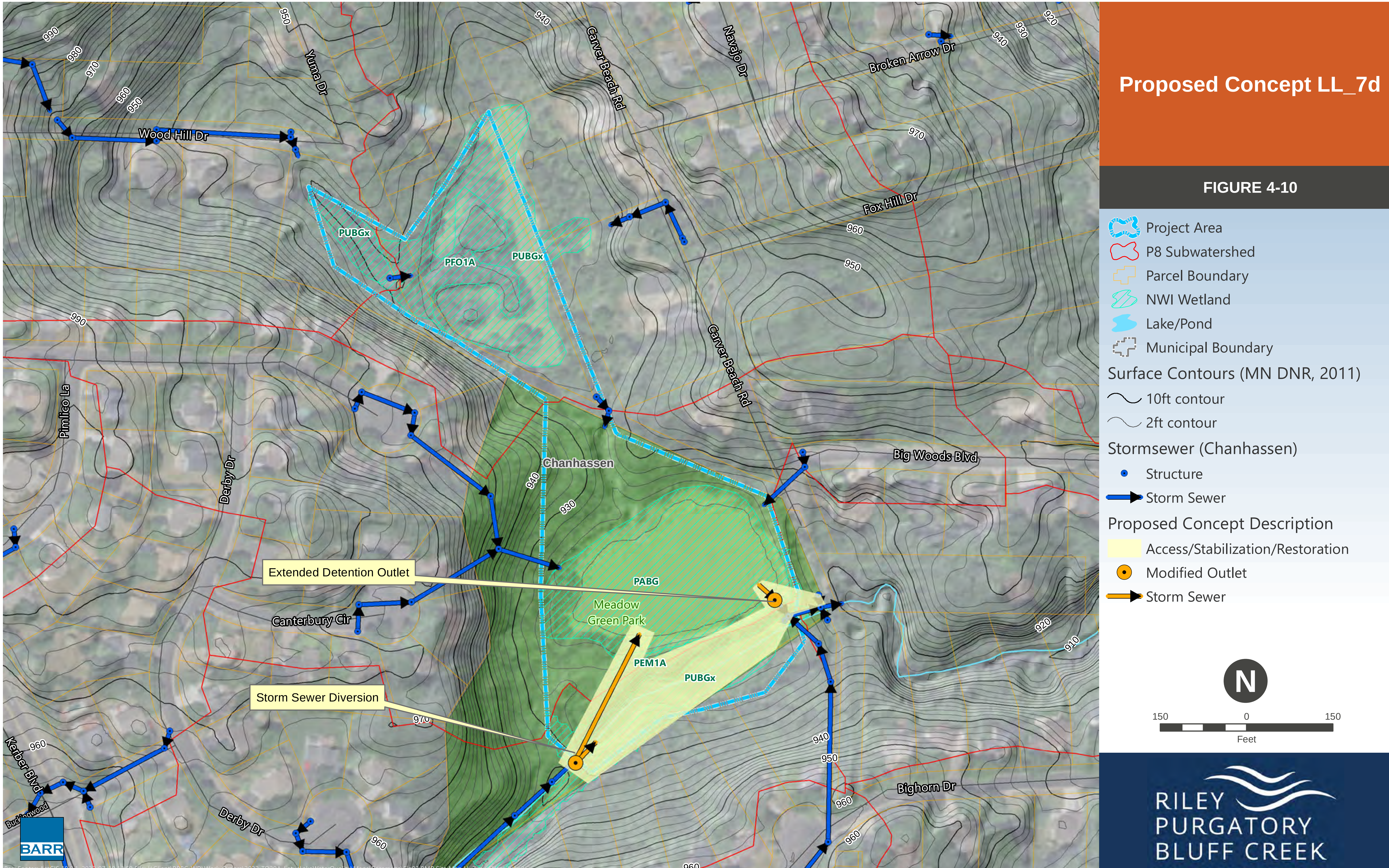
#### 4.3.1.4 LL_7d: Diversion Pipe and Lower Wetland Extended Detention

- Diversion Structure with a 9' weir at 922.5 ft MSL to divert flows from the existing storm sewer upstream of the East Wetland to Lower Wetland
- Extended detention outlet modification at the Lower Wetland (as outlined above)
- Modifications (if needed) to berm on south edge of lower wetland
- Any disturbed areas are to be improved for soil health (decompacted and amended) and then vegetated in appropriate wet meadow or prairie vegetation.
- Restoration of East Wetland, in response to reduced hydraulic loading resulting from the diversion of flows toward the Lower Wetland

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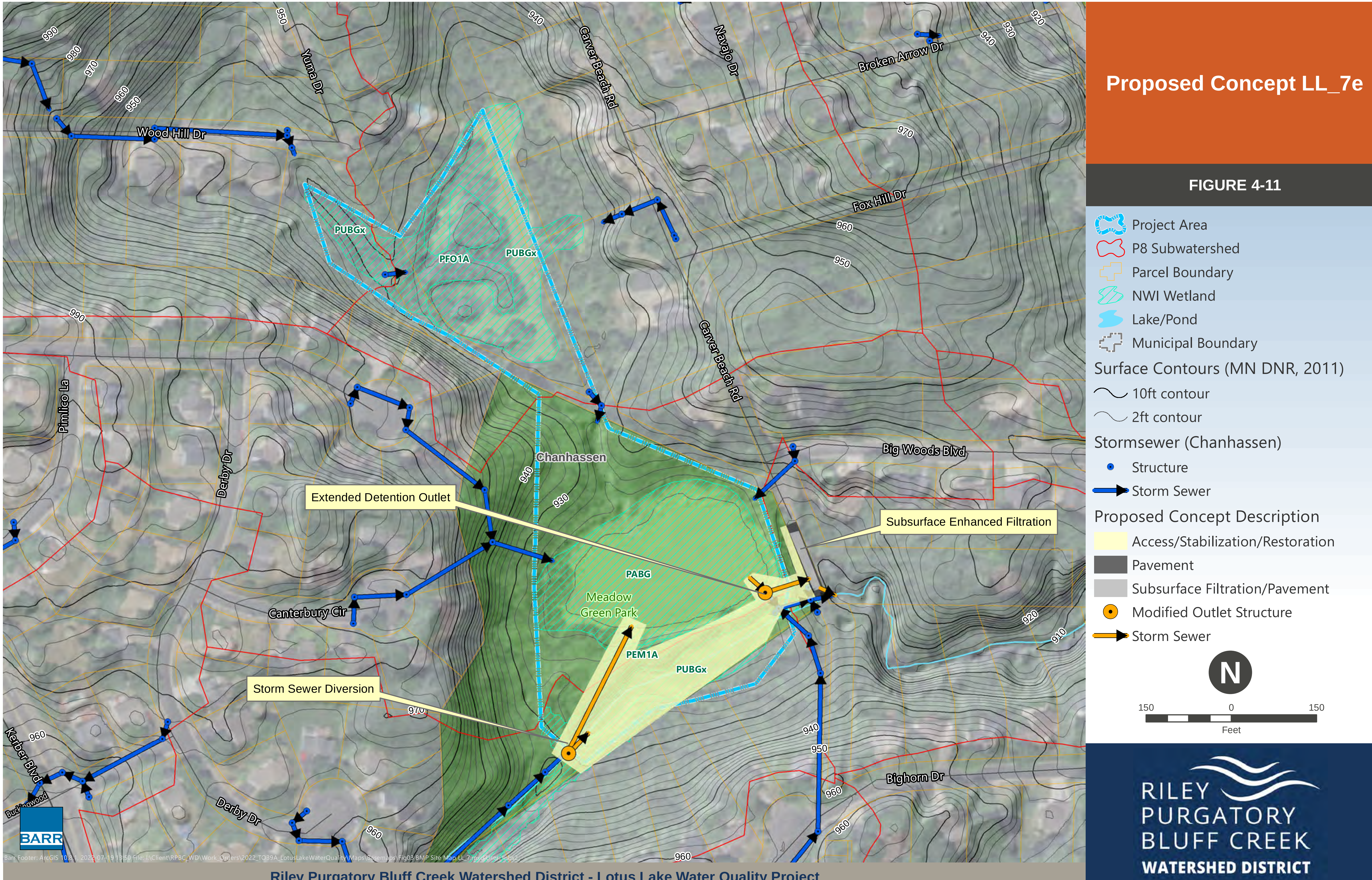
#### 4.3.1.5 LL_7e: Diversion Pipe, Lower Wetland Extended Detention, & Enhanced Filtration

- Iron-Enhanced Sand Filter at Lower Wetland (as outlined above)
- Diversion Structure from the existing storm sewer upstream of the East Wetland to Lower Wetland (as outlined above)
- Extended detention outlet modification at the Lower Wetland (as outlined above)
- Modifications (if needed) to berm on south edge of lower wetland
- Any disturbed areas are to be improved for soil health (decompacted and amended) and then vegetated in appropriate wet meadow or prairie vegetation.
- Restoration of East Wetland, in response to reduced hydraulic loading resulting from the diversion of flows toward the Lower Wetland

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### 4.3.2 Anticipated Hydraulic Performance

Table 4-9 below summarizes the anticipated impacts of each concept on peak elevation and discharge from the three wetlands, as well as the estimated peak discharge, velocity, depth, and shear stress in the downstream ravine. The concepts considered at Site LL_7 ultimately do not significantly alter hydraulics leaving the site, but focused more on diverting flow between the wetlands to maximize water quality benefits.

Although there is some peak flow reduction in the downstream channel during the more frequent events, there is minimal change in peak velocity in the downstream ravine under any of the proposed concepts.   The above designs will not increase the peak 100-year water surface elevations within the wetland complex.

Under concepts LL_7d and LL_7e, flow is diverted from the east wetland to the lower wetland. Under these conditions, the east wetland will still receive runoff flows during rain events at or greater than the 0.5" rain event and higher precipitation. Under concepts LL_7d and LL_7e, the peak elevation of the east wetland decreases by ~ 0.3 ft during the 1-year 24-hour event.

## Table 4-9 LL_7 Anticipated Hydraulic Performance

| Atlas-14 Design Storm Event | Location | | Existing | LL_7a | LL_7b | LL_7c | LL_7d | LL_7e |
|---|---|---|---|---|---|---|---|---|
| 1-Year 24-Hour | Upper Wetland | Peak Elevation (ft) | 926.0 | 926.1 | 926.0 | 926.0 | 926.0 | 926.0 |
| | | Peak Discharge (cfs) | 5 | 4 | 5 | 5 | 5 | 5 |
| | Lower Wetland | Peak Elevation (ft) | 922.2 | 922.1 | 922.7 | 922.7 | 923.2 | 923.2 |
| | | Peak Discharge (cfs) | 5 | 4 | 3 | 3 | 8 | 8 |
| | East Wetland | Peak Elevation (ft) | 923.5 | 923.5 | 923.5 | 923.5 | 923.2 | 923.2 |
| | | Peak Discharge (cfs) | 19 | 19 | 19 | 19 | 12 | 12 |
| | Downstream Ravine | Peak Discharge (cfs) | 26 | 26 | 24 | 24 | 22 | 22 |
| | | Peak Velocity (ft/s) | **3.1** | **3.0** | **3.0** | **3.0** | **2.9** | **2.9** |
| | | Peak Depth (ft) | 1.4 | 1.4 | 1.4 | 1.4 | 1.1 | 1.1 |
| | | Peak Shear (lbs/sf) | **1.2** | **1.2** | **1.2** | **1.2** | **1.0** | **1.0** |
| 2-Year 24-Hour | Upper Wetland | Peak Elevation (ft) | 926.2 | 926.3 | 926.2 | 926.2 | 926.2 | 926.2 |
| | | Peak Discharge (cfs) | 7 | 7 | 7 | 7 | 7 | 7 |
| | Lower Wetland | Peak Elevation (ft) | 922.4 | 922.4 | 923.0 | 923.0 | 923.7 | 923.7 |
| | | Peak Discharge (cfs) | 8 | 7 | 5 | 5 | 15 | 15 |
| | East Wetland | Peak Elevation (ft) | 923.8 | 923.8 | 923.8 | 923.8 | 923.6 | 923.6 |
| | | Peak Discharge (cfs) | 38 | 35 | 35 | 35 | 23 | 23 |
| | Downstream Ravine | Peak Discharge (cfs) | 45.9 | 45.5 | 41.5 | 41.5 | 41.0 | 41.0 |
| | | Peak Velocity (ft/s) | **4** | **4** | **4** | **4** | **4** | **4** |
| | | Peak Depth (ft) | 1.9 | 1.9 | 1.6 | 1.6 | 1.6 | 1.6 |
| | | Peak Shear (lbs/sf) | **1.7** | **1.7** | **1.5** | **1.5** | **1.5** | **1.5** |
| 10-Year 24-Hour | Upper Wetland | Peak Elevation (ft) | 927.2 | 927.1 | 927.2 | 927.2 | 927.2 | 927.2 |
| | | Peak Discharge (cfs) | 13 | 17 | 13 | 13 | 13 | 13 |
| | Lower Wetland | Peak Elevation (ft) | 923.3 | 923.5 | 923.6 | 923.6 | 924.6 | 924.6 |
| | | Peak Discharge (cfs) | 22 | 25 | 13 | 13 | 33 | 33 |
| | East Wetland | Peak Elevation (ft) | 926.2 | 926.2 | 926.2 | 926.2 | 924.5 | 924.5 |
| | | Peak Discharge (cfs) | 338 | 326 | 329 | 329 | 92 | 92 |
| | Downstream Ravine | Peak Discharge (cfs) | 251 | 251 | 250 | 250 | 115 | 115 |
| | | Peak Velocity (ft/s) | **6.4** | **6.4** | **6.4** | **6.4** | **4.7** | **4.7** |
| | | Peak Depth (ft) | 3.8 | 3.8 | 3.8 | 3.8 | 2.7 | 2.7 |
| | | Peak Shear (lbs/sf) | **3.4** | **3.4** | **3.4** | **3.4** | **2.4** | **2.4** |
| 100-Year 24-Hour | Upper Wetland | Peak Elevation (ft) | 928.0 | 928.0 | 928.0 | 928.0 | 928.0 | 928.0 |
| | | Peak Discharge (cfs) | 86 | 88 | 86 | 86 | 86 | 86 |
| | Lower Wetland | Peak Elevation (ft) | 926.4 | 926.4 | 926.4 | 926.4 | 926.4 | 926.4 |
| | | Peak Discharge (cfs) | 91 | 92 | 91 | 91 | 110 | 110 |
| | East Wetland | Peak Elevation (ft) | 926.4 | 926.4 | 926.4 | 926.4 | 926.4 | 926.4 |
| | | Peak Discharge (cfs) | 385 | 378 | 377 | 377 | 380 | 380 |
| | Downstream Ravine | Peak Discharge (cfs) | 417 | 418 | 418 | 417 | 420 | 420 |
| | | Peak Velocity (ft/s) | **6.5** | **6.5** | **6.5** | **6.5** | **6.5** | **6.5** |
| | | Peak Depth (ft) | 4.6 | 4.9 | 4.9 | 4.9 | 4.9 | 4.9 |
| | | Peak Shear (lbs/sf) | **4.1** | **4.4** | **4.4** | **4.4** | **4.4** | **4.4** |

Notes

(1) Based on available SSURGO data and infiltration testing results, the predominant exposed soil in the ravine downstream of LL_7 is likely a silty loam. Values in bold indicate velocities and shear stresses that exceed the erosive threshold for bare silty loam soils (2.25 ft/s and 0.045-0.05 lbs/sf) (Fischenich, 2001)

### 4.3.3 Anticipated Water Quality Improvements

P8 modeling results for the above conceptual designs are summarized in Table 4-10 below. The diversion of flow from the east wetland the lower wetland (Concepts LL_7d and LL_7e) result in significantly higher reductions in phosphorus and sediment load reduction than the remaining concepts. The water quality results align with the conclusions discussed in Section 2.2.7 that the east wetland is overloaded and unable to settle out pollutants from the ravine at site LL_3.

**Table 4-10 Estimated Sediment and Total Phosphorus Removal at Site LL_1 by Concept**

| Alternative | Description | Sediment Load Reduction (1) (lbs/yr) | TP Load Reduction (2) (lbs/yr) |
|---|---|---|---|
| LL_7a | Upper Wetland Extended Detention | 139 | 0.6 |
| LL_7b | Lower Wetland Extended Detention | 136 | 0.7 |
| LL_7c | Lower Wetland Extended Detention with IESF | 136 | 4.6 |
| LL_7d | Diversion Structure and Lower Wetland Extended Detention | 3683 | 13.2 |
| LL_7e | Diversion Structure, Lower Wetland Extended Detention, and IESF | 3634 | 20.8 |

Note(s):

(1) Sediment load reduction under existing and proposed conditions estimated in P8
(2) TP estimated based on conversion factor for iron-enhanced sand presented in Minnesota Stormwater Manual: Calculating credits for iron enhanced sand filter (accessed January 2023)

### 4.3.4 Engineer's Opinion of Probable Cost

Table 4-11 summarizes the costs associated with each proposed concept at site LL_7.

**Table 4-11 Engineer's Opinion of Probable Cost for Concepts at LL_7**

| Alternative: | | LL_7a: Upper Wetland Extended Detention | LL_7b: Lower Wetland Extended Detention | LL_7c: Lower Wetland Extended Detention with IESF | LL_7d: Diversion Structure and Lower Wetland | LL_7e: Diversion Structure, Lower Wetland Extended Detention, and IESF |
|---|---|---|---|---|---|---|
| Point Estimate | | $118,000 | $395,000 | $703,000 | $560,000 | $865,000 |
| Cost Range | Low | $83,000 | $277,000 | $493,000 | $392,000 | $606,000 |
| | High | $177,000 | $593,000 | $1,055,000 | $840,000 | $1,298,000 |
| 30-Year Annualized Project Cost | | $3,933 | $13,167 | $23,433 | $18,667 | $28,833 |
| 30-Year Annualized O&M | | $500 | $500 | $7,500 | $1,000 | $8,000 |
| Total 30-Year Annualized Cost | | $4,433 | $13,667 | $30,933 | $19,667 | $36,833 |
| Annual TP Removal Cost ($/lb TP/yr) | | $7,400 | $19,500 | $6,700 | $1,500 | $1,800 |
| Annual TSS Removal Cost ($/lb TSS/yr) | | $30 | $100 | $230 | $5 | $10 |

### 4.3.5 Wetland and Upland Impacts

The proposed work will occur in and adjacent to the wetland complex. The upper wetland, lower wetland, and east wetland, and upstream ravine are each mapped as national wetlands inventory (NWI) wetlands. The District's database indicates a MnRAM assessment has been completed and has listed each of the four wetlands as medium-value.

Based on available information, the proposed modification to the wetland complex in each concept will cause temporary construction disturbance within mapped wetlands and place storm sewer infrastructure within these areas (to be determined with a future wetland delineation). The proposed concepts will maintain existing normal water levels as well as flood elevations on all wetlands and no changes in wetland type, functions, or wildlife habitat are expected.

The extents of disturbance for concepts involving modifications to existing outlet pipes/structure, addition of a diversion structure and piping into the lower wetland (LL_7d and LL_7e) and concepts involving construction of inlet pipes and subsurface iron enhanced sand filter structure (LL_7c and LL_7e) below an existing trail.

Exact numbers of tree removal would be quantified during final design and replacement of trees can be discussed as part of the restoration plan.

### 4.3.6 Regulatory Approval

The upper and lower wetlands in the LL_7 project area a not mapped as MnDNR public waters basins. However, the channel (and east wetland) is mapped as an MnDNR public watercourse. An MnDNR public waters permit for work may be required, depending on the type of work and contributing watershed area (which is less than 5 square miles).

Although a wetland delineation has not been completed yet, the proposed work will likely occur in a mapped wetland complex. As a result, the project will require approval under WCA. It is not anticipated to change the wetland type, functions, or wildlife habitat. The City of Chanhassen is the wetland permitting authority for this project, administering the Wetland Conservation Act (WCA).

In additional to the wetland delineation, a United States Army Corps of Engineers (USACE) jurisdictional determination should be completed as part of a future project. If the wetland would be determined to be jurisdictional, the project may require USACE permits.

The City of Chanhassen earth work permit will be required for any project that disturbs or hauls between 50 CY and 1000 CY of soil/ground or any amount of material if it changes drainage patterns.

The MPCA regulates the National Pollutant Discharge Elimination System (NPDES) stormwater permitting program. A NPDES construction stormwater permit is required for construction projects disturbing 1 acre or more of soil. The MPCA will also require a stormwater pollution prevention plan (SWPPP). The estimated disturbance limits for all of the LL_7 concepts is not expected to exceed 1 acre, and it will not require a MPCA NPDES construction stormwater permit and SWPPP.

RPBCWD regulates the control of floodwater to ensure the preservation of floodplains and flood storage areas, improve water quality, preserve vegetation, alleviate identified erosion problems, ensure the preservation of wetland and creek buffers, and prevent erosion of shorelines and stream banks. A RPBCWD permit will be required, although the applicable rules will depend on the final site design and configuration. It is anticipated that a permit for Rule B – Floodplain Management and Drainage Alterations, Rule C – Erosion and Sediment Control, Rule D – Wetland and Creek Buffers, Rule F – Shoreline and Streambank Stabilization, and Rule J – Stormwater Management may be required.

### 4.3.7 Affected Property Owners

The project would impact City of Chanhassen Park property.  The impacts would include clearing select trees, removal of some brush, excavation, installation of stabilization measures, potential storm sewer structures, site restoration, and buffer designations.

A large portion of the work associated with the proposed concept might be able to be completed within City of Chanhassen property or the existing drainage and utility easement areas.  However, there may be locations where this work will extend outside the existing drainage and utility easements, such as storm sewer alignment to avoid conflicts with the existing sanitary sewer. Because drainage and utility easement do not convey any property rights, easements will be needed to secure access, construction and maintenance easements covering all areas with potential land-disturbing activities. Although planning level easements costs have been estimated as part of this study, the actual easements will be further defined as part of final design, should the project move forward.

Additionally, the RPBCWD will need to enter into a cooperative agreement with the City to define the roles of each partner during the project development, construction, and maintenance periods. During construction, the likely construction entrance would be constructed via trail off Carver Beach Rd.

## 4.4 BMP Site LL_8: Ravine off Frontier Trail

Four conceptual designs for BMP Site LL_8 were considered:

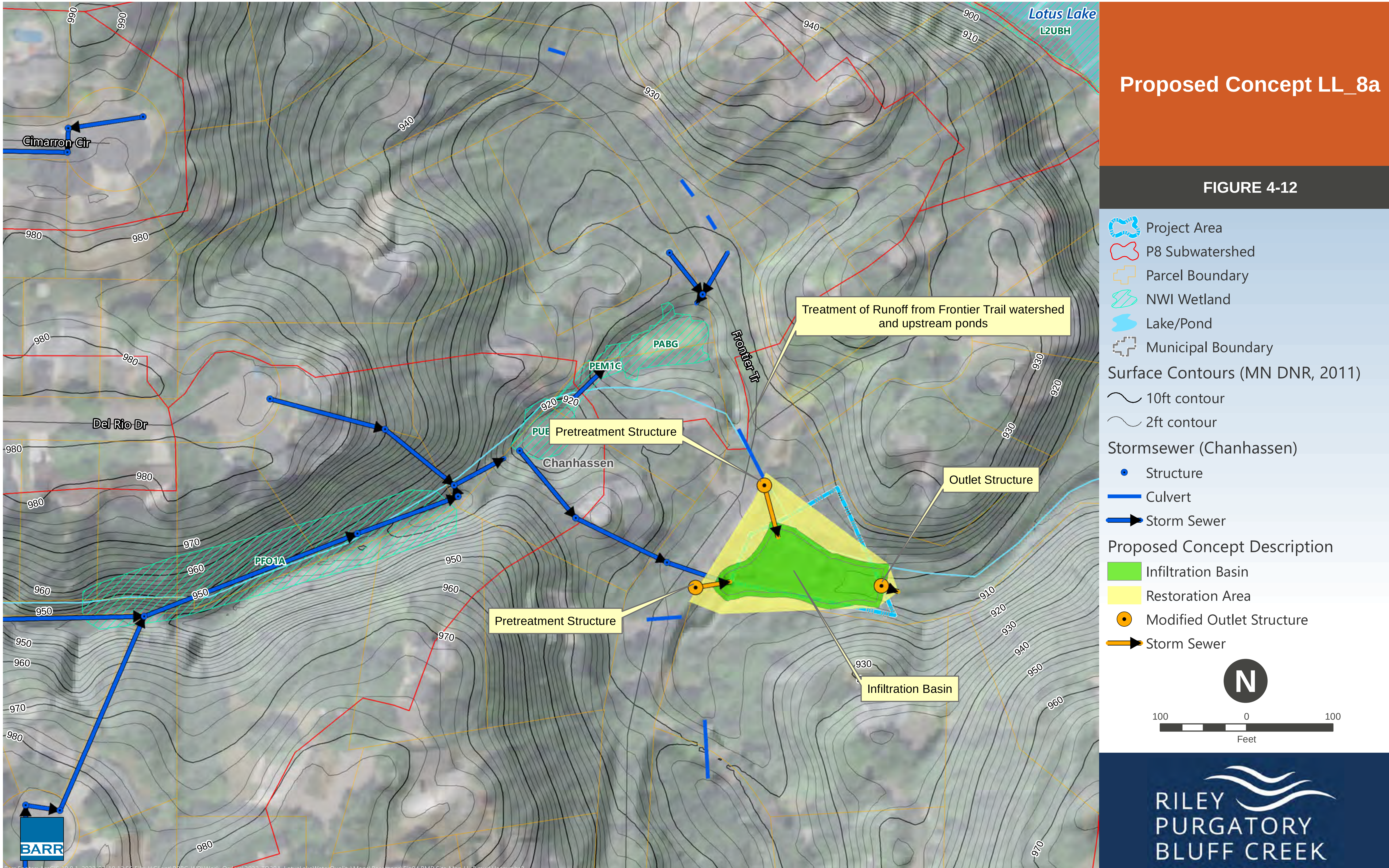
- Concept LL_8a: Large Infiltration Basin
- Concept LL_8b: Subsurface Infiltration with Infiltration Basin
- Concept LL_8c: Kraken Filter
- Concept LL_8d: Small Footprint Infiltration Basin

The City of Chanhassen plans to reconstruct Frontier Trail starting in 2025. With this redesign, there is an opportunity to reroute some of the existing storm sewer to maximize direction of stormwater runoff to the LL_8 BMP site. Each conceptual design proposes interception of runoff from the frontier trail watershed and upstream ponds.

### 4.4.1 Description of Alternatives

#### 4.4.1.1 LL_8a: Large Infiltration Basin

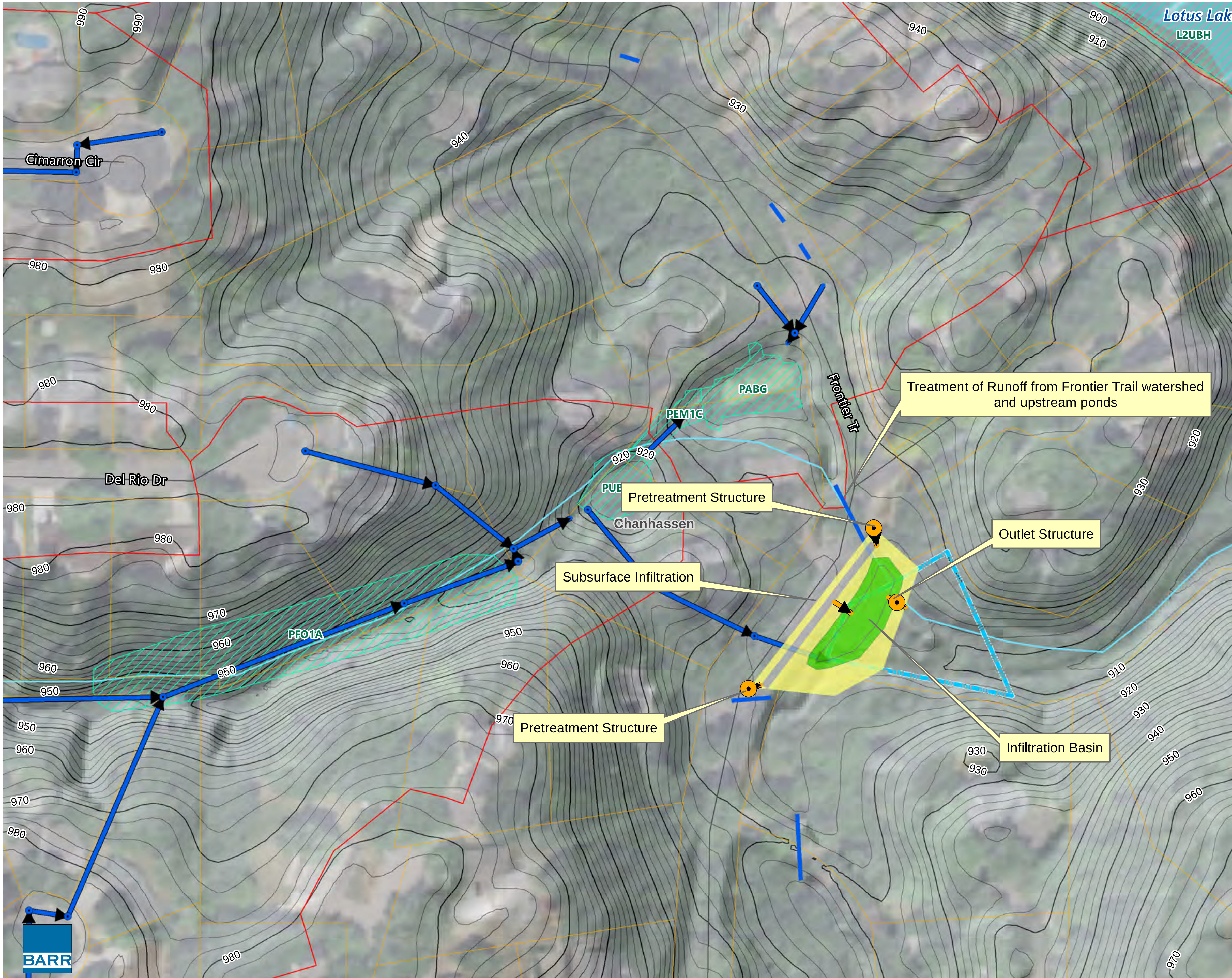
- Site grading to clear and remove many trees in proposed basin area
- Construction of infiltration basin with an invert at 910.0, assuming an infiltration rate of 0.2 inch/hr (HSG C)
- Construction of outlet structure with discharge elevation at 911.5
- Construction of overflow berm at downstream end of basin to elevation 912
- Basin provides water quality volume of 15,238 cf below the outlet structure and additional flood storage of 5,814 cf between the outlet structure and berm overflow
- Construction of associated storm sewer
- Tree planting to occur adjacent to the infiltration basin along with sedge meadow and pollinator vegetation to restore habitat value and improve biodiversity and soil health



Lotus Lake
L2UBH
Cimarron Cir
Del Rio Dr
Frontier Tr
Chanhassen
PABG
PEM1C
PFO1A
Treatment of Runoff from Frontier Trail watershed and upstream ponds
Pretreatment Structure
Outlet Structure
Pretreatment Structure
Infiltration Basin
Proposed Concept LL_8a
FIGURE 4-12
Project Area
P8 Subwatershed
Parcel Boundary
NWI Wetland
Lake/Pond
Municipal Boundary
Surface Contours (MN DNR, 2011)
10ft contour
2ft contour
Stormsewer (Chanhassen)
Structure
Culvert
Storm Sewer
Proposed Concept Description
Infiltration Basin
Restoration Area
Modified Outlet Structure
Storm Sewer
N
100 0 100
Feet
RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT
BARR

#### 4.4.1.2 LL_8b: Subsurface Infiltration with Infiltration Basin

- Site Grading to clear and remove trees (fewer than LL_8a) in the existing channel area closest to the roadway
- Construction of Subsurface Infiltration Chamber with bottom at 909.2, discharge elevation at 910.0, and top height at 912.0, assuming an infiltration rate of 0.2 inch/hr (HSG C)
- Construction of surface infiltration basin with an invert at 909.2, outlet discharge elevation at 910, and overflow berm at 912
- The combined subsurface and surface infiltration basins provide a water quality volume of 3,227 cf below the outlet structures at 910, and additional flood storage of 10,550 cf between the outlet structure and berm overflow
- Tree planting to occur within the infiltration basin along with sedge meadow and pollinator vegetation to restore habitat value and improve biodiversity and soil health




# Proposed Concept LL_8b

## FIGURE 4-13

Project Area
P8 Subwatershed
Parcel Boundary
NWI Wetland
Lake/Pond
Municipal Boundary

Surface Contours (MN DNR, 2011)
10ft contour
2ft contour

Stormsewer (Chanhassen)
Structure
Culvert
Storm Sewer

Proposed Concept Description
Infiltration Basin
Restoration Area
Subsurface Infiltration
Modified Outlet Structure
Storm Sewer

N

100 0 100
Feet

RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

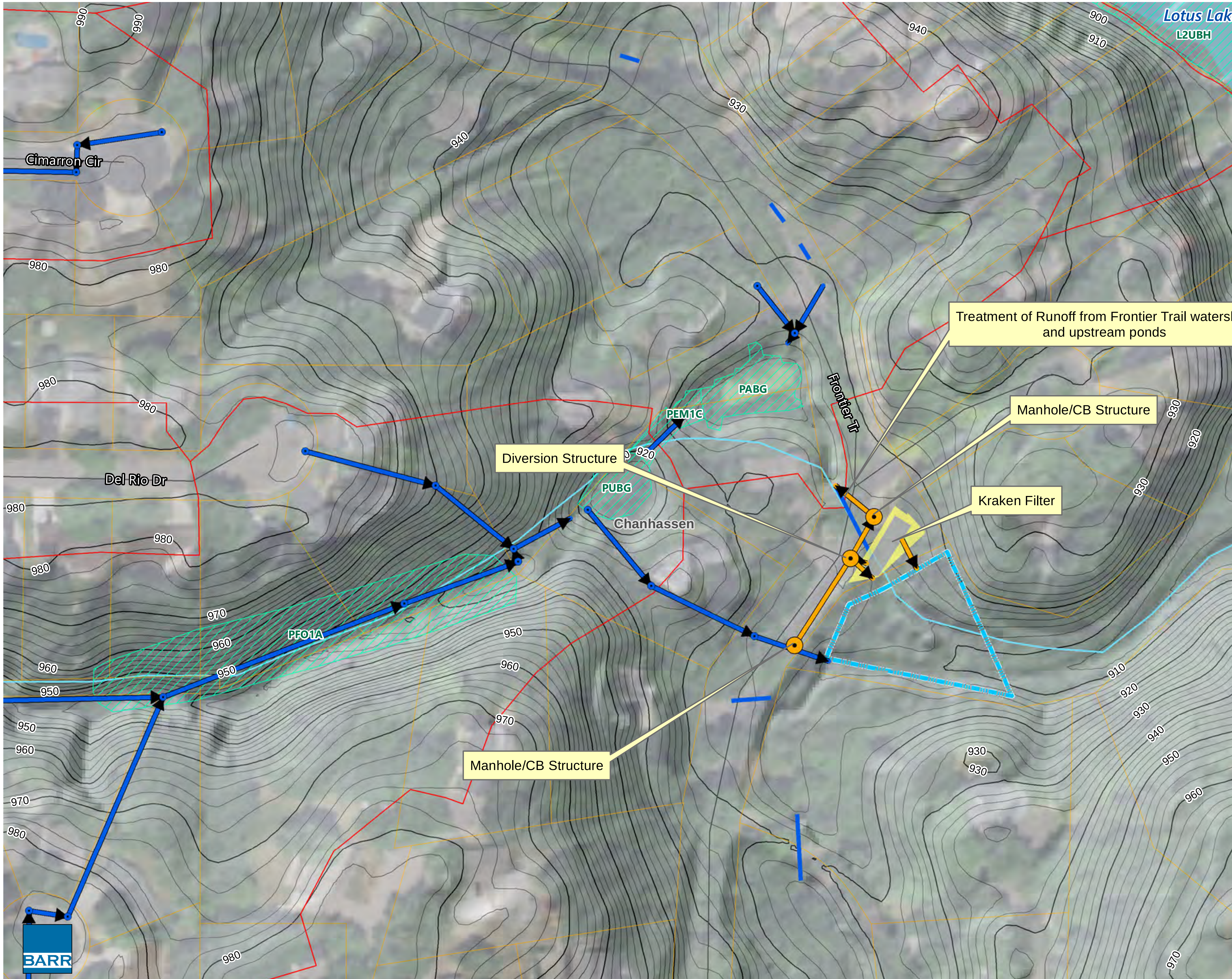
Riley Purgatory Bluff Creek Watershed District - Lotus Lake Water Quality Project

#### 4.4.1.3 LL_8c: Kraken Filter

- Evaluation of Kraken Filter, selected to treat able to treat 2.16 cfs. The Kraken filter was selected as it is able to treat a higher flow rate than many other MTDs, with a similar footprint.
- Construction of associated storm sewer to divert low flows through the Kraken Filter, while allowing high flows to bypass.
- Restoration of appropriate native vegetation withing the disturbance extents.

# Proposed Concept LL_8c

FIGURE 4-14




Project Area
P8 Subwatershed
Parcel Boundary
NWI Wetland
Lake/Pond
Municipal Boundary

Surface Contours (MN DNR, 2011)
10ft contour
2ft contour

Stormsewer (Chanhassen)
Structure
Culvert
Storm Sewer

Proposed Concept Description
Krakken/Restoration
Restoration
Modified Outlet Structure
Storm Sewer

N

100 0 100
Feet

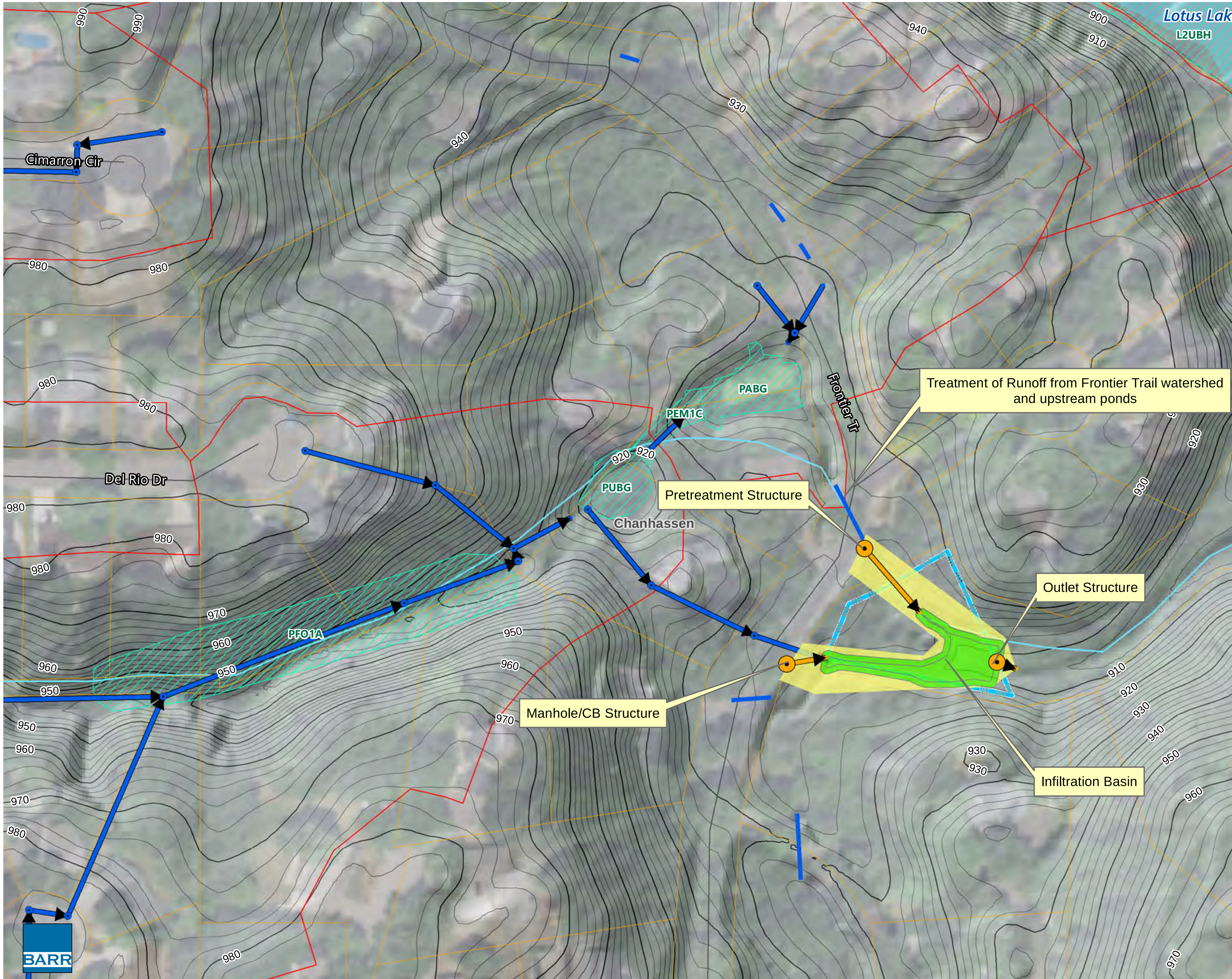
RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

#### 4.4.1.4 LL_8d: Small Footprint Infiltration Basin

- Site grading to clear and remove trees, however concept attempts to preserve existing trees on the elevated ground within the outlot area between the two inflow channels.
- Construction of infiltration basin with an invert at 909
- Construction of outlet structure with discharge elevation at 910.5
- Construction of overflow berm at downstream end of basin to elevation 912
- Basin provides water quality volume of 6,709 cf below the outlet structure and additional flood storage of 10,864 cf between the outlet structure and berm overflow
- Construction of associated storm sewer
- Restoration of basin with appropriate native vegetation

# Proposed Concept LL_8d

**FIGURE 4-15**




Project Area
P8 Subwatershed
Parcel Boundary
NWI Wetland
Lake/Pond
Municipal Boundary

Surface Contours (MN DNR, 2011)
10ft contour
2ft contour

Stormsewer (Chanhassen)
Structure
Culvert
Storm Gravity Main

Proposed Basin Description
Infiltration Basin
Restoration Area
Modified Outlet Structure
Storm Sewer

N

100 0 100
Feet

RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

### 4.4.2 Anticipated Hydraulic Performance

Table 4-12 below summarizes the anticipated impacts of each concept on peak elevation and discharge from the out-lot as well as the estimated peak discharge, velocity, depth, and shear stress in the downstream ravine.

Concept LL_8c does not impact the existing on-site hydraulics. Concepts LL_8a, LL_8b, and LL_8d all show an increase in peak elevation based on the proposed construction of berms above existing grade to hold back water. Peak discharge is significantly reduced during each storm event for concepts LL_8a, LL_8b, and LL_8c.

### Table 4-12 Anticipated Hydraulic Performance of Concepts at LL_8

| Atlas-14 Design Storm Event | | Existing | LL_8a | LL_8b | LL_8c | LL_8d |
|---|---|---|---|---|---|---|
| 1-Year 24-Hour | Peak Elevation (ft) | 909.6 | 912.4 | 912.2 | 909.6 | 912.3 |
| | Peak Discharge (cfs) | 68 | 25 | 27 | 68 | 26 |
| | Peak Velocity (cfs) | **4.2** | 1.4 | 1.4 | **4.2** | 1.4 |
| | Peak Depth (ft) | 1.3 | 1.4 | 1.4 | 1.3 | 1.4 |
| | Peak Shear (lbs/sf) | **0.2** | **0.2** | **0.2** | **0.2** | **0.2** |
| 2-Year 24-Hour | Peak Elevation (ft) | 909.8 | 912.5 | 912.4 | 909.8 | 912.5 |
| | Peak Discharge (cfs) | 88 | 36 | 36 | 88 | 36 |
| | Peak Velocity (ft/s) | **4.4** | 1.5 | 1.5 | **4.4** | 1.5 |
| | Peak Depth (ft) | 1.4 | 1.7 | 1.7 | 1.4 | 1.7 |
| | Peak Shear (lbs/sf) | **0.2** | **0.2** | **0.2** | **0.2** | **0.2** |
| 10-Year 24-Hour | Peak Elevation (ft) | 910.4 | 912.9 | 912.8 | 910.4 | 912.8 |
| | Peak Discharge (cfs) | 158 | 82 | 82 | 158 | 82 |
| | Peak Velocity (ft/s) | **5.0** | **1.8** | **1.8** | **5.0** | **1.8** |
| | Peak Depth (ft) | 2.0 | 2.5 | 2.5 | 2.0 | 2.5 |
| | Peak Shear (lbs/sf) | **0.3** | **0.4** | **0.4** | **0.3** | **0.4** |
| 100-Year 24-Hour | Peak Elevation (ft) | 911.4 | 914.2 | 914.2 | 911.4 | 914.3 |
| | Peak Discharge (cfs) | 350 | 192 | 191 | 350 | 191 |
| | Peak Velocity (ft/s) | **5.7** | **2.2** | **2.2** | **5.7** | **2.2** |
| | Peak Depth (ft) | 2.9 | 3.7 | 3.7 | 2.9 | 3.7 |
| | Peak Shear (lbs/sf) | **0.4** | **0.5** | **0.5** | **0.4** | **0.5** |

Notes

(1) Based on available SSURGO data and infiltration testing results, the predominant exposed soil at LL_8 is likely a sandy loam. Values in bold indicate velocities and shear stresses that exceed the erosive threshold for bare sandy loam soils (1.75 ft/s and 0.03-0.04 lbs/sf) (Fischenich, 2001)

### 4.4.3 Anticipated Water Quality Improvements

P8 modeling results for the above conceptual designs are summarized in Table 4-13 below. The basin design with the largest footprint, Concept LL_8a, results in the largest pollutant load reductions.

**Table 4-13 Estimated P8 Sediment and Total Phosphorus Removal at Site LL_1 by Concept**

| Alternative | Description | Sediment Load Reduction (1) (lbs/yr) | TP Load Reduction (2) (lbs/yr) |
|---|---|---|---|
| LL-8a | Large Infiltration Basin | 4757 | 14.3 |
| LL-8b | Subsurface Infiltration with Infiltration Basin | 3262 | 6.7 |
| LL-8c | Kraken Filter | 1525 | 5.9 |
| LL-8d | Small Footprint Infiltration Basin | 3811 | 9.0 |

### 4.4.4 Engineer's Opinion of Probable Cost

Table 4-14 below summarizes the Engineer's Opinion of Probable Cost at site LL_8.

**Table 4-14 Engineer's Opinion of Probable Cost for Concepts at LL_8**

| Alternative: | | LL_8a | LL_8b | LL_8c | LL_8d |
|---|---|---|---|---|---|
| Point Estimate | | $384,000 | $384,000 | $545,000 | $343,000 |
| Cost Range | Low | $269,000 | $269,000 | $382,000 | $241,000 |
| | High | $576,000 | $576,000 | $818,000 | $515,000 |
| 30-Year Annualized Project Cost | | $12,800 | $12,800 | $18,167 | $11,433 |
| 30-Year Annualized O&M | | $17,672 | $8,450 | $13,000 | $17,672 |
| Total 30-Year Annualized Cost | | $30,472 | $21,250 | $31,167 | $29,106 |
| Annual TP Removal Cost ($/lb TP/yr) | | $2,100 | $3,200 | $5,300 | $3,200 |
| Annual TSS Removal Cost ($/lb TSS/yr) | | $10 | $10 | $20 | $21 |

### 4.4.5 Wetland and Upland Impacts

There are no wetlands located on-site at LL_8. The proposed concepts will receive runoff from an upstream stormwater pond, as well as runoff from Frontier Trail.

The concepts involve varying extents of disturbance within the site. Concept LL_8a involves the most disturbance and tree removal to re-grade the ravine and construct a stormwater basin.  Concepts LL_8b, LL8d, and LL_8e all involve smaller-footprint infiltration basin or berm construction that would require varying levels of tree removal. Concept LL_8c (Kraken Filter) will not involve tree removal. Estimated impacts are summarized in Section 5.0.

Exact numbers of tree removal for the chosen concept would be quantified during final design and replacement of trees can be discussed as part of the restoration plan.

### 4.4.6 Regulatory Approval

The channel passing through the LL_8 is mapped as an MnDNR public watercourse.  An MnDNR public waters permit for work may be required, depending on the type of work and contributing watershed area (which is less than 5 square miles).

Although a wetland delineation has not been completed, the proposed project extents do not include any mapped wetlands through the NWI, the District's wetland (MnRAM data), nor the City of Chanhassen's wetland data.  A wetland delineation should be completed to determine if wetlands are present and if any mapped wetlands would be determined to be USACE jurisdictional.  If a wetland is mapped, the project will require approval under WCA. The City of Chanhassen is the WCA wetland permitting authority for this project.  If the wetland would be determined to be jurisdictional, the project may require USACE permits.

The City of Chanhassen earth work permit will be required for any project that disturbs or hauls between 50 CY and 1000 CY of soil/ground or any amount of material if it changes drainage patterns.

The MPCA regulates the National Pollutant Discharge Elimination System (NPDES) stormwater permitting program. A NPDES construction stormwater permit is required for construction projects disturbing 1 acre or more of soil.  The MPCA will also require a stormwater pollution prevention plan (SWPPP). The estimated disturbance limits for all of the LL_8 concepts is not expected to exceed 1 acre, and it will not require a MPCA NPDES construction stormwater permit and SWPPP.  However, if implemented as part of the city's larger road reconstruction project, an NPDES permit will be required.

RPBCWD regulates the control of floodwater to ensure the preservation of floodplains and flood storage areas, improve water quality, preserve vegetation, alleviate identified erosion problems, ensure the preservation of wetland and creek buffers, and prevent erosion of shorelines and stream banks. A RPBCWD permit will be required, although the applicable rules will depend on the final site design and configuration. It is anticipated that a permit for Rule B – Floodplain Management and Drainage Alterations, Rule C – Erosion and Sediment Control, Rule D – Wetland and Creek Buffers, Rule F – Shoreline and Streambank Stabilization, and Rule J – Stormwater Management may be required.

### 4.4.7 Affected Property Owners

The project would impact property owned by the Frontier Trail Association property and right of way along Frontier Trail. This area includes a drainage and utility easements for sanitary sewer through this area. The impacts would include clearing select trees, removal of some brush, excavation, potential grading and installation of stabilization measures, and site restoration.

Additionally, the RPBCWD will need to enter into a cooperative agreement with the City to define the roles of each partner during the project development, construction, and maintenance periods. During construction, the likely construction entrance would be constructed off Frontier Trail through ravine adjacent to Frontier Ct.

## 4.5 BMP Site Kerber Pond Ravine Stabilization: Concept 1

While two conceptual designs for ravine stabilization were presented in the Kerber Pond Ravine Feasibility Study (Barr Engineering, 2020); this report will summarizes Concept 1, the design recommended for implementation (see Figure 4-16).

Concept 1 involves in-channel ravine stabilization practices including the following:

- Modifications to the Kerber Pond outlet, including stabilizing the outlet pipe, flared end structure, and scour hole
- Installation of rock riffles, rock vanes, or log check dams, along the ravine profile, especially in steeper portions of the channel where actively eroding banks have been observed and at locations with existing head cuts and drops

- Stabilization of eroding banks with grading and use of targeted rock placement along banks, focusing on the steeper portions of the channel where active bank erosion has been observed
- Stabilization of two eroding side channels to the ravine with rock or drop structures
- Restoration of disturbed slopes utilizing shade tolerant vegetation due to the existing canopy cover

### 4.5.1 Anticipated Water Quality Improvements

Watershed pollutant loads and pollutant removals along Kerber Pond ravine were estimated with the same methodology used at site LL_3 to quantify stream bank and in-channel erosion processes: the Bank Assessment for Non-Point Source Consequences of Sediment (BANCS)

The BEHI and NBS estimation tools were applied using channel information from available LiDAR data, site visit and field notes, and photos of the ravine for each segment of ravine potentially contributing sediment to the channel. Table 4-15 summarizes the BEHI and NBS ratings along the Kerber Pond Ravine.

**Table 4-15 Estimated Bank Erosion Hazard Index (BEHI) and Near-Bank Stress (NBS) along Kerber Pond Ravine**

| Reach | US Station | DS Station | Distance (ft) | BEHI | NBS |
|---|---|---|---|---|---|
| LL-9.1 | 0 | 50 | 50 | Very High | High |
| | 50 | 120 | 70 | Very High | Low |
| | 120 | 220 | 100 | High | Low |
| | 220 | 320 | 100 | High | Low |
| LL-9.2 | 320 | 500 | 180 | Moderate | Low |
| LL-9.3 | 500 | 920 | 420 | Moderate | Low |
| | 920 | 1010 | 90 | Moderate | Moderate |

The BEHI/NBS estimated erosion rate for each segment of the ravine was compared to the typical erosion ranges presented in the Streambank Erosion section of the Natural Resource Conservation Service (NRCS), Wisconsin Field Office Technical Guide (August 2015). The BEHI/NBS estimated erosion indices for the Kerber Pond ravine reaches were compared to the NRCS guidance, falling within the moderately erosive category and the upper and lower bounds for this classification were used to establish the range in the estimated sediment and total phosphorus load reductions.

The annual erosion rates, estimated sediment and total phosphorus loads, and the ravine stabilization benefits (load reductions) are shown in Table 4-3. The reduction in total phosphorus load ranges from 0.8 lbs/yr to 3.8 lbs/yr, with the point estimate of 2.9 lbs/yr.  These estimates are used to quantify the TP reduction benefit of stabilizing the ravine and demonstrate that stabilizing the Kerber Pond Ravine could help meet approximately 50% of the annual load reduction assigned to erosion sources in the Lotus Lake TMDL. In addition to reduce the phosphorus load to the lake, stabilization of the ravine would reduce the sediment loading to the lake by roughly 5,820 lbs/yr.

**Table 4-16 Estimated Sediment and Total Phosphorus Removal by Ravine Stabilization**

| Reach | Stationing | Estimated Bank Erosion[1] (ft/yr) | Estimated Average Bank Height (ft) | Estimated Eroding Ravine Length (ft) | Sediment Load Reduction [1] (lbs/yr) | TP Load Reduction [2] (lbs/yr) |
|---|---|---|---|---|---|---|
| LL-9.1 | 0+00 to 0+50 | 0.17 (0.06 – 0.20) | 3 | 37.5 | 1,570 (430-1,950) | 0.79 (0.22-0.98) |
| | 0+50 to 1+20 | 0.17 (0.06 – 0.20) | 2.5 | 52.5 | 1,840 (510-2,280) | 0.92 (0.25-1.14) |
| | 1+20 to 2+20 | 0.17 (0.06 – 0.20) | 1.5 | 75 | 1,570 (430-1,950) | 0.79 (0.22-0.98) |
| | 2+20 to 3+20 | 0.17 (0.06 – 0.20) | 0.5 | 75 | 520 (140-650) | 0.26 (0.07-0.33) |
| LL-9.2 | 3+20 to 5+00 | 0.09 (0.06 – 0.20) | 0.5 | 45 | 160 (90-390) | 0.08 (0.04-0.20) |
| LL-9.3 | 5+00 to 9+20 | 0.09 (0.06 – 0.20) | 0.5 | 0 | 0 (0-0) | 0.00 (0.00-0.00) |
| | 9+20 to 10+10 | 0.09 (0.06 – 0.20) | 0.5 | 45 | 160 (90-390) | 0.08 (0.04-0.20) |
| ***Total*** | | | | | ***5,820 (1,690-7,610)*** | ***2.9 (0.8-3.8)*** |

Note(s):
(1) High and low erosion estimates were based on comparison with the BEHI/NBS erosion rate point estimate in combination with the table in the Streambank Erosion section of the WI NRCS Field Office Technical Guide (Wisconsin Natural Resources Conservation Service, 2015). Erosion under existing conditions was estimated based on field visit.
(2) TP estimated based on conversion factor presented in the Minnesota Board of Water and Soil Resources Pollution Reduction Estimator for loam soils (September 2010)

In addition to the estimated water quality improvements, restoration provides opportunity to restore/create new habitat and improve ecological function of the ravine. Stabilization of actively eroding areas can also preserve the existing soil profile and can protect soil health. Because an existing sanitary sewer runs along the thalweg of the ravine, the stabilization of the ravine will protect this existing infrastructure and may provide better access to this infrastructure through the project design.

### 4.5.2 Engineer's Opinion of Probable Cost

Table 4-17 below summarizes the Engineer's Opinion of Probable Cost at site Kerber Pond Ravine.

**Table 4-17 Engineer's Opinion of Probable Cost for Concept 1 at Kerber Pond Ravine**

| Concept: | | Concept 1 |
|---|---|---|
| Point Estimate | | $460,000 |
| Cost Range | Low | $320,000 |
| | High | $680,000 |
| 30-Year Annualized Project Cost | | $15,333 |
| 30-Year Annualized O&M | | $5,700 |
| Total 30-Year Annualized Cost | | $21,033 |
| Annual TP Removal Cost ($/lb TP/yr) | | $7,200 |
| Annual TSS Removal Cost (%/lb TSS/yr) | | $4 |

Notes

(1) Cost to purchase additional easements as may be needed is not included in the costs listed above. However, the purchase of a permanent easement for construction and access could be between $100,000 and $225,000 assuming a 20 to 40 ft wide easement along the length of the ravine at a cost of $5/SF.

### 4.5.3 Wetland and Upland Impacts

Both Kerber Pond and Lotus Lake are mapped as national wetlands inventory (NWI) wetlands the ravine is mapped as part of the NWI as a riverine wetland. Additionally, Kerber Pond and Lotus Lake are mapped as MnDNR public waters inventory (PWI) basins; however, the ravine is not mapped as an MnDNR public water course. A wetland delineation has not yet been completed. However, conversations with city, district, and agency (MnDNR and USACE) indicate the lower portion of the ravine near Frontier Trail will likely be delineated as a wetland.

The City of Chanhassen is the wetland permitting authority responsible for administering the Wetland Conservation Act (WCA) for this project. At the time of the wetland delineation, a MnRAM assessment will need to be completed to determine the RPBCWD's wetland value and buffer requirements as well as the city's management strategy.

Based on available information, the proposed modification to the ravine in Concept 1 will stabilize areas of existing headcuts and drops, which is likely within a mapped wetland area (to be determined with a future wetland delineation). However, this disturbance is not anticipated to change the wetland type, functions, or wildlife habitat.

Some tree removal may be necessary for access and construction, especially along the upstream reach of the ravine. However, much of the existing canopy is located on the upper slopes of the ravine, so much of the work could be done without impacts to the main canopy. Exact numbers of tree removal would be quantified during final design and replacement of trees can be discussed as part of the restoration plan. The area also has many downed trees currently laying over the existing channel that would need to be removed for construction.

### 4.5.4 Regulatory Approval

Approval of the project under WCA will be required. Also, a grading permit for Conceptual 1 will be required by the City of Chanhassen. There may be temporary wetland impacts to stabilize and restore the ravine.

The MnDNR regulates work below the ordinary high-water level (OHWL) of public waters. A detailed topographic survey will need to be completed as part of project design. However, Concept 1 proposes changes to the Kerber Pond outlet including potential work below the OHWL for both Kerber Pond (OHWL not established). Because work will likely occur below the OHWL, approval under RPBCWD's regulatory framework is needed unless a project specific Public Water Work Permit is obtained from the MnDNR.

Additionally, conversation with the United States Army Corps of Engineers (USACE) staff indicated they will likely have jurisdiction over the Kerber Pond ravine based on the presence of NWI mapping along the ravine and the flow conditions in the channel. Based on the proposed Concept 1, agency staff indicated that this project will likely fall under Nationwide Permit 13 (Bank Stabilization). However, if it is longer than 500 ft of stabilization along the bank, a waiver may be needed as well.

The MPCA regulates the National Pollutant Discharge Elimination System (NPDES) stormwater permitting program. A NPDES construction stormwater permit is required for construction projects disturbing 1 acre or more of soil. The MPCA will also require a stormwater pollution prevention plan (SWPPP). The estimated disturbance limits for this concept may be close to 1 acre and if paired with the City's CIP project for the reconstruction project for Frontier Trail, will likely require an MPCA NPDES construction stormwater permit and SWPPP.

RPBCWD regulates the control of floodwater to ensure the preservation of floodplains and flood storage areas, improve water quality, preserve vegetation, alleviate identified erosion problems, ensure the preservation of wetland and creek buffers, and prevent erosion of shorelines and stream banks. A RPBCWD permit will be required, although the applicable rules will depend on the final site design and configuration. It is anticipated that a permit for Rule B – Floodplain Management and Drainage Alterations, Rule C – Erosion and Sediment Control, Rule D – Wetland and Creek Buffers, Rule F – Shoreline and Streambank Stabilization, and Rule J – Stormwater Management may be required.

### 4.5.5 Affected Property Owners

Property ownership along the Kerber Pond Ravine is nearly all private except at the outlet from Kerber Pond itself (in city park property) and at the Frontier Trail crossing (in right of way). The project would impact city park property and 12 private parcels. The impacts would include clearing select trees, removal of some brush, excavation, installation of stabilization measures, site restoration, and buffer designations.

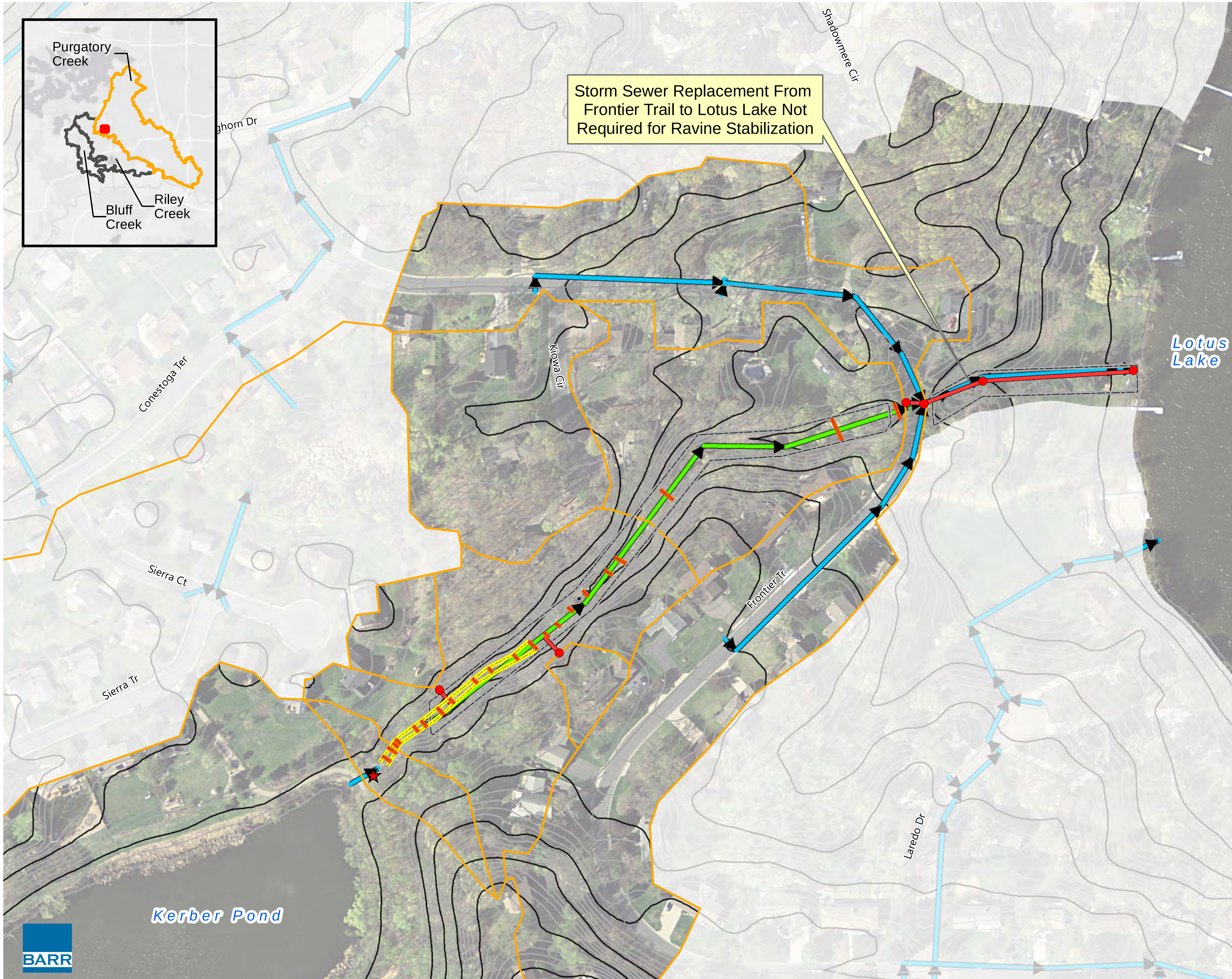
Kerber Pond and the outlet are located within City of Chanhassen park property. However, the Kerber Pond ravine channel is located on private property from the point downstream of the City of Chanhassen Park Property to Frontier Trail. There is a 40-foot-wide drainage and utility easement that follows the existing sanitary sewer alignment from the park property to Frontier Trail.

Most of the work associated with the proposed concept might be able to be completed within City of Chanhassen property or the existing drainage and utility easement areas. However, there may be locations where this work will extend outside the existing drainage and utility easements. Because drainage and utility easement do not convey any property rights to RPBCWD, easements or access/construction/maintenance agreements will be needed to secure access, construction and maintenance easements covering all areas with potential land-disturbing activities. Although planning level easements costs have been estimated as part of this study, the actual easements will be further defined as part of final design, should the project move forward.

Additionally, the RPBCWD will need to enter into a cooperative agreement with the City to define the roles of each partner during the project development, construction, and maintenance periods. During construction, the likely construction entrance would be constructed off Frontier Trail through the backyard at 7200 Frontier Trail. A second access route could be via trail in the City of Chanhassen Park property at the head of the ravine, although access here will be narrow and require more significant removal of vegetation to access the ravine channel.

# Kerber Pond Ravine Concept 1

## FIGURE 4-16




**Proposed Stabilization**

- Targeted Rock Armoring
- Rock Riffle/Log Check Dams
- Outlet modification at Kerber Pond
- Proposed Storm Manhole/Structure
- Proposed Storm Sewer
- Existing Easement (Approx)
- Purgatory Creek Watershed
- Subwatersheds
- Storm Sewer
- Sanitary Sewer

2 Foot Contours, Carver County, 2011

- 10-Foot Contour
- 2-Foot Contour

N

0 75 150 300 Feet

RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

# 5.0 Conceptual Design Summary

Table 5-1 summarizes the estimated annual total phosphorus removal, site impacts, and Engineer’s opinion of probable cost for each of concept design considered at each of the BMP sites evaluated in the study as well as the concepts from the 2020 Kerber Pond Ravine Feasibility Study (Barr Engineering, 2020).

## Table 5-1 Summary of Lotus Lake Water Quality Improvement Concepts

| Location | Description | Opinion of Probable Cost (-30% - +50%) | Annual Project Cost | Annual O&M | Total Annual Cost(1) | Volume Retention (ac-ft/yr) | Increase in TP removal (lbs/yr) | Annualized TP Removal Cost ($/lbs/yr) | Increase in TSS Removal (lbs/yr) | Annualized TSS Removal Cost ($/lbs/yr) | Restoration Area (ac) (2) | Potential Wetland Impacts (ac) (2) | Public or Private Property | Easement Required | Potential for Education and Engagement | Potential Partnership with City |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LL_1 | LL_1a - Filtration Basin (IESF) | $1,439,000 ($1,008,000 - $2,159,000) | $47,967 | $34,202 | $82,169 | N/A | 13.7 | $6,000 | 3958 | $21.00 | 3.8 | 0.0 | Public | No | High | X |
| | LL_1a - Infiltration Basin | $1,295,000 ($907,000 - $1,943,000) | $43,167 | $34,202 | $77,369 | 33.8 | 17.2 | $4,500 | 3958 | $20.00 | 3.8 | 0.0 | Public | No | High | X |
| | LL_1b - Filtration/Intermittent Swale (IESF) | $1,378,000 ($965,000 - $2,067,000) | $45,933 | $30,794 | $76,727 | N/A | 12.0 | $6,400 | 3586 | $21.00 | 3.6 | 0.0 | Public | No | High | X |
| | LL_1b - Infiltration/Intermittent Swale | $1,333,000 ($934,000 - $2,000,000) | $44,433 | $30,094 | $74,527 | 30.0 | 15.2 | $4,900 | 3586 | $21.00 | 3.6 | 0.0 | Public | No | High | X |
| LL_3 | LL_3a - Rock Check Dam to Stabilize Channel Sediment | $53,000 ($38,000 - $80,000) | $1,767 | $500 | $2,267 | N/A | 2.1 | $1,100 | 2,560 | $1.00 | 0.04 | 0.02 | Public | Yes | Low | X |
| | LL_3b - Modify Structure to Stabilize Channel Sediment | $65,000 ($46,000 - $98,000) | $2,167 | $500 | $2,667 | N/A | 2.1 | $1,300 | 2,560 | $1.00 | 0.04 | 0.02 | Public | Yes | Low | X |
| | LL_3c - Modify Structure to Stabilize Channel Sediment and Stabilize Channel | $150,000 ($105,000 - $225,000) | $5,000 | $1,000 | $6,000 | N/A | 2.1 | $2,800 | 2,560 | $2.00 | 0.70 | 0.11 | Public | Yes | Low | X |
| LL_7 | LL_7a - Extended Detention - Upper Wetland | $118,000 ($83,000 - $177,000) | $3,933 | $500 | $4,433 | N/A | 0.6 | $7,400 | 139 | $30.00 | 0.21 | 0.0 | Public | No | Low | - |
| | LL_7b - Extended Detention - Lower Wetland | $395,000 ($277,000 - $593,000) | $13,167 | $500 | $13,667 | N/A | 0.7 | $19,500 | 136 | $100.00 | 0.11 | 0.08 | Public | No | Low | - |
| | LL_7c - Extended Detention - Lower Wetland & Subsurface IESF | $703,000 ($493,000 - $1,055,000) | $23,433 | $7,500 | $30,933 | N/A | 4.6 | $6,700 | 136 | $230.00 | 0.15 | 0.08 | Public | No | Low | - |
| | LL_7d - Storm Sewer Diversion and Extended Detention - Lower Wetland | $560,000 ($392,000 - $840,000) | $18,667 | $1,000 | $19,667 | N/A | 13.2 | $1,500 | 3683 | $5.00 | 0.24 | 0.56 | Public | No | Low | - |
| | LL_7e - Storm Sewer Diversion and Extended Detention - Lower Wetland & Subsurface IESF | $865,000 ($606,000 - $1,298,000) | $28,833 | $8,000 | $36,833 | N/A | 20.8 | $1,800 | 3634 | $10.00 | 0.24 | 0.56 | Public | No | Low | - |
| LL_8 | LL_8a - Infiltration Basin | $384,000 ($269,000 - $576,000) | $12,800 | $17,672 | $30,472 | 16.4 | 14.3 | $2,100 | 4757 | $10.00 | 0.5 | 0.0 | Private | Yes | Low | X |
| | LL_8b - Subsurface Infiltration & Infiltration Basin | $384,000 ($269,000 - $576,000) | $12,800 | $8,450 | $21,250 | 5.8 | 6.7 | $3,200 | 3262 | $10.00 | 0.3 | 0.0 | Private | Yes | Low | X |
| | LL_8c - Kraken Filter | $545,000 ($382,000 - $818,000) | $18,167 | $13,000 | $31,167 | N/A | 5.9 | $5,300 | 1525 | $20.00 | 0.06 | 0.0 | Public Right of Way/ Private | Maybe | Low | X |
| | LL_8d - Reduced Footprint Infiltration Basin | $343,000 ($241,000 - $515,000) | $11,433 | $17,672 | $29,106 | 8.8 | 9.0 | $3,200 | 3811 | $21.00 | 0.4 | 0.0 | Private | Yes | Low | X |
| Kerber Pond Ravine | Concept 1: Channel Stabilization Measures | $460,000 ($320,000 - $680,000) | $15,333 | $5,700 | $21,033 | N/A | 2.9 | $7,200 | 5820 | $4.00 | 0.5 | ~TBD – Less(3) | Private | Yes | Low | X |
| | Concept 2: Low-Flow Channel, High-Flow Storm Sewer | $780,000 ($540,000 - $1,180,000) | $26,000 | $9,700 | $35,700 | N/A | 2.9 | $12,300 | 5820 | $10.00 | 0.8 | ~TBD – More(3) | Private | Yes | Low | X |
| | Storm Sewer Replacement from Frontier Trail to Lotus Lake | $300,000 ($210,000 - $450,000) | $10,000 | N/A | $10,000 | N/A | N/A | N/A | N/A | N/A | 0.5 | N/A | Private | Yes | Low | X |

(1) Based on a 30-year period. Includes estimated costs for permitting, engineering, and construction; and estimated annual operation and maintenance costs.
(2) Wetland delineations, topographic surveys, and tree surveys will need to be completed as part of final design. Wetland impacts area to be determined (TBD) during final design when wetland delineation is complete – listed as relative to each concept. Total impacts area is approximate and will be optimized during the next phase of design.

## 5.1 RPBCWD CIP Prioritization Score

The BMPs evaluated in this study were included in the 10-year capital improvement program (exception being the Kerber Pond Ravine stabilization project). The BMPs were ranked using the District's prioritization metric which resulted in the scores summarized in Table 5-2 and Figure 5-1. Typically, a prioritization score of 30 or higher is used to identify when a project is carried forward into the district's 10-year capital improvement program (CIP) in the 10-year plan.

With the exception of site LL_3, all sites within the Lotus Lake watershed have BMP concepts identified that exceed a prioritization score of 30, ranking the potential projects above the threshold used for the incorporation into the RPBCWD CIP.

**Table 5-2 Lotus Lake Project Benefit Score[1]**

| Metric | LL_1a[2] | LL_1b[2] | LL_3a | LL_3b | LL_3c | LL_7a | LL_7b | LL_7c | LL_7d | LL_7e | LL_8a | LL_8b | LL_8c | LL_8d | Kerber Pond Ravine |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Goal Index | 4 - 4 | 4 - 4 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 3 | 2 |
| Sustainability Index | 7 - 7 | 7 - 7 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 5 | 5 | 3 | 5 | 7 |
| Volume Management Index | 1 - 7 | 1 - 4 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 1 |
| Pollutant Management | 5 - 7 | 5 - 5 | 1 | 1 | 1 | 1 | 1 | 3 | 5 | 7 | 5 | 5 | 5 | 5 | 1 |
| Stabilization | 0 - 0 | 0 - 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| Habitat Restoration | 5 - 5 | 5 - 5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 3 | 5 |
| Partnership | 7 - 7 | 7 - 7 | 7 | 7 | 7 | 3 | 3 | 3 | 3 | 3 | 7 | 7 | 7 | 7 | 5 |
| Education | 7 - 7 | 7 - 7 | 5 | 5 | 5 | 5 | 5 | 7 | 5 | 7 | 1 | 1 | 1 | 1 | 3 |
| Watershed Benefit | 7 - 7 | 7 - 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| **Total Benefit Score** | **43 - 51** | **43 - 49** | 29 | 29 | 29 | 23 | 23 | 29 | 29 | **33** | **38** | **37** | 27 | **38** | **34** |

Note:
(1) See Section 4 of 10-Year Watershed Management Plan for additional details about the RPBCWD prioritization methodology and associated descriptions for the variables used to assess multiple project benefits. Typically, projects scoring above a 30 are carried through the RPBCWD prioritization process although projects scoring less than 30 could be considered based on other logistical considerations.
(2) Range in numbers reflects the proposed concept constructed as a filtration system (lower score) versus an infiltration system (higher score)

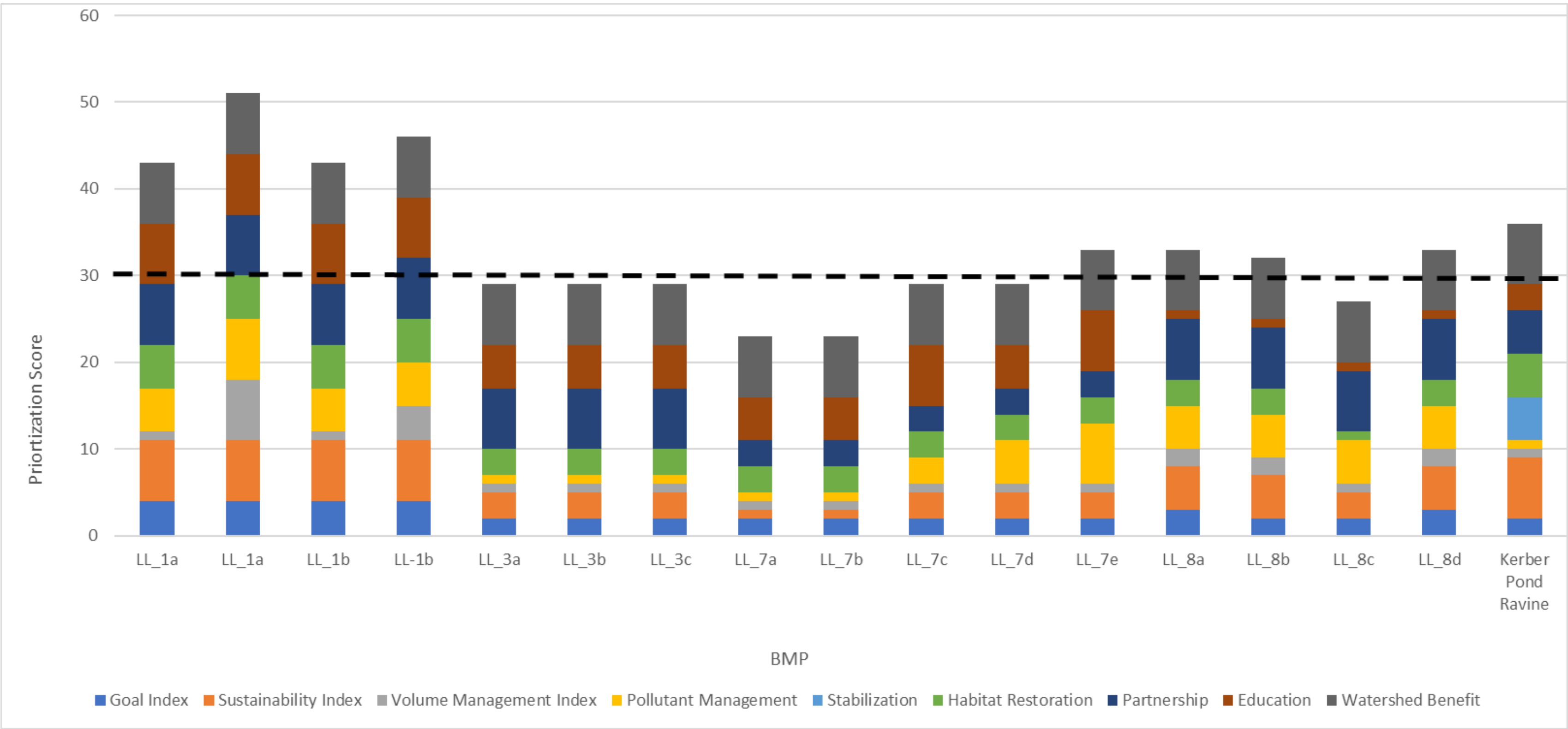



**Figure 5-1 Lotus Lake Project Benefit Scores**

# 6.0 Recommendations

Based on the results of the engineering assessment, potential site impacts, phosphorous removed, restoration and education opportunities, and opportunities for partnership with the City of Chanhassen aligning with their upcoming roadway reconstruction projects, the following is a summary of the feasibility study recommendations for the Lotus Lake watershed. Because the TMDL for Lotus Lake indicated that a total phosphorus load reduction of 47% is needed to achieve the MPCA water quality standards by addressing loads from stormwater runoff, erosion sources, and internal loads, the watershed pollutant load reductions will require implementation of nearly all recommended projects. Figure 6-1 and Table 6-1 summarizes the recommended BMPs from the Lotus Lake feasibility study.

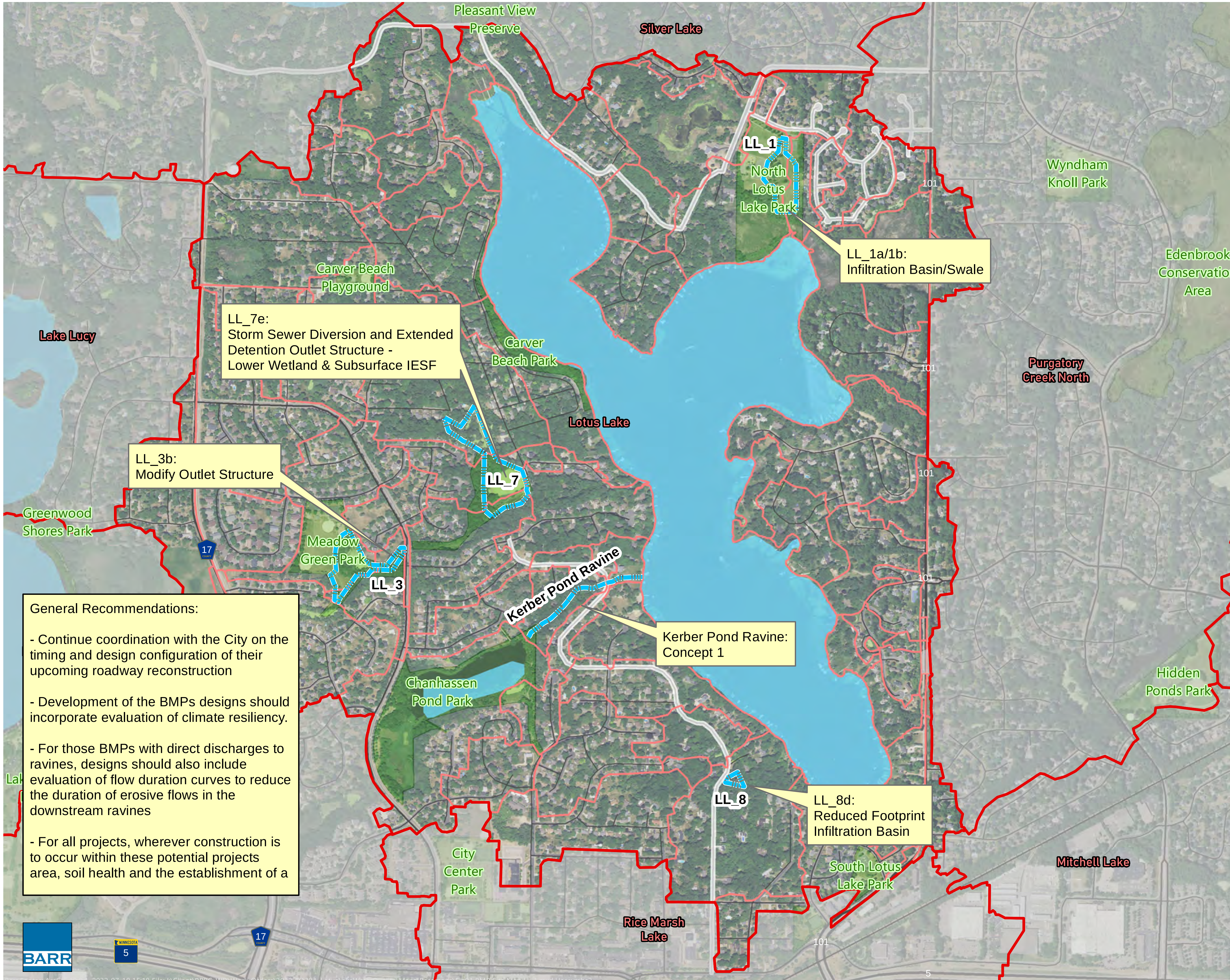
Table 6-2 summarizes the TMDL waste load allocation (WLA) for the City of Chanhassen and erosion source load allocation (LA) and the associated TP reductions from the Lotus Lake TMDL. Also summarized are the TP removals for the recently implemented project at the stormwater pond in Meadow Green Park (by City of Chanhassen in 2021) as well as the estimated removals for all recommended BMPs. This demonstrates that if all BMPs are implemented, the required TMDL WLA, erosion source LA, and associated pollutant load reduction will be achieved.

Based on the assessment of the concepts summarized in this report, site-specific recommendations were generally based on considerations of the following:

- Provides significant nutrient (TP) and TSS removal opportunities,
- Allows for volume reduction and/or peak flow rate control,
- Provides a cost-effective solution for nutrient reduction,
- Provides multiple benefits beyond water quality improvement including:
    - Opportunity to improve ecological function by restoring habitat and improving soil health,
    - Allows for public education and/or provides improved recreational opportunities for certain sites.
- Allows for partnership opportunity with the City of Chanhassen as it relates to implementation in coordination with upcoming road reconstruction/CIP projects.

# Lotus Lake Feasibility Study: Recomendations

FIGURE 6-1




Lake/Pond
Park/Playground
Preserve/Recreation Area
Project Area
Major Subwatersheds
Lotus Lake Subwatersheds
City of Chanhassen Upcoming Road Reconstruciton (2023 - 2027)

N

1,000 0 1,000
Feet

RILEY PURGATORY BLUFF CREEK WATERSHED DISTRICT

Riley Purgatory Bluff Creek Watershed District - Lotus Lake Water Quality Project

## Table 6-1 Summary of Lotus Lake Recommended Projects

| Location | Description | Opinion of Probable Cost (-30% - +50%) | Annual Project Cost | Annual O&M | Total Annual Cost(1) | Volume Retention (ac-ft/yr) | Increase in TP removal (lbs/yr) | Annualized TP Removal Cost ($/lbs/yr) | Increase in TSS Removal (lbs/yr) | Annualized TSS Removal Cost ($/lbs/yr) | Restoration Area (ac) (2) | Potential Wetland Impacts (ac) (2) | Public or Private Property | Easement Required | Potential for Education and Engagement | Potential Partnership with City | RPBCWD Project Benefit Score |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LL_1 | LL_1a/1b - Infiltration Basin/Swale | $1,295,000 ($907,000 - $1,943,000) (3) | $43,167 (3) | $34,202 (3) | $77,369 (3) | 30.0 - 33.8 (4) | 15.2 - 17.2 (4) | $4,500 - $4,900 (4) | 3586 – 3958 (4) | $20.00 - $21.00 (4) | 3.6 - 3.8 (4) | 0.0 | Public | No | High | X | 51 |
| LL_3 | LL_3b - Modify Structure to Stabilize Channel Sediment | $65,000 ($46,000 - $98,000) | $2,167 | $500 | $2,667 | N/A | 2.1 | $1,300 | 2560 | $1.00 | 0.04 | 0.02 | Public | Yes | Low | X | 29 |
| LL_7 | LL_7e - Storm Sewer Diversion and Extended Detention - Lower Wetland & Subsurface IESF | $865,000 ($606,000 - $1,298,000) | $28,833 | $8,000 | $36,833 | N/A | 20.8 | $1,800 | 3634 | $10.00 | 0.24 | 0.56 | Public | No | Low | - | 33 |
| LL_8 | LL_8d – Reduced Footprint Infiltration Basin | $343,000 ($241,000 - $515,000) | $11,433 | $17,672 | $29,106 | 8.8 | 9.0 | $3,200 | 3811 | $21.00 | 0.4 | 0.0 | Private | Yes | Low | X | 38 |
| Kerber Pond Ravine | Concept 1: Channel Stabilization Measures | $460,000 ($320,000 - $680,000) | $15,333 | $5,700 | $21,033 | N/A | 2.9 | $7,200 | 5820 | $4.00 | 0.5 | ~TBD – Less | Private | Yes | Low | X | 34 |
| **Total** | | ***$3.0 million ($2.1 - $4.5 million)*** | | | | ***38.8 – 42.6*** | ***50 – 52*** | | ***19,411 – 19,783*** | | ***4.8 – 5.0*** | ***0.6*** | | | | | |

Notes

1. (1) Based on a 30-year period. Includes estimated costs for permitting, engineering, and construction; and estimated annual operation and maintenance costs.
2. (2) Wetland delineations, topographic surveys, and tree surveys will need to be completed as part of final design. Wetland impacts area to be determined (TBD) during final design when wetland delineation is complete – listed as relative to each concept. Total impacts area is approximate and will be optimized during the next phase of design.
3. (3) Costs are pulled from the LL_1a infiltration basin estimate. The costs associated with the LL_1b infiltration swale are similar (see Table 5-1)
4. (4) Presented as a range to include the values associated with both concepts LL_1a infiltration and LL_1b infiltration. See Table 5-1 for a breakdown of each concept.

**Table 6-2 Lotus Lake Recommended Water Quality Improvement Project Summary**

| Recommended BMP | Annual TP Removal (lbs TP/yr) | Annual TSS Removal (lbs TSS/yr) |
|---|---|---|
| Meadow Green Park Pond Improvements (completed by Chanhassen in 2021) | 8.0 | 3157 |
| LL_1a/1b - Infiltration Basin (North Lotus Lake Park) | 15.2 - 17.2 | 3586 - 3958 |
| LL_3b – Modify Outlet Structure to Stabilize Channel Sediment (Meadow Green Park) | 2.1 | 2560 |
| LL_7e - Storm Sewer Diversion and Extended Detention Outlet Structure - Lower Wetland & Subsurface IESF (Meadow Green Park) | 20.8 | 3634 |
| LL_8d – Reduced Footprint Infiltration Basin (Frontier Trail Association Outlot) | 9.0 | 3811 |
| Kerber Pond Ravine Concept 1 | 2.9 | 5820 |
| ***Total Removal by Proposed BMPs (lbs/year)*** | ***58 – 60*** | ***22,568 – 22,940*** |
| ***Total Reduction Required by the Lotus Lake TMDL***<br>- City of Chanhassen Reduction per TMDL WLA<br>- Erosion Load Reduction per TMDL LA | ***56.0*** | ***N/A*** |

## 6.1 General Recommendations

In addition to the recommended BMPs, general recommendations for the Lotus Lake water quality improvement project are as follows:

- Continue coordination with the City on the timing and design configuration of their upcoming roadway reconstruction in the Lotus Lake Watershed (i.e. Pleasantview Road, Frontier Trail, Fox Hollow Drive area).
- Development of the BMPs designs should incorporate evaluation of climate resiliency. This includes evaluation of the final design in response to estimated mid-century events as well as considering plant selections during design of the final restoration of projects.
- For those BMPs with direct discharges to ravines, designs should also include evaluation of flow duration curves to reduce the duration of erosive flows in the downstream ravines.

- For all projects, wherever construction is to occur within these potential projects area, soil health and the establishment of a diversity of native vegetation should be prioritized.
- Based on the District's assessment of the Lotus Lake shoreline pursue opportunities to work with shoreline residents to restore the ecological functions of the shoreland areas.

## 6.2 Schedule, Agreements, and Workplan

To optimize design, bidding, and construction administration and oversight costs, we recommend that these water quality improvement projects in the Lotus Lake watershed be implemented at the same time. Additionally, several of the projects (LL_1, LL_8, Kerber Pond Ravine) will require coordination with city road reconstruction projects, and project timing will likely be driven by the anticipated design and construction of these projects as outlined in the City of Chanhassen CIP.

To align with the city projects, design of these BMPs should start in 2024 with construction expected in 2025 – 2026. The proposed activities and schedule are summarized in Figure 6-2 according to each of the main tasks for project execution including data collection, engineering and design, permitting, coordination of agreements/easements, bidding, construction, establishment, and close out.

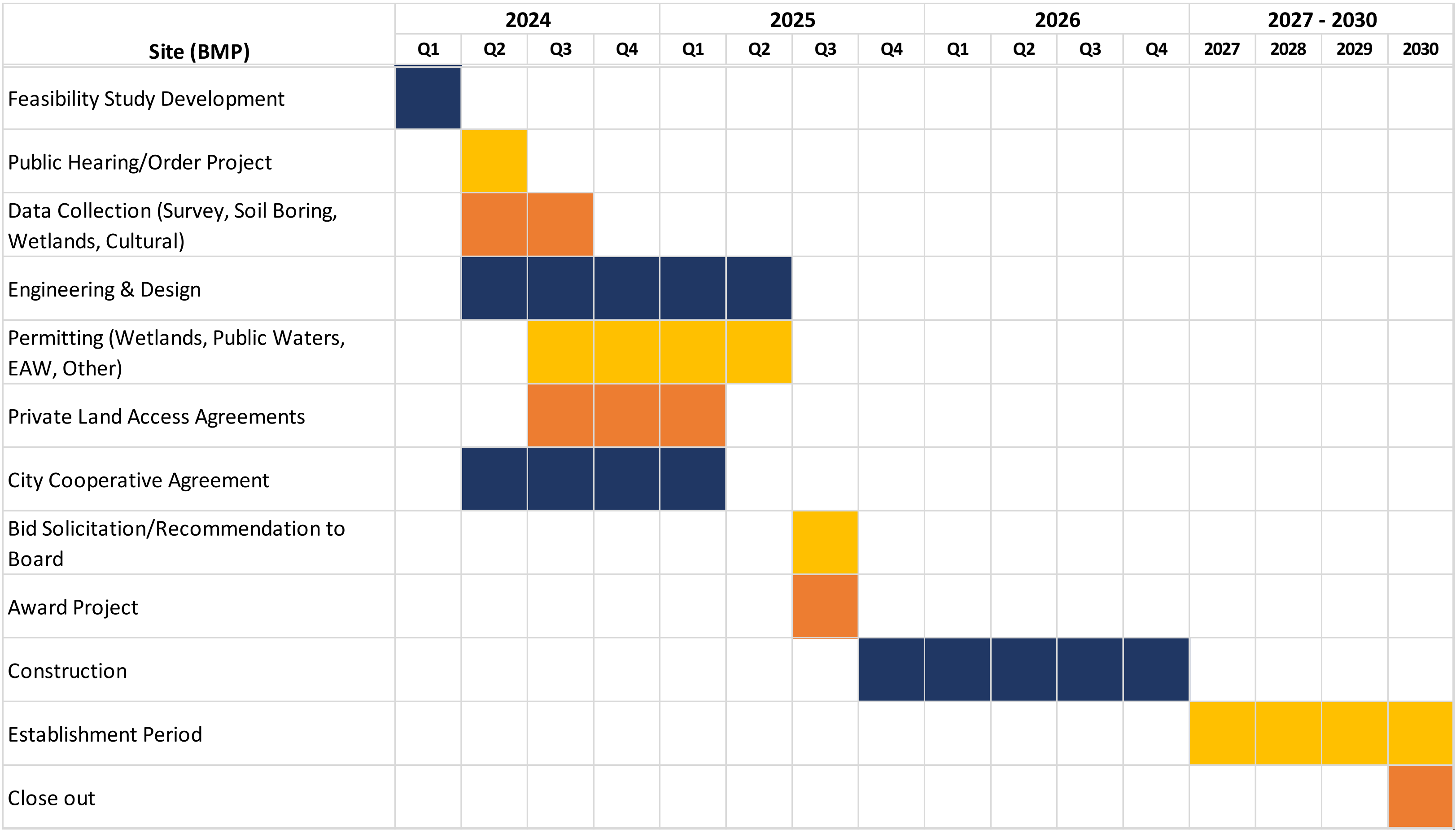



**Figure 6-2 Lotus Lake Recommended Project Schedule**

Table 6-3 identifies general work plan, finances and responsibilities for the project as well as the expected agreements needed for project implementation. Also included is a summary of the post-construction monitoring and long-term monitoring/maintenance considerations.

For budgeting estimates, the values listed reflect the point opinion of probable cost. Given the limited engineering completed with the development of the conceptual design, there is significant cost uncertainty with an acceptable range of between -30% and +50% of the estimated project cost.

The implementation of several of these proposed projects could be implemented jointly as part of the City of Chanhassen CIP projects for the future reconstruction of Frontier Trail, Pleasantview Road, and the roads in the Fox Hollow neighborhood. Under this scenario, the project would be implemented as a partnership between the city and the RPBCWD. For those projects aligned with the city's roadway reconstruction projects, the RPBCWD and the City could share the cost of final design, permitting, and project construction. The design of the BMPs would be led by the RPBCWD. The City of Chanhassen would be responsible for the design and financing of infrastructure improvement within the roadway corridors in addition to financing ongoing operation and maintenance activities following construction.

**Table 6-3 Work Plan, Agreements, and Financing Summary**

| Task | Activity | Budget[1] | Years | Lead |
|---|---|---|---|---|
| Engineering, Design, & Permitting | Public Hearing/Order Project | $670,000 | 2024 | RPBCWD |
| | Data Collection (Survey, Soil Boring, Wetlands, Cultural) | | 2024 | RPBCWD |
| | Design | | 2024-2025 | RPBCWD |
| | Permitting (Wetlands, Public Waters, EAW, Other) | | 2024-2025 | RPBCWD |
| | Bidding and Construction Oversight | | 2025-2026 | RPBCWD |
| Agreements/ Easements | Private land access, construction, maintenance, and buffer agreements:<br>**LL_3 Channel Stabilization at Meadow Green Park –** Agreement with residential property owner(s) to access site<br><br>**LL_8 Infiltration at Frontier Trail Association Outlot –** Agreement with residential property owner(s) (Frontier Trail Association) to access, construct and maintain the project<br>**Kerber Pond Ravine Stabilization –** Agreement with residential property owner(s) to access residential property to construct and maintain the proposed project. | $69,000 | 2024-2025 | RPBCWD |
| | Cooperative agreement between RPBCWD and City of Chanhassen for activities related to access, construction, cost-share, and operation and maintenance of the recommended BMP projects. The agreement would establish procedures for performing specific tasks and define responsibilities of each organization.<br>**LL_1 Infiltration at North Lotus Lake Park –** Located fully with city owned property or right of way<br>**LL_3 Channel Stabilization at Meadow Green Park –** Construction activities located fully with city owned property or right of way<br>**LL_7 Diversion with extended detention and enhanced filtration -** Located fully with city owned property or right of way<br>**LL_8 Infiltration at Frontier Trail Association Outlot –** closely coordinated with pubic works upcoming city road reconstruction projects (Frontier Trail)<br>**Kerber Pond Ravine Stabilization –** closely coordinated with pubic works upcoming city road reconstruction projects (Frontier Trail) | | 2024-2025 | RPBCWD |
| Bidding/Award | Bid Solicitation Request/Opening/Recommendation to Board | Part of Engineering, Design task above | 2025 | RPBCWD |
| | Award Project | | 2025 | RPBCWD |
| Implementation | Construction | $2,630,000 | 2025-2026 | RPBCWD |
| Post Construction Monitoring | 3-Year Vegetation Establishment Period | In-Kind (staff will monitoring) | 2027-2029 | RPBCWD/City of Chanhassen |
| | Close out | | 2029 | RPBCWD |
| Long Term | Inspections (All Sites) | In-kind | 2030-2050 | RPBCWD/City of Chanhassen |
| | Routine Maintenance (All Sites) | TBD | 2030-2050 | City of Chanhassen |
| | Non-Routine Maintenance (All Sites) | As needed per inspections | 2030-2050 | RPBCWD/City of Chanhassen |
| | Stormwater Pond Cleanout/Maintenance (LL-7 only) | As needed per inspections | 2030-2050 | City of Chanhassen |

1 - Costs based on engineer's opinion of probable cost. Due to conceptual design and limited engineering, there is uncertainty of -30% to +50% to these estimates.

The anticipated primary points of contact are summarized in Table 6-4.

**Table 6-4 Anticipated Primary Points of Contact**

| Organization | Name | Phone |
|---|---|---|
| RPBCWD | Terry Jeffery, District Administrator | 952.607.6512 |
| City of Chanhassen | Charles Howley, Director of Public Works/City Engineer | 952.227.1169 |

# 7.0 References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Wisconsin Natural Resources Conservation Service. (2015). *Field Office Technical Guide: Streambank Erosion.*

# Appendix A

## Engineer's Opinion of Probable Cost

| | | | | | | |
|---|---|---|---|---|---|---|
| BARR | PREPARED BY: BARR ENGINEERING COMPANY | | SHEET: | 1 | OF | 1 |
| | | | CREATED BY: | KRT | DATE: | 11/1/2023 |
| ENGINEER'S OPINION OF PROBABLE PROJECT COST | | | CHECKED BY: | JAK2 | DATE: | 12/1/2023 |
| PROJECT: | Lotus Lake Water Quality Improvement Project | | APPROVED BY: | SAS | DATE: | 12/10/2023 |
| LOCATION: | Riley Purgatory Bluff Creek Watershed District | ISSUED: | | | DATE: | |
| PROJECT #: | 23270053.14 TO39 | ISSUED: | | | DATE: | |
| **OPINION OF COST - SUMMARY** | | ISSUED: | | | DATE: | |

# Engineer's Opinion of Probable Project Cost

## LL_1a - Filtration Basin (IESF)

| Cat. No. | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | UNIT COST | ITEM COST | NOTES |
|---|---|---|---|---|---|---|
| | Mobilization/Demobilization | LS | 1 | $100,000.00 | $100,000.00 | 1,2,3,4,5,6 |
| | Traffic and Pedestrian Safety Control Measures | LS | 1 | $5,000.00 | $5,000.00 | 1,2,3,4,5,6 |
| | Construction Layout and Staking | LS | 1 | $7,500.00 | $7,500.00 | 1,2,3,4,5,6 |
| | Rock Construction Entrance | Ea | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Storm Drain Inlet Protection (P) | Ea | 4 | $300.00 | $1,200.00 | 1,2,3,4,5,6 |
| | Silt Fence, Machine Sliced | LF | 1,500 | $2.50 | $3,750.00 | 1,2,3,4,5,6 |
| | Sediment Log | LF | 1,500 | $5.00 | $7,500.00 | 1,2,3,4,5,6 |
| | Daily Street Sweeping | LS | 1 | $6,000.00 | $6,000.00 | 1,2,3,4,5,6 |
| | Construction Fencing | LF | 3,000 | $3.50 | $10,500.00 | 1,2,3,4,5,6 |
| | Clearing and Grubbing Trees/Shrubs less than 12" Diameter | LS | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | Removal and Disposal of Tree Stump 12 inch to 24 inch Diameter | EA | 11 | $350.00 | $3,850.00 | 1,2,3,4,5,6 |
| | Sawcut Bituminous Pavement (Full Depth) | LF | 80 | $6.00 | $480.00 | 1,2,3,4,5,6 |
| | Remove and Dispose Bituminous Pavement (P) | SY | 1,600 | $6.00 | $9,600.00 | 1,2,3,4,5,6 |
| | Salvage and Reinstall Topsoil (P) | CY | 2,022 | $15.00 | $30,333.67 | 1,2,3,4,5,6 |
| | Import Topsoil Borrow and Placement | CY | 2,022 | $35.00 | $70,778.55 | 1,2,3,4,5,6 |
| | Common Excavation, Haul, & Disposal Offsite (P) | CY | 4,171 | $30.00 | $125,133.78 | 1,2,3,4,5,6 |
| | Sand with 5 percent iron filings | TON | 178 | $260.00 | $46,222.22 | 1,2,3,4,5,6 |
| | Subsoiling - Deep Soil Ripping | AC | 5.0 | $4,000.00 | $20,055.32 | 1,2,3,4,5,6 |
| | ECB/HydroMulch | SY | 25,000 | $2.50 | $62,500.00 | 1,2,3,4,5,6 |
| | Turf Seeding | AC | 1.23 | $4,000.00 | $4,905.62 | 1,2,3,4,5,6 |
| | Native Restoration Seeding (Prairie/Wet Meadow) | AC | 3.79 | $6,000.00 | $22,724.54 | 1,2,3,4,5,6 |
| | Native Restoration Plantings (Plugs/Shrubs/Perennials) | AC | 3.79 | $20,000.00 | $75,748.48 | 1,2,3,4,5,6 |
| | Tree Planting | EA | 11 | $500.00 | $5,500.00 | 1,2,3,4,5,6 |
| | Year 1 Maintenance Period | LS | 1 | $6,000.00 | $6,000.00 | 1,2,3,4,5,6 |
| | Year 2 Maintenance Period | LS | 1 | $4,000.00 | $4,000.00 | 1,2,3,4,5,6 |
| | Year 3 Maintenance Period | LS | 1 | $4,000.00 | $4,000.00 | 1,2,3,4,5,6 |
| | Bituminous Trail | SY | 1,600 | $35.00 | $56,000.00 | 1,2,3,4,5,6 |
| | Aggregate Base (CV), Class 5 - Bituminous Trail | TON | 427 | $40.00 | $17,080.00 | 1,2,3,4,5,6 |
| | Secondary/Overlook Trail - Natural Surface | SY | 700 | $35.00 | $24,500.00 | 1,2,3,4,5,6 |
| | Concrete Bench Pad (P) | SY | 14 | $60.00 | $866.67 | 1,2,3,4,5,6 |
| | Aggregate Base (CV), Class 5 - Bench Pad | TON | 4 | $40.00 | $160.00 | 1,2,3,4,5,6 |
| | 6" Perf Dual Wall CPEP Draintile & Fittings (no sock) - IESF | LF | 1,500 | $23.00 | $34,500.00 | 1,2,3,4,5,6 |
| | 6" PVC Storm Sewer Pipe and Fittings - IESF | LF | 20 | $50.00 | $1,000.00 | 1,2,3,4,5,6 |
| | 6" Draintile Cleanout and Assembly - IESF | EA | 9 | $550.00 | $4,950.00 | 1,2,3,4,5,6 |
| | 24" RCP Pipe Sewer | LF | 200 | $150.00 | $30,000.00 | 1,2,3,4,5,6,7 |
| | 24" RCP FES | EA | 4 | $2,200.00 | $8,800.00 | 1,2,3,4,5,6 |
| | 24" RCP Trash Rack | EA | 2 | $2,000.00 | $4,000.00 | 1,2,3,4,5,6 |
| | Drainage Structures | EA | 2 | $20,000.00 | $40,000.00 | 1,2,3,4,5,6 |
| | Pretreatment Structures | Each | 1 | $30,000.00 | $30,000.00 | 1,2,3,4,5,6 |
| | Rip Rap | TON | 4 | $215.00 | $860.00 | 1,2,3,4,5,6 |
| | Bridge/Interactive Features | LS | 1 | $50,000.00 | $50,000.00 | 1,2,3,4,5,6 |
| | Art Features | LS | 1 | $15,000.00 | $15,000.00 | 1,2,3,4,5,6 |
| | Victor Stanley, Inc. Model 8 Bench | EA | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | | | | | | |
| | CONSTRUCTION SUBTOTAL | | | | $959,000 | 1,2,3,4,5,6,7,8 |
| | CONSTRUCTION CONTINGENCY (20%) | | | | $192,000 | 1,4,8 |
| | ESTIMATED CONSTRUCTION COST | | | | $1,151,000 | 1,2,3,4,5,6,7,8 |
| | | | | | | |
| | PLANNING, ENGINEERING, DESIGN, & PERMITTING | | | | $184,160 | |
| | LEGAL | | | | $23,020 | |
| | CONSTRUCTON MANAGEMENT | | | | $80,570 | |
| | EASEMENTS | SF | 0 | $6.00 | $0 | |
| | | | | | | |
| | ESTIMATED TOTAL PROJECT COST | | | | **$1,439,000** | 1,2,3,4,5,6,7,8 |
| **ESTIMATED ACCURACY RANGE** | | **-30%** | | | $1,008,000 | 1,2,3,4,5,6,7,8 |
| | | **50%** | | | $2,159,000 | 1,2,3,4,5,6,7,8 |

Notes

[1] Quantities based on Design Work Completed (1 - 15%).

[2] Unit Prices Based on Information Available at This Time.

[3] Limited Soil Boring and Field Investigation Information Available.

[4] This design level (Class 4, 1-15% design completion per ASTM E 2516-11) cost estimate is based on concept designs, alignments, quantities and unit prices. Costs will change with further design. Time value-of-money escalation costs are not included. A construction schedule is not available at this time. Contingency is an allowance for the net sum of costs that will be in the Final Total Project Cost at the time of the completion of design, but are not included at this level of project definition. The estimated accuracy range for the Total Project Cost as the project is defined is -20% to +30%. The accuracy range is based on professional judgement considering the level of design completed, the complexity of the project and the uncertainties in the project as scoped. The contingency and the accuracy range are not intended to include costs for future scope changes that are not part of the project as currently scoped or costs for risk contingency. Operation and Maintenance costs are not included.

[5] Estimate assumes that projects will not be located on contaminated soil.

[6] Estimate costs are to design, construct, and permit each alternative. The estimated costs do not include maintenance, monitoring or additional tasks following construction.

[7] Furnish and Install pipe cost per linear foot includes all trenching, bedding, backfilling, compaction, and disposal of excess materials

[8] Estimate costs are reported to nearest thousand dollars.

| PREPARED BY: BARR ENGINEERING COMPANY | | SHEET: | 1 | OF | 1 |
|---|---|---|---|---|---|
| | | CREATED BY: | KRT | DATE: | 11/1/2023 |
| **ENGINEER'S OPINION OF PROBABLE PROJECT COST** | | CHECKED BY: | JAK2 | DATE: | 12/1/2023 |
| PROJECT: Lotus Lake Water Quality Improvement Project | | APPROVED BY: | SAS | DATE: | 12/10/2023 |
| LOCATION: Riley Purgatory Bluff Creek Watershed District | ISSUED: | | | DATE: | |
| PROJECT #: 23270053.14 TO39 | ISSUED: | | | DATE: | |
| **OPINION OF COST - SUMMARY** | ISSUED: | | | DATE: | |

# Engineer's Opinion of Probable Project Cost

**LL_1a - Infiltration Basin**

| Cat. No. | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | UNIT COST | ITEM COST | NOTES |
|---|---|---|---|---|---|---|
| | Mobilization/Demobilization | LS | 1 | $90,000.00 | $90,000.00 | 1,2,3,4,5,6 |
| | Traffic and Pedestrian Safety Control Measures | LS | 1 | $5,000.00 | $5,000.00 | 1,2,3,4,5,6 |
| | Construction Layout and Staking | LS | 1 | $7,500.00 | $7,500.00 | 1,2,3,4,5,6 |
| | Rock Construction Entrance | Ea | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Storm Drain Inlet Protection (P) | Ea | 4 | $300.00 | $1,200.00 | 1,2,3,4,5,6 |
| | Silt Fence, Machine Sliced | LF | 1,500 | $2.50 | $3,750.00 | 1,2,3,4,5,6 |
| | Sediment Log | LF | 1,500 | $5.00 | $7,500.00 | 1,2,3,4,5,6 |
| | Daily Street Sweeping | LS | 1 | $6,000.00 | $6,000.00 | 1,2,3,4,5,6 |
| | Construction Fencing | LF | 3,000 | $3.50 | $10,500.00 | 1,2,3,4,5,6 |
| | Clearing and Grubbing Trees/Shrubs less than 12" Diameter | LS | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | Removal and Disposal of Tree Stump 12 inch to 24 inch Diameter | EA | 11 | $350.00 | $3,850.00 | 1,2,3,4,5,6 |
| | Sawcut Bituminous Pavement (Full Depth) | LF | 80 | $6.00 | $480.00 | 1,2,3,4,5,6 |
| | Remove and Dispose Bituminous Pavement (P) | SY | 1,600 | $6.00 | $9,600.00 | 1,2,3,4,5,6 |
| | Salvage and Reinstall Topsoil (P) | CY | 2,022 | $15.00 | $30,333.67 | 1,2,3,4,5,6 |
| | Import Topsoil Borrow and Placement | CY | 2,022 | $35.00 | $70,778.55 | 1,2,3,4,5,6 |
| | Common Excavation, Haul, & Disposal Offsite (P) | CY | 4,171 | $30.00 | $125,133.78 | 1,2,3,4,5,6 |
| | Subsoiling - Deep Soil Ripping | AC | 5.0 | $4,000.00 | $20,055.32 | 1,2,3,4,5,6 |
| | ECB/HydroMulch | SY | 25,000 | $2.50 | $62,500.00 | 1,2,3,4,5,6 |
| | Turf Seeding | AC | 1.23 | $4,000.00 | $4,905.62 | 1,2,3,4,5,6 |
| | Native Restoration Seeding (Prairie/Wet Meadow) | AC | 3.79 | $6,000.00 | $22,724.54 | 1,2,3,4,5,6 |
| | Native Restoration Plantings (Plugs/Shrubs/Perennials) | AC | 3.79 | $20,000.00 | $75,748.48 | 1,2,3,4,5,6 |
| | Tree Planting | EA | 11 | $500.00 | $5,500.00 | 1,2,3,4,5,6 |
| | Year 1 Maintenance Period | LS | 1 | $6,000.00 | $6,000.00 | 1,2,3,4,5,6 |
| | Year 2 Maintenance Period | LS | 1 | $4,000.00 | $4,000.00 | 1,2,3,4,5,6 |
| | Year 3 Maintenance Period | LS | 1 | $4,000.00 | $4,000.00 | 1,2,3,4,5,6 |
| | Bituminous Trail | SY | 1,600 | $35.00 | $56,000.00 | 1,2,3,4,5,6 |
| | Aggregate Base (CV), Class 5 - Bituminous Trail | TON | 427 | $40.00 | $17,080.00 | 1,2,3,4,5,6 |
| | Secondary/Overlook Trail - Natural Surface | SY | 700 | $35.00 | $24,500.00 | 1,2,3,4,5,6 |
| | Concrete Bench Pad (P) | SY | 14 | $60.00 | $866.67 | 1,2,3,4,5,6 |
| | Aggregate Base (CV), Class 5 - Bench Pad | TON | 4 | $40.00 | $160.00 | 1,2,3,4,5,6 |
| | 24" RCP Pipe Sewer | LF | 200 | $150.00 | $30,000.00 | 1,2,3,4,5,6,7 |
| | 24" RCP FES | EA | 4 | $2,200.00 | $8,800.00 | 1,2,3,4,5,6 |
| | 24" RCP Trash Rack | EA | 2 | $2,000.00 | $4,000.00 | 1,2,3,4,5,6 |
| | Drainage Structures | EA | 2 | $20,000.00 | $40,000.00 | 1,2,3,4,5,6 |
| | Pretreatment Structures | Each | 1 | $30,000.00 | $30,000.00 | 1,2,3,4,5,6 |
| | Rip Rap | TON | 4 | $215.00 | $860.00 | 1,2,3,4,5,6 |
| | Bridge/Interactive Features | LS | 1 | $50,000.00 | $50,000.00 | 1,2,3,4,5,6 |
| | Art Features | LS | 1 | $15,000.00 | $15,000.00 | 1,2,3,4,5,6 |
| | Victor Stanley, Inc. Model 8 Bench | EA | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | | | | | | |
| | CONSTRUCTION SUBTOTAL | | | | $863,000 | 1,2,3,4,5,6,7,8 |
| | CONSTRUCTION CONTINGENCY (20%) | | | | $173,000 | 1,4,8 |
| | ESTIMATED CONSTRUCTION COST | | | | $1,036,000 | 1,2,3,4,5,6,7,8 |
| | | | | | | |
| | PLANNING, ENGINEERING, DESIGN, & PERMITTING | | | | $165,760 | |
| | LEGAL | | | | $20,720 | |
| | CONSTRUCTON MANAGEMENT | | | | $72,520 | |
| | EASEMENTS | SF | 0 | $6.00 | $0 | |
| | | | | | | |
| | ESTIMATED TOTAL PROJECT COST | | | | **$1,295,000** | 1,2,3,4,5,6,7,8 |
| **ESTIMATED ACCURACY RANGE** | | **-30%** | | | $907,000 | 1,2,3,4,5,6,7,8 |
| | | **50%** | | | $1,943,000 | 1,2,3,4,5,6,7,8 |

Notes

[1] Quantities based on Design Work Completed (1 - 15%).

[2] Unit Prices Based on Information Available at This Time.

[3] Limited Soil Boring and Field Investigation Information Available.

[4] This design level (Class 4, 1-15% design completion per ASTM E 2516-11) cost estimate is based on concept designs, alignments, quantities and unit prices. Costs will change with further design. Time value-of-money escalation costs are not included. A construction schedule is not available at this time. Contingency is an allowance for the net sum of costs that will be in the Final Total Project Cost at the time of the completion of design, but are not included at this level of project definition. The estimated accuracy range for the Total Project Cost as the project is defined is -20% to +30%. The accuracy range is based on professional judgement considering the level of design completed, the complexity of the project and the uncertainties in the project as scoped. The contingency and the accuracy range are not intended to include costs for future scope changes that are not part of the project as currently scoped or costs for risk contingency. Operation and Maintenance costs are not included.

[5] Estimate assumes that projects will not be located on contaminated soil.

[6] Estimate costs are to design, construct, and permit each alternative. The estimated costs do not include maintenance, monitoring or additional tasks following construction.

[7] Furnish and Install pipe cost per linear foot includes all trenching, bedding, backfilling, compaction, and disposal of excess materials

[8] Estimate costs are reported to nearest thousand dollars.

| | | | SHEET: | 1 | OF | 1 |
|---|---|---|---|---|---|---|
| BARR | PREPARED BY: BARR ENGINEERING COMPANY | | CREATED BY: | KRT | DATE: | 11/1/2023 |
| ENGINEER'S OPINION OF PROBABLE PROJECT COST | | | CHECKED BY: | JAK2 | DATE: | 12/1/2023 |
| PROJECT: | Lotus Lake Water Quality Improvement Project | | APPROVED BY: | SAS | DATE: | 12/10/2023 |
| LOCATION: | Riley Purgatory Bluff Creek Watershed District | ISSUED: | | | DATE: | |
| PROJECT #: | 23270053.14 TO39 | ISSUED: | | | DATE: | |
| **OPINION OF COST - SUMMARY** | | ISSUED: | | | DATE: | |

# Engineer's Opinion of Probable Project Cost

## LL_1b - Filtration/Intermittant Swale (IESF)

| Cat. No. | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | UNIT COST | ITEM COST | NOTES |
|---|---|---|---|---|---|---|
| | Mobilization/Demobilization | LS | 1 | $100,000.00 | $100,000.00 | 1,2,3,4,5,6 |
| | Traffic and Pedestrian Safety Control Measures | LS | 1 | $5,000.00 | $5,000.00 | 1,2,3,4,5,6 |
| | Construction Layout and Staking | LS | 1 | $7,500.00 | $7,500.00 | 1,2,3,4,5,6 |
| | Rock Construction Entrance | Ea | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Storm Drain Inlet Protection (P) | Ea | 4 | $300.00 | $1,200.00 | 1,2,3,4,5,6 |
| | Silt Fence, Machine Sliced | LF | 1,500 | $2.50 | $3,750.00 | 1,2,3,4,5,6 |
| | Sediment Log | LF | 1,500 | $5.00 | $7,500.00 | 1,2,3,4,5,6 |
| | Daily Street Sweeping | LS | 1 | $6,000.00 | $6,000.00 | 1,2,3,4,5,6 |
| | Construction Fencing | LF | 3,000 | $3.50 | $10,500.00 | 1,2,3,4,5,6 |
| | Clearing and Grubbing Trees/Shrubs less than 12" Diameter | LS | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | Removal and Disposal of Tree Stump 12 inch to 24 inch Diameter | EA | 11 | $350.00 | $3,850.00 | 1,2,3,4,5,6 |
| | Sawcut Bituminous Pavement (Full Depth) | LF | 80 | $6.00 | $480.00 | 1,2,3,4,5,6 |
| | Remove and Dispose Bituminous Pavement (P) | SY | 1,600 | $6.00 | $9,600.00 | 1,2,3,4,5,6 |
| | Salvage and Reinstall Topsoil (P) | CY | 1,930 | $15.00 | $28,944.78 | 1,2,3,4,5,6 |
| | Import Topsoil Borrow and Placement | CY | 1,930 | $35.00 | $67,537.81 | 1,2,3,4,5,6 |
| | Common Excavation, Haul, & Disposal Offsite (P) | CY | 1,039 | $30.00 | $31,166.24 | 1,2,3,4,5,6 |
| | Sand with 5 percent iron filings | TON | 59 | $260.00 | $15,407.41 | 1,2,3,4,5,6 |
| | Subsoiling - Deep Soil Ripping | AC | 4.8 | $4,000.00 | $19,137.04 | 1,2,3,4,5,6 |
| | ECB/HydroMulch | SY | 24,000 | $2.50 | $60,000.00 | 1,2,3,4,5,6 |
| | Turf Seeding | AC | 1.23 | $4,000.00 | $4,905.62 | 1,2,3,4,5,6 |
| | Native Restoration Seeding (Prairie/Wet Meadow) | AC | 3.56 | $6,000.00 | $21,347.13 | 1,2,3,4,5,6 |
| | Native Restoration Plantings (Plugs/Shrubs/Perennials) | AC | 3.56 | $20,000.00 | $71,157.11 | 1,2,3,4,5,6 |
| | Tree Planting | EA | 11 | $500.00 | $5,500.00 | 1,2,3,4,5,6 |
| | Year 1 Maintenance Period | LS | 1 | $6,000.00 | $6,000.00 | 1,2,3,4,5,6 |
| | Year 2 Maintenance Period | LS | 1 | $4,000.00 | $4,000.00 | 1,2,3,4,5,6 |
| | Year 3 Maintenance Period | LS | 1 | $4,000.00 | $4,000.00 | 1,2,3,4,5,6 |
| | Bituminous Trail | SY | 1,700 | $35.00 | $59,500.00 | 1,2,3,4,5,6 |
| | Aggregate Base (CV), Class 5 - Bituminous Trail | TON | 453 | $40.00 | $18,120.00 | 1,2,3,4,5,6 |
| | Secondary/Overlook Trail - Natural Surface | SY | 700 | $35.00 | $24,500.00 | 1,2,3,4,5,6 |
| | Concrete Bench Pad (P) | SY | 14 | $60.00 | $866.67 | 1,2,3,4,5,6 |
| | Aggregate Base (CV), Class 5 - Bench Pad | TON | 4 | $40.00 | $160.00 | 1,2,3,4,5,6 |
| | 6" Perf Dual Wall CPEP Draintile & Fittings (no sock) - IESF | LF | 500 | $23.00 | $11,500.00 | 1,2,3,4,5,6 |
| | 6" PVC Storm Sewer Pipe and Fittings - IESF | LF | 20 | $50.00 | $1,000.00 | 1,2,3,4,5,6 |
| | 6" Draintile Cleanout and Assembly - IESF | EA | 3 | $550.00 | $1,650.00 | 1,2,3,4,5,6 |
| | 24" RCP Pipe Sewer | LF | 200 | $150.00 | $30,000.00 | 1,2,3,4,5,6,7 |
| | 24" RCP FES | EA | 4 | $2,200.00 | $8,800.00 | 1,2,3,4,5,6 |
| | 24" RCP Trash Rack | EA | 2 | $2,000.00 | $4,000.00 | 1,2,3,4,5,6 |
| | Drainage Structures | EA | 2 | $20,000.00 | $40,000.00 | 1,2,3,4,5,6 |
| | Pretreatment Structures | Each | 1 | $30,000.00 | $30,000.00 | 1,2,3,4,5,6 |
| | Boulders/Rock | TON | 255 | $470.00 | $119,675.93 | 1,2,3,4,5,6 |
| | Bridge/Interactive Features | LS | 1 | $50,000.00 | $50,000.00 | 1,2,3,4,5,6 |
| | Art Features | LS | 1 | $15,000.00 | $15,000.00 | 1,2,3,4,5,6 |
| | Victor Stanley, Inc. Model 8 Bench | EA | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | | | | | | |
| | CONSTRUCTION SUBTOTAL | | | | $918,000 | 1,2,3,4,5,6,7,8 |
| | CONSTRUCTION CONTINGENCY (20%) | | | | $184,000 | 1,4,8 |
| | ESTIMATED CONSTRUCTION COST | | | | $1,102,000 | 1,2,3,4,5,6,7,8 |
| | | | | | | |
| | PLANNING, ENGINEERING, DESIGN, & PERMITTING | | | | $176,320 | |
| | LEGAL | | | | $22,040 | |
| | CONSTRUCTON MANAGEMENT | | | | $77,140 | |
| | EASEMENTS | SF | 0 | $6.00 | $0 | |
| | | | | | | |
| | ESTIMATED TOTAL PROJECT COST | | | | **$1,378,000** | 1,2,3,4,5,6,7,8 |
| **ESTIMATED ACCURACY RANGE** | | **-30%** | | | $965,000 | 1,2,3,4,5,6,7,8 |
| | | **50%** | | | $2,067,000 | 1,2,3,4,5,6,7,8 |

Notes

[1] Quantities based on Design Work Completed (1 - 15%).

[2] Unit Prices Based on Information Available at This Time.

[3] Limited Soil Boring and Field Investigation Information Available.

[4] This design level (Class 4, 1-15% design completion per ASTM E 2516-11) cost estimate is based on concept designs, alignments, quantities and unit prices. Costs will change with further design. Time value-of-money escalation costs are not included. A construction schedule is not available at this time. Contingency is an allowance for the net sum of costs that will be in the Final Total Project Cost at the time of the completion of design, but are not included at this level of project definition. The estimated accuracy range for the Total Project Cost as the project is defined is -20% to +30%. The accuracy range is based on professional judgement considering the level of design completed, the complexity of the project and the uncertainties in the project as scoped. The contingency and the accuracy range are not intended to include costs for future scope changes that are not part of the project as currently scoped or costs for risk contingency. Operation and Maintenance costs are not included.

[5] Estimate assumes that projects will not be located on contaminated soil.

[6] Estimate costs are to design, construct, and permit each alternative. The estimated costs do not include maintenance, monitoring or additional tasks following construction.

[7] Furnish and Install pipe cost per linear foot includes all trenching, bedding, backfilling, compaction, and disposal of excess materials

[8] Estimate costs are reported to nearest thousand dollars.

| | | | | | |
|---|---|---|---|---|---|
| PREPARED BY: BARR ENGINEERING COMPANY | | SHEET: | 1 | OF | 1 |
| | | CREATED BY: | KRT | DATE: | 11/1/2023 |
| **ENGINEER'S OPINION OF PROBABLE PROJECT COST** | | CHECKED BY: | JAK2 | DATE: | 12/1/2023 |
| PROJECT: Lotus Lake Water Quality Improvement Project | | APPROVED BY: | SAS | DATE: | 12/10/2023 |
| LOCATION: Riley Purgatory Bluff Creek Watershed District | ISSUED: | | | DATE: | |
| PROJECT #: 23270053.14 TO39 | ISSUED: | | | DATE: | |
| **OPINION OF COST - SUMMARY** | ISSUED: | | | DATE: | |

# Engineer's Opinion of Probable Project Cost

## LL_1b - Infiltration/Intermittant Swale (IESF)

| Cat. No. | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | UNIT COST | ITEM COST | NOTES |
|---|---|---|---|---|---|---|
| | Mobilization/Demobilization | LS | 1 | $100,000.00 | $100,000.00 | 1,2,3,4,5,6 |
| | Traffic and Pedestrian Safety Control Measures | LS | 1 | $5,000.00 | $5,000.00 | 1,2,3,4,5,6 |
| | Construction Layout and Staking | LS | 1 | $7,500.00 | $7,500.00 | 1,2,3,4,5,6 |
| | Rock Construction Entrance | Ea | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Storm Drain Inlet Protection (P) | Ea | 4 | $300.00 | $1,200.00 | 1,2,3,4,5,6 |
| | Silt Fence, Machine Sliced | LF | 1,500 | $2.50 | $3,750.00 | 1,2,3,4,5,6 |
| | Sediment Log | LF | 1,500 | $5.00 | $7,500.00 | 1,2,3,4,5,6 |
| | Daily Street Sweeping | LS | 1 | $6,000.00 | $6,000.00 | 1,2,3,4,5,6 |
| | Construction Fencing | LF | 3,000 | $3.50 | $10,500.00 | 1,2,3,4,5,6 |
| | Clearing and Grubbing Trees/Shrubs less than 12" Diameter | LS | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | Removal and Disposal of Tree Stump 12 inch to 24 inch Diameter | EA | 11 | $350.00 | $3,850.00 | 1,2,3,4,5,6 |
| | Sawcut Bituminous Pavement (Full Depth) | LF | 80 | $6.00 | $480.00 | 1,2,3,4,5,6 |
| | Remove and Dispose Bituminous Pavement (P) | SY | 1,600 | $6.00 | $9,600.00 | 1,2,3,4,5,6 |
| | Salvage and Reinstall Topsoil (P) | CY | 1,930 | $15.00 | $28,944.78 | 1,2,3,4,5,6 |
| | Import Topsoil Borrow and Placement | CY | 1,930 | $35.00 | $67,537.81 | 1,2,3,4,5,6 |
| | Common Excavation, Haul, & Disposal Offsite (P) | CY | 1,039 | $30.00 | $31,166.24 | 1,2,3,4,5,6 |
| | Subsoiling - Deep Soil Ripping | AC | 4.8 | $4,000.00 | $19,137.04 | 1,2,3,4,5,6 |
| | ECB/HydroMulch | SY | 24,000 | $2.50 | $60,000.00 | 1,2,3,4,5,6 |
| | Turf Seeding | AC | 1.23 | $4,000.00 | $4,905.62 | 1,2,3,4,5,6 |
| | Native Restoration Seeding (Prairie/Wet Meadow) | AC | 3.56 | $6,000.00 | $21,347.13 | 1,2,3,4,5,6 |
| | Native Restoration Plantings (Plugs/Shrubs/Perennials) | AC | 3.56 | $20,000.00 | $71,157.11 | 1,2,3,4,5,6 |
| | Tree Planting | EA | 11 | $500.00 | $5,500.00 | 1,2,3,4,5,6 |
| | Year 1 Maintenance Period | LS | 1 | $6,000.00 | $6,000.00 | 1,2,3,4,5,6 |
| | Year 2 Maintenance Period | LS | 1 | $4,000.00 | $4,000.00 | 1,2,3,4,5,6 |
| | Year 3 Maintenance Period | LS | 1 | $4,000.00 | $4,000.00 | 1,2,3,4,5,6 |
| | Bituminous Trail | SY | 1,700 | $35.00 | $59,500.00 | 1,2,3,4,5,6 |
| | Aggregate Base (CV), Class 5 - Bituminous Trail | TON | 453 | $40.00 | $18,120.00 | 1,2,3,4,5,6 |
| | Secondary/Overlook Trail - Natural Surface | SY | 700 | $35.00 | $24,500.00 | 1,2,3,4,5,6 |
| | Concrete Bench Pad (P) | SY | 14 | $60.00 | $866.67 | 1,2,3,4,5,6 |
| | Aggregate Base (CV), Class 5 - Bench Pad | TON | 4 | $40.00 | $160.00 | 1,2,3,4,5,6 |
| | 24" RCP Pipe Sewer | LF | 200 | $150.00 | $30,000.00 | 1,2,3,4,5,6,7 |
| | 24" RCP FES | EA | 4 | $2,200.00 | $8,800.00 | 1,2,3,4,5,6 |
| | 24" RCP Trash Rack | EA | 2 | $2,000.00 | $4,000.00 | 1,2,3,4,5,6 |
| | Drainage Structures | EA | 2 | $20,000.00 | $40,000.00 | 1,2,3,4,5,6 |
| | Pretreatment Structures | Each | 1 | $30,000.00 | $30,000.00 | 1,2,3,4,5,6 |
| | Boulders/Rock | TON | 255 | $470.00 | $119,675.93 | 1,2,3,4,5,6 |
| | Bridge/Interactive Features | LS | 1 | $50,000.00 | $50,000.00 | 1,2,3,4,5,6 |
| | Art Features | LS | 1 | $15,000.00 | $15,000.00 | 1,2,3,4,5,6 |
| | Victor Stanley, Inc. Model 8 Bench | EA | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | | | | | | |
| | CONSTRUCTION SUBTOTAL | | | | $888,000 | 1,2,3,4,5,6,7,8 |
| | CONSTRUCTION CONTINGENCY (20%) | | | | $178,000 | 1,4,8 |
| | ESTIMATED CONSTRUCTION COST | | | | $1,066,000 | 1,2,3,4,5,6,7,8 |
| | | | | | | |
| | PLANNING, ENGINEERING, DESIGN, & PERMITTING | | | | $170,560 | |
| | LEGAL | | | | $21,320 | |
| | CONSTRUCTON MANAGEMENT | | | | $74,620 | |
| | EASEMENTS | SF | 0 | $6.00 | $0 | |
| | | | | | | |
| | ESTIMATED TOTAL PROJECT COST | | | | **$1,333,000** | 1,2,3,4,5,6,7,8 |
| **ESTIMATED ACCURACY RANGE** | | **-30%** | | | $934,000 | 1,2,3,4,5,6,7,8 |
| | | **50%** | | | $2,000,000 | 1,2,3,4,5,6,7,8 |

Notes

[1] Quantities based on Design Work Completed (1 - 15%).

[2] Unit Prices Based on Information Available at This Time.

[3] Limited Soil Boring and Field Investigation Information Available.

[4] This design level (Class 4, 1-15% design completion per ASTM E 2516-11) cost estimate is based on concept designs, alignments, quantities and unit prices. Costs will change with further design. Time value-of-money escalation costs are not included. A construction schedule is not available at this time. Contingency is an allowance for the net sum of costs that will be in the Final Total Project Cost at the time of the completion of design, but are not included at this level of project definition. The estimated accuracy range for the Total Project Cost as the project is defined is -20% to +30%. The accuracy range is based on professional judgement considering the level of design completed, the complexity of the project and the uncertainties in the project as scoped. The contingency and the accuracy range are not intended to include costs for future scope changes that are not part of the project as currently scoped or costs for risk contingency. Operation and Maintenance costs are not included.

[5] Estimate assumes that projects will not be located on contaminated soil.

[6] Estimate costs are to design, construct, and permit each alternative. The estimated costs do not include maintenance, monitoring or additional tasks following construction.

[7] Furnish and Install pipe cost per linear foot includes all trenching, bedding, backfilling, compaction, and disposal of excess materials

[8] Estimate costs are reported to nearest thousand dollars.

| | | | | | | |
|---|---|---|---|---|---|---|
| BARR | PREPARED BY: BARR ENGINEERING COMPANY | | SHEET: | 1 | OF | 1 |
| | | | CREATED BY: | KRT | DATE: | 11/1/2023 |
| ENGINEER'S OPINION OF PROBABLE PROJECT COST | | | CHECKED BY: | JAK2 | DATE: | 12/1/2023 |
| PROJECT: | Lotus Lake Water Quality Improvement Project | | APPROVED BY: | SAS | DATE: | 12/10/2023 |
| LOCATION: | Riley Purgatory Bluff Creek Watershed District | ISSUED: | | | DATE: | |
| PROJECT #: | 23270053.14 TO39 | ISSUED: | | | DATE: | |
| **OPINION OF COST - SUMMARY** | | ISSUED: | | | DATE: | |

# Engineer's Opinion of Probable Project Cost

## LL_3a - Rock Check Dam to Stabilize Channel Sediment

| Cat. No. | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | UNIT COST | ITEM COST | NOTES |
|---|---|---|---|---|---|---|
| | Mobilization/Demobilization | LS | 1 | $10,000.00 | $10,000.00 | 1,2,3,4,5,6 |
| | Traffic and Pedestrian Safety Control Measures | LS | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Construction Layout and Staking | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Rock Construction Entrance | Ea | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Storm Drain Inlet Protection (P) | Ea | 4 | $300.00 | $1,200.00 | 1,2,3,4,5,6 |
| | Silt Fence, Machine Sliced | LF | 150 | $2.50 | $375.00 | 1,2,3,4,5,6 |
| | Sediment Log | LF | 150 | $5.00 | $750.00 | 1,2,3,4,5,6 |
| | Daily Street Sweeping | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Construction Fencing | LF | 300 | $3.50 | $1,050.00 | 1,2,3,4,5,6 |
| | Clearing and Grubbing Trees/Shrubs less than 12" Diameter | LS | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | Common Excavation, Haul, & Disposal Offsite | CY | 30 | $32.00 | $951.43 | 1,2,3,4,5,6 |
| | Rip Rap/Check Dam | TON | 28 | $215.00 | $6,051.85 | 1,2,3,4,5,6 |
| | ECB/HydroMulch | SY | 212 | $2.50 | $530.73 | 1,2,3,4,5,6 |
| | Native Restoration Seeding | AC | 0.04 | $6,000.00 | $263.17 | 1,2,3,4,5,6 |
| | Year 1 Maintenance Period | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Year 2 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | Year 3 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | | | | | | |
| | CONSTRUCTION SUBTOTAL | | | | $35,000 | 1,2,3,4,5,6,7,8 |
| | CONSTRUCTION CONTINGENCY (20%) | | | | $7,000 | 1,4,8 |
| | ESTIMATED CONSTRUCTION COST | | | | $42,000 | 1,2,3,4,5,6,7,8 |
| | | | | | | |
| | PLANNING, ENGINEERING, DESIGN, & PERMITTING | | | | $6,720 | |
| | LEGAL | | | | $840 | |
| | CONSTRUCTON MANAGEMENT | | | | $2,940 | |
| | EASEMENTS | SF | | $6.00 | $0 | |
| | | | | | | |
| | ESTIMATED TOTAL PROJECT COST | | | | **$53,000** | 1,2,3,4,5,6,7,8 |
| **ESTIMATED ACCURACY RANGE** | | **-30%** | | | $38,000 | 1,2,3,4,5,6,7,8 |
| | | **50%** | | | $80,000 | 1,2,3,4,5,6,7,8 |

Notes

[1] Quantities based on Design Work Completed (1 - 15%).

[2] Unit Prices Based on Information Available at This Time.

[3] Limited Soil Boring and Field Investigation Information Available.

[4] This design level (Class 4, 1-15% design completion per ASTM E 2516-11) cost estimate is based on concept designs, alignments, quantities and unit prices. Costs will change with further design. Time value-of-money escalation costs are not included. A construction schedule is not available at this time. Contingency is an allowance for the net sum of costs that will be in the Final Total Project Cost at the time of the completion of design, but are not included at this level of project definition. The estimated accuracy range for the Total Project Cost as the project is defined is -20% to +30%. The accuracy range is based on professional judgement considering the level of design completed, the complexity of the project and the uncertainties in the project as scoped. The contingency and the accuracy range are not intended to include costs for future scope changes that are not part of the project as currently scoped or costs for risk contingency. Operation and Maintenance costs are not included.

[5] Estimate assumes that projects will not be located on contaminated soil.

[6] Estimate costs are to design, construct, and permit each alternative. The estimated costs do not include maintenance, monitoring or additional tasks following construction.

[7] Furnish and Install pipe cost per linear foot includes all trenching, bedding, backfilling, compaction, and disposal of excess materials

[8] Estimate costs are reported to nearest thousand dollars.

| | | | | | | |
|---|---|---|---|---|---|---|
| PREPARED BY: BARR ENGINEERING COMPANY | | | SHEET: | 1 | OF | 1 |
| | | | CREATED BY: | KRT | DATE: | 11/1/2023 |
| **ENGINEER'S OPINION OF PROBABLE PROJECT COST** | | | CHECKED BY: | JAK2 | DATE: | 12/1/2023 |
| PROJECT: | Lotus Lake Water Quality Improvement Project | | APPROVED BY: | SAS | DATE: | 12/10/2023 |
| LOCATION: | Riley Purgatory Bluff Creek Watershed District | ISSUED: | | | DATE: | |
| PROJECT #: | 23270053.14 TO39 | ISSUED: | | | DATE: | |
| **OPINION OF COST - SUMMARY** | | ISSUED: | | | DATE: | |

# Engineer's Opinion of Probable Project Cost

## LL_3b - Modify Structure to Stabilize Channel Sediment

| Cat. No. | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | UNIT COST | ITEM COST | NOTES |
|---|---|---|---|---|---|---|
| | Mobilization/Demobilization | LS | 1 | $10,000.00 | $10,000.00 | 1,2,3,4,5,6 |
| | Traffic and Pedestrian Safety Control Measures | LS | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Construction Layout and Staking | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Rock Construction Entrance | Ea | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Storm Drain Inlet Protection (P) | Ea | 4 | $300.00 | $1,200.00 | 1,2,3,4,5,6 |
| | Silt Fence, Machine Sliced | LF | 100 | $2.50 | $250.00 | 1,2,3,4,5,6 |
| | Sediment Log | LF | 100 | $5.00 | $500.00 | 1,2,3,4,5,6 |
| | Daily Street Sweeping | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Construction Fencing | LF | 200 | $3.50 | $700.00 | 1,2,3,4,5,6 |
| | Clearing and Grubbing Trees/Shrubs less than 12" Diameter | LS | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | Common Excavation, Haul, & Disposal Offsite | CY | 30 | $32.00 | $951.43 | 1,2,3,4,5,6 |
| | ECB/HydroMulch | SY | 201 | $2.50 | $503.61 | 1,2,3,4,5,6 |
| | Native Restoration Seeding | AC | 0.04 | $6,000.00 | $249.73 | 1,2,3,4,5,6 |
| | Year 1 Maintenance Period | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Year 2 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | Year 3 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | Modify Drainage Strurcture | EA | 1 | $15,000.00 | $15,000.00 | 1,2,3,4,5,6 |
| | | | | | | |
| | CONSTRUCTION SUBTOTAL | | | | $43,000 | 1,2,3,4,5,6,7,8 |
| | CONSTRUCTION CONTINGENCY (20%) | | | | $9,000 | 1,4,8 |
| | ESTIMATED CONSTRUCTION COST | | | | $52,000 | 1,2,3,4,5,6,7,8 |
| | | | | | | |
| | PLANNING, ENGINEERING, DESIGN, & PERMITTING | | | | $8,320 | |
| | LEGAL | | | | $1,040 | |
| | CONSTRUCTON MANAGEMENT | | | | $3,640 | |
| | EASEMENTS | SF | | $6.00 | $0 | |
| | | | | | | |
| | ESTIMATED TOTAL PROJECT COST | | | | **$65,000** | 1,2,3,4,5,6,7,8 |
| **ESTIMATED ACCURACY RANGE** | | **-30%** | | | $46,000 | 1,2,3,4,5,6,7,8 |
| | | **50%** | | | $98,000 | 1,2,3,4,5,6,7,8 |

Notes

[1] Quantities based on Design Work Completed (1 - 15%).

[2] Unit Prices Based on Information Available at This Time.

[3] Limited Soil Boring and Field Investigation Information Available.

[4] This design level (Class 4, 1-15% design completion per ASTM E 2516-11) cost estimate is based on concept designs, alignments, quantities and unit prices. Costs will change with further design. Time value-of-money escalation costs are not included. A construction schedule is not available at this time. Contingency is an allowance for the net sum of costs that will be in the Final Total Project Cost at the time of the completion of design, but are not included at this level of project definition. The estimated accuracy range for the Total Project Cost as the project is defined is -20% to +30%. The accuracy range is based on professional judgement considering the level of design completed, the complexity of the project and the uncertainties in the project as scoped. The contingency and the accuracy range are not intended to include costs for future scope changes that are not part of the project as currently scoped or costs for risk contingency. Operation and Maintenance costs are not included.

[5] Estimate assumes that projects will not be located on contaminated soil.

[6] Estimate costs are to design, construct, and permit each alternative. The estimated costs do not include maintenance, monitoring or additional tasks following construction.

[7] Furnish and Install pipe cost per linear foot includes all trenching, bedding, backfilling, compaction, and disposal of excess materials

[8] Estimate costs are reported to nearest thousand dollars.

| | | | | | | |
|---|---|---|---|---|---|---|
| BARR | PREPARED BY: BARR ENGINEERING COMPANY | | SHEET: | 1 | OF | 1 |
| | | | CREATED BY: | KRT | DATE: | 11/1/2023 |
| ENGINEER'S OPINION OF PROBABLE PROJECT COST | | | CHECKED BY: | JAK2 | DATE: | 12/1/2023 |
| PROJECT: | Lotus Lake Water Quality Improvement Project | | APPROVED BY: | SAS | DATE: | 12/10/2023 |
| LOCATION: | Riley Purgatory Bluff Creek Watershed District | ISSUED: | | | DATE: | |
| PROJECT #: | 23270053.14 TO39 | ISSUED: | | | DATE: | |
| **OPINION OF COST - SUMMARY** | | ISSUED: | | | DATE: | |

# Engineer's Opinion of Probable Project Cost

## LL_3c - Modify Structure to Stabilize Channel Sediment and Stabilize Channel

| Cat. No. | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | UNIT COST | ITEM COST | NOTES |
|---|---|---|---|---|---|---|
| | Mobilization/Demobilization | LS | 1 | $10,000.00 | $10,000.00 | 1,2,3,4,5,6 |
| | Traffic and Pedestrian Safety Control Measures | LS | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Construction Layout and Staking | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Rock Construction Entrance | Ea | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Storm Drain Inlet Protection (P) | Ea | 4 | $300.00 | $1,200.00 | 1,2,3,4,5,6 |
| | Silt Fence, Machine Sliced | LF | 100 | $2.50 | $250.00 | 1,2,3,4,5,6 |
| | Sediment Log | LF | 100 | $5.00 | $500.00 | 1,2,3,4,5,6 |
| | Daily Street Sweeping | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Construction Fencing | LF | 200 | $3.50 | $700.00 | 1,2,3,4,5,6 |
| | Clearing and Grubbing Trees/Shrubs less than 12" Diameter | LS | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | Common Excavation, Haul, & Disposal Offsite | CY | 30 | $32.00 | $951.43 | 1,2,3,4,5,6 |
| | ECB/HydroMulch | SY | 3,388 | $2.50 | $8,470.00 | 1,2,3,4,5,6 |
| | Native Restoration Seeding | AC | 0.70 | $6,000.00 | $4,200.00 | 1,2,3,4,5,6 |
| | Year 1 Maintenance Period | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Year 2 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | Year 3 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | Modify Drainage Strurcture | EA | 1 | $15,000.00 | $15,000.00 | 1,2,3,4,5,6 |
| | Channel Stabilization | LF | 225 | $200.00 | $45,000.00 | 1,2,3,4,5,6 |
| | | | | | | |
| | CONSTRUCTION SUBTOTAL | | | | $100,000 | 1,2,3,4,5,6,7,8 |
| | CONSTRUCTION CONTINGENCY (20%) | | | | $20,000 | 1,4,8 |
| | ESTIMATED CONSTRUCTION COST | | | | $120,000 | 1,2,3,4,5,6,7,8 |
| | | | | | | |
| | PLANNING, ENGINEERING, DESIGN, & PERMITTING | | | | $19,200 | |
| | LEGAL | | | | $2,400 | |
| | CONSTRUCTON MANAGEMENT | | | | $8,400 | |
| | EASEMENTS | SF | | $6.00 | $0 | |
| | | | | | | |
| | ESTIMATED TOTAL PROJECT COST | | | | **$150,000** | 1,2,3,4,5,6,7,8 |
| ESTIMATED ACCURACY RANGE | | **-30%** | | | $105,000 | 1,2,3,4,5,6,7,8 |
| | | **50%** | | | $225,000 | 1,2,3,4,5,6,7,8 |

Notes

[1] Quantities based on Design Work Completed (1 - 15%).

[2] Unit Prices Based on Information Available at This Time.

[3] Limited Soil Boring and Field Investigation Information Available.

[4] This design level (Class 4, 1-15% design completion per ASTM E 2516-11) cost estimate is based on concept designs, alignments, quantities and unit prices. Costs will change with further design. Time value-of-money escalation costs are not included. A construction schedule is not available at this time. Contingency is an allowance for the net sum of costs that will be in the Final Total Project Cost at the time of the completion of design, but are not included at this level of project definition. The estimated accuracy range for the Total Project Cost as the project is defined is -20% to +30%. The accuracy range is based on professional judgement considering the level of design completed, the complexity of the project and the uncertainties in the project as scoped. The contingency and the accuracy range are not intended to include costs for future scope changes that are not part of the project as currently scoped or costs for risk contingency. Operation and Maintenance costs are not included.

[5] Estimate assumes that projects will not be located on contaminated soil.

[6] Estimate costs are to design, construct, and permit each alternative. The estimated costs do not include maintenance, monitoring or additional tasks following construction.

[7] Furnish and Install pipe cost per linear foot includes all trenching, bedding, backfilling, compaction, and disposal of excess materials

[8] Estimate costs are reported to nearest thousand dollars.

| PREPARED BY: BARR ENGINEERING COMPANY | | SHEET: | 1 | OF | 1 |
|---|---|---|---|---|---|
| | | CREATED BY: | KRT | DATE: | 11/1/2023 |
| **ENGINEER'S OPINION OF PROBABLE PROJECT COST** | | CHECKED BY: | JAK2 | DATE: | 12/1/2023 |
| PROJECT: Lotus Lake Water Quality Improvement Project | | APPROVED BY: | SAS | DATE: | 12/10/2023 |
| LOCATION: Riley Purgatory Bluff Creek Watershed District | ISSUED: | | | DATE: | |
| PROJECT #: 23270053.14 TO39 | ISSUED: | | | DATE: | |
| **OPINION OF COST - SUMMARY** | ISSUED: | | | DATE: | |

# Engineer's Opinion of Probable Project Cost

## LL_7a - Extended Detention Outlet Structure - Upper Wetland

| Cat. No. | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | UNIT COST | ITEM COST | NOTES |
|---|---|---|---|---|---|---|
| | Mobilization/Demobilization | LS | 1 | $10,000.00 | $10,000.00 | 1,2,3,4,5,6 |
| | Traffic and Pedestrian Safety Control Measures | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Construction Layout and Staking | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Rock Construction Entrance | Ea | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Silt Fence, Machine Sliced | LF | 450 | $2.50 | $1,125.00 | 1,2,3,4,5,6 |
| | Sediment Log | LF | 450 | $5.00 | $2,250.00 | 1,2,3,4,5,6 |
| | Daily Street Sweeping | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Construction Fencing | LF | 900 | $3.50 | $3,150.00 | 1,2,3,4,5,6 |
| | Remove existing outlet and storm sewer | LS | 1 | $5,000.00 | $5,000.00 | 1,2,3,4,5,6 |
| | Extended Detention Structure | EA | 1 | $20,000.00 | $20,000.00 | 1,2,3,4,5,6 |
| | 30" RCP Pipe Sewer | LF | 80 | $200.00 | $16,000.00 | 1,2,3,4,5,6,7 |
| | 30" RCP FES | EA | 2 | $3,000.00 | $6,000.00 | 1,2,3,4,5,6 |
| | 30" RCP Trash Rack | EA | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | ECB/HydroMulch | SY | 1,038 | $2.50 | $2,596.08 | 1,2,3,4,5,6 |
| | Native Restoration Seeding | AC | 0.21 | $6,000.00 | $1,287.31 | 1,2,3,4,5,6 |
| | Year 1 Maintenance Period | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Year 2 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | Year 3 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | | | | | | |
| | CONSTRUCTION SUBTOTAL | | | | $78,000 | 1,2,3,4,5,6,7,8 |
| | CONSTRUCTION CONTINGENCY (20%) | | | | $16,000 | 1,4,8 |
| | ESTIMATED CONSTRUCTION COST | | | | $94,000 | 1,2,3,4,5,6,7,8 |
| | | | | | | |
| | PLANNING, ENGINEERING, DESIGN, & PERMITTING | | | | $15,040 | |
| | LEGAL | | | | $1,880 | |
| | CONSTRUCTON MANAGEMENT | | | | $6,580 | |
| | EASEMENTS | SF | 0 | $6.00 | $0 | |
| | | | | | | |
| | ESTIMATED TOTAL PROJECT COST | | | | **$118,000** | 1,2,3,4,5,6,7,8 |
| **ESTIMATED ACCURACY RANGE** | | **-30%** | | | $83,000 | 1,2,3,4,5,6,7,8 |
| | | **50%** | | | $177,000 | 1,2,3,4,5,6,7,8 |

Notes

[1] Quantities based on Design Work Completed (1 - 15%).

[2] Unit Prices Based on Information Available at This Time.

[3] Limited Soil Boring and Field Investigation Information Available.

[4] This design level (Class 4, 1-15% design completion per ASTM E 2516-11) cost estimate is based on concept designs, alignments, quantities and unit prices. Costs will change with further design. Time value-of-money escalation costs are not included. A construction schedule is not available at this time. Contingency is an allowance for the net sum of costs that will be in the Final Total Project Cost at the time of the completion of design, but are not included at this level of project definition. The estimated accuracy range for the Total Project Cost as the project is defined is -20% to +30%. The accuracy range is based on professional judgement considering the level of design completed, the complexity of the project and the uncertainties in the project as scoped. The contingency and the accuracy range are not intended to include costs for future scope changes that are not part of the project as currently scoped or costs for risk contingency. Operation and Maintenance costs are not included.

[5] Estimate assumes that projects will not be located on contaminated soil.

[6] Estimate costs are to design, construct, and permit each alternative. The estimated costs do not include maintenance, monitoring or additional tasks following construction.

[7] Furnish and Install pipe cost per linear foot includes all trenching, bedding, backfilling, compaction, and disposal of excess materials

[8] Estimate costs are reported to nearest thousand dollars.

| PREPARED BY: BARR ENGINEERING COMPANY | | SHEET: | 1 | OF | 1 |
|---|---|---|---|---|---|
| | | CREATED BY: | KRT | DATE: | 11/1/2023 |
| **ENGINEER'S OPINION OF PROBABLE PROJECT COST** | | CHECKED BY: | JAK2 | DATE: | 12/1/2023 |
| PROJECT: Lotus Lake Water Quality Improvement Project | | APPROVED BY: | SAS | DATE: | 12/10/2023 |
| LOCATION: Riley Purgatory Bluff Creek Watershed District | ISSUED: | | | DATE: | |
| PROJECT #: 23270053.14 TO39 | ISSUED: | | | DATE: | |
| **OPINION OF COST - SUMMARY** | ISSUED: | | | DATE: | |

# Engineer's Opinion of Probable Project Cost

## LL_7b - Extended Detention Outlet Structure - Lower Wetland

| Cat. No. | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | UNIT COST | ITEM COST | NOTES |
|---|---|---|---|---|---|---|
| | Mobilization/Demobilization | LS | 1 | $10,000.00 | $10,000.00 | 1,2,3,4,5,6 |
| | Traffic and Pedestrian Safety Control Measures | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Construction Layout and Staking | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Rock Construction Entrance | Ea | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Silt Fence, Machine Sliced | LF | 200 | $2.50 | $500.00 | 1,2,3,4,5,6 |
| | Sediment Log | LF | 200 | $5.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Daily Street Sweeping | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Construction Fencing | LF | 400 | $3.50 | $1,400.00 | 1,2,3,4,5,6 |
| | Remove existing outlet and storm sewer | LS | 1 | $5,000.00 | $5,000.00 | 1,2,3,4,5,6 |
| | Extended Detention Structure | EA | 1 | $20,000.00 | $20,000.00 | 1,2,3,4,5,6 |
| | 30" RCP Pipe Sewer | LF | 50 | $200.00 | $10,000.00 | 1,2,3,4,5,6,7 |
| | 30" RCP FES | EA | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | 30" RCP Trash Rack | EA | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | ECB/HydroMulch | SY | 514 | $2.50 | $1,285.61 | 1,2,3,4,5,6 |
| | Native Restoration Seeding | AC | 0.11 | $6,000.00 | $637.49 | 1,2,3,4,5,6 |
| | Year 1 Maintenance Period | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Year 2 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | Year 3 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | Berm Stability, Geotechnical | LS | 1 | $200,000.00 | $200,000.00 | 1,2,3,4,5,6 |
| | | | | | | |
| | CONSTRUCTION SUBTOTAL | | | | $263,000 | 1,2,3,4,5,6,7,8 |
| | CONSTRUCTION CONTINGENCY (20%) | | | | $53,000 | 1,4,8 |
| | ESTIMATED CONSTRUCTION COST | | | | $316,000 | 1,2,3,4,5,6,7,8 |
| | | | | | | |
| | PLANNING, ENGINEERING, DESIGN, & PERMITTING | | | | $50,560 | |
| | LEGAL | | | | $6,320 | |
| | CONSTRUCTON MANAGEMENT | | | | $22,120 | |
| | EASEMENTS | SF | 0 | $6.00 | $0 | |
| | | | | | | |
| | ESTIMATED TOTAL PROJECT COST | | | | **$395,000** | 1,2,3,4,5,6,7,8 |
| **ESTIMATED ACCURACY RANGE** | | **-30%** | | | $277,000 | 1,2,3,4,5,6,7,8 |
| | | **50%** | | | $593,000 | 1,2,3,4,5,6,7,8 |

Notes

[1] Quantities based on Design Work Completed (1 - 15%).

[2] Unit Prices Based on Information Available at This Time.

[3] Limited Soil Boring and Field Investigation Information Available.

[4] This design level (Class 4, 1-15% design completion per ASTM E 2516-11) cost estimate is based on concept designs, alignments, quantities and unit prices. Costs will change with further design. Time value-of-money escalation costs are not included. A construction schedule is not available at this time. Contingency is an allowance for the net sum of costs that will be in the Final Total Project Cost at the time of the completion of design, but are not included at this level of project definition. The estimated accuracy range for the Total Project Cost as the project is defined is -20% to +30%. The accuracy range is based on professional judgement considering the level of design completed, the complexity of the project and the uncertainties in the project as scoped. The contingency and the accuracy range are not intended to include costs for future scope changes that are not part of the project as currently scoped or costs for risk contingency. Operation and Maintenance costs are not included.

[5] Estimate assumes that projects will not be located on contaminated soil.

[6] Estimate costs are to design, construct, and permit each alternative. The estimated costs do not include maintenance, monitoring or additional tasks following construction.

[7] Furnish and Install pipe cost per linear foot includes all trenching, bedding, backfilling, compaction, and disposal of excess materials

[8] Estimate costs are reported to nearest thousand dollars.

| | | | | | | |
|---|---|---|---|---|---|---|
| BARR | **PREPARED BY: BARR ENGINEERING COMPANY** | | SHEET: | 1 | OF | 1 |
| | | | CREATED BY: | KRT | DATE: | 11/1/2023 |
| **ENGINEER'S OPINION OF PROBABLE PROJECT COST** | | | CHECKED BY: | JAK2 | DATE: | 12/1/2023 |
| PROJECT: | Lotus Lake Water Quality Improvement Project | | APPROVED BY: | SAS | DATE: | 12/10/2023 |
| LOCATION: | Riley Purgatory Bluff Creek Watershed District | ISSUED: | | | DATE: | |
| PROJECT #: | 23270053.14 TO39 | ISSUED: | | | DATE: | |
| **OPINION OF COST - SUMMARY** | | ISSUED: | | | DATE: | |

# Engineer's Opinion of Probable Project Cost

## LL_7c - Extended Detention Outlet Structure - Lower Wetland & Subsurface IESF

| Cat. No. | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | UNIT COST | ITEM COST | NOTES |
|---|---|---|---|---|---|---|
| | Mobilization/Demobilization | LS | 1 | $30,000.00 | $30,000.00 | 1,2,3,4,5,6 |
| | Traffic and Pedestrian Safety Control Measures | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Construction Layout and Staking | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Rock Construction Entrance | Ea | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Silt Fence, Machine Sliced | LF | 200 | $2.50 | $500.00 | 1,2,3,4,5,6 |
| | Sediment Log | LF | 200 | $5.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Daily Street Sweeping | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Construction Fencing | LF | 400 | $3.50 | $1,400.00 | 1,2,3,4,5,6 |
| | Remove existing outlet and storm sewer | LS | 1 | $5,000.00 | $5,000.00 | 1,2,3,4,5,6 |
| | Extended Detention Structure | EA | 1 | $20,000.00 | $20,000.00 | 1,2,3,4,5,6 |
| | 30" RCP Pipe Sewer | LF | 50 | $200.00 | $10,000.00 | 1,2,3,4,5,6,7 |
| | 30" RCP FES | EA | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | 30" RCP Trash Rack | EA | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | 12" RCP Pipe Sewer | LF | 120 | $85.00 | $10,200.00 | 1,2,3,4,5,6 |
| | 12" RCP FES | EA | 2 | $2,000.00 | $4,000.00 | 1,2,3,4,5,6 |
| | 12" RCP Trash Rack | EA | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Surface Filtration System | CF | 5,950 | $17.00 | $101,150.00 | 1,2,3,4,5,6 |
| | Iron Enhanced Sand (5% Iron by Weight, 2 ft depth) | TON | 201 | $260.00 | $52,385.19 | 1,2,3,4,5,6 |
| | Bituminous Trail Repair (Subgrade and Bituimous) | SY | 305 | $50.00 | $15,231.24 | 1,2,3,4,5,6 |
| | ECB/HydroMulch | SY | 724 | $2.50 | $1,809.83 | 1,2,3,4,5,6 |
| | Native Restoration Seeding | AC | 0.15 | $6,000.00 | $897.44 | 1,2,3,4,5,6 |
| | Year 1 Maintenance Period | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Year 2 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | Year 3 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | Berm Stability, Geotechnical | LS | 1 | $200,000.00 | $200,000.00 | 1,2,3,4,5,6 |
| | | | | | | |
| | CONSTRUCTION SUBTOTAL | | | | $468,000 | 1,2,3,4,5,6,7,8 |
| | CONSTRUCTION CONTINGENCY (20%) | | | | $94,000 | 1,4,8 |
| | ESTIMATED CONSTRUCTION COST | | | | $562,000 | 1,2,3,4,5,6,7,8 |
| | | | | | | |
| | PLANNING, ENGINEERING, DESIGN, & PERMITTING | | | | $89,920 | |
| | LEGAL | | | | $11,240 | |
| | CONSTRUCTON MANAGEMENT | | | | $39,340 | |
| | EASEMENTS | SF | 0 | $6.00 | $0 | |
| | | | | | | |
| | ESTIMATED TOTAL PROJECT COST | | | | **$703,000** | 1,2,3,4,5,6,7,8 |
| **ESTIMATED ACCURACY RANGE** | | **-30%** | | | $493,000 | 1,2,3,4,5,6,7,8 |
| | | **50%** | | | $1,055,000 | 1,2,3,4,5,6,7,8 |

Notes

[1] Quantities based on Design Work Completed (1 - 15%).

[2] Unit Prices Based on Information Available at This Time.

[3] Limited Soil Boring and Field Investigation Information Available.

[4] This design level (Class 4, 1-15% design completion per ASTM E 2516-11) cost estimate is based on concept designs, alignments, quantities and unit prices. Costs will change with further design. Time value-of-money escalation costs are not included. A construction schedule is not available at this time. Contingency is an allowance for the net sum of costs that will be in the Final Total Project Cost at the time of the completion of design, but are not included at this level of project definition. The estimated accuracy range for the Total Project Cost as the project is defined is -20% to +30%. The accuracy range is based on professional judgement considering the level of design completed, the complexity of the project and the uncertainties in the project as scoped. The contingency and the accuracy range are not intended to include costs for future scope changes that are not part of the project as currently scoped or costs for risk contingency. Operation and Maintenance costs are not included.

[5] Estimate assumes that projects will not be located on contaminated soil.

[6] Estimate costs are to design, construct, and permit each alternative. The estimated costs do not include maintenance, monitoring or additional tasks following construction.

[7] Furnish and Install pipe cost per linear foot includes all trenching, bedding, backfilling, compaction, and disposal of excess materials

[8] Estimate costs are reported to nearest thousand dollars.

| | PREPARED BY: BARR ENGINEERING COMPANY | | SHEET: | 1 | OF | 1 |
|---|---|---|---|---|---|---|
| BARR | | | CREATED BY: | KRT | DATE: | 11/1/2023 |
| ENGINEER'S OPINION OF PROBABLE PROJECT COST | | | CHECKED BY: | JAK2 | DATE: | 12/1/2023 |
| PROJECT: | Lotus Lake Water Quality Improvement Project | | APPROVED BY: | SAS | DATE: | 12/10/2023 |
| LOCATION: | Riley Purgatory Bluff Creek Watershed District | ISSUED: | | | DATE: | |
| PROJECT #: | 23270053.14 TO39 | ISSUED: | | | DATE: | |
| **OPINION OF COST - SUMMARY** | | ISSUED: | | | DATE: | |

# Engineer's Opinion of Probable Project Cost

## LL_7d - Storm Sewer Diversion and Extended Detention Outlet Structure - Lower Wetland

| Cat. No. | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | UNIT COST | ITEM COST | NOTES |
|---|---|---|---|---|---|---|
| | Mobilization/Demobilization | LS | 1 | $20,000.00 | $20,000.00 | 1,2,3,4,5,6 |
| | Traffic and Pedestrian Safety Control Measures | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Construction Layout and Staking | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Rock Construction Entrance | Ea | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Silt Fence, Machine Sliced | LF | 200 | $2.50 | $500.00 | 1,2,3,4,5,6 |
| | Sediment Log | LF | 200 | $5.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Daily Street Sweeping | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Construction Fencing | LF | 400 | $3.50 | $1,400.00 | 1,2,3,4,5,6 |
| | Remove existing outlet and storm sewer | LS | 1 | $5,000.00 | $5,000.00 | 1,2,3,4,5,6 |
| | Extended Detention Structure | EA | 1 | $20,000.00 | $20,000.00 | 1,2,3,4,5,6 |
| | Diversion Structure | EA | 1 | $20,000.00 | $20,000.00 | 1,2,3,4,5,6 |
| | 30" RCP Pipe Sewer | LF | 50 | $200.00 | $10,000.00 | 1,2,3,4,5,6,7 |
| | 30" RCP FES | EA | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | 30" RCP Trash Rack | EA | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | 24" RCP Pipe Sewer | LF | 260 | $150.00 | $39,000.00 | 1,2,3,4,5,6 |
| | 24" RCP FES | EA | 1 | $2,200.00 | $2,200.00 | 1,2,3,4,5,6 |
| | 33" RCP Pipe Sewer | LF | 60 | $250.00 | $15,000.00 | 1,2,3,4,5,6 |
| | 33" RCP FES | EA | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | ECB/HydroMulch | SY | 5,856 | $2.50 | $14,641.00 | 1,2,3,4,5,6 |
| | Native Restoration Seeding | AC | 1.21 | $6,000.00 | $7,260.00 | 1,2,3,4,5,6 |
| | Year 1 Maintenance Period | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Year 2 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | Year 3 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | Berm Stability, Geotechnical | LS | 1 | $200,000.00 | $200,000.00 | 1,2,3,4,5,6 |
| | | | | | | |
| | CONSTRUCTION SUBTOTAL | | | | $373,000 | 1,2,3,4,5,6,7,8 |
| | CONSTRUCTION CONTINGENCY (20%) | | | | $75,000 | 1,4,8 |
| | ESTIMATED CONSTRUCTION COST | | | | $448,000 | 1,2,3,4,5,6,7,8 |
| | | | | | | |
| | PLANNING, ENGINEERING, DESIGN, & PERMITTING | | | | $71,680 | |
| | LEGAL | | | | $8,960 | |
| | CONSTRUCTON MANAGEMENT | | | | $31,360 | |
| | EASEMENTS | SF | 0 | $6.00 | $0 | |
| | | | | | | |
| | ESTIMATED TOTAL PROJECT COST | | | | **$560,000** | 1,2,3,4,5,6,7,8 |
| **ESTIMATED ACCURACY RANGE** | | **-30%** | | | $392,000 | 1,2,3,4,5,6,7,8 |
| | | **50%** | | | $840,000 | 1,2,3,4,5,6,7,8 |

Notes

[1] Quantities based on Design Work Completed (1 - 15%).

[2] Unit Prices Based on Information Available at This Time.

[3] Limited Soil Boring and Field Investigation Information Available.

[4] This design level (Class 4, 1-15% design completion per ASTM E 2516-11) cost estimate is based on concept designs, alignments, quantities and unit prices. Costs will change with further design. Time value-of-money escalation costs are not included. A construction schedule is not available at this time. Contingency is an allowance for the net sum of costs that will be in the Final Total Project Cost at the time of the completion of design, but are not included at this level of project definition. The estimated accuracy range for the Total Project Cost as the project is defined is -20% to +30%. The accuracy range is based on professional judgement considering the level of design completed, the complexity of the project and the uncertainties in the project as scoped. The contingency and the accuracy range are not intended to include costs for future scope changes that are not part of the project as currently scoped or costs for risk contingency. Operation and Maintenance costs are not included.

[5] Estimate assumes that projects will not be located on contaminated soil.

[6] Estimate costs are to design, construct, and permit each alternative. The estimated costs do not include maintenance, monitoring or additional tasks following construction.

[7] Furnish and Install pipe cost per linear foot includes all trenching, bedding, backfilling, compaction, and disposal of excess materials

[8] Estimate costs are reported to nearest thousand dollars.

| | | | | | | |
|---|---|---|---|---|---|---|
| BARR | PREPARED BY: BARR ENGINEERING COMPANY | | SHEET: | 1 | OF | 1 |
| | | | CREATED BY: | KRT | DATE: | 11/1/2023 |
| **ENGINEER'S OPINION OF PROBABLE PROJECT COST** | | | CHECKED BY: | JAK2 | DATE: | 12/1/2023 |
| PROJECT: | Lotus Lake Water Quality Improvement Project | | APPROVED BY: | SAS | DATE: | 12/10/2023 |
| LOCATION: | Riley Purgatory Bluff Creek Watershed District | ISSUED: | | | DATE: | |
| PROJECT #: | 23270053.14 TO39 | ISSUED: | | | DATE: | |
| **OPINION OF COST - SUMMARY** | | ISSUED: | | | DATE: | |

# Engineer's Opinion of Probable Project Cost

## LL_7e - Storm Sewer Diversion and Extended Detention Outlet Structure - Lower Wetland & Subsurface IESF

| Cat. No. | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | UNIT COST | ITEM COST | NOTES |
|---|---|---|---|---|---|---|
| | Mobilization/Demobilization | LS | 1 | $40,000.00 | $40,000.00 | 1,2,3,4,5,6 |
| | Traffic and Pedestrian Safety Control Measures | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Construction Layout and Staking | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Rock Construction Entrance | Ea | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Silt Fence, Machine Sliced | LF | 200 | $2.50 | $500.00 | 1,2,3,4,5,6 |
| | Sediment Log | LF | 200 | $5.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Daily Street Sweeping | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Construction Fencing | LF | 400 | $3.50 | $1,400.00 | 1,2,3,4,5,6 |
| | Remove existing outlet and storm sewer | LS | 1 | $5,000.00 | $5,000.00 | 1,2,3,4,5,6 |
| | Extended Detention Structure | EA | 1 | $20,000.00 | $20,000.00 | 1,2,3,4,5,6 |
| | Diversion Structure | EA | 1 | $20,000.00 | $20,000.00 | 1,2,3,4,5,6 |
| | 30" RCP Pipe Sewer | LF | 50 | $200.00 | $10,000.00 | 1,2,3,4,5,6,7 |
| | 30" RCP FES | EA | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | 30" RCP Trash Rack | EA | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | 24" RCP Pipe Sewer | LF | 260 | $150.00 | $39,000.00 | 1,2,3,4,5,6 |
| | 24" RCP FES | EA | 1 | $2,200.00 | $2,200.00 | 1,2,3,4,5,6 |
| | 33" RCP Pipe Sewer | LF | 60 | $250.00 | $15,000.00 | 1,2,3,4,5,6 |
| | 33" RCP FES | EA | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | 12" RCP Pipe Sewer | LF | 120 | $85.00 | $10,200.00 | 1,2,3,4,5,6 |
| | 12" RCP FES | EA | 2 | $2,000.00 | $4,000.00 | 1,2,3,4,5,6 |
| | 12" RCP Trash Rack | EA | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Surface Filtration System | CF | 5,950 | $17.00 | $101,150.00 | 1,2,3,4,5,6 |
| | Iron Enhanced Sand (5% Iron by Weight, 2 ft depth) | TON | 201 | $260.00 | $52,385.19 | 1,2,3,4,5,6 |
| | Bituminous Trail Repair (Subgrade and Bituimous) | SY | 305 | $50.00 | $15,231.24 | 1,2,3,4,5,6 |
| | ECB/HydroMulch | SY | 6,050 | $2.50 | $15,125.00 | 1,2,3,4,5,6 |
| | Native Restoration Seeding | AC | 1.25 | $6,000.00 | $7,500.00 | 1,2,3,4,5,6 |
| | Year 1 Maintenance Period | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Year 2 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | Year 3 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | Berm Stability, Geotechnical | LS | 1 | $200,000.00 | $200,000.00 | 1,2,3,4,5,6 |
| | | | | | | |
| | CONSTRUCTION SUBTOTAL | | | | $577,000 | 1,2,3,4,5,6,7,8 |
| | CONSTRUCTION CONTINGENCY (20%) | | | | $115,000 | 1,4,8 |
| | ESTIMATED CONSTRUCTION COST | | | | $692,000 | 1,2,3,4,5,6,7,8 |
| | | | | | | |
| | PLANNING, ENGINEERING, DESIGN, & PERMITTING | | | | $110,720 | |
| | LEGAL | | | | $13,840 | |
| | CONSTRUCTON MANAGEMENT | | | | $48,440 | |
| | EASEMENTS | SF | 0 | $6.00 | $0 | |
| | | | | | | |
| | ESTIMATED TOTAL PROJECT COST | | | | **$865,000** | 1,2,3,4,5,6,7,8 |
| **ESTIMATED ACCURACY RANGE** | | **-30%** | | | $606,000 | 1,2,3,4,5,6,7,8 |
| | | **50%** | | | $1,298,000 | 1,2,3,4,5,6,7,8 |

Notes

[1] Quantities based on Design Work Completed (1 - 15%).

[2] Unit Prices Based on Information Available at This Time.

[3] Limited Soil Boring and Field Investigation Information Available.

[4] This design level (Class 4, 1-15% design completion per ASTM E 2516-11) cost estimate is based on concept designs, alignments, quantities and unit prices. Costs will change with further design. Time value-of-money escalation costs are not included. A construction schedule is not available at this time. Contingency is an allowance for the net sum of costs that will be in the Final Total Project Cost at the time of the completion of design, but are not included at this level of project definition. The estimated accuracy range for the Total Project Cost as the project is defined is -20% to +30%. The accuracy range is based on professional judgement considering the level of design completed, the complexity of the project and the uncertainties in the project as scoped. The contingency and the accuracy range are not intended to include costs for future scope changes that are not part of the project as currently scoped or costs for risk contingency. Operation and Maintenance costs are not included.

[5] Estimate assumes that projects will not be located on contaminated soil.

[6] Estimate costs are to design, construct, and permit each alternative. The estimated costs do not include maintenance, monitoring or additional tasks following construction.

[7] Furnish and Install pipe cost per linear foot includes all trenching, bedding, backfilling, compaction, and disposal of excess materials

[8] Estimate costs are reported to nearest thousand dollars.

| PREPARED BY: BARR ENGINEERING COMPANY | | SHEET: | 1 | OF | 1 |
|---|---|---|---|---|---|
| | | CREATED BY: | KRT | DATE: | 11/1/2023 |
| **ENGINEER'S OPINION OF PROBABLE PROJECT COST** | | CHECKED BY: | JAK2 | DATE: | 12/1/2023 |
| PROJECT: Lotus Lake Water Quality Improvement Project | | APPROVED BY: | SAS | DATE: | 12/10/2023 |
| LOCATION: Riley Purgatory Bluff Creek Watershed District | ISSUED: | | | DATE: | |
| PROJECT #: 23270053.14 TO39 | ISSUED: | | | DATE: | |
| **OPINION OF COST - SUMMARY** | ISSUED: | | | DATE: | |

# Engineer's Opinion of Probable Project Cost

## LL_8a - Infiltration Basin

| Cat. No. | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | UNIT COST | ITEM COST | NOTES |
|---|---|---|---|---|---|---|
| | Mobilization/Demobilization | LS | 1 | $30,000.00 | $30,000.00 | 1,2,3,4,5,6 |
| | Traffic and Pedestrian Safety Control Measures | LS | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Construction Layout and Staking | LS | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Rock Construction Entrance | Ea | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Storm Drain Inlet Protection (P) | Ea | 4 | $300.00 | $1,200.00 | 1,2,3,4,5,6 |
| | Silt Fence, Machine Sliced | LF | 350 | $2.50 | $875.00 | 1,2,3,4,5,6 |
| | Sediment Log | LF | 350 | $5.00 | $1,750.00 | 1,2,3,4,5,6 |
| | Daily Street Sweeping | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Construction Fencing | LF | 700 | $3.50 | $2,450.00 | 1,2,3,4,5,6 |
| | Clearing and Grubbing Trees/Shrubs less than 12" Diameter | LS | 1 | $6,000.00 | $6,000.00 | 1,2,3,4,5,6 |
| | Removal and Disposal of Tree Stump 12 inch to 24 inch Diameter | EA | 30 | $350.00 | $10,500.00 | 1,2,3,4,5,6 |
| | Salvage and Reinstall Topsoil (P) | CY | 208 | $15.00 | $3,123.28 | 1,2,3,4,5,6 |
| | Import Topsoil Borrow and Placement | CY | 208 | $35.00 | $7,287.66 | 1,2,3,4,5,6 |
| | Common Excavation, Haul, & Disposal Offsite | CY | 304 | $30.00 | $9,114.31 | 1,2,3,4,5,6 |
| | Contruct Basin/Overflow Berm | CY | 778 | $15.00 | $11,666.67 | 1,2,3,4,5,6 |
| | Subsoiling - Deep Soil Ripping | AC | 0.5 | $4,000.00 | $2,064.98 | 1,2,3,4,5,6 |
| | ECB/HydroMulch | SY | 3,000 | $2.50 | $7,500.00 | 1,2,3,4,5,6 |
| | Native Restoration Seeding (Prairie/Wet Meadow) | AC | 0.52 | $6,000.00 | $3,097.47 | 1,2,3,4,5,6 |
| | Native Restoration Plantings (Plugs/Shrubs/Perennials) | AC | 0.39 | $20,000.00 | $7,743.68 | 1,2,3,4,5,6 |
| | Tree Planting | EA | 15 | $500.00 | $7,500.00 | 1,2,3,4,5,6 |
| | Year 1 Maintenance Period | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Year 2 Maintenance Period | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Year 3 Maintenance Period | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | 36" RCP Pipe Sewer | LF | 125 | $300.00 | $37,500.00 | 1,2,3,4,5,6,7 |
| | 36" RCP FES | EA | 3 | $3,000.00 | $9,000.00 | 1,2,3,4,5,6 |
| | 36" RCP Trash Rack | EA | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | Drainage Structures | EA | 1 | $20,000.00 | $20,000.00 | 1,2,3,4,5,6 |
| | Pretreatment Structure | Each | 2 | $30,000.00 | $60,000.00 | 1,2,3,4,5,6 |
| | Rip Rap | TON | 4 | $215.00 | $860.00 | 1,2,3,4,5,6 |
| | | | | | | |
| | CONSTRUCTION SUBTOTAL | | | | $256,000 | 1,2,3,4,5,6,7,8 |
| | CONSTRUCTION CONTINGENCY (20%) | | | | $51,000 | 1,4,8 |
| | ESTIMATED CONSTRUCTION COST | | | | $307,000 | 1,2,3,4,5,6,7,8 |
| | | | | | | |
| | PLANNING, ENGINEERING, DESIGN, & PERMITTING | | | | $49,120 | |
| | LEGAL | | | | $6,140 | |
| | CONSTRUCTON MANAGEMENT | | | | $21,490 | |
| | EASEMENTS | SF | | $6.00 | $0 | |
| | | | | | | |
| | ESTIMATED TOTAL PROJECT COST | | | | **$384,000** | 1,2,3,4,5,6,7,8 |
| **ESTIMATED ACCURACY RANGE** | | **-30%** | | | $269,000 | 1,2,3,4,5,6,7,8 |
| | | **50%** | | | $576,000 | 1,2,3,4,5,6,7,8 |

Notes

[1] Quantities based on Design Work Completed (1 - 15%).

[2] Unit Prices Based on Information Available at This Time.

[3] Limited Soil Boring and Field Investigation Information Available.

[4] This design level (Class 4, 1-15% design completion per ASTM E 2516-11) cost estimate is based on concept designs, alignments, quantities and unit prices. Costs will change with further design. Time value-of-money escalation costs are not included. A construction schedule is not available at this time. Contingency is an allowance for the net sum of costs that will be in the Final Total Project Cost at the time of the completion of design, but are not included at this level of project definition. The estimated accuracy range for the Total Project Cost as the project is defined is -20% to +30%. The accuracy range is based on professional judgement considering the level of design completed, the complexity of the project and the uncertainties in the project as scoped. The contingency and the accuracy range are not intended to include costs for future scope changes that are not part of the project as currently scoped or costs for risk contingency. Operation and Maintenance costs are not included.

[5] Estimate assumes that projects will not be located on contaminated soil.

[6] Estimate costs are to design, construct, and permit each alternative. The estimated costs do not include maintenance, monitoring or additional tasks following construction.

[7] Furnish and Install pipe cost per linear foot includes all trenching, bedding, backfilling, compaction, and disposal of excess materials

[8] Estimate costs are reported to nearest thousand dollars.

| | | | | | | |
|---|---|---|---|---|---|---|
| BARR | PREPARED BY: BARR ENGINEERING COMPANY | | SHEET: | 1 | OF | 1 |
| | | | CREATED BY: | KRT | DATE: | 11/1/2023 |
| ENGINEER'S OPINION OF PROBABLE PROJECT COST | | | CHECKED BY: | JAK2 | DATE: | 12/1/2023 |
| PROJECT: | Lotus Lake Water Quality Improvement Project | | APPROVED BY: | SAS | DATE: | 12/10/2023 |
| LOCATION: | Riley Purgatory Bluff Creek Watershed District | ISSUED: | | | DATE: | |
| PROJECT #: | 23270053.14 TO39 | ISSUED: | | | DATE: | |
| **OPINION OF COST - SUMMARY** | | ISSUED: | | | DATE: | |

# Engineer's Opinion of Probable Project Cost

## LL_8b - Subsurface Infiltration & Infiltration Basin

| Cat. No. | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | UNIT COST | ITEM COST | NOTES |
|---|---|---|---|---|---|---|
| | Mobilization/Demobilization | LS | 1 | $30,000.00 | $30,000.00 | 1,2,3,4,5,6 |
| | Traffic and Pedestrian Safety Control Measures | LS | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Construction Layout and Staking | LS | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Rock Construction Entrance | Ea | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Storm Drain Inlet Protection (P) | Ea | 4 | $300.00 | $1,200.00 | 1,2,3,4,5,6 |
| | Silt Fence, Machine Sliced | LF | 300 | $2.50 | $750.00 | 1,2,3,4,5,6 |
| | Sediment Log | LF | 300 | $5.00 | $1,500.00 | 1,2,3,4,5,6 |
| | Daily Street Sweeping | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Construction Fencing | LF | 600 | $3.50 | $2,100.00 | 1,2,3,4,5,6 |
| | Clearing and Grubbing Trees/Shrubs less than 12" Diameter | LS | 1 | $4,000.00 | $4,000.00 | 1,2,3,4,5,6 |
| | Removal and Disposal of Tree Stump 12 inch to 24 inch Diameter | EA | 10 | $350.00 | $3,500.00 | 1,2,3,4,5,6 |
| | Salvage and Reinstall Topsoil (P) | CY | 122 | $15.00 | $1,822.55 | 1,2,3,4,5,6 |
| | Import Topsoil Borrow and Placement | CY | 122 | $35.00 | $4,252.62 | 1,2,3,4,5,6 |
| | Common Excavation, Haul, & Disposal Offsite | CY | 377 | $30.00 | $11,304.10 | 1,2,3,4,5,6 |
| | Subsurface Storage | CF | 3,983 | $17.00 | $67,714.95 | 1,2,3,4,5,6 |
| | Subsoiling - Deep Soil Ripping | AC | 0.30 | $4,000.00 | $1,204.99 | 1,2,3,4,5,6 |
| | ECB/HydroMulch | SY | 2,000 | $2.50 | $5,000.00 | 1,2,3,4,5,6 |
| | Native Restoration Seeding (Prairie/Wet Meadow) | AC | 0.30 | $6,000.00 | $1,807.49 | 1,2,3,4,5,6 |
| | Native Restoration Plantings (Plugs/Shrubs/Perennials) | AC | 0.15 | $20,000.00 | $3,012.48 | 1,2,3,4,5,6 |
| | Tree Planting | EA | 5 | $500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Year 1 Maintenance Period | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Year 2 Maintenance Period | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Year 3 Maintenance Period | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | 18" RCP Pipe Sewer | LF | 80 | $130.00 | $10,400.00 | 1,2,3,4,5,6,7 |
| | 18" RCP FES | EA | 4 | $2,000.00 | $8,000.00 | 1,2,3,4,5,6 |
| | 18" RCP Trash Rack | EA | 1 | $1,500.00 | $1,500.00 | 1,2,3,4,5,6 |
| | Drainage Structures | EA | 1 | $20,000.00 | $20,000.00 | 1,2,3,4,5,6 |
| | Pretreatment Structures | Each | 2 | $30,000.00 | $60,000.00 | 1,2,3,4,5,6 |
| | Rip Rap | TON | 3 | $215.00 | $645.00 | 1,2,3,4,5,6 |
| | | | | | | |
| | CONSTRUCTION SUBTOTAL | | | | $256,000 | 1,2,3,4,5,6,7,8 |
| | CONSTRUCTION CONTINGENCY (20%) | | | | $51,000 | 1,4,8 |
| | ESTIMATED CONSTRUCTION COST | | | | $307,000 | 1,2,3,4,5,6,7,8 |
| | | | | | | |
| | PLANNING, ENGINEERING, DESIGN, & PERMITTING | | | | $49,120 | |
| | LEGAL | | | | $6,140 | |
| | CONSTRUCTON MANAGEMENT | | | | $21,490 | |
| | EASEMENTS | SF | | $6.00 | $0 | |
| | | | | | | |
| | ESTIMATED TOTAL PROJECT COST | | | | **$384,000** | 1,2,3,4,5,6,7,8 |
| **ESTIMATED ACCURACY RANGE** | | **-30%** | | | $269,000 | 1,2,3,4,5,6,7,8 |
| | | **50%** | | | $576,000 | 1,2,3,4,5,6,7,8 |

Notes

1 Quantities based on Design Work Completed (1 - 15%).

2 Unit Prices Based on Information Available at This Time.

3 Limited Soil Boring and Field Investigation Information Available.

4 This design level (Class 4, 1-15% design completion per ASTM E 2516-11) cost estimate is based on concept designs, alignments, quantities and unit prices. Costs will change with further design. Time value-of-money escalation costs are not included. A construction schedule is not available at this time. Contingency is an allowance for the net sum of costs that will be in the Final Total Project Cost at the time of the completion of design, but are not included at this level of project definition. The estimated accuracy range for the Total Project Cost as the project is defined is -20% to +30%. The accuracy range is based on professional judgement considering the level of design completed, the complexity of the project and the uncertainties in the project as scoped. The contingency and the accuracy range are not intended to include costs for future scope changes that are not part of the project as currently scoped or costs for risk contingency. Operation and Maintenance costs are not included.

5 Estimate assumes that projects will not be located on contaminated soil.

6 Estimate costs are to design, construct, and permit each alternative. The estimated costs do not include maintenance, monitoring or additional tasks following construction.

7 Furnish and Install pipe cost per linear foot includes all trenching, bedding, backfilling, compaction, and disposal of excess materials

8 Estimate costs are reported to nearest thousand dollars.

| | PREPARED BY: BARR ENGINEERING COMPANY | | SHEET: | 1 | OF | 1 |
|---|---|---|---|---|---|---|
| BARR | | | CREATED BY: | KRT | DATE: | 11/1/2023 |
| ENGINEER'S OPINION OF PROBABLE PROJECT COST | | | CHECKED BY: | JAK2 | DATE: | 12/1/2023 |
| PROJECT: | Lotus Lake Water Quality Improvement Project | | APPROVED BY: | SAS | DATE: | 12/10/2023 |
| LOCATION: | Riley Purgatory Bluff Creek Watershed District | ISSUED: | | | DATE: | |
| PROJECT #: | 23270053.14 TO39 | ISSUED: | | | DATE: | |
| **OPINION OF COST - SUMMARY** | | ISSUED: | | | DATE: | |

# Engineer's Opinion of Probable Project Cost

**LL_8c - Kraken Filter**

| Cat. No. | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | UNIT COST | ITEM COST | NOTES |
|---|---|---|---|---|---|---|
| | Mobilization/Demobilization | LS | 1 | $40,000.00 | $40,000.00 | 1,2,3,4,5,6 |
| | Traffic and Pedestrian Safety Control Measures | LS | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Construction Layout and Staking | LS | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Rock Construction Entrance | Ea | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Storm Drain Inlet Protection (P) | Ea | 4 | $300.00 | $1,200.00 | 1,2,3,4,5,6 |
| | Silt Fence, Machine Sliced | LF | 150 | $2.50 | $375.00 | 1,2,3,4,5,6 |
| | Sediment Log | LF | 150 | $5.00 | $750.00 | 1,2,3,4,5,6 |
| | Daily Street Sweeping | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Construction Fencing | LF | 300 | $3.50 | $1,050.00 | 1,2,3,4,5,6 |
| | Clearing and Grubbing Trees/Shrubs less than 12" Diameter | LS | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | Removal and Disposal of Tree Stump 12 inch to 24 inch Diameter | EA | 6 | $350.00 | $2,100.00 | 1,2,3,4,5,6 |
| | Salvage and Reinstall Topsoil (P) | CY | 23 | $15.00 | $349.99 | 1,2,3,4,5,6 |
| | Import Topsoil Borrow and Placement | CY | 23 | $35.00 | $816.65 | 1,2,3,4,5,6 |
| | Kraken Filter (12x8) | EA | 1 | $200,000.00 | $200,000.00 | 1,2,3,4,5,6 |
| | Subsoiling - Deep Soil Ripping | AC | 0.06 | $4,000.00 | $231.40 | 1,2,3,4,5,6 |
| | ECB/HydroMulch | SY | 1,000 | $2.50 | $2,500.00 | 1,2,3,4,5,6 |
| | Native Restoration Seeding (Prairie/Wet Meadow) | AC | 0.06 | $6,000.00 | $347.10 | 1,2,3,4,5,6 |
| | Tree Planting | EA | 3 | $500.00 | $1,500.00 | 1,2,3,4,5,6 |
| | Year 1 Maintenance Period | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Year 2 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | Year 3 Maintenance Period | LS | 1 | $500.00 | $500.00 | 1,2,3,4,5,6 |
| | 18" RCP Pipe Sewer | LF | 250 | $130.00 | $32,500.00 | 1,2,3,4,5,6,7 |
| | 18" RCP FES | EA | 2 | $2,000.00 | $4,000.00 | 1,2,3,4,5,6 |
| | 18" RCP Trash Rack | EA | 0 | $1,500.00 | $0.00 | 1,2,3,4,5,6 |
| | Drainage Structures | EA | 3 | $20,000.00 | $60,000.00 | 1,2,3,4,5,6 |
| | Rip Rap | TON | 2 | $215.00 | $430.00 | 1,2,3,4,5,6 |
| | | | | | | |
| | CONSTRUCTION SUBTOTAL | | | | $363,000 | 1,2,3,4,5,6,7,8 |
| | CONSTRUCTION CONTINGENCY (20%) | | | | $73,000 | 1,4,8 |
| | ESTIMATED CONSTRUCTION COST | | | | $436,000 | 1,2,3,4,5,6,7,8 |
| | | | | | | |
| | PLANNING, ENGINEERING, DESIGN, & PERMITTING | | | | $69,760 | |
| | LEGAL | | | | $8,720 | |
| | CONSTRUCTON MANAGEMENT | | | | $30,520 | |
| | EASEMENTS | SF | 0 | $6.00 | $0 | |
| | | | | | | |
| | ESTIMATED TOTAL PROJECT COST | | | | **$545,000** | 1,2,3,4,5,6,7,8 |
| **ESTIMATED ACCURACY RANGE** | | **-30%** | | | $382,000 | 1,2,3,4,5,6,7,8 |
| | | **50%** | | | $818,000 | 1,2,3,4,5,6,7,8 |

Notes

[1] Quantities based on Design Work Completed (1 - 15%).

[2] Unit Prices Based on Information Available at This Time.

[3] Limited Soil Boring and Field Investigation Information Available.

[4] This design level (Class 4, 1-15% design completion per ASTM E 2516-11) cost estimate is based on concept designs, alignments, quantities and unit prices. Costs will change with further design. Time value-of-money escalation costs are not included. A construction schedule is not available at this time. Contingency is an allowance for the net sum of costs that will be in the Final Total Project Cost at the time of the completion of design, but are not included at this level of project definition. The estimated accuracy range for the Total Project Cost as the project is defined is -20% to +30%. The accuracy range is based on professional judgement considering the level of design completed, the complexity of the project and the uncertainties in the project as scoped. The contingency and the accuracy range are not intended to include costs for future scope changes that are not part of the project as currently scoped or costs for risk contingency. Operation and Maintenance costs are not included.

[5] Estimate assumes that projects will not be located on contaminated soil.

[6] Estimate costs are to design, construct, and permit each alternative. The estimated costs do not include maintenance, monitoring or additional tasks following construction.

[7] Furnish and Install pipe cost per linear foot includes all trenching, bedding, backfilling, compaction, and disposal of excess materials

[8] Estimate costs are reported to nearest thousand dollars.

| | | | | | | |
|---|---|---|---|---|---|---|
| BARR | PREPARED BY: BARR ENGINEERING COMPANY | | SHEET: | 1 | OF | 1 |
| | | | CREATED BY: | KRT | DATE: | 11/1/2023 |
| **ENGINEER'S OPINION OF PROBABLE PROJECT COST** | | | CHECKED BY: | JAK2 | DATE: | 12/1/2023 |
| PROJECT: | Lotus Lake Water Quality Improvement Project | | APPROVED BY: | SAS | DATE: | 12/10/2023 |
| LOCATION: | Riley Purgatory Bluff Creek Watershed District | ISSUED: | | | DATE: | |
| PROJECT #: | 23270053.14 TO39 | ISSUED: | | | DATE: | |
| **OPINION OF COST - SUMMARY** | | ISSUED: | | | DATE: | |

# Engineer's Opinion of Probable Project Cost

## LL_8d - Reduced Footprint Infiltration Basin

| Cat. No. | ITEM DESCRIPTION | UNIT | ESTIMATED QUANTITY | UNIT COST | ITEM COST | NOTES |
|---|---|---|---|---|---|---|
| | Mobilization/Demobilization | LS | 1 | $30,000.00 | $30,000.00 | 1,2,3,4,5,6 |
| | Traffic and Pedestrian Safety Control Measures | LS | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Construction Layout and Staking | LS | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Rock Construction Entrance | Ea | 1 | $2,500.00 | $2,500.00 | 1,2,3,4,5,6 |
| | Storm Drain Inlet Protection (P) | Ea | 4 | $300.00 | $1,200.00 | 1,2,3,4,5,6 |
| | Silt Fence, Machine Sliced | LF | 400 | $2.50 | $1,000.00 | 1,2,3,4,5,6 |
| | Sediment Log | LF | 400 | $5.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Daily Street Sweeping | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Construction Fencing | LF | 800 | $3.50 | $2,800.00 | 1,2,3,4,5,6 |
| | Clearing and Grubbing Trees/Shrubs less than 12" Diameter | LS | 1 | $6,000.00 | $6,000.00 | 1,2,3,4,5,6 |
| | Removal and Disposal of Tree Stump 12 inch to 24 inch Diameter | EA | 5 | $350.00 | $1,750.00 | 1,2,3,4,5,6 |
| | Salvage and Reinstall Topsoil (P) | CY | 152 | $15.00 | $2,283.27 | 1,2,3,4,5,6 |
| | Import Topsoil Borrow and Placement | CY | 152 | $35.00 | $5,327.63 | 1,2,3,4,5,6 |
| | Common Excavation, Haul, & Disposal Offsite | CY | 158 | $30.00 | $4,752.76 | 1,2,3,4,5,6 |
| | Contruct Basin/Overflow Berm | CY | 778 | $15.00 | $11,666.67 | 1,2,3,4,5,6 |
| | Subsoiling - Deep Soil Ripping | AC | 0.4 | $4,000.00 | $1,509.60 | 1,2,3,4,5,6 |
| | ECB/HydroMulch | SY | 2,000 | $2.50 | $5,000.00 | 1,2,3,4,5,6 |
| | Native Restoration Seeding (Prairie/Wet Meadow) | AC | 0.38 | $6,000.00 | $2,264.40 | 1,2,3,4,5,6 |
| | Native Restoration Plantings (Plugs/Shrubs/Perennials) | AC | 0.28 | $20,000.00 | $5,661.00 | 1,2,3,4,5,6 |
| | Tree Planting | EA | 3 | $500.00 | $1,250.00 | 1,2,3,4,5,6 |
| | Year 1 Maintenance Period | LS | 1 | $2,000.00 | $2,000.00 | 1,2,3,4,5,6 |
| | Year 2 Maintenance Period | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | Year 3 Maintenance Period | LS | 1 | $1,000.00 | $1,000.00 | 1,2,3,4,5,6 |
| | 36" RCP Pipe Sewer | LF | 125 | $300.00 | $37,500.00 | 1,2,3,4,5,6,7 |
| | 36" RCP FES | EA | 3 | $3,000.00 | $9,000.00 | 1,2,3,4,5,6 |
| | 36" RCP Trash Rack | EA | 1 | $3,000.00 | $3,000.00 | 1,2,3,4,5,6 |
| | Drainage Structures | EA | 1 | $20,000.00 | $20,000.00 | 1,2,3,4,5,6 |
| | Pretreatment Structure | Each | 2 | $30,000.00 | $60,000.00 | 1,2,3,4,5,6 |
| | Rip Rap | TON | 4 | $215.00 | $860.00 | 1,2,3,4,5,6 |
| | | | | | | |
| | CONSTRUCTION SUBTOTAL | | | | $228,000 | 1,2,3,4,5,6,7,8 |
| | CONSTRUCTION CONTINGENCY (20%) | | | | $46,000 | 1,4,8 |
| | ESTIMATED CONSTRUCTION COST | | | | $274,000 | 1,2,3,4,5,6,7,8 |
| | | | | | | |
| | PLANNING, ENGINEERING, DESIGN, & PERMITTING | | | | $43,840 | |
| | LEGAL | | | | $5,480 | |
| | CONSTRUCTON MANAGEMENT | | | | $19,180 | |
| | EASEMENTS | SF | | $6.00 | $0 | |
| | | | | | | |
| | ESTIMATED TOTAL PROJECT COST | | | | **$343,000** | 1,2,3,4,5,6,7,8 |
| **ESTIMATED ACCURACY RANGE** | | **-30%** | | | $241,000 | 1,2,3,4,5,6,7,8 |
| | | **50%** | | | $515,000 | 1,2,3,4,5,6,7,8 |

Notes

[1] Quantities based on Design Work Completed (1 - 15%).

[2] Unit Prices Based on Information Available at This Time.

[3] Limited Soil Boring and Field Investigation Information Available.

[4] This design level (Class 4, 1-15% design completion per ASTM E 2516-11) cost estimate is based on concept designs, alignments, quantities and unit prices. Costs will change with further design. Time value-of-money escalation costs are not included. A construction schedule is not available at this time. Contingency is an allowance for the net sum of costs that will be in the Final Total Project Cost at the time of the completion of design, but are not included at this level of project definition. The estimated accuracy range for the Total Project Cost as the project is defined is -20% to +30%. The accuracy range is based on professional judgement considering the level of design completed, the complexity of the project and the uncertainties in the project as scoped. The contingency and the accuracy range are not intended to include costs for future scope changes that are not part of the project as currently scoped or costs for risk contingency. Operation and Maintenance costs are not included.

[5] Estimate assumes that projects will not be located on contaminated soil.

[6] Estimate costs are to design, construct, and permit each alternative. The estimated costs do not include maintenance, monitoring or additional tasks following construction.

[7] Furnish and Install pipe cost per linear foot includes all trenching, bedding, backfilling, compaction, and disposal of excess materials

[8] Estimate costs are reported to nearest thousand dollars.

# Appendix B

## Soil Health Testing Results

# Comprehensive Assessment of Soil Health

From the Cornell Soil Health Laboratory, Department of Soil and Crop Sciences
School of Integrative Plant Science, Cornell University, Ithaca, NY 14853
https://soilhealthlab.cals.cornell.edu

Grower:
Zach Dickhausen
18681 Lake Drive East
Chanhussen, MN 55317
zdickhausen@rpbcwd.org

| | |
|---|---|
| Sample ID: | WW2423 |
| Field ID: | N. Lotus Lake Park 1 |
| Date Sampled: | 05/09/2023 |
| Given Soil Type: | Hamel |
| Crops Grown: | PRK/PRK/PRK |
| Tillage: | no till |
| Coordinates: | Latitude: 44.884475000000<br>Longitude: -93.526200000000 |

Measured Soil Textural Class: **loam**

Sand: **44%** - Silt: **36%** - Clay: **18%**

| Group | Indicator | Value | Rating | Constraints |
|---|---|---|---|---|
| *physical* | Predicted Available Water Capacity | **0.20** | **71** | |
| *physical* | Surface Hardness | **202** | **32** | |
| *physical* | Subsurface Hardness | **350** | **32** | |
| *physical* | Aggregate Stability | **38.6** | **66** | |
| *biological* | Organic Matter<br>Soil Organic Carbon: 2.62 / Total Carbon: 2.63 / Total Nitrogen: 0.23 | **3.6** | **74** | |
| *biological* | Predicted Soil Protein | **6.00** | **44** | |
| *biological* | Soil Respiration | **0.5** | **38** | |
| *biological* | Active Carbon | **551** | **60** | |
| *chemical* | Soil pH | **7.0** | **100** | |
| *chemical* | Extractable Phosphorus | **2.5** | **72** | |
| *chemical* | Extractable Potassium | **59.7** | **84** | |
| *chemical* | Additional Nutrients<br>Ca: 2641.8 / Mg: 460.0 / **S: 1.8**<br>Al: 2.8 / B: 0.24 / Cu: 0.06<br>Fe: 0.5 / Mn: 2.0 / **Zn: 0.1** | | **77** | |

Overall Quality Score: **63** / High

## Measured Soil Health Indicators

The Cornell Soil Health Test measures several indicators of soil physical, biological and chemical health. These are listed on the left side of the report summary, on the first page. The "value" column shows each result as a value, measured in the laboratory or in the field, in units of measure as described in the indicator summaries below. The "rating" column interprets that measured value on a scale of 0 to 100, where higher scores are better. Ratings in red are particularly important to take note of, but any in yellow, particularly those that are close to a rating of 30 are also important in addressing soil health problems.

- **A rating below 20 indicates *Very Low (constraining)* functioning and is color-coded red.** This indicates a problem that is likely limiting yields, crop quality, and long-term sustainability of the agroecosystem. In several cases this indicates risks of environmental loss as well. The "constraint" column provides a short list of soil processes that are not functioning optimally when an indicator rating is red. It is particularly important to take advantage of any opportunities to improve management that will address these constraints.
- **A rating between 20 and 40 indicates *Low* functioning and is color-coded orange.** This indicates that a soil process is functioning somewhat poorly and addressing this should be considered in the field management plan. The Management Suggestions Table at the end of the Soil Health Assessment Report provides linkages to field management practices that are useful in addressing each soil indicator process.
- **A rating between 40 and 60 indicates *Medium* functioning and is color-coded yellow.** This indicates that soil health could be better, and yield and sustainability could decrease over time if this is not addressed. This is especially so if the condition is being caused, or not being alleviated, by current management. Pay attention particularly to those indicators rated in yellow and close to 40.
- **A rating between 60 and 80 indicates *High* functioning and is color-coded light green.** This indicates that this soil process is functioning at a non-limiting level. Field soil management approaches should be maintained at the current intensity or improved.
- **A rating of 80 or greater indicates *Very High* functioning and is color-coded dark green.** Past management has been effective at maintaining soil health. It can be useful to note which particular aspects of management have likely maintained soil health, so that such management can be continued. Note that soil health is often high, when first converting from a permanent sod or forest. In these situations, intensive management quickly damages soil health when it includes intensive tillage, low organic matter inputs, bare soils for significant parts of the year, or excessive traffic, especially during wet times.
- **The Overall Quality Score** at the bottom of the report is an average of all ratings, and provides an indication of the soil’s overall health status. However, the important part is to know which particular soil processes are constrained or suboptimal so that these issues can be addressed through appropriate management. Therefore the ratings for each indicator are more important information.

**The Indicators** measured in the Cornell Soil Health Assessment are important soil properties and characteristics in themselves, but also are representative of key soil processes, necessary for the proper functioning of the soil. The following is a summary of the indicators measured, what each of these indicates about your soil’s health status, and what may influence the relevant properties and processes described.

**A Management Suggestions Table** follows, at the end of the report, with short and long term

suggestions for addressing constraints or maintaining a well-functioning system. This table will indicate constraints identified in this assessment for your soil sample by the same yellow and red color coding described above. Please also find further useful information by following the links to relevant publications and web resources that follow this section.

**Texture** is an inherent property of soil, meaning that it is rarely changed by management. It is thus not a soil health indicator per se, but is helpful both in interpreting the measured values of indicators (see the Cornell Soil Health Assessment Training Manual), and for deciding on appropriate management strategies that will work for that soil.

**Your soil's measured textural class and composition: loam**

**Sand: 44% Silt: 36% Clay: 18%**

**Predicted Available Water Capacity (AWC)** is not a directly measured soil property but is modeled from a suite of measured soil health indicators including the percent sand, silt, clay and organic matter. By using a decision tree approach, the developed Random Forest model can predict the laboratory measured AWC value with no more error than that encountered in the raw laboratory analysis. Details of this modeling effort can be found in our Soil Health Management Series Fact Sheet Number 19-05b.

https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/f/5772/files/2016/12/05b_Soil_Health_Fact_Sheet_Available_Water_Capacity-Predicted-2019-002-132f3th.pdf

The Soil Health Lab continues to offer the laboratory measured AWC test as an add-on to the soil health package analyses.

The Predicted AWC value is presented as grams of water per gram of soil. This value is scored against an observed distribution in regional soils with similar texture. A physical soil characteristic, AWC is an indicator of the amount of plant-available water the soil can store, and therefore how crops will fare in droughty conditions. Soils with lower storage capacity will cause greater risk of drought stress. AWC is generally lower when total organic matter and/or aggregation is low. It can be improved by reducing tillage, long-term cover cropping, and adding large amounts of well-decomposed organic matter such as compost. Coarse textured (sandy) soils inherently store less water than finer textured soils, so that managing for relatively high water storage capacity is particularly important in coarse textured soils. While the textural effect cannot be influenced by management, management decisions can be in part based on an understanding of inherent soil characteristics.

**Your Predicted Available Water Capacity value** is **0.20 g/g**, corresponding with a score of **71**. This score is in the **High** range, relative to soils with similar texture. **This suggests that this soil process is enhancing overall soil resilience. Soil management should aim at maintaining this functionality while addressing any other measured soil constraints as identified in the Soil Health Assessment Report.** Please refer to the management suggestions table at the end of this document.

**Surface Hardness** is a measure of compaction that develops when large pores are lost in the surface soil (0-6 inches). Compaction is measured in the field using a penetrometer, and the resultant value is expressed in pounds per square inch (p.s.i.), representing the localized pressure necessary to break forward through soil. It is scored by comparison with a distribution observed in

regional soils, with lower hardness values rating higher scores. A strongly physical characteristic of soils, surface hardness is an indicator of both physical and biological health of the soil, as growing roots and fungal hyphae must be able to grow through soil, and may be severely restricted by excessively hard soil. Compaction also influences water movement through soil. When surface soils are compacted, runoff, erosion, and slow infiltration can result. Soil compaction is influenced by management, particularly in timing and degree of traffic and plowing disturbance, being worst when the soil is worked wet.

> **Your measured Surface Hardness value** is **202 p.s.i.**, corresponding with a score of **32**. This score is in the **Low** range, relative to soils with similar texture. **This suggests that, while Surface Hardness does not currently register as a strong constraint, management practices should be geared toward improving this condition, as it currently indicates suboptimal functioning.** Please refer to the management suggestions table at the end of this document.

**Subsurface Hardness** is a measure of compaction that develops when large pores are lost in the subsurface soil (6-18 inches). Subsurface hardness is measured and scored similarly to surface hardness, but deeper in the profile, and scored against an observed distribution in regional soils with similar texture. Large pores are necessary for water and air movement and to allow roots to explorethe soil. Subsurface hardness prevents deep rooting and thus deep water and nutrient uptake by plants, and can increase disease pressure by stressing plants. It also causes poor drainage and poor deep water storage. After heavy rain events, water can build up over a hard pan causing poor aeration both at depth and at the surface, as well as ponding, poor infiltration, runoff and erosion. Impaired water movement and storage create greater risk during heavy rainfall events, as well as greater risk of drought stress. Compaction occurs very rapidly when the soil is worked or trafficked while it is too wet, and compaction can be transferred deep into the soil even from surface pressure. Subsoil compaction in the form of a plow pan is usually found beneath the plow layer, and is caused by smearing and pressure exerted on the undisturbed soil just beneath the deepest tillage operation, especially when wet.

> **Your measured Subsurface Hardness value** is **350 p.s.i.**, corresponding with a score of **32**. This score is in the **Low** range, relative to soils with similar texture. **This suggests that, while Subsurface Hardness does not currently register as a strong constraint, management practices should be geared toward improving this condition, as it currently indicates suboptimal functioning.** Please refer to the management suggestions table at the end of this document.

**Aggregate Stability** is a measure of how well soil aggregates or crumbs hold together under rainfall or other rapid wetting stresses. Measured by the fraction of dried aggregates that disintegrate under a controlled, simulated rainfall event similar in energy delivery to a hard spring rain, the value is presented as a percent, and scored against a distribution observed in regional soils with similar textural characteristics. A physical characteristic of soil, Aggregate Stability is a good indicator of soil biological and physical health. Good aggregate stability helps prevent crusting, runoff, and erosion, and facilitates aeration, infiltration, and water storage, along with improving seed germination and root and microbial health. Aggregate stability is influenced by microbial activity, as aggregates are largely held together by microbial colonies and exudates, and is impacted by management practices, particularly tillage, cover cropping, and fresh organic matter additions.

> **Your measured Aggregate Stability value** is **38.6 %**, corresponding with a score of

**66**. This score is in the **High** range, relative to soils with similar texture. **This suggests that this soil process is enhancing overall soil resilience. Soil management should aim at maintaining this functionality while addressing any other measured soil constraints as identified in the Soil Health Assessment Report.** Please refer to the management suggestions table at the end of this document.

**Organic Matter** (OM) is a measure of the carbonaceous material in the soil that is biomass or biomass-derived. Measured by the mass lost on combustion of oven-dried soil, the value is presented as a percent of the total soil mass. This is scored against an observed distribution of OM in regional soils with similar texture. A soil characteristic that measures a physical substance of biological origin, OM is a key or central indicator of the physical, biological, and chemical health of the soil. OM content is an important influence on soil aggregate stabilization, water retention, nutrient cycling, and ion exchange capacity. Soils with low organic matter tend to require higher inputs, and be less resilient to drought and extreme rainfall. The retention and accumulation of OM is influenced by management practices such as tillage and cover cropping, as well as by microbial community growth. Intensive tillage and lack of organic matter biomass additions from various sources (amendments, residues, active crop or cover crop growth) will decrease organic matter content and overall soil health with time.
**Total Carbon** (Tot C) is an indicator for the OM in soil, with carbon comprising 48-58% of the total weight of OM. The Tot C analysis measures all of the carbon in a sample using complete oxidation of carbon to CO2 using high temperature combustion (1100C). The measured Tot C includes ***organic*** forms of carbon (Soil Organic Carbon SOC), comprised of available carbon as well as relatively inert carbon in stable organic materials. Carbon can also be found in ***inorganic*** form (Soil Inorganic Carbon SIC) as carbonate minerals such as calcium carbonate (lime).
**Soil Organic Carbon** (SOC) is equivalent to Tot C when there are no carbonate minerals. However, soils above pH 6.5 may contain high levels of carbonates. These carbonates are measured as SIC and subtracted from the Tot C: **SOC = Tot C - SIC**.
**Total Nitrogen** (Tot N) includes the organic (living and non-living) and inorganic (or mineral) forms of nitrogen. About half of the Tot N found in soil is in relatively stable organic compounds. Inorganic nitrogen is liberated from organic nitrogen sources in the soil, particularly proteins and amino acids through the action of soil microorganisms. Ammonium (NH4+) and nitrate (NO3-) are the inorganic forms of nitrogen found in soil that are plant available. The Tot N is determined following the combustion methodology known as DUMAS.

**Your measured Organic Matter value** is **3.6 %**, corresponding with a score of **74**. This score is in the **High** range, relative to soils with similar texture. **This suggests that this soil process is enhancing overall soil resilience. Soil management should aim at maintaining this functionality while addressing any other measured soil constraints as identified in the Soil Health Assessment Report.** Please refer to the management suggestions table at the end of this document. The **SOC** level is **2.62%**, the **Tot C** level is **2.63%**, the **Tot N** level is **0.23%**.

<u>**Predicted**</u> **Soil Protein** is not a directly measured soil property but is modeled from a suite of measured soil health indicators including the percent sand, silt, clay and organic matter. By using a decision tree approach, the developed Random Forest model can predict the laboratory measured soil protein value with a tolerable small error. Details of this modeling effort can be found in our Soil Health Management Series Fact Sheet 20-09b.
https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/f/5772/files/2020/05/09b-Predicted-Protein.pdf

The Soil Health Lab continues to offer the laboratory measured Soil Protein test as an add-on to the Standard soil health package analyses.

The Predicted Soil Protein is presented as mg per gram of soil. This indicator represents the fraction of the soil organic matter that is present as protein or protein-like substances. Protein content, as organically bound N, influences the ability of the soil to make N available by mineralization, and has been associated with soil aggregation and water movement. Protein content can be influenced by biomass additions, the presence of roots and soil microbes, and tends to decrease with increasing soil disturbance such as tillage.

> **Your measured Predicted Soil Protein value** is **6.00** , corresponding with a score of **44**. This score is in the **Medium** range, relative to soils with similar texture. **This suggests that, while Predicted Soil Protein is functioning at an average level, management practices should be geared toward improving this condition, as it currently indicates suboptimal functioning. Soil management should aim at improving this functionality while addressing any other measured soil constraints as identified in the Soil Health Assessment Report.** Please refer to the management suggestions table at the end of this document.

**Soil Respiration** is a measure of the metabolic activity of the soil microbial community. Measured by capturing and quantifying carbon dioxide (CO 2) produced by this activity, the value is expressed as total CO 2 released (in mg) per gram of soil over a 4 day incubation period. Respiration is scored against an observed distribution in regional soils, taking texture into account. A direct biological activity measurement, respiration is an indicator of the biological status of the soil community, integrating abundance and activity of microbial life. Soil biological activity accomplishes numerous important functions, such as cycling of nutrients into and out of soil OM pools, transformations of N between its several forms, and decomposition of incorporated residues. Soil biological activity influences key physical characteristics like OM accumulation, and aggregate formation and stabilization. Microbial activity is influenced by management practices such as tillage, cover cropping, manure or green manure incorporation, and biocide (pesticide, fungicide, herbicide) use.

> **Your measured Soil Respiration value** is **0.5 mg**, corresponding with a score of **38**. This score is in the **Low** range, relative to soils with similar texture. **This suggests that, while Soil Respiration does not currently register as a strong constraint, management practices should be geared toward improving this condition, as it currently indicates suboptimal functioning.** Please refer to the management suggestions table at the end of this document.

**Active Carbon** is a measure of the small portion of the organic matter that can serve as an easily available food source for soil microbes, thus helping maintain a healthy soil food web. Measured by potassium permanganate oxidation, the value is presented in parts per million (ppm), and scored against an observed distribution in regional soils with similar texture. While a measure of a class of physical substances, active carbon is a good leading indicator of biological soil health and tends to respond to changes in management earlier than total organic matter content, because when a large population of soil microbes is fed plentifully with enough organic matter over an extended period of time, well-decomposed organic matter builds up. A healthy and diverse microbial community is essential to maintain disease resistance, nutrient cycling, aggregation, and many other important functions. Intensive tillage and lack of organic matter additions from various sources (amendments, residues, active crop or cover crop growth) will decrease active carbon, and thus will over the longer term decrease total organic matter.

> **Your measured Active Carbon value** is **551 ppm**, corresponding with a score of **60**. This score is in the **High** range, relative to soils with similar texture. **This suggests that this soil process is enhancing overall soil resilience. Soil management should aim at maintaining this functionality while addressing any other measured soil constraints as identified in the Soil Health Assessment Report.** Please refer to the management suggestions table at the end of this document.

**Soil pH** is a measure of how acidic the soil is, which controls how available nutrients are to crops. A physico-chemical characteristic of soils, pH is an indicator of the chemical or nutrient status of the soil. Measured with an electrode in a 1:1 soil:water suspension, the value is presented in standard pH units, and scored using an optimality curve. Optimum pH is around 6.2-6.8 for most crops (exceptions include potatoes and blueberries, which grow best in more acidic soil – this is not accounted for in the report interpretation). If pH is too high, nutrients such as phosphorus, iron, manganese, copper and boron become unavailable to the crop. If pH is too low, calcium, magnesium, phosphorus, potassium and molybdenum become unavailable. Lack of nutrient availability will limit crop yields and quality. Aluminum toxicity can also be a concern in low pH soils, which can severely decrease root growth and yield, and in some cases lead to accumulation of aluminum and other metals in crop tissue. In general, as soil OM increases, crops can tolerate lower soil pH. Soil pH also influences the ability of certain pathogens to thrive, and of beneficial organisms to effectively colonize roots. Raising the pH through lime or wood ash applications, and organic matter additions, will help immobilize aluminum andheavy metals, and maintain proper nutrient availability.

> **Your measured Soil pH value** is **7.0** , corresponding with a score of **100**. This score is in the **Very High** range, relative to soils with similar texture. **This suggests that management practices should be geared toward maintaining this condition, as it currently indicates ideal soil functioning.** Please refer to the management suggestions table at the end of this document.

**Extractable Phosphorus** is a measure of phosphorus (P) availability to a crop. Measured on a modified Morgan's extract using an ICP Spectrometer, the value is presented in parts per million (ppm), and scored against an optimality curve for sufficiency or excess. P is an essential plant macronutrient, and its availability varies with soil pH and mineral composition. Low P values indicate poor P availability to plants, and excessively high P values indicates a risk of adverse environmental impact through runoff and contamination of surface waters. Most soils in the Northeast store unavailable P from the soil’s mineral make up or from previously applied fertilizer or manure. This becomes more available to plants as soils warm up. Therefore, incorporating or banding 10-25 lbs/acre of soluble ‘starter’ P fertilizer at planting can be useful even when soil levels are optimum. Some cover crops, such as buckwheat, are good at mining otherwise unavailable P so that it becomes more available to the following crop. When plants associate with mycorrhizal fungi, these can also help make P (and other nutrients and water) more available to the crop. P is an environmental contaminant and runoff of P into fresh surface water will cause damage through eutrophication, so over-application is strongly discouraged, especially close to surface water, on slopes, and on large scales.

> **Your measured Extractable Phosphorus value** is **2.5 ppm**, corresponding with a score of **72**. This score is in the **High** range, relative to soils with similar texture. **This**

**suggests that this soil process is enhancing overall soil resilience. Soil management should aim at maintaining this functionality while addressing any other measured soil constraints as identified in the Soil Health Assessment Report.** Please refer to the management suggestions table at the end of this document.

**Extractable Potassium** is a measure of potassium (K) availability to the crop. Measured on a modified Morgan's extract using an ICP Spectrometer, the value is presented in parts per million (ppm), and scored against an optimality curve for sufficiency. K is an indicator of soil nutrient status, as it is an essential plant macronutrient. Plants with higher potassium tend to be more tolerant of frost and cold. Thus good potassium levels may help with season extension. While soil pH only marginally affects K availability, K is easily leached from sandy soils and is only weakly held by increased organic matter, so that applications of the amount removed by the specific crop being grown are generally necessary in such soils.

**Your measured Extractable Potassium value** is **59.7 ppm**, corresponding with a score of **84**. This score is in the **Very High** range, relative to soils with similar texture. **This suggests that management practices should be geared toward maintaining this condition, as it currently indicates ideal soil functioning.** Please refer to the management suggestions table at the end of this document.

**Additional Nutrients** including (calcium (Ca), magnesium (Mg) and sulfur (S)) with micronutrients (aluminum (Al), boron (B), copper (Cu), iron (Fe), manganese (Mn) and zinc (Zn), etc.) are essential plant nutrients taken up by plants in smaller quantities than the macronutrients N, P and K. Note that some leafy vegetables can require significant amounts of these nutrients. If any of these nutrients are deficient, this will decrease yield and crop quality, but toxicities can also occur when concentrations are too high. While Al is not technically a plant nutrient, it can become toxic to crop plants at pH below 5.5. The solubility and availability of all of the elements are strongly influenced by pH and organic matter. High pH favors the availability of magnesium and calcium whereas low pH increases the availability of most micronutrients. High OM and microbial activity tend to increase micronutrient availability. The ratings indicate whether these measured nutrients are deficient or excessive.

**Your measured Additional Nutrients Rating** is **77**. This score is in the **High** range. Magnesium (460.0 ppm) is sufficient, Iron (0.5 ppm) is sufficient, Manganese (2.0 ppm) is sufficient, Zinc (0.1 ppm) is deficient, Aluminum (2.8 ppm) is sufficient, Calcium (2641.8 ppm) is sufficient, Copper (0.06 ppm) is sufficient, Sulfur (1.8 ppm) is deficient, Boron (0.24 ppm) is sufficient. **This suggests that this soil process is enhancing overall soil resilience. Soil management should aim at maintaining this functionality while addressing any other measured soil constraints as identified in the Soil Health Assessment Report.** Please refer to the management suggestions table at the end of this document.

**Overall Quality Score:** an overall quality score is computed from the individual indicator scores. This score is further rated as follows: less than 20% is regarded as very low, 20-40% is low, 40-60% is medium, 60-80% is high, and greater than 80% is very high. The highest possible quality score is 100 and the least score is 0, thus it is a relative overall soil health status indicator. However, of greater importance than a single overall metric is identification of constrained or suboptimally functioning soil processes, so that these issues can be addressed through appropriate management. The overall soil quality score should be taken as a general summary rather than the main focus.

**Your Overall Quality Score** is **63**, which is in the **High** range.

## Management Suggestions for Physical and Biological Constraints

| Constraint | Short Term Management Suggestions | Long Term Management Suggestions |
|---|---|---|
| Predicted Available Water Capacity Low | • Add stable organic materials, mulch<br>• Add compost or biochar<br>• Incorporate high biomass cover crop | • Reduce tillage<br>• Rotate with sod crops<br>• Incorporate high biomass cover crop |
| Surface Hardness High | • Perform some mechanical soil loosening (strip till, aerators, broadfork, spader)<br>• Use shallow-rooted cover crops<br>• Use a living mulch or interseed cover crop | • Shallow-rooted cover/rotation crops<br>• Avoid traffic on wet soils, monitor<br>• Avoid excessive traffic/tillage/loads<br>• Use controlled traffic patterns/lanes |
| Subsurface Hardness High | • Use targeted deep tillage (subsoiler, yeomans plow, chisel plow, spader.)<br>• Plant deep rooted cover crops/radish | • Avoid plows/disks that create pans<br>• Avoid heavy loads<br>• Reduce traffic when subsoil is wet |
| Aggregate Stability Low | • Incorporate fresh organic materials<br>• Use shallow-rooted cover/rotation crops<br>• Add manure, green manure, mulch | • Reduce tillage<br>• Use a surface mulch<br>• Rotate with sod crops and mycorrhizal hosts |
| Organic Matter Low | • Add stable organic materials, mulch<br>• Add compost and biochar<br>• Incorporate high biomass cover crop | • Reduce tillage/mechanical cultivation<br>• Rotate with sod crop<br>• Incorporate high biomass cover crop |
| Predicted Soil Protein Low | • Add N-rich organic matter (low C:N source like manure, high N well-finished compost)<br>• Incorporate young, green, cover crop biomass<br>• Plant legumes and grass-legume mixtures<br>• Inoculate legume seed with Rhizobia & check for nodulation | • Reduce tillage<br>• Rotate with forage legume sod crop<br>• Cover crop and add fresh manure<br>• Keep pH at 6.2-6.5 (helps N fixation)<br>• Monitor C:N ratio of inputs |
| Soil Respiration Low | • Maintain plant cover throughout season<br>• Add fresh organic materials<br>• Add manure, green manure<br>• Consider reducing biocide usage | • Reduce tillage/mechanical cultivation<br>• Increase rotational diversity<br>• Maintain plant cover throughout season<br>• Cover crop with symbiotic host plants |
| Active Carbon Low | • Add fresh organic materials<br>• Use shallow-rooted cover/rotation crops<br>• Add manure, green manure, mulch | • Reduce tillage/mechanical cultivation<br>• Rotate with sod crop<br>• Cover crop whenever possible |

## Management Suggestions for Chemical Constraints

| Constraint | Short Term Management Suggestions | Long Term Management Suggestions |
| --- | --- | --- |
| Soil pH Low | • Add lime or wood ash per soil test recommendations<br>• Add calcium sulfate (gypsum) in addition to lime if aluminum is high<br>• Use less ammonium or urea | • Test soil annually & add "maintenance" lime per soil test recommendations to keep pH in range<br>• Raise organic matter to improve buffering capacity |
| Soil pH High | • Stop adding lime or wood ash<br>• Add elemental sulfur per soil test recommendations | • Test soil annually<br>• Use higher % ammonium or urea |
| Extractable Phosphorus Low | • Add P amendments per soil test recommendations<br>• Use cover crops to recycle fixed P<br>• Adjust pH to 6.2-6.5 to free up fixed P | • Promote mycorrhizal populations<br>• Maintain a pH of 6.2-6.5<br>• Use cover crops to recycle fixed P |
| Extractable Phosphorus High | • Stop adding manure and compost<br>• Choose low or no-P fertilizer blend<br>• Apply only 20 lbs/ac starter P if needed<br>• Apply P at or below crop removal rates | • Use cover crops that accumulate P and export to low P fields or offsite<br>• Consider low P rations for livestock<br>• Consider phytase for non-ruminants |
| Extractable Potassium Low | • Add wood ash, fertilizer, manure, or compost per soil test recommendations<br>• Use cover crops to recycle K<br>• Choose a high K fertilizer blend | • Use cover crops to recycle K<br>• Add "maintenance" K per soil recommendations each year to keep K consistently available |
| Additional Nutrients Low | • Add chelated micronutrients per soil test recommendations<br>• Use cover crops to recycle micronutrients<br>• Do not exceed pH 6.5 for most crops | • Promote mycorrhizal populations<br>• Improve organic matter<br>• Decrease soil P (binds micronutrients)<br>• Add lime (Ca and Mg), gypsum (S), rock powder |
| Additional Nutrients High | • Raise pH to 6.2-6.5 (for all high micro-nutrients and Aluminum)<br>• Do not use fertilizers with micronutrients | • Maintain a pH of 6.2-6.5<br>• Monitor irrigation/improve drainage<br>• Avoid compost additions with high micronutrient levels |

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College of Agriculture and Life Sciences, Cornell University

Developed in partnership with Cornell Soil Health, Farmier, and GreenStart.

# Comprehensive Assessment of Soil Health

From the Cornell Soil Health Laboratory, Department of Soil and Crop Sciences
School of Integrative Plant Science, Cornell University, Ithaca, NY 14853
https://soilhealthlab.cals.cornell.edu

Grower:
Zach Dickhausen
18681 Lake Drive East
Chanhussen, MN 55317
zdickhausen@rpbcwd.org

| | |
|---|---|
| Sample ID: | WW2424 |
| Field ID: | N. Lotus Lake Park 2 |
| Date Sampled: | 05/09/2023 |
| Given Soil Type: | Lester-Kilkenny |
| Crops Grown: | PRK/PRK/PRK |
| Tillage: | no till |
| Coordinates: | Latitude: 44.884027000000<br>Longitude: -93.526559000000 |

Measured Soil Textural Class: **sandy loam**

Sand: **59%** - Silt: **23%** - Clay: **16%**

| Group | Indicator | Value | Rating | Constraints |
|---|---|---|---|---|
| *physical* | Predicted Available Water Capacity | **0.18** | **76** | |
| *physical* | Surface Hardness | **325** | **2** | Rooting, Water Transmission |
| *physical* | Subsurface Hardness | **600** | **0** | Subsurface Pan/Deep Compaction, Deep Rooting, Water and Nutrient Access |
| *physical* | Aggregate Stability | **39.0** | **48** | |
| *biological* | Organic Matter<br>Soil Organic Carbon: 1.73 / Total Carbon: 1.80 / Total Nitrogen: 0.16 | **2.8** | **82** | |
| *biological* | Predicted Soil Protein | **4.70** | **22** | |
| *biological* | Soil Respiration | **0.5** | **34** | |
| *biological* | Active Carbon | **359** | **32** | |
| *chemical* | Soil pH | **7.4** | **96** | |
| *chemical* | Extractable Phosphorus | **2.5** | **72** | |
| *chemical* | Extractable Potassium | **62.5** | **87** | |
| *chemical* | Additional Nutrients<br>Ca: 2770.2 / Mg: 398.8 / **S: 2.0**<br>Al: 3.2 / B: 0.26 / Cu: 0.03<br>Fe: 0.6 / Mn: 2.3 / **Zn: 0.1** | | **77** | |

Overall Quality Score: **52** / Medium

## Measured Soil Health Indicators

The Cornell Soil Health Test measures several indicators of soil physical, biological and chemical health. These are listed on the left side of the report summary, on the first page. The "value" column shows each result as a value, measured in the laboratory or in the field, in units of measure as described in the indicator summaries below. The "rating" column interprets that measured value on a scale of 0 to 100, where higher scores are better. Ratings in red are particularly important to take note of, but any in yellow, particularly those that are close to a rating of 30 are also important in addressing soil health problems.

- **A rating below 20 indicates *Very Low (constraining)* functioning and is color-coded red.** This indicates a problem that is likely limiting yields, crop quality, and long-term sustainability of the agroecosystem. In several cases this indicates risks of environmental loss as well. The "constraint" column provides a short list of soil processes that are not functioning optimally when an indicator rating is red. It is particularly important to take advantage of any opportunities to improve management that will address these constraints.
- **A rating between 20 and 40 indicates *Low* functioning and is color-coded orange.** This indicates that a soil process is functioning somewhat poorly and addressing this should be considered in the field management plan. The Management Suggestions Table at the end of the Soil Health Assessment Report provides linkages to field management practices that are useful in addressing each soil indicator process.
- **A rating between 40 and 60 indicates *Medium* functioning and is color-coded yellow.** This indicates that soil health could be better, and yield and sustainability could decrease over time if this is not addressed. This is especially so if the condition is being caused, or not being alleviated, by current management. Pay attention particularly to those indicators rated in yellow and close to 40.
- **A rating between 60 and 80 indicates *High* functioning and is color-coded light green.** This indicates that this soil process is functioning at a non-limiting level. Field soil management approaches should be maintained at the current intensity or improved.
- **A rating of 80 or greater indicates *Very High* functioning and is color-coded dark green.** Past management has been effective at maintaining soil health. It can be useful to note which particular aspects of management have likely maintained soil health, so that such management can be continued. Note that soil health is often high, when first converting from a permanent sod or forest. In these situations, intensive management quickly damages soil health when it includes intensive tillage, low organic matter inputs, bare soils for significant parts of the year, or excessive traffic, especially during wet times.
- **The Overall Quality Score** at the bottom of the report is an average of all ratings, and provides an indication of the soil’s overall health status. However, the important part is to know which particular soil processes are constrained or suboptimal so that these issues can be addressed through appropriate management. Therefore the ratings for each indicator are more important information.

**The Indicators** measured in the Cornell Soil Health Assessment are important soil properties and characteristics in themselves, but also are representative of key soil processes, necessary for the proper functioning of the soil. The following is a summary of the indicators measured, what each of these indicates about your soil’s health status, and what may influence the relevant properties and processes described.

**A Management Suggestions Table** follows, at the end of the report, with short and long term

suggestions for addressing constraints or maintaining a well-functioning system. This table will indicate constraints identified in this assessment for your soil sample by the same yellow and red color coding described above. Please also find further useful information by following the links to relevant publications and web resources that follow this section.

**Texture** is an inherent property of soil, meaning that it is rarely changed by management. It is thus not a soil health indicator per se, but is helpful both in interpreting the measured values of indicators (see the Cornell Soil Health Assessment Training Manual), and for deciding on appropriate management strategies that will work for that soil.

> **Your soil's measured textural class and composition: sandy loam**
>
> **Sand: 59% Silt: 23% Clay: 16%**

**Predicted Available Water Capacity (AWC)** is not a directly measured soil property but is modeled from a suite of measured soil health indicators including the percent sand, silt, clay and organic matter. By using a decision tree approach, the developed Random Forest model can predict the laboratory measured AWC value with no more error than that encountered in the raw laboratory analysis. Details of this modeling effort can be found in our Soil Health Management Series Fact Sheet Number 19-05b.

https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/f/5772/files/2016/12/05b_Soil_Health_Fact_Sheet_Available_Water_Capacity-Predicted-2019-002-132f3th.pdf

The Soil Health Lab continues to offer the laboratory measured AWC test as an add-on to the soil health package analyses.

The Predicted AWC value is presented as grams of water per gram of soil. This value is scored against an observed distribution in regional soils with similar texture. A physical soil characteristic, AWC is an indicator of the amount of plant-available water the soil can store, and therefore how crops will fare in droughty conditions. Soils with lower storage capacity will cause greater risk of drought stress. AWC is generally lower when total organic matter and/or aggregation is low. It can be improved by reducing tillage, long-term cover cropping, and adding large amounts of well-decomposed organic matter such as compost. Coarse textured (sandy) soils inherently store less water than finer textured soils, so that managing for relatively high water storage capacity is particularly important in coarse textured soils. While the textural effect cannot be influenced by management, management decisions can be in part based on an understanding of inherent soil characteristics.

> **Your Predicted Available Water Capacity value** is **0.18 g/g**, corresponding with a score of **76**. This score is in the **High** range, relative to soils with similar texture. **This suggests that this soil process is enhancing overall soil resilience. Soil management should aim at maintaining this functionality while addressing any other measured soil constraints as identified in the Soil Health Assessment Report.** Please refer to the management suggestions table at the end of this document.

**Surface Hardness** is a measure of compaction that develops when large pores are lost in the surface soil (0-6 inches). Compaction is measured in the field using a penetrometer, and the resultant value is expressed in pounds per square inch (p.s.i.), representing the localized pressure necessary to break forward through soil. It is scored by comparison with a distribution observed in

regional soils, with lower hardness values rating higher scores. A strongly physical characteristic of soils, surface hardness is an indicator of both physical and biological health of the soil, as growing roots and fungal hyphae must be able to grow through soil, and may be severely restricted by excessively hard soil. Compaction also influences water movement through soil. When surface soils are compacted, runoff, erosion, and slow infiltration can result. Soil compaction is influenced by management, particularly in timing and degree of traffic and plowing disturbance, being worst when the soil is worked wet.

> **Your measured Surface Hardness value** is **325 p.s.i.**, corresponding with a score of **2**. This score is in the **Very Low (constraining)** range, relative to soils with similar texture. **Surface Hardness level should be given a high priority in management decisions based on this assessment, as it is likely to be an important constraint to proper soil functioning and sustainability of management at this time.** Please refer to the management suggestions table at the end of this document.

**Subsurface Hardness** is a measure of compaction that develops when large pores are lost in the subsurface soil (6-18 inches). Subsurface hardness is measured and scored similarly to surface hardness, but deeper in the profile, and scored against an observed distribution in regional soils with similar texture. Large pores are necessary for water and air movement and to allow roots to explorethe soil. Subsurface hardness prevents deep rooting and thus deep water and nutrient uptake by plants, and can increase disease pressure by stressing plants. It also causes poor drainage and poor deep water storage. After heavy rain events, water can build up over a hard pan causing poor aeration both at depth and at the surface, as well as ponding, poor infiltration, runoff and erosion. Impaired water movement and storage create greater risk during heavy rainfall events, as well as greater risk of drought stress. Compaction occurs very rapidly when the soil is worked or trafficked while it is too wet, and compaction can be transferred deep into the soil even from surface pressure. Subsoil compaction in the form of a plow pan is usually found beneath the plow layer, and is caused by smearing and pressure exerted on the undisturbed soil just beneath the deepest tillage operation, especially when wet.

> **Your measured Subsurface Hardness value** is **600 p.s.i.**, corresponding with a score of . This score is in the **Very Low (constraining)** range, relative to soils with similar texture. **Subsurface Hardness level should be given a high priority in management decisions based on this assessment, as it is likely to be an important constraint to proper soil functioning and sustainability of management at this time.** Please refer to the management suggestions table at the end of this document.

**Aggregate Stability** is a measure of how well soil aggregates or crumbs hold together under rainfall or other rapid wetting stresses. Measured by the fraction of dried aggregates that disintegrate under a controlled, simulated rainfall event similar in energy delivery to a hard spring rain, the value is presented as a percent, and scored against a distribution observed in regional soils with similar textural characteristics. A physical characteristic of soil, Aggregate Stability is a good indicator of soil biological and physical health. Good aggregate stability helps prevent crusting, runoff, and erosion, and facilitates aeration, infiltration, and water storage, along with improving seed germination and root and microbial health. Aggregate stability is influenced by microbial activity, as aggregates are largely held together by microbial colonies and exudates, and is impacted by management practices, particularly tillage, cover cropping, and fresh organic matter additions.

**Your measured Aggregate Stability value** is **39.0 %**, corresponding with a score of **48**. This score is in the **Medium** range, relative to soils with similar texture. **This suggests that, while Aggregate Stability is functioning at an average level, management practices should be geared toward improving this condition, as it currently indicates suboptimal functioning. Soil management should aim at improving this functionality while addressing any other measured soil constraints as identified in the Soil Health Assessment Report.** Please refer to the management suggestions table at the end of this document.

**Organic Matter** (OM) is a measure of the carbonaceous material in the soil that is biomass or biomass-derived. Measured by the mass lost on combustion of oven-dried soil, the value is presented as a percent of the total soil mass. This is scored against an observed distribution of OM in regional soils with similar texture. A soil characteristic that measures a physical substance of biological origin, OM is a key or central indicator of the physical, biological, and chemical health of the soil. OM content is an important influence on soil aggregate stabilization, water retention, nutrient cycling, and ion exchange capacity. Soils with low organic matter tend to require higher inputs, and be less resilient to drought and extreme rainfall. The retention and accumulation of OM is influenced by management practices such as tillage and cover cropping, as well as by microbial community growth. Intensive tillage and lack of organic matter biomass additions from various sources (amendments, residues, active crop or cover crop growth) will decrease organic matter content and overall soil health with time.
**Total Carbon** (Tot C) is an indicator for the OM in soil, with carbon comprising 48-58% of the total weight of OM. The Tot C analysis measures all of the carbon in a sample using complete oxidation of carbon to CO2 using high temperature combustion (1100C). The measured Tot C includes ***organic*** forms of carbon (Soil Organic Carbon SOC), comprised of available carbon as well as relatively inert carbon in stable organic materials. Carbon can also be found in ***inorganic*** form (Soil Inorganic Carbon SIC) as carbonate minerals such as calcium carbonate (lime).
**Soil Organic Carbon** (SOC) is equivalent to Tot C when there are no carbonate minerals. However, soils above pH 6.5 may contain high levels of carbonates. These carbonates are measured as SIC and subtracted from the Tot C: **SOC = Tot C - SIC**.
**Total Nitrogen** (Tot N) includes the organic (living and non-living) and inorganic (or mineral) forms of nitrogen. About half of the Tot N found in soil is in relatively stable organic compounds. Inorganic nitrogen is liberated from organic nitrogen sources in the soil, particularly proteins and amino acids through the action of soil microorganisms. Ammonium (NH4+) and nitrate (NO3-) are the inorganic forms of nitrogen found in soil that are plant available. The Tot N is determined following the combustion methodology known as DUMAS.

**Your measured Organic Matter value** is **2.8 %**, corresponding with a score of **82**. This score is in the **Very High** range, relative to soils with similar texture. **This suggests that management practices should be geared toward maintaining this condition, as it currently indicates ideal soil functioning.** Please refer to the management suggestions table at the end of this document. The **SOC** level is **1.73%**, the **Tot C** level is **1.80%**, the **Tot N** level is **0.16%**.

<u>**Predicted**</u> **Soil Protein** is not a directly measured soil property but is modeled from a suite of measured soil health indicators including the percent sand, silt, clay and organic matter. By using a decision tree approach, the developed Random Forest model can predict the laboratory measured soil protein value with a tolerable small error. Details of this modeling effort can be found in our Soil Health Management Series Fact Sheet 20-09b.

https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/f/5772/files/2020/05/09b-Predicted-Protein.pdf

The Soil Health Lab continues to offer the laboratory measured Soil Protein test as an add-on to the Standard soil health package analyses.

The Predicted Soil Protein is presented as mg per gram of soil. This indicator represents the fraction of the soil organic matter that is present as protein or protein-like substances. Protein content, as organically bound N, influences the ability of the soil to make N available by mineralization, and has been associated with soil aggregation and water movement. Protein content can be influenced by biomass additions, the presence of roots and soil microbes, and tends to decrease with increasing soil disturbance such as tillage.

> **Your measured Predicted Soil Protein value** is **4.70** , corresponding with a score of **22**. This score is in the **Low** range, relative to soils with similar texture. **This suggests that, while Predicted Soil Protein does not currently register as a strong constraint, management practices should be geared toward improving this condition, as it currently indicates suboptimal functioning.** Please refer to the management suggestions table at the end of this document.

**Soil Respiration** is a measure of the metabolic activity of the soil microbial community. Measured by capturing and quantifying carbon dioxide ($CO_2$) produced by this activity, the value is expressed as total $CO_2$ released (in mg) per gram of soil over a 4 day incubation period. Respiration is scored against an observed distribution in regional soils, taking texture into account. A direct biological activity measurement, respiration is an indicator of the biological status of the soil community, integrating abundance and activity of microbial life. Soil biological activity accomplishes numerous important functions, such as cycling of nutrients into and out of soil OM pools, transformations of N between its several forms, and decomposition of incorporated residues. Soil biological activity influences key physical characteristics like OM accumulation, and aggregate formation and stabilization. Microbial activity is influenced by management practices such as tillage, cover cropping, manure or green manure incorporation, and biocide (pesticide, fungicide, herbicide) use.

> **Your measured Soil Respiration value** is **0.5 mg**, corresponding with a score of **34**. This score is in the **Low** range, relative to soils with similar texture. **This suggests that, while Soil Respiration does not currently register as a strong constraint, management practices should be geared toward improving this condition, as it currently indicates suboptimal functioning.** Please refer to the management suggestions table at the end of this document.

**Active Carbon** is a measure of the small portion of the organic matter that can serve as an easily available food source for soil microbes, thus helping maintain a healthy soil food web. Measured by potassium permanganate oxidation, the value is presented in parts per million (ppm), and scored against an observed distribution in regional soils with similar texture. While a measure of a class of physical substances, active carbon is a good leading indicator of biological soil health and tends to respond to changes in management earlier than total organic matter content, because when a large population of soil microbes is fed plentifully with enough organic matter over an extended period of time, well-decomposed organic matter builds up. A healthy and diverse microbial community is essential to maintain disease resistance, nutrient cycling, aggregation, and many other important functions. Intensive tillage and lack of organic matter additions from various sources (amendments, residues, active crop or cover crop growth) will decrease active carbon, and thus will over the longer term decrease total organic matter.

> **Your measured Active Carbon value** is **359 ppm**, corresponding with a score of **32**. This score is in the **Low** range, relative to soils with similar texture. **This suggests that, while Active Carbon does not currently register as a strong constraint, management practices should be geared toward improving this condition, as it currently indicates suboptimal functioning.** Please refer to the management suggestions table at the end of this document.

**Soil pH** is a measure of how acidic the soil is, which controls how available nutrients are to crops. A physico-chemical characteristic of soils, pH is an indicator of the chemical or nutrient status of the soil. Measured with an electrode in a 1:1 soil:water suspension, the value is presented in standard pH units, and scored using an optimality curve. Optimum pH is around 6.2-6.8 for most crops (exceptions include potatoes and blueberries, which grow best in more acidic soil – this is not accounted for in the report interpretation). If pH is too high, nutrients such as phosphorus, iron, manganese, copper and boron become unavailable to the crop. If pH is too low, calcium, magnesium, phosphorus, potassium and molybdenum become unavailable. Lack of nutrient availability will limit crop yields and quality. Aluminum toxicity can also be a concern in low pH soils, which can severely decrease root growth and yield, and in some cases lead to accumulation of aluminum and other metals in crop tissue. In general, as soil OM increases, crops can tolerate lower soil pH. Soil pH also influences the ability of certain pathogens to thrive, and of beneficial organisms to effectively colonize roots. Raising the pH through lime or wood ash applications, and organic matter additions, will help immobilize aluminum andheavy metals, and maintain proper nutrient availability.

> **Your measured Soil pH value** is **7.4** , corresponding with a score of **96**. This score is in the **Very High** range, relative to soils with similar texture. **This suggests that management practices should be geared toward maintaining this condition, as it currently indicates ideal soil functioning.** Please refer to the management suggestions table at the end of this document.

**Extractable Phosphorus** is a measure of phosphorus (P) availability to a crop. Measured on a modified Morgan's extract using an ICP Spectrometer, the value is presented in parts per million (ppm), and scored against an optimality curve for sufficiency or excess. P is an essential plant macronutrient, and its availability varies with soil pH and mineral composition. Low P values indicate poor P availability to plants, and excessively high P values indicates a risk of adverse environmental impact through runoff and contamination of surface waters. Most soils in the Northeast store unavailable P from the soil’s mineral make up or from previously applied fertilizer or manure. This becomes more available to plants as soils warm up. Therefore, incorporating or banding 10-25 lbs/acre of soluble ‘starter’ P fertilizer at planting can be useful even when soil levels are optimum. Some cover crops, such as buckwheat, are good at mining otherwise unavailable P so that it becomes more available to the following crop. When plants associate with mycorrhizal fungi, these can also help make P (and other nutrients and water) more available to the crop. P is an environmental contaminant and runoff of P into fresh surface water will cause damage through eutrophication, so over-application is strongly discouraged, especially close to surface water, on slopes, and on large scales.

> **Your measured Extractable Phosphorus value** is **2.5 ppm**, corresponding with a

score of **72**. This score is in the **High** range, relative to soils with similar texture. **This suggests that this soil process is enhancing overall soil resilience. Soil management should aim at maintaining this functionality while addressing any other measured soil constraints as identified in the Soil Health Assessment Report.** Please refer to the management suggestions table at the end of this document.

**Extractable Potassium** is a measure of potassium (K) availability to the crop. Measured on a modified Morgan's extract using an ICP Spectrometer, the value is presented in parts per million (ppm), and scored against an optimality curve for sufficiency. K is an indicator of soil nutrient status, as it is an essential plant macronutrient. Plants with higher potassium tend to be more tolerant of frost and cold. Thus good potassium levels may help with season extension. While soil pH only marginally affects K availability, K is easily leached from sandy soils and is only weakly held by increased organic matter, so that applications of the amount removed by the specific crop being grown are generally necessary in such soils.

**Your measured Extractable Potassium value** is **62.5 ppm**, corresponding with a score of **87**. This score is in the **Very High** range, relative to soils with similar texture. **This suggests that management practices should be geared toward maintaining this condition, as it currently indicates ideal soil functioning.** Please refer to the management suggestions table at the end of this document.

**Additional Nutrients** including (calcium (Ca), magnesium (Mg) and sulfur (S)) with micronutrients (aluminum (Al), boron (B), copper (Cu), iron (Fe), manganese (Mn) and zinc (Zn), etc.) are essential plant nutrients taken up by plants in smaller quantities than the macronutrients N, P and K. Note that some leafy vegetables can require significant amounts of these nutrients. If any of these nutrients are deficient, this will decrease yield and crop quality, but toxicities can also occur when concentrations are too high. While Al is not technically a plant nutrient, it can become toxic to crop plants at pH below 5.5. The solubility and availability of all of the elements are strongly influenced by pH and organic matter. High pH favors the availability of magnesium and calcium whereas low pH increases the availability of most micronutrients. High OM and microbial activity tend to increase micronutrient availability. The ratings indicate whether these measured nutrients are deficient or excessive.

**Your measured Additional Nutrients Rating** is **77**. This score is in the **High** range. Magnesium (398.8 ppm) is sufficient, Iron (0.6 ppm) is sufficient, Manganese (2.3 ppm) is sufficient, Zinc (0.1 ppm) is deficient, Aluminum (3.2 ppm) is sufficient, Calcium (2770.2 ppm) is sufficient, Copper (0.03 ppm) is sufficient, Sulfur (2.0 ppm) is deficient, Boron (0.26 ppm) is sufficient. **This suggests that this soil process is enhancing overall soil resilience. Soil management should aim at maintaining this functionality while addressing any other measured soil constraints as identified in the Soil Health Assessment Report.** Please refer to the management suggestions table at the end of this document.

**Overall Quality Score:** an overall quality score is computed from the individual indicator scores. This score is further rated as follows: less than 20% is regarded as very low, 20-40% is low, 40-60% is medium, 60-80% is high, and greater than 80% is very high. The highest possible quality score is 100 and the least score is 0, thus it is a relative overall soil health status indicator. However, of greater importance than a single overall metric is identification of constrained or suboptimally functioning soil processes, so that these issues can be addressed through appropriate management. The overall soil quality score should be taken as a general summary rather than the main focus.

**Your Overall Quality Score** is **52**, which is in the **Medium** range.

## Management Suggestions for Physical and Biological Constraints

| Constraint | Short Term Management Suggestions | Long Term Management Suggestions |
|---|---|---|
| Predicted Available Water Capacity Low | • Add stable organic materials, mulch<br>• Add compost or biochar<br>• Incorporate high biomass cover crop | • Reduce tillage<br>• Rotate with sod crops<br>• Incorporate high biomass cover crop |
| **Surface Hardness High** | • Perform some mechanical soil loosening (strip till, aerators, broadfork, spader)<br>• Use shallow-rooted cover crops<br>• Use a living mulch or interseed cover crop | • Shallow-rooted cover/rotation crops<br>• Avoid traffic on wet soils, monitor<br>• Avoid excessive traffic/tillage/loads<br>• Use controlled traffic patterns/lanes |
| **Subsurface Hardness High** | • Use targeted deep tillage (subsoiler, yeomans plow, chisel plow, spader.)<br>• Plant deep rooted cover crops/radish | • Avoid plows/disks that create pans<br>• Avoid heavy loads<br>• Reduce traffic when subsoil is wet |
| Aggregate Stability Low | • Incorporate fresh organic materials<br>• Use shallow-rooted cover/rotation crops<br>• Add manure, green manure, mulch | • Reduce tillage<br>• Use a surface mulch<br>• Rotate with sod crops and mycorrhizal hosts |
| Organic Matter Low | • Add stable organic materials, mulch<br>• Add compost and biochar<br>• Incorporate high biomass cover crop | • Reduce tillage/mechanical cultivation<br>• Rotate with sod crop<br>• Incorporate high biomass cover crop |
| Predicted Soil Protein Low | • Add N-rich organic matter (low C:N source like manure, high N well-finished compost)<br>• Incorporate young, green, cover crop biomass<br>• Plant legumes and grass-legume mixtures<br>• Inoculate legume seed with Rhizobia & check for nodulation | • Reduce tillage<br>• Rotate with forage legume sod crop<br>• Cover crop and add fresh manure<br>• Keep pH at 6.2-6.5 (helps N fixation)<br>• Monitor C:N ratio of inputs |
| Soil Respiration Low | • Maintain plant cover throughout season<br>• Add fresh organic materials<br>• Add manure, green manure<br>• Consider reducing biocide usage | • Reduce tillage/mechanical cultivation<br>• Increase rotational diversity<br>• Maintain plant cover throughout season<br>• Cover crop with symbiotic host plants |
| Active Carbon Low | • Add fresh organic materials<br>• Use shallow-rooted cover/rotation crops<br>• Add manure, green manure, mulch | • Reduce tillage/mechanical cultivation<br>• Rotate with sod crop<br>• Cover crop whenever possible |

## Management Suggestions for Chemical Constraints

| Constraint | Short Term Management Suggestions | Long Term Management Suggestions |
|---|---|---|
| Soil pH Low | • Add lime or wood ash per soil test recommendations<br>• Add calcium sulfate (gypsum) in addition to lime if aluminum is high<br>• Use less ammonium or urea | • Test soil annually & add "maintenance" lime per soil test recommendations to keep pH in range<br>• Raise organic matter to improve buffering capacity |
| Soil pH High | • Stop adding lime or wood ash<br>• Add elemental sulfur per soil test recommendations | • Test soil annually<br>• Use higher % ammonium or urea |
| Extractable Phosphorus Low | • Add P amendments per soil test recommendations<br>• Use cover crops to recycle fixed P<br>• Adjust pH to 6.2-6.5 to free up fixed P | • Promote mycorrhizal populations<br>• Maintain a pH of 6.2-6.5<br>• Use cover crops to recycle fixed P |
| Extractable Phosphorus High | • Stop adding manure and compost<br>• Choose low or no-P fertilizer blend<br>• Apply only 20 lbs/ac starter P if needed<br>• Apply P at or below crop removal rates | • Use cover crops that accumulate P and export to low P fields or offsite<br>• Consider low P rations for livestock<br>• Consider phytase for non-ruminants |
| Extractable Potassium Low | • Add wood ash, fertilizer, manure, or compost per soil test recommendations<br>• Use cover crops to recycle K<br>• Choose a high K fertilizer blend | • Use cover crops to recycle K<br>• Add "maintenance" K per soil recommendations each year to keep K consistently available |
| Additional Nutrients Low | • Add chelated micronutrients per soil test recommendations<br>• Use cover crops to recycle micronutrients<br>• Do not exceed pH 6.5 for most crops | • Promote mycorrhizal populations<br>• Improve organic matter<br>• Decrease soil P (binds micronutrients)<br>• Add lime (Ca and Mg), gypsum (S), rock powder |
| Additional Nutrients High | • Raise pH to 6.2-6.5 (for all high micro-nutrients and Aluminum)<br>• Do not use fertilizers with micronutrients | • Maintain a pH of 6.2-6.5<br>• Monitor irrigation/improve drainage<br>• Avoid compost additions with high micronutrient levels |

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College of Agriculture and Life Sciences, Cornell University

Developed in partnership with Cornell Soil Health, Farmier, and GreenStart.

# Comprehensive Assessment of Soil Health

From the Cornell Soil Health Laboratory, Department of Soil and Crop Sciences
School of Integrative Plant Science, Cornell University, Ithaca, NY 14853
https://soilhealthlab.cals.cornell.edu

Grower:
Zach Dickhausen
18681 Lake Drive East
Chanhussen, MN 55317
zdickhausen@rpbcwd.org

| | |
|---|---|
| Sample ID: | WW2425 |
| Field ID: | N. Lotus Lake Park 3 |
| Date Sampled: | 05/09/2023 |
| Given Soil Type: | Lester-Kilkenny |
| Crops Grown: | PRK/PRK/PRK |
| Tillage: | no till |
| Coordinates: | Latitude: 44.883746000000<br>Longitude: -93.526763000000 |

Measured Soil Textural Class: **loam**

Sand: **47%** - Silt: **28%** - Clay: **23%**

| Group | Indicator | Value | Rating | Constraints |
|---|---|---|---|---|
| *physical* | Predicted Available Water Capacity | **0.19** | **70** | |
| *physical* | Surface Hardness | **281** | **8** | Rooting, Water Transmission |
| *physical* | Subsurface Hardness | **518** | **2** | Subsurface Pan/Deep Compaction, Deep Rooting, Water and Nutrient Access |
| *physical* | Aggregate Stability | **39.3** | **67** | |
| *biological* | Organic Matter<br>Soil Organic Carbon: 2.11 / Total Carbon: 2.20 / Total Nitrogen: 0.20 | **3.2** | **58** | |
| *biological* | Predicted Soil Protein | **4.50** | **27** | |
| *biological* | Soil Respiration | **0.5** | **43** | |
| *biological* | Active Carbon | **385** | **26** | |
| *chemical* | Soil pH | **7.6** | **86** | |
| *chemical* | Extractable Phosphorus | **1.6** | **46** | |
| *chemical* | Extractable Potassium | **74.4** | **99** | |
| *chemical* | Additional Nutrients<br>Ca: 3409.1 / Mg: 559.9 / **S: 1.6**<br>Al: 3.7 / B: 0.31 / Cu: 0.06<br>Fe: 0.3 / Mn: 1.9 / **Zn: 0.1** | | **77** | |

Overall Quality Score: **51** / Medium

## Measured Soil Health Indicators

The Cornell Soil Health Test measures several indicators of soil physical, biological and chemical health. These are listed on the left side of the report summary, on the first page. The "value" column shows each result as a value, measured in the laboratory or in the field, in units of measure as described in the indicator summaries below. The "rating" column interprets that measured value on a scale of 0 to 100, where higher scores are better. Ratings in red are particularly important to take note of, but any in yellow, particularly those that are close to a rating of 30 are also important in addressing soil health problems.

- **A rating below 20 indicates *Very Low (constraining)* functioning and is color-coded red.** This indicates a problem that is likely limiting yields, crop quality, and long-term sustainability of the agroecosystem. In several cases this indicates risks of environmental loss as well. The "constraint" column provides a short list of soil processes that are not functioning optimally when an indicator rating is red. It is particularly important to take advantage of any opportunities to improve management that will address these constraints.
- **A rating between 20 and 40 indicates *Low* functioning and is color-coded orange.** This indicates that a soil process is functioning somewhat poorly and addressing this should be considered in the field management plan. The Management Suggestions Table at the end of the Soil Health Assessment Report provides linkages to field management practices that are useful in addressing each soil indicator process.
- **A rating between 40 and 60 indicates *Medium* functioning and is color-coded yellow.** This indicates that soil health could be better, and yield and sustainability could decrease over time if this is not addressed. This is especially so if the condition is being caused, or not being alleviated, by current management. Pay attention particularly to those indicators rated in yellow and close to 40.
- **A rating between 60 and 80 indicates *High* functioning and is color-coded light green.** This indicates that this soil process is functioning at a non-limiting level. Field soil management approaches should be maintained at the current intensity or improved.
- **A rating of 80 or greater indicates *Very High* functioning and is color-coded dark green.** Past management has been effective at maintaining soil health. It can be useful to note which particular aspects of management have likely maintained soil health, so that such management can be continued. Note that soil health is often high, when first converting from a permanent sod or forest. In these situations, intensive management quickly damages soil health when it includes intensive tillage, low organic matter inputs, bare soils for significant parts of the year, or excessive traffic, especially during wet times.
- **The Overall Quality Score** at the bottom of the report is an average of all ratings, and provides an indication of the soil’s overall health status. However, the important part is to know which particular soil processes are constrained or suboptimal so that these issues can be addressed through appropriate management. Therefore the ratings for each indicator are more important information.

**The Indicators** measured in the Cornell Soil Health Assessment are important soil properties and characteristics in themselves, but also are representative of key soil processes, necessary for the proper functioning of the soil. The following is a summary of the indicators measured, what each of these indicates about your soil’s health status, and what may influence the relevant properties and processes described.

**A Management Suggestions Table** follows, at the end of the report, with short and long term

suggestions for addressing constraints or maintaining a well-functioning system. This table will indicate constraints identified in this assessment for your soil sample by the same yellow and red color coding described above. Please also find further useful information by following the links to relevant publications and web resources that follow this section.

**Texture** is an inherent property of soil, meaning that it is rarely changed by management. It is thus not a soil health indicator per se, but is helpful both in interpreting the measured values of indicators (see the Cornell Soil Health Assessment Training Manual), and for deciding on appropriate management strategies that will work for that soil.

**Your soil's measured textural class and composition: loam**

**Sand: 47% Silt: 28% Clay: 23%**

**Predicted Available Water Capacity (AWC)** is not a directly measured soil property but is modeled from a suite of measured soil health indicators including the percent sand, silt, clay and organic matter. By using a decision tree approach, the developed Random Forest model can predict the laboratory measured AWC value with no more error than that encountered in the raw laboratory analysis. Details of this modeling effort can be found in our Soil Health Management Series Fact Sheet Number 19-05b.

https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/f/5772/files/2016/12/05b_Soil_Health_Fact_Sheet_Available_Water_Capacity-Predicted-2019-002-132f3th.pdf

The Soil Health Lab continues to offer the laboratory measured AWC test as an add-on to the soil health package analyses.

The Predicted AWC value is presented as grams of water per gram of soil. This value is scored against an observed distribution in regional soils with similar texture. A physical soil characteristic, AWC is an indicator of the amount of plant-available water the soil can store, and therefore how crops will fare in droughty conditions. Soils with lower storage capacity will cause greater risk of drought stress. AWC is generally lower when total organic matter and/or aggregation is low. It can be improved by reducing tillage, long-term cover cropping, and adding large amounts of well-decomposed organic matter such as compost. Coarse textured (sandy) soils inherently store less water than finer textured soils, so that managing for relatively high water storage capacity is particularly important in coarse textured soils. While the textural effect cannot be influenced by management, management decisions can be in part based on an understanding of inherent soil characteristics.

**Your Predicted Available Water Capacity value** is **0.19 g/g**, corresponding with a score of **70**. This score is in the **High** range, relative to soils with similar texture. **This suggests that this soil process is enhancing overall soil resilience. Soil management should aim at maintaining this functionality while addressing any other measured soil constraints as identified in the Soil Health Assessment Report.** Please refer to the management suggestions table at the end of this document.

**Surface Hardness** is a measure of compaction that develops when large pores are lost in the surface soil (0-6 inches). Compaction is measured in the field using a penetrometer, and the resultant value is expressed in pounds per square inch (p.s.i.), representing the localized pressure necessary to break forward through soil. It is scored by comparison with a distribution observed in

regional soils, with lower hardness values rating higher scores. A strongly physical characteristic of soils, surface hardness is an indicator of both physical and biological health of the soil, as growing roots and fungal hyphae must be able to grow through soil, and may be severely restricted by excessively hard soil. Compaction also influences water movement through soil. When surface soils are compacted, runoff, erosion, and slow infiltration can result. Soil compaction is influenced by management, particularly in timing and degree of traffic and plowing disturbance, being worst when the soil is worked wet.

> **Your measured Surface Hardness value** is **281 p.s.i.**, corresponding with a score of **8**. This score is in the **Very Low (constraining)** range, relative to soils with similar texture. **Surface Hardness level should be given a high priority in management decisions based on this assessment, as it is likely to be an important constraint to proper soil functioning and sustainability of management at this time.** Please refer to the management suggestions table at the end of this document.

**Subsurface Hardness** is a measure of compaction that develops when large pores are lost in the subsurface soil (6-18 inches). Subsurface hardness is measured and scored similarly to surface hardness, but deeper in the profile, and scored against an observed distribution in regional soils with similar texture. Large pores are necessary for water and air movement and to allow roots to explorethe soil. Subsurface hardness prevents deep rooting and thus deep water and nutrient uptake by plants, and can increase disease pressure by stressing plants. It also causes poor drainage and poor deep water storage. After heavy rain events, water can build up over a hard pan causing poor aeration both at depth and at the surface, as well as ponding, poor infiltration, runoff and erosion. Impaired water movement and storage create greater risk during heavy rainfall events, as well as greater risk of drought stress. Compaction occurs very rapidly when the soil is worked or trafficked while it is too wet, and compaction can be transferred deep into the soil even from surface pressure. Subsoil compaction in the form of a plow pan is usually found beneath the plow layer, and is caused by smearing and pressure exerted on the undisturbed soil just beneath the deepest tillage operation, especially when wet.

> **Your measured Subsurface Hardness value** is **518 p.s.i.**, corresponding with a score of **2**. This score is in the **Very Low (constraining)** range, relative to soils with similar texture. **Subsurface Hardness level should be given a high priority in management decisions based on this assessment, as it is likely to be an important constraint to proper soil functioning and sustainability of management at this time.** Please refer to the management suggestions table at the end of this document.

**Aggregate Stability** is a measure of how well soil aggregates or crumbs hold together under rainfall or other rapid wetting stresses. Measured by the fraction of dried aggregates that disintegrate under a controlled, simulated rainfall event similar in energy delivery to a hard spring rain, the value is presented as a percent, and scored against a distribution observed in regional soils with similar textural characteristics. A physical characteristic of soil, Aggregate Stability is a good indicator of soil biological and physical health. Good aggregate stability helps prevent crusting, runoff, and erosion, and facilitates aeration, infiltration, and water storage, along with improving seed germination and root and microbial health. Aggregate stability is influenced by microbial activity, as aggregates are largely held together by microbial colonies and exudates, and is impacted by management practices, particularly tillage, cover cropping, and fresh organic matter additions.

**Your measured Aggregate Stability value** is **39.3 %**, corresponding with a score of **67**. This score is in the **High** range, relative to soils with similar texture. **This suggests that this soil process is enhancing overall soil resilience. Soil management should aim at maintaining this functionality while addressing any other measured soil constraints as identified in the Soil Health Assessment Report.** Please refer to the management suggestions table at the end of this document.

**Organic Matter** (OM) is a measure of the carbonaceous material in the soil that is biomass or biomass-derived. Measured by the mass lost on combustion of oven-dried soil, the value is presented as a percent of the total soil mass. This is scored against an observed distribution of OM in regional soils with similar texture. A soil characteristic that measures a physical substance of biological origin, OM is a key or central indicator of the physical, biological, and chemical health of the soil. OM content is an important influence on soil aggregate stabilization, water retention, nutrient cycling, and ion exchange capacity. Soils with low organic matter tend to require higher inputs, and be less resilient to drought and extreme rainfall. The retention and accumulation of OM is influenced by management practices such as tillage and cover cropping, as well as by microbial community growth. Intensive tillage and lack of organic matter biomass additions from various sources (amendments, residues, active crop or cover crop growth) will decrease organic matter content and overall soil health with time.
**Total Carbon** (Tot C) is an indicator for the OM in soil, with carbon comprising 48-58% of the total weight of OM. The Tot C analysis measures all of the carbon in a sample using complete oxidation of carbon to CO2 using high temperature combustion (1100C). The measured Tot C includes ***organic*** forms of carbon (Soil Organic Carbon SOC), comprised of available carbon as well as relatively inert carbon in stable organic materials. Carbon can also be found in ***inorganic*** form (Soil Inorganic Carbon SIC) as carbonate minerals such as calcium carbonate (lime).
**Soil Organic Carbon** (SOC) is equivalent to Tot C when there are no carbonate minerals. However, soils above pH 6.5 may contain high levels of carbonates. These carbonates are measured as SIC and subtracted from the Tot C: **SOC = Tot C - SIC**.
**Total Nitrogen** (Tot N) includes the organic (living and non-living) and inorganic (or mineral) forms of nitrogen. About half of the Tot N found in soil is in relatively stable organic compounds. Inorganic nitrogen is liberated from organic nitrogen sources in the soil, particularly proteins and amino acids through the action of soil microorganisms. Ammonium (NH4+) and nitrate (NO3-) are the inorganic forms of nitrogen found in soil that are plant available. The Tot N is determined following the combustion methodology known as DUMAS.

**Your measured Organic Matter value** is **3.2 %**, corresponding with a score of **58**. This score is in the **Medium** range, relative to soils with similar texture. **This suggests that, while Organic Matter is functioning at an average level, management practices should be geared toward improving this condition, as it currently indicates suboptimal functioning. Soil management should aim at improving this functionality while addressing any other measured soil constraints as identified in the Soil Health Assessment Report.** Please refer to the management suggestions table at the end of this document. The **SOC** level is **2.11%**, the **Tot C** level is **2.20%**, the **Tot N** level is **0.20%**.

<u>**Predicted**</u> **Soil Protein** is not a directly measured soil property but is modeled from a suite of measured soil health indicators including the percent sand, silt, clay and organic matter. By using a decision tree approach, the developed Random Forest model can predict the laboratory measured soil protein value with a tolerable small error. Details of this modeling effort can be found in our Soil

Health Management Series Fact Sheet 20-09b.
https://cpb-us-e1.wpmucdn.com/blogs.cornell.edu/dist/f/5772/files/2020/05/09b-Predicted-Protein.pdf

The Soil Health Lab continues to offer the laboratory measured Soil Protein test as an add-on to the Standard soil health package analyses.

The Predicted Soil Protein is presented as mg per gram of soil. This indicator represents the fraction of the soil organic matter that is present as protein or protein-like substances. Protein content, as organically bound N, influences the ability of the soil to make N available by mineralization, and has been associated with soil aggregation and water movement. Protein content can be influenced by biomass additions, the presence of roots and soil microbes, and tends to decrease with increasing soil disturbance such as tillage.

> **Your measured Predicted Soil Protein value** is **4.50** , corresponding with a score of **27**. This score is in the **Low** range, relative to soils with similar texture. **This suggests that, while Predicted Soil Protein does not currently register as a strong constraint, management practices should be geared toward improving this condition, as it currently indicates suboptimal functioning.** Please refer to the management suggestions table at the end of this document.

**Soil Respiration** is a measure of the metabolic activity of the soil microbial community. Measured by capturing and quantifying carbon dioxide (CO 2) produced by this activity, the value is expressed as total CO 2 released (in mg) per gram of soil over a 4 day incubation period. Respiration is scored against an observed distribution in regional soils, taking texture into account. A direct biological activity measurement, respiration is an indicator of the biological status of the soil community, integrating abundance and activity of microbial life. Soil biological activity accomplishes numerous important functions, such as cycling of nutrients into and out of soil OM pools, transformations of N between its several forms, and decomposition of incorporated residues. Soil biological activity influences key physical characteristics like OM accumulation, and aggregate formation and stabilization. Microbial activity is influenced by management practices such as tillage, cover cropping, manure or green manure incorporation, and biocide (pesticide, fungicide, herbicide) use.

> **Your measured Soil Respiration value** is **0.5 mg**, corresponding with a score of **43**. This score is in the **Medium** range, relative to soils with similar texture. **This suggests that, while Soil Respiration is functioning at an average level, management practices should be geared toward improving this condition, as it currently indicates suboptimal functioning. Soil management should aim at improving this functionality while addressing any other measured soil constraints as identified in the Soil Health Assessment Report.** Please refer to the management suggestions table at the end of this document.

**Active Carbon** is a measure of the small portion of the organic matter that can serve as an easily available food source for soil microbes, thus helping maintain a healthy soil food web. Measured by potassium permanganate oxidation, the value is presented in parts per million (ppm), and scored against an observed distribution in regional soils with similar texture. While a measure of a class of physical substances, active carbon is a good leading indicator of biological soil health and tends to respond to changes in management earlier than total organic matter content, because when a large population of soil microbes is fed plentifully with enough organic matter over an extended period of time, well-decomposed organic matter builds up. A healthy and diverse microbial community is essential to maintain disease resistance, nutrient cycling, aggregation, and many other important functions. Intensive tillage and lack of organic matter additions from various sources (amendments, residues, active crop or cover crop growth) will decrease active carbon, and thus will over the longer term decrease total organic matter.

> **Your measured Active Carbon value** is **385 ppm**, corresponding with a score of **26**. This score is in the **Low** range, relative to soils with similar texture. **This suggests that, while Active Carbon does not currently register as a strong constraint, management practices should be geared toward improving this condition, as it currently indicates suboptimal functioning.** Please refer to the management suggestions table at the end of this document.

**Soil pH** is a measure of how acidic the soil is, which controls how available nutrients are to crops. A physico-chemical characteristic of soils, pH is an indicator of the chemical or nutrient status of the soil. Measured with an electrode in a 1:1 soil:water suspension, the value is presented in standard pH units, and scored using an optimality curve. Optimum pH is around 6.2-6.8 for most crops (exceptions include potatoes and blueberries, which grow best in more acidic soil – this is not accounted for in the report interpretation). If pH is too high, nutrients such as phosphorus, iron, manganese, copper and boron become unavailable to the crop. If pH is too low, calcium, magnesium, phosphorus, potassium and molybdenum become unavailable. Lack of nutrient availability will limit crop yields and quality. Aluminum toxicity can also be a concern in low pH soils, which can severely decrease root growth and yield, and in some cases lead to accumulation of aluminum and other metals in crop tissue. In general, as soil OM increases, crops can tolerate lower soil pH. Soil pH also influences the ability of certain pathogens to thrive, and of beneficial organisms to effectively colonize roots. Raising the pH through lime or wood ash applications, and organic matter additions, will help immobilize aluminum andheavy metals, and maintain proper nutrient availability.

> **Your measured Soil pH value** is **7.6** , corresponding with a score of **86**. This score is in the **Very High** range, relative to soils with similar texture. **This suggests that management practices should be geared toward maintaining this condition, as it currently indicates ideal soil functioning.** Please refer to the management suggestions table at the end of this document.

**Extractable Phosphorus** is a measure of phosphorus (P) availability to a crop. Measured on a modified Morgan's extract using an ICP Spectrometer, the value is presented in parts per million (ppm), and scored against an optimality curve for sufficiency or excess. P is an essential plant macronutrient, and its availability varies with soil pH and mineral composition. Low P values indicate poor P availability to plants, and excessively high P values indicates a risk of adverse environmental impact through runoff and contamination of surface waters. Most soils in the Northeast store unavailable P from the soil's mineral make up or from previously applied fertilizer or manure. This becomes more available to plants as soils warm up. Therefore, incorporating or banding 10-25 lbs/acre of soluble 'starter' P fertilizer at planting can be useful even when soil levels are optimum. Some cover crops, such as buckwheat, are good at mining otherwise unavailable P so that it becomes more available to the following crop. When plants associate with mycorrhizal fungi, these can also help make P (and other nutrients and water) more available to the crop. P is an environmental contaminant and runoff of P into fresh surface water will cause damage through eutrophication, so over-application is strongly discouraged, especially close to surface water, on slopes, and on large scales.

> **Your measured Extractable Phosphorus value** is **1.6 ppm**, corresponding with a score of **46**. This score is in the **Medium** range, relative to soils with similar texture. **This suggests that, while Extractable Phosphorus is functioning at an average level, management practices should be geared toward improving this condition, as it currently indicates suboptimal functioning. Soil management should aim at improving this functionality while addressing any other measured soil constraints as identified in the Soil Health Assessment Report.** Please refer to the management suggestions table at the end of this document.

**Extractable Potassium** is a measure of potassium (K) availability to the crop. Measured on a modified Morgan’s extract using an ICP Spectrometer, the value is presented in parts per million (ppm), and scored against an optimality curve for sufficiency. K is an indicator of soil nutrient status, as it is an essential plant macronutrient. Plants with higher potassium tend to be more tolerant of frost and cold. Thus good potassium levels may help with season extension. While soil pH only marginally affects K availability, K is easily leached from sandy soils and is only weakly held by increased organic matter, so that applications of the amount removed by the specific crop being grown are generally necessary in such soils.

> **Your measured Extractable Potassium value** is **74.4 ppm**, corresponding with a score of **99**. This score is in the **Very High** range, relative to soils with similar texture. **This suggests that management practices should be geared toward maintaining this condition, as it currently indicates ideal soil functioning.** Please refer to the management suggestions table at the end of this document.

**Additional Nutrients** including (calcium (Ca), magnesium (Mg) and sulfur (S)) with micronutrients (aluminum (Al), boron (B), copper (Cu), iron (Fe), manganese (Mn) and zinc (Zn), etc.) are essential plant nutrients taken up by plants in smaller quantities than the macronutrients N, P and K. Note that some leafy vegetables can require significant amounts of these nutrients. If any of these nutrients are deficient, this will decrease yield and crop quality, but toxicities can also occur when concentrations are too high. While Al is not technically a plant nutrient, it can become toxic to crop plants at pH below 5.5. The solubility and availability of all of the elements are strongly influenced by pH and organic matter. High pH favors the availability of magnesium and calcium whereas low pH increases the availability of most micronutrients. High OM and microbial activity tend to increase micronutrient availability. The ratings indicate whether these measured nutrients are deficient or excessive.

> **Your measured Additional Nutrients Rating** is **77**. This score is in the **High** range. Magnesium (559.9 ppm) is sufficient, Iron (0.3 ppm) is sufficient, Manganese (1.9 ppm) is sufficient, Zinc (0.1 ppm) is deficient, Aluminum (3.7 ppm) is sufficient, Calcium (3409.1 ppm) is sufficient, Copper (0.06 ppm) is sufficient, Sulfur (1.6 ppm) is deficient, Boron (0.31 ppm) is sufficient. **This suggests that this soil process is enhancing overall soil resilience. Soil management should aim at maintaining this functionality while addressing any other measured soil constraints as identified in the Soil Health Assessment Report.** Please refer to the management suggestions table at the end of this document.

**Overall Quality Score:** an overall quality score is computed from the individual indicator scores.

This score is further rated as follows: less than 20% is regarded as very low, 20-40% is low, 40-60% is medium, 60-80% is high, and greater than 80% is very high. The highest possible quality score is 100 and the least score is 0, thus it is a relative overall soil health status indicator. However, of greater importance than a single overall metric is identification of constrained or suboptimally functioning soil processes, so that these issues can be addressed through appropriate management. The overall soil quality score should be taken as a general summary rather than the main focus.

**Your Overall Quality Score** is **51**, which is in the **Medium** range.

Management Suggestions for Physical and Biological Constraints

| Constraint | Short Term Management Suggestions | Long Term Management Suggestions |
|---|---|---|
| Predicted Available Water Capacity Low | • Add stable organic materials, mulch<br>• Add compost or biochar<br>• Incorporate high biomass cover crop | • Reduce tillage<br>• Rotate with sod crops<br>• Incorporate high biomass cover crop |
| **Surface Hardness High** | • Perform some mechanical soil loosening (strip till, aerators, broadfork, spader)<br>• Use shallow-rooted cover crops<br>• Use a living mulch or interseed cover crop | • Shallow-rooted cover/rotation crops<br>• Avoid traffic on wet soils, monitor<br>• Avoid excessive traffic/tillage/loads<br>• Use controlled traffic patterns/lanes |
| **Subsurface Hardness High** | • Use targeted deep tillage (subsoiler, yeomans plow, chisel plow, spader.)<br>• Plant deep rooted cover crops/radish | • Avoid plows/disks that create pans<br>• Avoid heavy loads<br>• Reduce traffic when subsoil is wet |
| Aggregate Stability Low | • Incorporate fresh organic materials<br>• Use shallow-rooted cover/rotation crops<br>• Add manure, green manure, mulch | • Reduce tillage<br>• Use a surface mulch<br>• Rotate with sod crops and mycorrhizal hosts |
| Organic Matter Low | • Add stable organic materials, mulch<br>• Add compost and biochar<br>• Incorporate high biomass cover crop | • Reduce tillage/mechanical cultivation<br>• Rotate with sod crop<br>• Incorporate high biomass cover crop |
| Predicted Soil Protein Low | • Add N-rich organic matter (low C:N source like manure, high N well-finished compost)<br>• Incorporate young, green, cover crop biomass<br>• Plant legumes and grass-legume mixtures<br>• Inoculate legume seed with Rhizobia & check for nodulation | • Reduce tillage<br>• Rotate with forage legume sod crop<br>• Cover crop and add fresh manure<br>• Keep pH at 6.2-6.5 (helps N fixation)<br>• Monitor C:N ratio of inputs |
| Soil Respiration Low | • Maintain plant cover throughout season<br>• Add fresh organic materials<br>• Add manure, green manure<br>• Consider reducing biocide usage | • Reduce tillage/mechanical cultivation<br>• Increase rotational diversity<br>• Maintain plant cover throughout season<br>• Cover crop with symbiotic host plants |
| Active Carbon Low | • Add fresh organic materials<br>• Use shallow-rooted cover/rotation crops<br>• Add manure, green manure, mulch | • Reduce tillage/mechanical cultivation<br>• Rotate with sod crop<br>• Cover crop whenever possible |

## Management Suggestions for Chemical Constraints

| Constraint | Short Term Management Suggestions | Long Term Management Suggestions |
|---|---|---|
| Soil pH Low | • Add lime or wood ash per soil test recommendations<br>• Add calcium sulfate (gypsum) in addition to lime if aluminum is high<br>• Use less ammonium or urea | • Test soil annually & add "maintenance" lime per soil test recommendations to keep pH in range<br>• Raise organic matter to improve buffering capacity |
| Soil pH High | • Stop adding lime or wood ash<br>• Add elemental sulfur per soil test recommendations | • Test soil annually<br>• Use higher % ammonium or urea |
| Extractable Phosphorus Low | • Add P amendments per soil test recommendations<br>• Use cover crops to recycle fixed P<br>• Adjust pH to 6.2-6.5 to free up fixed P | • Promote mycorrhizal populations<br>• Maintain a pH of 6.2-6.5<br>• Use cover crops to recycle fixed P |
| Extractable Phosphorus High | • Stop adding manure and compost<br>• Choose low or no-P fertilizer blend<br>• Apply only 20 lbs/ac starter P if needed<br>• Apply P at or below crop removal rates | • Use cover crops that accumulate P and export to low P fields or offsite<br>• Consider low P rations for livestock<br>• Consider phytase for non-ruminants |
| Extractable Potassium Low | • Add wood ash, fertilizer, manure, or compost per soil test recommendations<br>• Use cover crops to recycle K<br>• Choose a high K fertilizer blend | • Use cover crops to recycle K<br>• Add "maintenance" K per soil recommendations each year to keep K consistently available |
| Additional Nutrients Low | • Add chelated micronutrients per soil test recommendations<br>• Use cover crops to recycle micronutrients<br>• Do not exceed pH 6.5 for most crops | • Promote mycorrhizal populations<br>• Improve organic matter<br>• Decrease soil P (binds micronutrients)<br>• Add lime (Ca and Mg), gypsum (S), rock powder |
| Additional Nutrients High | • Raise pH to 6.2-6.5 (for all high micro-nutrients and Aluminum)<br>• Do not use fertilizers with micronutrients | • Maintain a pH of 6.2-6.5<br>• Monitor irrigation/improve drainage<br>• Avoid compost additions with high micronutrient levels |

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Developed in partnership with Cornell Soil Health, Farmier, and GreenStart.

# Appendix C

## Infiltration Testing Results

# Infiltration Report

**RPBCWD**

**Kerber Ravine June 2023 -**

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## $K_{sat}$ best-fit site average: 15 mm/hr or 0.574 in/hr

### *GPS Infiltration Test Site Map*


| Map Pin # | Test # | Test Name | Ksat (mm/hr) | Ksat (in/hr) | C (mm) | RMS Error of Regression (s) | Normalized RMS |
|---|---|---|---|---|---|---|---|
| 1 | 24754 | kerber a | 0.13 | 0.005 | -11,168.0 | 147 | 0.7% |
| 2 | 24755 | kerber b | 24 | 0.961 | -23.6 | 367 | 2.8% |
| 3 | 24756 | kerber c | 73 | 2.88 | -68.6 | 67 | 1.8% |

MPD INFILTROMETER
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# Infiltration Report

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## RPBCWD

## Kerber Ravine June 2023 -

This report summarizes the results of a set of Modified Philip Dunne (MPD) Infiltrometer tests performed at the above referenced site. RPBCWD personnel performed the field tests. The software used to compute saturated hydraulic conductivity ($K_{sat}$) and generate this report assumes that the field personnel used infiltrometers manufactured by Upstream Technologies Inc. and followed the procedures outlined in “Manual – Modified Philip - Dunne Infiltrometer” by Ahmed, Gulliver, and Nieber.

The following paragraphs describe the individual tests, input values used in the analysis, and methods used to compute the $K_{sat}$ value.

After individual $K_{sat}$ values were calculated, the method used to determine the overall site $K_{sat}$value ($K_{best\text{-}fit}$) is described in "Effective Saturated Hydraulic Conductivity of an Infiltration-Based Stormwater Control Measure" by Weiss and Gulliver 2015, "A relationship to more consistently and accurately predict the best-fit value of saturated hydraulic conductivity used a weighted sum of 0.32 times the arithmetic mean and 0.68 times the geometric mean."

### METHOD USED TO COMPUTE $K_{sat}$

The MPD Infiltrometer software uses the following procedure described in "The Comparison of Infiltration Devices and Modification of the Philip-Dunne Permeameter for the Assessment of Rain Gardens" by Rebecca Nestigen, University of Minnesota, November 2007.

The steps are as follows:

1. For each measurement of head, use the following equation to find the corresponding distance to the sharp wetting front.

$$[H_0 - H(t)]r_1^2 = \frac{\theta_1 - \theta_2}{3}[2[R(t)]^3 + 3[R(t)]^2 L_{max} - L_{max}^3 - 4r_0^3]$$

2. Estimate the change in head with respect to time and the change in wetting front distance with respect to time by using the backward difference for all values of R(t) equal to or greater than the distance

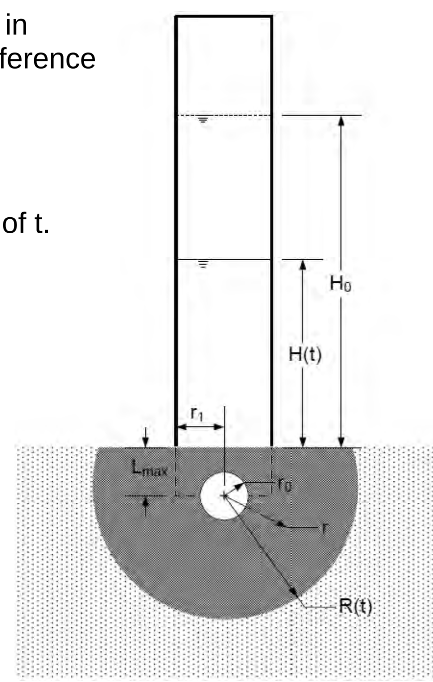
$$\sqrt{r_1^2 + L_{max}^2}$$

3. Make initial guesses for K and C.
4. Solve the following equations for ΔP(t) at each incremental value of t.

$$\Delta P(t) = \frac{\pi^2}{8}\left\{\theta_1 - \theta_0 \frac{[R(t)^2] + [R(t)]L_{max}}{K}\frac{dr}{dt} - 2r_0^2\right\}\frac{ln[\frac{R(t)[r_0 + L_{max}]}{r_0[R(t) + L_{max}]}]}{L_{max}}$$

$$\Delta P(t) = C - H(t) - L_{max} + \frac{L_{max}}{K}\frac{dh}{dt}$$

5. Minimize the absolute difference between the two solutions found in Step 4 by adjusting the values of K and C.




*Parameters for Equations*

$\Theta_0$ = volumetric water content of soil before MPD test

$\Theta_1$ = volumetric water content of soil after MPD test

# Infiltration Report

## RPBCWD

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### kerber a

| | |
|---|---|
| Date | 6/14/2023 |
| Time | 2:01 PM |
| Latitude | 44.873025 |
| Longitude | -93.533856 |
| Initial Volumetric Moisture | 62.00 % |
| Final Volumetric Moisture | 80.00 % |
| Cylinder Size | 3 Liter |

### kerber a Results

| | |
|---|---|
| Map Pin # | 1 |
| Test Number | 24754 |
| Ksat - mm/hr | 0.13 |
| Ksat - in/hr | 0.005 |
| Capillary Pressure C mm | -11,168.0 |
| RMS Error of Regression | 147 |
| Normalized RMS | 0.7% |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 s | 30.49 cm | 26 | 248 s | 30.32 cm | 51 | 498 s | 30.2 cm | 76 | 748 s | 30.08 cm |
| 2 | 8 s | 30.46 cm | 27 | 258 s | 30.31 cm | 52 | 508 s | 30.19 cm | 77 | 758 s | 30.08 cm |
| 3 | 18 s | 30.44 cm | 28 | 268 s | 30.31 cm | 53 | 518 s | 30.19 cm | 78 | 768 s | 30.07 cm |
| 4 | 28 s | 30.43 cm | 29 | 278 s | 30.3 cm | 54 | 528 s | 30.19 cm | 79 | 778 s | 30.07 cm |
| 5 | 38 s | 30.42 cm | 30 | 288 s | 30.3 cm | 55 | 538 s | 30.18 cm | 80 | 788 s | 30.06 cm |
| 6 | 48 s | 30.42 cm | 31 | 298 s | 30.28 cm | 56 | 548 s | 30.18 cm | 81 | 798 s | 30.06 cm |
| 7 | 58 s | 30.41 cm | 32 | 308 s | 30.28 cm | 57 | 558 s | 30.17 cm | 82 | 808 s | 30.05 cm |
| 8 | 68 s | 30.4 cm | 33 | 318 s | 30.28 cm | 58 | 568 s | 30.17 cm | 83 | 818 s | 30.05 cm |
| 9 | 78 s | 30.39 cm | 34 | 328 s | 30.27 cm | 59 | 578 s | 30.16 cm | 84 | 828 s | 30.05 cm |
| 10 | 88 s | 30.39 cm | 35 | 338 s | 30.27 cm | 60 | 588 s | 30.16 cm | 85 | 838 s | 30.04 cm |
| 11 | 98 s | 30.38 cm | 36 | 348 s | 30.26 cm | 61 | 598 s | 30.16 cm | 86 | 848 s | 30.04 cm |
| 12 | 108 s | 30.38 cm | 37 | 358 s | 30.26 cm | 62 | 608 s | 30.15 cm | 87 | 858 s | 30.03 cm |
| 13 | 118 s | 30.37 cm | 38 | 368 s | 30.26 cm | 63 | 618 s | 30.15 cm | 88 | 868 s | 30.03 cm |
| 14 | 128 s | 30.36 cm | 39 | 378 s | 30.25 cm | 64 | 628 s | 30.14 cm | 89 | 878 s | 30.02 cm |
| 15 | 138 s | 30.36 cm | 40 | 388 s | 30.25 cm | 65 | 638 s | 30.14 cm | 90 | 888 s | 30.02 cm |
| 16 | 148 s | 30.35 cm | 41 | 398 s | 30.24 cm | 66 | 648 s | 30.14 cm | 91 | 898 s | 30.01 cm |
| 17 | 158 s | 30.35 cm | 42 | 408 s | 30.23 cm | 67 | 658 s | 30.13 cm | 92 | 908 s | 30.01 cm |
| 18 | 168 s | 30.35 cm | 43 | 418 s | 30.23 cm | 68 | 668 s | 30.13 cm | 93 | 918 s | 30.0 cm |
| 19 | 178 s | 30.35 cm | 44 | 428 s | 30.23 cm | 69 | 678 s | 30.11 cm | 94 | 928 s | 30.0 cm |
| 20 | 188 s | 30.34 cm | 45 | 438 s | 30.22 cm | 70 | 688 s | 30.11 cm | 95 | 938 s | 29.99 cm |
| 21 | 198 s | 30.34 cm | 46 | 448 s | 30.21 cm | 71 | 698 s | 30.1 cm | 96 | 948 s | 29.99 cm |
| 22 | 208 s | 30.33 cm | 47 | 458 s | 30.21 cm | 72 | 708 s | 30.1 cm | 97 | 958 s | 29.98 cm |
| 23 | 218 s | 30.33 cm | 48 | 468 s | 30.21 cm | 73 | 718 s | 30.09 cm | 98 | 968 s | 29.98 cm |
| 24 | 228 s | 30.32 cm | 49 | 478 s | 30.2 cm | 74 | 728 s | 30.09 cm | 99 | 978 s | 29.97 cm |
| 25 | 238 s | 30.32 cm | 50 | 488 s | 30.2 cm | 75 | 738 s | 30.09 cm | 100 | 988 s | 29.95 cm |

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# Infiltration Report

## RPBCWD

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | 998 s | 29.95 cm | 133 | 1318 s | 29.78 cm | 165 | 1638 s | 29.6 cm | 197 | 1958 s | 29.42 cm |
| 102 | 1008 s | 29.95 cm | 134 | 1328 s | 29.78 cm | 166 | 1648 s | 29.6 cm | 198 | 1968 s | 29.41 cm |
| 103 | 1018 s | 29.94 cm | 135 | 1338 s | 29.77 cm | 167 | 1658 s | 29.59 cm | 199 | 1978 s | 29.41 cm |
| 104 | 1028 s | 29.93 cm | 136 | 1348 s | 29.77 cm | 168 | 1668 s | 29.59 cm | 200 | 1988 s | 29.4 cm |
| 105 | 1038 s | 29.93 cm | 137 | 1358 s | 29.76 cm | 169 | 1678 s | 29.58 cm | 201 | 1998 s | 29.39 cm |
| 106 | 1048 s | 29.93 cm | 138 | 1368 s | 29.76 cm | 170 | 1688 s | 29.58 cm | 202 | 2008 s | 29.39 cm |
| 107 | 1058 s | 29.92 cm | 139 | 1378 s | 29.75 cm | 171 | 1698 s | 29.57 cm | 203 | 2018 s | 29.51 cm |
| 108 | 1068 s | 29.91 cm | 140 | 1388 s | 29.75 cm | 172 | 1708 s | 29.57 cm | 204 | 2028 s | 29.5 cm |
| 109 | 1078 s | 29.91 cm | 141 | 1398 s | 29.74 cm | 173 | 1718 s | 29.56 cm | 205 | 2038 s | 29.49 cm |
| 110 | 1088 s | 29.91 cm | 142 | 1408 s | 29.74 cm | 174 | 1728 s | 29.55 cm | 206 | 2048 s | 29.49 cm |
| 111 | 1098 s | 29.9 cm | 143 | 1418 s | 29.73 cm | 175 | 1738 s | 29.55 cm | 207 | 2058 s | 29.48 cm |
| 112 | 1108 s | 29.9 cm | 144 | 1428 s | 29.73 cm | 176 | 1748 s | 29.54 cm | 208 | 2068 s | 29.48 cm |
| 113 | 1118 s | 29.88 cm | 145 | 1438 s | 29.72 cm | 177 | 1758 s | 29.54 cm | 209 | 2078 s | 29.46 cm |
| 114 | 1128 s | 29.89 cm | 146 | 1448 s | 29.72 cm | 178 | 1768 s | 29.53 cm | 210 | 2088 s | 29.46 cm |
| 115 | 1138 s | 29.88 cm | 147 | 1458 s | 29.71 cm | 179 | 1778 s | 29.53 cm | 211 | 2098 s | 29.45 cm |
| 116 | 1148 s | 29.88 cm | 148 | 1468 s | 29.71 cm | 180 | 1788 s | 29.52 cm | 212 | 2108 s | 29.45 cm |
| 117 | 1158 s | 29.87 cm | 149 | 1478 s | 29.7 cm | 181 | 1798 s | 29.52 cm | 213 | 2118 s | 29.44 cm |
| 118 | 1168 s | 29.87 cm | 150 | 1488 s | 29.69 cm | 182 | 1808 s | 29.51 cm | 214 | 2479 s | 29.27 cm |
| 119 | 1178 s | 29.87 cm | 151 | 1498 s | 29.69 cm | 183 | 1818 s | 29.51 cm | 215 | 2489 s | 29.26 cm |
| 120 | 1188 s | 29.86 cm | 152 | 1508 s | 29.68 cm | 184 | 1828 s | 29.5 cm | 216 | 2499 s | 29.25 cm |
| 121 | 1198 s | 29.85 cm | 153 | 1518 s | 29.68 cm | 185 | 1838 s | 29.49 cm | 217 | 2509 s | 29.25 cm |
| 122 | 1208 s | 29.85 cm | 154 | 1528 s | 29.67 cm | 186 | 1848 s | 29.49 cm | 218 | 2519 s | 29.24 cm |
| 123 | 1218 s | 29.84 cm | 155 | 1538 s | 29.67 cm | 187 | 1858 s | 29.48 cm | 219 | 2529 s | 29.24 cm |
| 124 | 1228 s | 29.84 cm | 156 | 1548 s | 29.66 cm | 188 | 1868 s | 29.48 cm | 220 | 2539 s | 29.23 cm |
| 125 | 1238 s | 29.83 cm | 157 | 1558 s | 29.66 cm | 189 | 1878 s | 29.46 cm | 221 | 2549 s | 29.23 cm |
| 126 | 1248 s | 29.83 cm | 158 | 1568 s | 29.65 cm | 190 | 1888 s | 29.46 cm | 222 | 2559 s | 29.22 cm |
| 127 | 1258 s | 29.82 cm | 159 | 1578 s | 29.65 cm | 191 | 1898 s | 29.45 cm | 223 | 2569 s | 29.22 cm |
| 128 | 1268 s | 29.82 cm | 160 | 1588 s | 29.64 cm | 192 | 1908 s | 29.45 cm | 224 | 2579 s | 29.21 cm |
| 129 | 1278 s | 29.81 cm | 161 | 1598 s | 29.64 cm | 193 | 1918 s | 29.44 cm | 225 | 2589 s | 29.21 cm |
| 130 | 1288 s | 29.81 cm | 162 | 1608 s | 29.62 cm | 194 | 1928 s | 29.44 cm | 226 | 2599 s | 29.2 cm |
| 131 | 1298 s | 29.79 cm | 163 | 1618 s | 29.62 cm | 195 | 1938 s | 29.43 cm | 227 | 2609 s | 29.2 cm |
| 132 | 1308 s | 29.79 cm | 164 | 1628 s | 29.61 cm | 196 | 1948 s | 29.42 cm | 228 | 2619 s | 29.19 cm |

# Infiltration Report

**RPBCWD**

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 229 | 2629 s | 29.16 cm | 261 | 2949 s | 28.99 cm | 293 | 3269 s | 28.8 cm | 325 | 3589 s | 28.61 cm |
| 230 | 2639 s | 29.16 cm | 262 | 2959 s | 28.99 cm | 294 | 3279 s | 28.8 cm | 326 | 3599 s | 28.6 cm |
| 231 | 2649 s | 29.15 cm | 263 | 2969 s | 28.97 cm | 295 | 3289 s | 28.79 cm | 327 | 3609 s | 28.6 cm |
| 232 | 2659 s | 29.15 cm | 264 | 2979 s | 28.97 cm | 296 | 3299 s | 28.79 cm | 328 | 3619 s | 28.59 cm |
| 233 | 2669 s | 29.13 cm | 265 | 2989 s | 28.96 cm | 297 | 3309 s | 28.78 cm | 329 | 3629 s | 28.58 cm |
| 234 | 2679 s | 29.13 cm | 266 | 2999 s | 28.96 cm | 298 | 3319 s | 28.78 cm | 330 | 3639 s | 28.58 cm |
| 235 | 2689 s | 29.12 cm | 267 | 3009 s | 28.95 cm | 299 | 3329 s | 28.77 cm | 331 | 3649 s | 28.57 cm |
| 236 | 2699 s | 29.11 cm | 268 | 3019 s | 28.94 cm | 300 | 3339 s | 28.77 cm | 332 | 3659 s | 28.57 cm |
| 237 | 2709 s | 29.11 cm | 269 | 3029 s | 28.94 cm | 301 | 3349 s | 28.76 cm | 333 | 3669 s | 28.56 cm |
| 238 | 2719 s | 29.11 cm | 270 | 3039 s | 28.93 cm | 302 | 3359 s | 28.76 cm | 334 | 3679 s | 28.56 cm |
| 239 | 2729 s | 29.1 cm | 271 | 3049 s | 28.93 cm | 303 | 3369 s | 28.75 cm | 335 | 3689 s | 28.55 cm |
| 240 | 2739 s | 29.1 cm | 272 | 3059 s | 28.93 cm | 304 | 3379 s | 28.74 cm | 336 | 3699 s | 28.55 cm |
| 241 | 2749 s | 29.09 cm | 273 | 3069 s | 28.92 cm | 305 | 3389 s | 28.74 cm | 337 | 3709 s | 28.54 cm |
| 242 | 2759 s | 29.09 cm | 274 | 3079 s | 28.91 cm | 306 | 3399 s | 28.73 cm | 338 | 3719 s | 28.53 cm |
| 243 | 2769 s | 29.08 cm | 275 | 3089 s | 28.91 cm | 307 | 3409 s | 28.73 cm | 339 | 3729 s | 28.53 cm |
| 244 | 2779 s | 29.08 cm | 276 | 3099 s | 28.91 cm | 308 | 3419 s | 28.72 cm | 340 | 3739 s | 28.52 cm |
| 245 | 2789 s | 29.07 cm | 277 | 3109 s | 28.9 cm | 309 | 3429 s | 28.72 cm | 341 | 3749 s | 28.52 cm |
| 246 | 2799 s | 29.07 cm | 278 | 3119 s | 28.9 cm | 310 | 3439 s | 28.71 cm | 342 | 3759 s | 28.51 cm |
| 247 | 2809 s | 29.06 cm | 279 | 3129 s | 28.89 cm | 311 | 3449 s | 28.7 cm | 343 | 3769 s | 28.51 cm |
| 248 | 2819 s | 29.06 cm | 280 | 3139 s | 28.89 cm | 312 | 3459 s | 28.69 cm | 344 | 3779 s | 28.5 cm |
| 249 | 2829 s | 29.05 cm | 281 | 3149 s | 28.88 cm | 313 | 3469 s | 28.69 cm | 345 | 3789 s | 28.5 cm |
| 250 | 2839 s | 29.05 cm | 282 | 3159 s | 28.87 cm | 314 | 3479 s | 28.68 cm | 346 | 3799 s | 28.48 cm |
| 251 | 2849 s | 29.04 cm | 283 | 3169 s | 28.87 cm | 315 | 3489 s | 28.67 cm | 347 | 3809 s | 28.48 cm |
| 252 | 2859 s | 29.04 cm | 284 | 3179 s | 28.86 cm | 316 | 3499 s | 28.67 cm | 348 | 3819 s | 28.47 cm |
| 253 | 2869 s | 29.03 cm | 285 | 3189 s | 28.86 cm | 317 | 3509 s | 28.66 cm | 349 | 3829 s | 28.46 cm |
| 254 | 2879 s | 29.03 cm | 286 | 3199 s | 28.85 cm | 318 | 3519 s | 28.66 cm | 350 | 3839 s | 28.46 cm |
| 255 | 2889 s | 29.02 cm | 287 | 3209 s | 28.85 cm | 319 | 3529 s | 28.64 cm | 351 | 3849 s | 28.45 cm |
| 256 | 2899 s | 29.01 cm | 288 | 3219 s | 28.84 cm | 320 | 3539 s | 28.64 cm | 352 | 3859 s | 28.45 cm |
| 257 | 2909 s | 29.01 cm | 289 | 3229 s | 28.84 cm | 321 | 3549 s | 28.63 cm | 353 | 3869 s | 28.44 cm |
| 258 | 2919 s | 29.0 cm | 290 | 3239 s | 28.83 cm | 322 | 3559 s | 28.62 cm | 354 | 3879 s | 28.44 cm |
| 259 | 2929 s | 29.0 cm | 291 | 3249 s | 28.83 cm | 323 | 3569 s | 28.62 cm | 355 | 3889 s | 28.43 cm |
| 260 | 2939 s | 29.0 cm | 292 | 3259 s | 28.82 cm | 324 | 3579 s | 28.61 cm | 356 | 3899 s | 28.43 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 357 | 3909 s | 28.42 cm | 389 | 4229 s | 28.23 cm | 421 | 4549 s | 28.05 cm | 453 | 4869 s | 27.87 cm |
| 358 | 3919 s | 28.42 cm | 390 | 4239 s | 28.23 cm | 422 | 4559 s | 28.05 cm | 454 | 4879 s | 27.86 cm |
| 359 | 3929 s | 28.41 cm | 391 | 4249 s | 28.22 cm | 423 | 4569 s | 28.04 cm | 455 | 4889 s | 27.85 cm |
| 360 | 3939 s | 28.4 cm | 392 | 4259 s | 28.22 cm | 424 | 4579 s | 28.04 cm | 456 | 4899 s | 27.85 cm |
| 361 | 3949 s | 28.4 cm | 393 | 4269 s | 28.21 cm | 425 | 4589 s | 28.03 cm | 457 | 4909 s | 27.84 cm |
| 362 | 3959 s | 28.39 cm | 394 | 4279 s | 28.21 cm | 426 | 4599 s | 28.02 cm | 458 | 4919 s | 27.84 cm |
| 363 | 3969 s | 28.39 cm | 395 | 4289 s | 28.2 cm | 427 | 4609 s | 28.02 cm | 459 | 4929 s | 27.82 cm |
| 364 | 3979 s | 28.38 cm | 396 | 4299 s | 28.2 cm | 428 | 4619 s | 28.01 cm | 460 | 4939 s | 27.82 cm |
| 365 | 3989 s | 28.38 cm | 397 | 4309 s | 28.19 cm | 429 | 4629 s | 28.01 cm | 461 | 4949 s | 27.81 cm |
| 366 | 3999 s | 28.37 cm | 398 | 4319 s | 28.19 cm | 430 | 4639 s | 28.0 cm | 462 | 4959 s | 27.81 cm |
| 367 | 4009 s | 28.36 cm | 399 | 4329 s | 28.18 cm | 431 | 4649 s | 28.0 cm | 463 | 4969 s | 27.8 cm |
| 368 | 4019 s | 28.36 cm | 400 | 4339 s | 28.18 cm | 432 | 4659 s | 27.98 cm | 464 | 4979 s | 27.8 cm |
| 369 | 4029 s | 28.35 cm | 401 | 4349 s | 28.17 cm | 433 | 4669 s | 27.98 cm | 465 | 4989 s | 27.79 cm |
| 370 | 4039 s | 28.35 cm | 402 | 4359 s | 28.17 cm | 434 | 4679 s | 27.97 cm | 466 | 4999 s | 27.79 cm |
| 371 | 4049 s | 28.34 cm | 403 | 4369 s | 28.15 cm | 435 | 4689 s | 27.97 cm | 467 | 5009 s | 27.78 cm |
| 372 | 4059 s | 28.34 cm | 404 | 4379 s | 28.14 cm | 436 | 4699 s | 27.96 cm | 468 | 5019 s | 27.77 cm |
| 373 | 4069 s | 28.33 cm | 405 | 4389 s | 28.14 cm | 437 | 4709 s | 27.95 cm | 469 | 5029 s | 27.77 cm |
| 374 | 4079 s | 28.33 cm | 406 | 4399 s | 28.13 cm | 438 | 4719 s | 27.95 cm | 470 | 5039 s | 27.76 cm |
| 375 | 4089 s | 28.31 cm | 407 | 4409 s | 28.13 cm | 439 | 4729 s | 27.94 cm | 471 | 5049 s | 27.76 cm |
| 376 | 4099 s | 28.3 cm | 408 | 4419 s | 28.12 cm | 440 | 4739 s | 27.94 cm | 472 | 5059 s | 27.75 cm |
| 377 | 4109 s | 28.3 cm | 409 | 4429 s | 28.12 cm | 441 | 4749 s | 27.93 cm | 473 | 5069 s | 27.75 cm |
| 378 | 4119 s | 28.29 cm | 410 | 4439 s | 28.11 cm | 442 | 4759 s | 27.93 cm | 474 | 5079 s | 27.74 cm |
| 379 | 4129 s | 28.29 cm | 411 | 4449 s | 28.11 cm | 443 | 4769 s | 27.92 cm | 475 | 5089 s | 27.74 cm |
| 380 | 4139 s | 28.28 cm | 412 | 4459 s | 28.1 cm | 444 | 4779 s | 27.92 cm | 476 | 5099 s | 27.73 cm |
| 381 | 4149 s | 28.28 cm | 413 | 4469 s | 28.1 cm | 445 | 4789 s | 27.91 cm | 477 | 5109 s | 27.73 cm |
| 382 | 4159 s | 28.27 cm | 414 | 4479 s | 28.09 cm | 446 | 4799 s | 27.9 cm | 478 | 5119 s | 27.72 cm |
| 383 | 4169 s | 28.27 cm | 415 | 4489 s | 28.09 cm | 447 | 4809 s | 27.9 cm | 479 | 5129 s | 27.72 cm |
| 384 | 4179 s | 28.26 cm | 416 | 4499 s | 28.08 cm | 448 | 4819 s | 27.89 cm | 480 | 5139 s | 27.71 cm |
| 385 | 4189 s | 28.26 cm | 417 | 4509 s | 28.07 cm | 449 | 4829 s | 27.89 cm | 481 | 5149 s | 27.71 cm |
| 386 | 4199 s | 28.25 cm | 418 | 4519 s | 28.07 cm | 450 | 4839 s | 27.88 cm | 482 | 5159 s | 27.7 cm |
| 387 | 4209 s | 28.24 cm | 419 | 4529 s | 28.06 cm | 451 | 4849 s | 27.88 cm | 483 | 5169 s | 27.7 cm |
| 388 | 4219 s | 28.24 cm | 420 | 4539 s | 28.06 cm | 452 | 4859 s | 27.87 cm | 484 | 5179 s | 27.69 cm |

# Infiltration Report

## RPBCWD

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 485 | 5189 s | 27.69 cm | 517 | 5509 s | 27.49 cm | 549 | 5829 s | 27.3 cm | 581 | 6149 s | 27.12 cm |
| 486 | 5199 s | 27.68 cm | 518 | 5519 s | 27.48 cm | 550 | 5839 s | 27.3 cm | 582 | 6159 s | 27.11 cm |
| 487 | 5209 s | 27.66 cm | 519 | 5529 s | 27.47 cm | 551 | 5849 s | 27.29 cm | 583 | 6169 s | 27.11 cm |
| 488 | 5219 s | 27.66 cm | 520 | 5539 s | 27.47 cm | 552 | 5859 s | 27.29 cm | 584 | 6179 s | 27.1 cm |
| 489 | 5229 s | 27.57 cm | 521 | 5549 s | 27.46 cm | 553 | 5869 s | 27.28 cm | 585 | 6189 s | 27.1 cm |
| 490 | 5239 s | 27.64 cm | 522 | 5559 s | 27.46 cm | 554 | 5879 s | 27.28 cm | 586 | 6199 s | 27.09 cm |
| 491 | 5249 s | 27.63 cm | 523 | 5569 s | 27.45 cm | 555 | 5889 s | 27.27 cm | 587 | 6209 s | 27.08 cm |
| 492 | 5259 s | 27.62 cm | 524 | 5579 s | 27.45 cm | 556 | 5899 s | 27.27 cm | 588 | 6219 s | 27.08 cm |
| 493 | 5269 s | 27.62 cm | 525 | 5589 s | 27.44 cm | 557 | 5909 s | 27.26 cm | 589 | 6229 s | 27.07 cm |
| 494 | 5279 s | 27.61 cm | 526 | 5599 s | 27.44 cm | 558 | 5919 s | 27.25 cm | 590 | 6239 s | 27.07 cm |
| 495 | 5289 s | 27.61 cm | 527 | 5609 s | 27.43 cm | 559 | 5929 s | 27.25 cm | 591 | 6249 s | 27.06 cm |
| 496 | 5299 s | 27.6 cm | 528 | 5619 s | 27.42 cm | 560 | 5939 s | 27.24 cm | 592 | 6259 s | 27.06 cm |
| 497 | 5309 s | 27.6 cm | 529 | 5629 s | 27.42 cm | 561 | 5949 s | 27.24 cm | 593 | 6269 s | 27.05 cm |
| 498 | 5319 s | 27.59 cm | 530 | 5639 s | 27.41 cm | 562 | 5959 s | 27.23 cm | 594 | 6279 s | 27.05 cm |
| 499 | 5329 s | 27.59 cm | 531 | 5649 s | 27.41 cm | 563 | 5969 s | 27.23 cm | 595 | 6289 s | 27.04 cm |
| 500 | 5339 s | 27.58 cm | 532 | 5659 s | 27.4 cm | 564 | 5979 s | 27.22 cm | 596 | 6299 s | 27.03 cm |
| 501 | 5349 s | 27.58 cm | 533 | 5669 s | 27.4 cm | 565 | 5989 s | 27.22 cm | 597 | 6309 s | 27.03 cm |
| 502 | 5359 s | 27.57 cm | 534 | 5679 s | 27.39 cm | 566 | 5999 s | 27.21 cm | 598 | 6319 s | 27.02 cm |
| 503 | 5369 s | 27.57 cm | 535 | 5689 s | 27.39 cm | 567 | 6009 s | 27.21 cm | 599 | 6329 s | 27.02 cm |
| 504 | 5379 s | 27.56 cm | 536 | 5699 s | 27.38 cm | 568 | 6019 s | 27.2 cm | 600 | 6339 s | 27.0 cm |
| 505 | 5389 s | 27.56 cm | 537 | 5709 s | 27.38 cm | 569 | 6029 s | 27.19 cm | 601 | 6349 s | 27.0 cm |
| 506 | 5399 s | 27.56 cm | 538 | 5719 s | 27.37 cm | 570 | 6039 s | 27.19 cm | 602 | 6359 s | 26.99 cm |
| 507 | 5409 s | 27.55 cm | 539 | 5729 s | 27.37 cm | 571 | 6049 s | 27.17 cm | 603 | 6369 s | 26.98 cm |
| 508 | 5419 s | 27.54 cm | 540 | 5739 s | 27.36 cm | 572 | 6059 s | 27.17 cm | 604 | 6379 s | 26.98 cm |
| 509 | 5429 s | 27.54 cm | 541 | 5749 s | 27.36 cm | 573 | 6069 s | 27.16 cm | 605 | 6389 s | 26.97 cm |
| 510 | 5439 s | 27.53 cm | 542 | 5759 s | 27.35 cm | 574 | 6079 s | 27.16 cm | 606 | 6399 s | 26.97 cm |
| 511 | 5449 s | 27.53 cm | 543 | 5769 s | 27.35 cm | 575 | 6089 s | 27.15 cm | 607 | 6409 s | 26.96 cm |
| 512 | 5459 s | 27.52 cm | 544 | 5779 s | 27.33 cm | 576 | 6099 s | 27.15 cm | 608 | 6419 s | 26.96 cm |
| 513 | 5469 s | 27.52 cm | 545 | 5789 s | 27.33 cm | 577 | 6109 s | 27.14 cm | 609 | 6429 s | 26.95 cm |
| 514 | 5479 s | 27.51 cm | 546 | 5799 s | 27.32 cm | 578 | 6119 s | 27.13 cm | 610 | 6439 s | 26.95 cm |
| 515 | 5489 s | 27.51 cm | 547 | 5809 s | 27.31 cm | 579 | 6129 s | 27.13 cm | 611 | 6449 s | 26.94 cm |
| 516 | 5499 s | 27.49 cm | 548 | 5819 s | 27.31 cm | 580 | 6139 s | 27.12 cm | 612 | 6459 s | 26.93 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -



### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 613 | 6469 s | 26.93 cm | 645 | 6789 s | 26.74 cm | 677 | 7109 s | 26.56 cm | 709 | 7429 s | 26.37 cm |
| 614 | 6479 s | 26.92 cm | 646 | 6799 s | 26.74 cm | 678 | 7119 s | 26.55 cm | 710 | 7439 s | 26.37 cm |
| 615 | 6489 s | 26.92 cm | 647 | 6809 s | 26.73 cm | 679 | 7129 s | 26.55 cm | 711 | 7449 s | 26.35 cm |
| 616 | 6499 s | 26.91 cm | 648 | 6819 s | 26.72 cm | 680 | 7139 s | 26.54 cm | 712 | 7459 s | 26.35 cm |
| 617 | 6509 s | 26.9 cm | 649 | 6829 s | 26.72 cm | 681 | 7149 s | 26.54 cm | 713 | 7469 s | 26.34 cm |
| 618 | 6519 s | 26.9 cm | 650 | 6839 s | 26.71 cm | 682 | 7159 s | 26.53 cm | 714 | 7479 s | 26.33 cm |
| 619 | 6529 s | 26.89 cm | 651 | 6849 s | 26.71 cm | 683 | 7169 s | 26.51 cm | 715 | 7489 s | 26.33 cm |
| 620 | 6539 s | 26.89 cm | 652 | 6859 s | 26.7 cm | 684 | 7179 s | 26.51 cm | 716 | 7499 s | 26.32 cm |
| 621 | 6549 s | 26.88 cm | 653 | 6869 s | 26.7 cm | 685 | 7189 s | 26.5 cm | 717 | 7509 s | 26.32 cm |
| 622 | 6559 s | 26.88 cm | 654 | 6879 s | 26.69 cm | 686 | 7199 s | 26.5 cm | 718 | 7519 s | 26.31 cm |
| 623 | 6569 s | 26.87 cm | 655 | 6889 s | 26.69 cm | 687 | 7209 s | 26.49 cm | 719 | 7529 s | 26.3 cm |
| 624 | 6579 s | 26.87 cm | 656 | 6899 s | 26.67 cm | 688 | 7219 s | 26.49 cm | 720 | 7539 s | 26.3 cm |
| 625 | 6589 s | 26.86 cm | 657 | 6909 s | 26.67 cm | 689 | 7229 s | 26.48 cm | 721 | 7549 s | 26.29 cm |
| 626 | 6599 s | 26.86 cm | 658 | 6919 s | 26.66 cm | 690 | 7239 s | 26.48 cm | 722 | 7559 s | 26.29 cm |
| 627 | 6609 s | 26.84 cm | 659 | 6929 s | 26.66 cm | 691 | 7249 s | 26.47 cm | 723 | 7569 s | 26.28 cm |
| 628 | 6619 s | 26.83 cm | 660 | 6939 s | 26.65 cm | 692 | 7259 s | 26.47 cm | 724 | 7579 s | 26.28 cm |
| 629 | 6629 s | 26.83 cm | 661 | 6949 s | 26.64 cm | 693 | 7269 s | 26.46 cm | 725 | 7589 s | 26.27 cm |
| 630 | 6639 s | 26.82 cm | 662 | 6959 s | 26.64 cm | 694 | 7279 s | 26.45 cm | 726 | 7599 s | 26.26 cm |
| 631 | 6649 s | 26.82 cm | 663 | 6969 s | 26.63 cm | 695 | 7289 s | 26.45 cm | 727 | 7609 s | 26.26 cm |
| 632 | 6659 s | 26.81 cm | 664 | 6979 s | 26.63 cm | 696 | 7299 s | 26.44 cm | 728 | 7619 s | 26.25 cm |
| 633 | 6669 s | 26.81 cm | 665 | 6989 s | 26.62 cm | 697 | 7309 s | 26.44 cm | 729 | 7629 s | 26.25 cm |
| 634 | 6679 s | 26.8 cm | 666 | 6999 s | 26.62 cm | 698 | 7319 s | 26.43 cm | 730 | 7639 s | 26.24 cm |
| 635 | 6689 s | 26.79 cm | 667 | 7009 s | 26.61 cm | 699 | 7329 s | 26.43 cm | 731 | 7649 s | 26.24 cm |
| 636 | 6699 s | 26.79 cm | 668 | 7019 s | 26.61 cm | 700 | 7339 s | 26.42 cm | 732 | 7659 s | 26.23 cm |
| 637 | 6709 s | 26.78 cm | 669 | 7029 s | 26.6 cm | 701 | 7349 s | 26.42 cm | 733 | 7669 s | 26.23 cm |
| 638 | 6719 s | 26.78 cm | 670 | 7039 s | 26.59 cm | 702 | 7359 s | 26.41 cm | 734 | 7679 s | 26.22 cm |
| 639 | 6729 s | 26.77 cm | 671 | 7049 s | 26.59 cm | 703 | 7369 s | 26.41 cm | 735 | 7689 s | 26.21 cm |
| 640 | 6739 s | 26.77 cm | 672 | 7059 s | 26.58 cm | 704 | 7379 s | 26.4 cm | 736 | 7699 s | 26.21 cm |
| 641 | 6749 s | 26.76 cm | 673 | 7069 s | 26.58 cm | 705 | 7389 s | 26.39 cm | 737 | 7709 s | 26.2 cm |
| 642 | 6759 s | 26.76 cm | 674 | 7079 s | 26.57 cm | 706 | 7399 s | 26.39 cm | 738 | 7719 s | 26.2 cm |
| 643 | 6769 s | 26.75 cm | 675 | 7089 s | 26.57 cm | 707 | 7409 s | 26.38 cm | 739 | 7729 s | 26.18 cm |
| 644 | 6779 s | 26.75 cm | 676 | 7099 s | 26.56 cm | 708 | 7419 s | 26.38 cm | 740 | 7739 s | 26.18 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 741 | 7749 s | 26.17 cm | 773 | 8069 s | 25.99 cm | 805 | 8389 s | 25.81 cm | 837 | 8709 s | 25.63 cm |
| 742 | 7759 s | 26.17 cm | 774 | 8079 s | 25.98 cm | 806 | 8399 s | 25.8 cm | 838 | 8719 s | 25.62 cm |
| 743 | 7769 s | 26.16 cm | 775 | 8089 s | 25.97 cm | 807 | 8409 s | 25.79 cm | 839 | 8729 s | 25.61 cm |
| 744 | 7779 s | 26.16 cm | 776 | 8099 s | 25.97 cm | 808 | 8419 s | 25.79 cm | 840 | 8739 s | 25.61 cm |
| 745 | 7789 s | 26.15 cm | 777 | 8109 s | 25.96 cm | 809 | 8429 s | 25.78 cm | 841 | 8749 s | 25.61 cm |
| 746 | 7799 s | 26.15 cm | 778 | 8119 s | 25.96 cm | 810 | 8439 s | 25.78 cm | 842 | 8759 s | 25.6 cm |
| 747 | 7809 s | 26.14 cm | 779 | 8129 s | 25.95 cm | 811 | 8449 s | 25.77 cm | 843 | 8769 s | 25.6 cm |
| 748 | 7819 s | 26.13 cm | 780 | 8139 s | 25.95 cm | 812 | 8459 s | 25.77 cm | 844 | 8779 s | 25.59 cm |
| 749 | 7829 s | 26.13 cm | 781 | 8149 s | 25.94 cm | 813 | 8469 s | 25.76 cm | 845 | 8789 s | 25.59 cm |
| 750 | 7839 s | 26.12 cm | 782 | 8159 s | 25.94 cm | 814 | 8479 s | 25.76 cm | 846 | 8799 s | 25.58 cm |
| 751 | 7849 s | 26.12 cm | 783 | 8169 s | 25.93 cm | 815 | 8489 s | 25.75 cm | 847 | 8809 s | 25.58 cm |
| 752 | 7859 s | 26.11 cm | 784 | 8179 s | 25.93 cm | 816 | 8499 s | 25.75 cm | 848 | 8819 s | 25.57 cm |
| 753 | 7869 s | 26.1 cm | 785 | 8189 s | 25.92 cm | 817 | 8509 s | 25.74 cm | 849 | 8829 s | 25.57 cm |
| 754 | 7879 s | 26.1 cm | 786 | 8199 s | 25.92 cm | 818 | 8519 s | 25.73 cm | 850 | 8839 s | 25.56 cm |
| 755 | 7889 s | 26.09 cm | 787 | 8209 s | 25.91 cm | 819 | 8529 s | 25.73 cm | 851 | 8849 s | 25.56 cm |
| 756 | 7899 s | 26.09 cm | 788 | 8219 s | 25.91 cm | 820 | 8539 s | 25.72 cm | 852 | 8859 s | 25.55 cm |
| 757 | 7909 s | 26.08 cm | 789 | 8229 s | 25.9 cm | 821 | 8549 s | 25.72 cm | 853 | 8869 s | 25.55 cm |
| 758 | 7919 s | 26.08 cm | 790 | 8239 s | 25.89 cm | 822 | 8559 s | 25.71 cm | 854 | 8879 s | 25.53 cm |
| 759 | 7929 s | 26.07 cm | 791 | 8249 s | 25.89 cm | 823 | 8569 s | 25.71 cm | 855 | 8889 s | 25.53 cm |
| 760 | 7939 s | 26.07 cm | 792 | 8259 s | 25.88 cm | 824 | 8579 s | 25.69 cm | 856 | 8899 s | 25.52 cm |
| 761 | 7949 s | 26.06 cm | 793 | 8269 s | 25.88 cm | 825 | 8589 s | 25.69 cm | 857 | 8909 s | 25.52 cm |
| 762 | 7959 s | 26.06 cm | 794 | 8279 s | 25.87 cm | 826 | 8599 s | 25.68 cm | 858 | 8919 s | 25.51 cm |
| 763 | 7969 s | 26.05 cm | 795 | 8289 s | 25.87 cm | 827 | 8609 s | 25.68 cm | 859 | 8929 s | 25.51 cm |
| 764 | 7979 s | 26.04 cm | 796 | 8299 s | 25.85 cm | 828 | 8619 s | 25.67 cm | 860 | 8939 s | 25.5 cm |
| 765 | 7989 s | 26.04 cm | 797 | 8309 s | 25.85 cm | 829 | 8629 s | 25.67 cm | 861 | 8949 s | 25.5 cm |
| 766 | 7999 s | 26.02 cm | 798 | 8319 s | 25.84 cm | 830 | 8639 s | 25.66 cm | 862 | 8959 s | 25.49 cm |
| 767 | 8009 s | 26.02 cm | 799 | 8329 s | 25.84 cm | 831 | 8649 s | 25.66 cm | 863 | 8969 s | 25.49 cm |
| 768 | 8019 s | 26.01 cm | 800 | 8339 s | 25.83 cm | 832 | 8659 s | 25.65 cm | 864 | 8979 s | 25.48 cm |
| 769 | 8029 s | 26.01 cm | 801 | 8349 s | 25.83 cm | 833 | 8669 s | 25.65 cm | 865 | 8989 s | 25.48 cm |
| 770 | 8039 s | 26.0 cm | 802 | 8359 s | 25.82 cm | 834 | 8679 s | 25.64 cm | 866 | 8999 s | 25.47 cm |
| 771 | 8049 s | 26.0 cm | 803 | 8369 s | 25.82 cm | 835 | 8689 s | 25.63 cm | 867 | 9009 s | 25.47 cm |
| 772 | 8059 s | 25.99 cm | 804 | 8379 s | 25.81 cm | 836 | 8699 s | 25.63 cm | 868 | 9019 s | 25.46 cm |

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## RPBCWD

## Kerber Ravine June 2023 -

### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 869 | 9029 s | 25.46 cm | 901 | 9349 s | 25.29 cm | 933 | 9669 s | 25.12 cm | 965 | 9989 s | 24.95 cm |
| 870 | 9039 s | 25.45 cm | 902 | 9359 s | 25.28 cm | 934 | 9679 s | 25.11 cm | 966 | 9999 s | 24.95 cm |
| 871 | 9049 s | 25.45 cm | 903 | 9369 s | 25.28 cm | 935 | 9689 s | 25.11 cm | 967 | 10009 s | 24.94 cm |
| 872 | 9059 s | 25.44 cm | 904 | 9379 s | 25.27 cm | 936 | 9699 s | 25.1 cm | 968 | 10019 s | 24.94 cm |
| 873 | 9069 s | 25.44 cm | 905 | 9389 s | 25.27 cm | 937 | 9709 s | 25.1 cm | 969 | 10029 s | 24.93 cm |
| 874 | 9079 s | 25.43 cm | 906 | 9399 s | 25.26 cm | 938 | 9719 s | 25.1 cm | 970 | 10039 s | 24.93 cm |
| 875 | 9089 s | 25.43 cm | 907 | 9409 s | 25.26 cm | 939 | 9729 s | 25.09 cm | 971 | 10049 s | 24.92 cm |
| 876 | 9099 s | 25.42 cm | 908 | 9419 s | 25.25 cm | 940 | 9739 s | 25.09 cm | 972 | 10059 s | 24.92 cm |
| 877 | 9109 s | 25.42 cm | 909 | 9429 s | 25.25 cm | 941 | 9749 s | 25.08 cm | 973 | 10069 s | 24.91 cm |
| 878 | 9119 s | 25.41 cm | 910 | 9439 s | 25.24 cm | 942 | 9759 s | 25.08 cm | 974 | 10079 s | 24.91 cm |
| 879 | 9129 s | 25.41 cm | 911 | 9449 s | 25.24 cm | 943 | 9769 s | 25.07 cm | 975 | 10089 s | 24.9 cm |
| 880 | 9139 s | 25.4 cm | 912 | 9459 s | 25.23 cm | 944 | 9779 s | 25.07 cm | 976 | 10099 s | 24.9 cm |
| 881 | 9149 s | 25.4 cm | 913 | 9469 s | 25.23 cm | 945 | 9789 s | 25.06 cm | 977 | 10109 s | 24.89 cm |
| 882 | 9159 s | 25.39 cm | 914 | 9479 s | 25.22 cm | 946 | 9799 s | 25.06 cm | 978 | 10119 s | 24.89 cm |
| 883 | 9169 s | 25.39 cm | 915 | 9489 s | 25.22 cm | 947 | 9809 s | 25.04 cm | 979 | 10129 s | 24.87 cm |
| 884 | 9179 s | 25.38 cm | 916 | 9499 s | 25.2 cm | 948 | 9819 s | 25.04 cm | 980 | 10139 s | 24.87 cm |
| 885 | 9189 s | 25.38 cm | 917 | 9509 s | 25.2 cm | 949 | 9829 s | 25.03 cm | 981 | 10149 s | 24.86 cm |
| 886 | 9199 s | 25.36 cm | 918 | 9519 s | 25.19 cm | 950 | 9839 s | 25.03 cm | 982 | 10159 s | 24.86 cm |
| 887 | 9209 s | 25.36 cm | 919 | 9529 s | 25.19 cm | 951 | 9849 s | 25.02 cm | 983 | 10169 s | 24.85 cm |
| 888 | 9219 s | 25.35 cm | 920 | 9539 s | 25.18 cm | 952 | 9859 s | 25.02 cm | 984 | 10179 s | 24.85 cm |
| 889 | 9229 s | 25.35 cm | 921 | 9549 s | 25.18 cm | 953 | 9869 s | 25.01 cm | 985 | 10189 s | 24.84 cm |
| 890 | 9239 s | 25.34 cm | 922 | 9559 s | 25.17 cm | 954 | 9879 s | 25.01 cm | 986 | 10199 s | 24.84 cm |
| 891 | 9249 s | 25.34 cm | 923 | 9569 s | 25.17 cm | 955 | 9889 s | 25.0 cm | 987 | 10209 s | 24.83 cm |
| 892 | 9259 s | 25.33 cm | 924 | 9579 s | 25.16 cm | 956 | 9899 s | 25.0 cm | 988 | 10219 s | 24.83 cm |
| 893 | 9269 s | 25.33 cm | 925 | 9589 s | 25.16 cm | 957 | 9909 s | 24.99 cm | 989 | 10229 s | 24.82 cm |
| 894 | 9279 s | 25.32 cm | 926 | 9599 s | 25.15 cm | 958 | 9919 s | 24.99 cm | 990 | 10239 s | 24.82 cm |
| 895 | 9289 s | 25.32 cm | 927 | 9609 s | 25.15 cm | 959 | 9929 s | 24.98 cm | 991 | 10249 s | 24.81 cm |
| 896 | 9299 s | 25.31 cm | 928 | 9619 s | 25.14 cm | 960 | 9939 s | 24.98 cm | 992 | 10259 s | 24.81 cm |
| 897 | 9309 s | 25.31 cm | 929 | 9629 s | 25.14 cm | 961 | 9949 s | 24.97 cm | 993 | 10269 s | 24.8 cm |
| 898 | 9319 s | 25.3 cm | 930 | 9639 s | 25.13 cm | 962 | 9959 s | 24.97 cm | 994 | 10279 s | 24.8 cm |
| 899 | 9329 s | 25.3 cm | 931 | 9649 s | 25.13 cm | 963 | 9969 s | 24.96 cm | 995 | 10289 s | 24.79 cm |
| 900 | 9339 s | 25.29 cm | 932 | 9659 s | 25.12 cm | 964 | 9979 s | 24.96 cm | 996 | 10299 s | 24.79 cm |

# Infiltration Report

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## Kerber Ravine June 2023 -

### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 997 | 10309 s | 24.78 cm | 1029 | 10629 s | 24.61 cm | 1061 | 10949 s | 24.44 cm | 1093 | 11269 s | 24.27 cm |
| 998 | 10319 s | 24.78 cm | 1030 | 10639 s | 24.6 cm | 1062 | 10959 s | 24.43 cm | 1094 | 11279 s | 24.26 cm |
| 999 | 10329 s | 24.77 cm | 1031 | 10649 s | 24.6 cm | 1063 | 10969 s | 24.43 cm | 1095 | 11289 s | 24.26 cm |
| 1000 | 10339 s | 24.77 cm | 1032 | 10659 s | 24.59 cm | 1064 | 10979 s | 24.42 cm | 1096 | 11299 s | 24.25 cm |
| 1001 | 10349 s | 24.76 cm | 1033 | 10669 s | 24.59 cm | 1065 | 10989 s | 24.42 cm | 1097 | 11309 s | 24.24 cm |
| 1002 | 10359 s | 24.75 cm | 1034 | 10679 s | 24.58 cm | 1066 | 10999 s | 24.41 cm | 1098 | 11319 s | 24.24 cm |
| 1003 | 10369 s | 24.75 cm | 1035 | 10689 s | 24.58 cm | 1067 | 11009 s | 24.41 cm | 1099 | 11329 s | 24.24 cm |
| 1004 | 10379 s | 24.75 cm | 1036 | 10699 s | 24.57 cm | 1068 | 11019 s | 24.4 cm | 1100 | 11339 s | 24.22 cm |
| 1005 | 10389 s | 24.74 cm | 1037 | 10709 s | 24.57 cm | 1069 | 11029 s | 24.4 cm | 1101 | 11349 s | 24.22 cm |
| 1006 | 10399 s | 24.73 cm | 1038 | 10719 s | 24.56 cm | 1070 | 11039 s | 24.38 cm | 1102 | 11359 s | 24.21 cm |
| 1007 | 10409 s | 24.73 cm | 1039 | 10729 s | 24.56 cm | 1071 | 11049 s | 24.38 cm | 1103 | 11369 s | 24.21 cm |
| 1008 | 10419 s | 24.71 cm | 1040 | 10739 s | 24.54 cm | 1072 | 11059 s | 24.38 cm | 1104 | 11379 s | 24.2 cm |
| 1009 | 10429 s | 24.71 cm | 1041 | 10749 s | 24.54 cm | 1073 | 11069 s | 24.37 cm | 1105 | 11389 s | 24.2 cm |
| 1010 | 10439 s | 24.7 cm | 1042 | 10759 s | 24.53 cm | 1074 | 11079 s | 24.36 cm | 1106 | 11399 s | 24.19 cm |
| 1011 | 10449 s | 24.7 cm | 1043 | 10769 s | 24.53 cm | 1075 | 11089 s | 24.36 cm | 1107 | 11409 s | 24.19 cm |
| 1012 | 10459 s | 24.69 cm | 1044 | 10779 s | 24.52 cm | 1076 | 11099 s | 24.35 cm | 1108 | 11419 s | 24.18 cm |
| 1013 | 10469 s | 24.69 cm | 1045 | 10789 s | 24.52 cm | 1077 | 11109 s | 24.35 cm | 1109 | 11429 s | 24.18 cm |
| 1014 | 10479 s | 24.68 cm | 1046 | 10799 s | 24.51 cm | 1078 | 11119 s | 24.34 cm | 1110 | 11439 s | 24.17 cm |
| 1015 | 10489 s | 24.68 cm | 1047 | 10809 s | 24.51 cm | 1079 | 11129 s | 24.34 cm | 1111 | 11449 s | 24.16 cm |
| 1016 | 10499 s | 24.67 cm | 1048 | 10819 s | 24.5 cm | 1080 | 11139 s | 24.33 cm | 1112 | 11459 s | 24.16 cm |
| 1017 | 10509 s | 24.67 cm | 1049 | 10829 s | 24.5 cm | 1081 | 11149 s | 24.33 cm | 1113 | 11469 s | 24.16 cm |
| 1018 | 10519 s | 24.66 cm | 1050 | 10839 s | 24.49 cm | 1082 | 11159 s | 24.32 cm | 1114 | 11479 s | 24.15 cm |
| 1019 | 10529 s | 24.66 cm | 1051 | 10849 s | 24.49 cm | 1083 | 11169 s | 24.32 cm | 1115 | 11489 s | 24.15 cm |
| 1020 | 10539 s | 24.65 cm | 1052 | 10859 s | 24.48 cm | 1084 | 11179 s | 24.31 cm | 1116 | 11499 s | 24.14 cm |
| 1021 | 10549 s | 24.65 cm | 1053 | 10869 s | 24.48 cm | 1085 | 11189 s | 24.31 cm | 1117 | 11509 s | 24.14 cm |
| 1022 | 10559 s | 24.64 cm | 1054 | 10879 s | 24.47 cm | 1086 | 11199 s | 24.3 cm | 1118 | 11519 s | 24.13 cm |
| 1023 | 10569 s | 24.64 cm | 1055 | 10889 s | 24.47 cm | 1087 | 11209 s | 24.3 cm | 1119 | 11529 s | 24.13 cm |
| 1024 | 10579 s | 24.63 cm | 1056 | 10899 s | 24.46 cm | 1088 | 11219 s | 24.29 cm | 1120 | 11539 s | 24.12 cm |
| 1025 | 10589 s | 24.63 cm | 1057 | 10909 s | 24.46 cm | 1089 | 11229 s | 24.29 cm | 1121 | 11549 s | 24.12 cm |
| 1026 | 10599 s | 24.62 cm | 1058 | 10919 s | 24.45 cm | 1090 | 11239 s | 24.28 cm | 1122 | 11559 s | 24.11 cm |
| 1027 | 10609 s | 24.62 cm | 1059 | 10929 s | 24.45 cm | 1091 | 11249 s | 24.28 cm | 1123 | 11569 s | 24.11 cm |
| 1028 | 10619 s | 24.61 cm | 1060 | 10939 s | 24.44 cm | 1092 | 11259 s | 24.27 cm | 1124 | 11579 s | 24.1 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1125 | 11589 s | 24.1 cm | 1157 | 11909 s | 23.92 cm | 1189 | 12229 s | 23.76 cm | 1221 | 12549 s | 23.59 cm |
| 1126 | 11599 s | 24.09 cm | 1158 | 11919 s | 23.92 cm | 1190 | 12239 s | 23.75 cm | 1222 | 12559 s | 23.58 cm |
| 1127 | 11609 s | 24.09 cm | 1159 | 11929 s | 23.91 cm | 1191 | 12249 s | 23.75 cm | 1223 | 12569 s | 23.58 cm |
| 1128 | 11619 s | 24.08 cm | 1160 | 11939 s | 23.91 cm | 1192 | 12259 s | 23.74 cm | 1224 | 12579 s | 23.56 cm |
| 1129 | 11629 s | 24.08 cm | 1161 | 11949 s | 23.89 cm | 1193 | 12269 s | 23.74 cm | 1225 | 12589 s | 23.55 cm |
| 1130 | 11639 s | 24.07 cm | 1162 | 11959 s | 23.89 cm | 1194 | 12279 s | 23.72 cm | 1226 | 12599 s | 23.55 cm |
| 1131 | 11649 s | 24.07 cm | 1163 | 11969 s | 23.88 cm | 1195 | 12289 s | 23.72 cm | 1227 | 12609 s | 23.54 cm |
| 1132 | 11659 s | 24.05 cm | 1164 | 11979 s | 23.88 cm | 1196 | 12299 s | 23.71 cm | 1228 | 12619 s | 23.54 cm |
| 1133 | 11669 s | 24.05 cm | 1165 | 11989 s | 23.87 cm | 1197 | 12309 s | 23.71 cm | 1229 | 12629 s | 23.53 cm |
| 1134 | 11679 s | 24.04 cm | 1166 | 11999 s | 23.87 cm | 1198 | 12319 s | 23.7 cm | 1230 | 12639 s | 23.53 cm |
| 1135 | 11689 s | 24.04 cm | 1167 | 12009 s | 23.86 cm | 1199 | 12329 s | 23.7 cm | 1231 | 12649 s | 23.52 cm |
| 1136 | 11699 s | 24.03 cm | 1168 | 12019 s | 23.86 cm | 1200 | 12339 s | 23.69 cm | 1232 | 12659 s | 23.52 cm |
| 1137 | 11709 s | 24.03 cm | 1169 | 12029 s | 23.85 cm | 1201 | 12349 s | 23.69 cm | 1233 | 12669 s | 23.51 cm |
| 1138 | 11719 s | 24.02 cm | 1170 | 12039 s | 23.85 cm | 1202 | 12359 s | 23.68 cm | 1234 | 12679 s | 23.51 cm |
| 1139 | 11729 s | 24.02 cm | 1171 | 12049 s | 23.85 cm | 1203 | 12369 s | 23.68 cm | 1235 | 12689 s | 23.5 cm |
| 1140 | 11739 s | 24.01 cm | 1172 | 12059 s | 23.84 cm | 1204 | 12379 s | 23.67 cm | 1236 | 12699 s | 23.5 cm |
| 1141 | 11749 s | 24.01 cm | 1173 | 12069 s | 23.84 cm | 1205 | 12389 s | 23.67 cm | 1237 | 12709 s | 23.49 cm |
| 1142 | 11759 s | 24.0 cm | 1174 | 12079 s | 23.83 cm | 1206 | 12399 s | 23.66 cm | 1238 | 12719 s | 23.49 cm |
| 1143 | 11769 s | 23.99 cm | 1175 | 12089 s | 23.83 cm | 1207 | 12409 s | 23.66 cm | 1239 | 12729 s | 23.48 cm |
| 1144 | 11779 s | 23.99 cm | 1176 | 12099 s | 23.82 cm | 1208 | 12419 s | 23.65 cm | 1240 | 12739 s | 23.48 cm |
| 1145 | 11789 s | 23.98 cm | 1177 | 12109 s | 23.82 cm | 1209 | 12429 s | 23.65 cm | 1241 | 12749 s | 23.47 cm |
| 1146 | 11799 s | 23.98 cm | 1178 | 12119 s | 23.81 cm | 1210 | 12439 s | 23.64 cm | 1242 | 12759 s | 23.47 cm |
| 1147 | 11809 s | 23.97 cm | 1179 | 12129 s | 23.8 cm | 1211 | 12449 s | 23.64 cm | 1243 | 12769 s | 23.46 cm |
| 1148 | 11819 s | 23.97 cm | 1180 | 12139 s | 23.8 cm | 1212 | 12459 s | 23.63 cm | 1244 | 12779 s | 23.46 cm |
| 1149 | 11829 s | 23.96 cm | 1181 | 12149 s | 23.8 cm | 1213 | 12469 s | 23.63 cm | 1245 | 12789 s | 23.45 cm |
| 1150 | 11839 s | 23.96 cm | 1182 | 12159 s | 23.79 cm | 1214 | 12479 s | 23.62 cm | 1246 | 12799 s | 23.45 cm |
| 1151 | 11849 s | 23.95 cm | 1183 | 12169 s | 23.78 cm | 1215 | 12489 s | 23.62 cm | 1247 | 12809 s | 23.44 cm |
| 1152 | 11859 s | 23.95 cm | 1184 | 12179 s | 23.78 cm | 1216 | 12499 s | 23.61 cm | 1248 | 12819 s | 23.44 cm |
| 1153 | 11869 s | 23.94 cm | 1185 | 12189 s | 23.78 cm | 1217 | 12509 s | 23.61 cm | 1249 | 12829 s | 23.43 cm |
| 1154 | 11879 s | 23.94 cm | 1186 | 12199 s | 23.77 cm | 1218 | 12519 s | 23.6 cm | 1250 | 12839 s | 23.43 cm |
| 1155 | 11889 s | 23.93 cm | 1187 | 12209 s | 23.77 cm | 1219 | 12529 s | 23.6 cm | 1251 | 12849 s | 23.42 cm |
| 1156 | 11899 s | 23.93 cm | 1188 | 12219 s | 23.76 cm | 1220 | 12539 s | 23.59 cm | 1252 | 12859 s | 23.42 cm |

# Infiltration Report

## RPBCWD

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1253 | 12869 s | 23.4 cm | 1285 | 13189 s | 23.23 cm | 1317 | 13509 s | 23.06 cm | 1349 | 13829 s | 22.89 cm |
| 1254 | 12879 s | 23.4 cm | 1286 | 13199 s | 23.23 cm | 1318 | 13519 s | 23.06 cm | 1350 | 13839 s | 22.89 cm |
| 1255 | 12889 s | 23.39 cm | 1287 | 13209 s | 23.22 cm | 1319 | 13529 s | 23.05 cm | 1351 | 13849 s | 22.88 cm |
| 1256 | 12899 s | 23.39 cm | 1288 | 13219 s | 23.22 cm | 1320 | 13539 s | 23.05 cm | 1352 | 13859 s | 22.88 cm |
| 1257 | 12909 s | 23.38 cm | 1289 | 13229 s | 23.21 cm | 1321 | 13549 s | 23.04 cm | 1353 | 13869 s | 22.87 cm |
| 1258 | 12919 s | 23.38 cm | 1290 | 13239 s | 23.21 cm | 1322 | 13559 s | 23.04 cm | 1354 | 13879 s | 22.87 cm |
| 1259 | 12929 s | 23.37 cm | 1291 | 13249 s | 23.2 cm | 1323 | 13569 s | 23.03 cm | 1355 | 13889 s | 22.86 cm |
| 1260 | 12939 s | 23.37 cm | 1292 | 13259 s | 23.2 cm | 1324 | 13579 s | 23.03 cm | 1356 | 13899 s | 22.86 cm |
| 1261 | 12949 s | 23.36 cm | 1293 | 13269 s | 23.19 cm | 1325 | 13589 s | 23.02 cm | 1357 | 13909 s | 22.85 cm |
| 1262 | 12959 s | 23.36 cm | 1294 | 13279 s | 23.19 cm | 1326 | 13599 s | 23.02 cm | 1358 | 13919 s | 22.85 cm |
| 1263 | 12969 s | 23.35 cm | 1295 | 13289 s | 23.18 cm | 1327 | 13609 s | 23.01 cm | 1359 | 13929 s | 22.84 cm |
| 1264 | 12979 s | 23.35 cm | 1296 | 13299 s | 23.18 cm | 1328 | 13619 s | 23.01 cm | 1360 | 13939 s | 22.84 cm |
| 1265 | 12989 s | 23.34 cm | 1297 | 13309 s | 23.17 cm | 1329 | 13629 s | 23.0 cm | 1361 | 13949 s | 22.84 cm |
| 1266 | 12999 s | 23.34 cm | 1298 | 13319 s | 23.17 cm | 1330 | 13639 s | 23.0 cm | 1362 | 13959 s | 22.83 cm |
| 1267 | 13009 s | 23.33 cm | 1299 | 13329 s | 23.16 cm | 1331 | 13649 s | 22.99 cm | 1363 | 13969 s | 22.82 cm |
| 1268 | 13019 s | 23.33 cm | 1300 | 13339 s | 23.16 cm | 1332 | 13659 s | 22.99 cm | 1364 | 13979 s | 22.82 cm |
| 1269 | 13029 s | 23.32 cm | 1301 | 13349 s | 23.15 cm | 1333 | 13669 s | 22.98 cm | 1365 | 13989 s | 22.81 cm |
| 1270 | 13039 s | 23.32 cm | 1302 | 13359 s | 23.15 cm | 1334 | 13679 s | 22.98 cm | 1366 | 13999 s | 22.81 cm |
| 1271 | 13049 s | 23.31 cm | 1303 | 13369 s | 23.14 cm | 1335 | 13689 s | 22.97 cm | 1367 | 14009 s | 22.8 cm |
| 1272 | 13059 s | 23.31 cm | 1304 | 13379 s | 23.14 cm | 1336 | 13699 s | 22.97 cm | 1368 | 14019 s | 22.8 cm |
| 1273 | 13069 s | 23.3 cm | 1305 | 13389 s | 23.13 cm | 1337 | 13709 s | 22.96 cm | 1369 | 14029 s | 22.8 cm |
| 1274 | 13079 s | 23.3 cm | 1306 | 13399 s | 23.13 cm | 1338 | 13719 s | 22.96 cm | 1370 | 14039 s | 22.79 cm |
| 1275 | 13089 s | 23.29 cm | 1307 | 13409 s | 23.12 cm | 1339 | 13729 s | 22.96 cm | 1371 | 14049 s | 22.79 cm |
| 1276 | 13099 s | 23.29 cm | 1308 | 13419 s | 23.12 cm | 1340 | 13739 s | 22.95 cm | 1372 | 14059 s | 22.78 cm |
| 1277 | 13109 s | 23.28 cm | 1309 | 13429 s | 23.11 cm | 1341 | 13749 s | 22.94 cm | 1373 | 14069 s | 22.78 cm |
| 1278 | 13119 s | 23.28 cm | 1310 | 13439 s | 23.11 cm | 1342 | 13759 s | 22.94 cm | 1374 | 14079 s | 22.77 cm |
| 1279 | 13129 s | 23.27 cm | 1311 | 13449 s | 23.1 cm | 1343 | 13769 s | 22.94 cm | 1375 | 14089 s | 22.76 cm |
| 1280 | 13139 s | 23.27 cm | 1312 | 13459 s | 23.1 cm | 1344 | 13779 s | 22.93 cm | 1376 | 14099 s | 22.76 cm |
| 1281 | 13149 s | 23.26 cm | 1313 | 13469 s | 23.09 cm | 1345 | 13789 s | 22.91 cm | 1377 | 14109 s | 22.74 cm |
| 1282 | 13159 s | 23.26 cm | 1314 | 13479 s | 23.09 cm | 1346 | 13799 s | 22.91 cm | 1378 | 14119 s | 22.74 cm |
| 1283 | 13169 s | 23.25 cm | 1315 | 13489 s | 23.07 cm | 1347 | 13809 s | 22.9 cm | 1379 | 14129 s | 22.73 cm |
| 1284 | 13179 s | 23.25 cm | 1316 | 13499 s | 23.07 cm | 1348 | 13819 s | 22.9 cm | 1380 | 14139 s | 22.73 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1381 | 14149 s | 22.72 cm | 1413 | 14469 s | 22.56 cm | 1445 | 14789 s | 22.39 cm | 1477 | 15109 s | 22.22 cm |
| 1382 | 14159 s | 22.72 cm | 1414 | 14479 s | 22.56 cm | 1446 | 14799 s | 22.38 cm | 1478 | 15119 s | 22.22 cm |
| 1383 | 14169 s | 22.71 cm | 1415 | 14489 s | 22.55 cm | 1447 | 14809 s | 22.38 cm | 1479 | 15129 s | 22.21 cm |
| 1384 | 14179 s | 22.71 cm | 1416 | 14499 s | 22.55 cm | 1448 | 14819 s | 22.37 cm | 1480 | 15139 s | 22.21 cm |
| 1385 | 14189 s | 22.7 cm | 1417 | 14509 s | 22.54 cm | 1449 | 14829 s | 22.37 cm | 1481 | 15149 s | 22.2 cm |
| 1386 | 14199 s | 22.7 cm | 1418 | 14519 s | 22.54 cm | 1450 | 14839 s | 22.37 cm | 1482 | 15159 s | 22.19 cm |
| 1387 | 14209 s | 22.69 cm | 1419 | 14529 s | 22.53 cm | 1451 | 14849 s | 22.36 cm | 1483 | 15169 s | 22.19 cm |
| 1388 | 14219 s | 22.69 cm | 1420 | 14539 s | 22.53 cm | 1452 | 14859 s | 22.36 cm | 1484 | 15179 s | 22.18 cm |
| 1389 | 14229 s | 22.68 cm | 1421 | 14549 s | 22.52 cm | 1453 | 14869 s | 22.35 cm | 1485 | 15189 s | 22.18 cm |
| 1390 | 14239 s | 22.68 cm | 1422 | 14559 s | 22.51 cm | 1454 | 14879 s | 22.35 cm | 1486 | 15199 s | 22.17 cm |
| 1391 | 14249 s | 22.67 cm | 1423 | 14569 s | 22.51 cm | 1455 | 14889 s | 22.34 cm | 1487 | 15209 s | 22.17 cm |
| 1392 | 14259 s | 22.67 cm | 1424 | 14579 s | 22.5 cm | 1456 | 14899 s | 22.34 cm | 1488 | 15219 s | 22.16 cm |
| 1393 | 14269 s | 22.66 cm | 1425 | 14589 s | 22.5 cm | 1457 | 14909 s | 22.33 cm | 1489 | 15229 s | 22.16 cm |
| 1394 | 14279 s | 22.66 cm | 1426 | 14599 s | 22.49 cm | 1458 | 14919 s | 22.33 cm | 1490 | 15239 s | 22.15 cm |
| 1395 | 14289 s | 22.66 cm | 1427 | 14609 s | 22.49 cm | 1459 | 14929 s | 22.32 cm | 1491 | 15249 s | 22.15 cm |
| 1396 | 14299 s | 22.65 cm | 1428 | 14619 s | 22.48 cm | 1460 | 14939 s | 22.31 cm | 1492 | 15259 s | 22.14 cm |
| 1397 | 14309 s | 22.65 cm | 1429 | 14629 s | 22.48 cm | 1461 | 14949 s | 22.31 cm | 1493 | 15269 s | 22.14 cm |
| 1398 | 14319 s | 22.64 cm | 1430 | 14639 s | 22.48 cm | 1462 | 14959 s | 22.31 cm | 1494 | 15279 s | 22.13 cm |
| 1399 | 14329 s | 22.64 cm | 1431 | 14649 s | 22.47 cm | 1463 | 14969 s | 22.3 cm | 1495 | 15289 s | 22.13 cm |
| 1400 | 14339 s | 22.63 cm | 1432 | 14659 s | 22.46 cm | 1464 | 14979 s | 22.3 cm | 1496 | 15299 s | 22.13 cm |
| 1401 | 14349 s | 22.63 cm | 1433 | 14669 s | 22.46 cm | 1465 | 14989 s | 22.29 cm | 1497 | 15309 s | 22.12 cm |
| 1402 | 14359 s | 22.62 cm | 1434 | 14679 s | 22.45 cm | 1466 | 14999 s | 22.29 cm | 1498 | 15319 s | 22.12 cm |
| 1403 | 14369 s | 22.62 cm | 1435 | 14689 s | 22.45 cm | 1467 | 15009 s | 22.28 cm | 1499 | 15329 s | 22.11 cm |
| 1404 | 14379 s | 22.61 cm | 1436 | 14699 s | 22.44 cm | 1468 | 15019 s | 22.28 cm | 1500 | 15339 s | 22.11 cm |
| 1405 | 14389 s | 22.61 cm | 1437 | 14709 s | 22.44 cm | 1469 | 15029 s | 22.27 cm | 1501 | 15349 s | 22.09 cm |
| 1406 | 14399 s | 22.6 cm | 1438 | 14719 s | 22.43 cm | 1470 | 15039 s | 22.27 cm | 1502 | 15359 s | 22.09 cm |
| 1407 | 14409 s | 22.6 cm | 1439 | 14729 s | 22.43 cm | 1471 | 15049 s | 22.25 cm | 1503 | 15369 s | 22.08 cm |
| 1408 | 14419 s | 22.6 cm | 1440 | 14739 s | 22.41 cm | 1472 | 15059 s | 22.25 cm | 1504 | 15379 s | 22.08 cm |
| 1409 | 14429 s | 22.58 cm | 1441 | 14749 s | 22.41 cm | 1473 | 15069 s | 22.24 cm | 1505 | 15389 s | 22.07 cm |
| 1410 | 14439 s | 22.58 cm | 1442 | 14759 s | 22.4 cm | 1474 | 15079 s | 22.24 cm | 1506 | 15399 s | 22.07 cm |
| 1411 | 14449 s | 22.57 cm | 1443 | 14769 s | 22.4 cm | 1475 | 15089 s | 22.23 cm | 1507 | 15409 s | 22.06 cm |
| 1412 | 14459 s | 22.57 cm | 1444 | 14779 s | 22.39 cm | 1476 | 15099 s | 22.23 cm | 1508 | 15419 s | 22.06 cm |

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1509 | 15429 s | 22.05 cm | 1541 | 15749 s | 21.89 cm | 1573 | 16069 s | 21.72 cm | 1605 | 16389 s | 21.56 cm |
| 1510 | 15439 s | 22.05 cm | 1542 | 15759 s | 21.88 cm | 1574 | 16079 s | 21.72 cm | 1606 | 16399 s | 21.55 cm |
| 1511 | 15449 s | 22.04 cm | 1543 | 15769 s | 21.88 cm | 1575 | 16089 s | 21.71 cm | 1607 | 16409 s | 21.55 cm |
| 1512 | 15459 s | 22.04 cm | 1544 | 15779 s | 21.87 cm | 1576 | 16099 s | 21.71 cm | 1608 | 16419 s | 21.54 cm |
| 1513 | 15469 s | 22.03 cm | 1545 | 15789 s | 21.87 cm | 1577 | 16109 s | 21.7 cm | 1609 | 16429 s | 21.54 cm |
| 1514 | 15479 s | 22.03 cm | 1546 | 15799 s | 21.86 cm | 1578 | 16119 s | 21.7 cm | 1610 | 16439 s | 21.53 cm |
| 1515 | 15489 s | 22.02 cm | 1547 | 15809 s | 21.86 cm | 1579 | 16129 s | 21.69 cm | 1611 | 16449 s | 21.53 cm |
| 1516 | 15499 s | 22.02 cm | 1548 | 15819 s | 21.85 cm | 1580 | 16139 s | 21.69 cm | 1612 | 16459 s | 21.52 cm |
| 1517 | 15509 s | 22.01 cm | 1549 | 15829 s | 21.85 cm | 1581 | 16149 s | 21.68 cm | 1613 | 16469 s | 21.52 cm |
| 1518 | 15519 s | 22.01 cm | 1550 | 15839 s | 21.84 cm | 1582 | 16159 s | 21.68 cm | 1614 | 16479 s | 21.51 cm |
| 1519 | 15529 s | 22.0 cm | 1551 | 15849 s | 21.84 cm | 1583 | 16169 s | 21.67 cm | 1615 | 16489 s | 21.51 cm |
| 1520 | 15539 s | 22.0 cm | 1552 | 15859 s | 21.83 cm | 1584 | 16179 s | 21.67 cm | 1616 | 16499 s | 21.5 cm |
| 1521 | 15549 s | 21.99 cm | 1553 | 15869 s | 21.83 cm | 1585 | 16189 s | 21.66 cm | 1617 | 16509 s | 21.5 cm |
| 1522 | 15559 s | 21.99 cm | 1554 | 15879 s | 21.82 cm | 1586 | 16199 s | 21.66 cm | 1618 | 16519 s | 21.49 cm |
| 1523 | 15569 s | 21.98 cm | 1555 | 15889 s | 21.82 cm | 1587 | 16209 s | 21.65 cm | 1619 | 16529 s | 21.49 cm |
| 1524 | 15579 s | 21.98 cm | 1556 | 15899 s | 21.81 cm | 1588 | 16219 s | 21.65 cm | 1620 | 16539 s | 21.48 cm |
| 1525 | 15589 s | 21.97 cm | 1557 | 15909 s | 21.81 cm | 1589 | 16229 s | 21.64 cm | 1621 | 16549 s | 21.48 cm |
| 1526 | 15599 s | 21.97 cm | 1558 | 15919 s | 21.8 cm | 1590 | 16239 s | 21.64 cm | 1622 | 16559 s | 21.47 cm |
| 1527 | 15609 s | 21.97 cm | 1559 | 15929 s | 21.8 cm | 1591 | 16249 s | 21.64 cm | 1623 | 16569 s | 21.47 cm |
| 1528 | 15619 s | 21.96 cm | 1560 | 15939 s | 21.8 cm | 1592 | 16259 s | 21.63 cm | 1624 | 16579 s | 21.46 cm |
| 1529 | 15629 s | 21.96 cm | 1561 | 15949 s | 21.79 cm | 1593 | 16269 s | 21.63 cm | 1625 | 16589 s | 21.46 cm |
| 1530 | 15639 s | 21.95 cm | 1562 | 15959 s | 21.79 cm | 1594 | 16279 s | 21.62 cm | 1626 | 16599 s | 21.46 cm |
| 1531 | 15649 s | 21.95 cm | 1563 | 15969 s | 21.78 cm | 1595 | 16289 s | 21.62 cm | 1627 | 16609 s | 21.45 cm |
| 1532 | 15659 s | 21.94 cm | 1564 | 15979 s | 21.78 cm | 1596 | 16299 s | 21.61 cm | 1628 | 16619 s | 21.45 cm |
| 1533 | 15669 s | 21.94 cm | 1565 | 15989 s | 21.76 cm | 1597 | 16309 s | 21.61 cm | 1629 | 16629 s | 21.43 cm |
| 1534 | 15679 s | 21.92 cm | 1566 | 15999 s | 21.75 cm | 1598 | 16319 s | 21.59 cm | 1630 | 16639 s | 21.43 cm |
| 1535 | 15689 s | 21.92 cm | 1567 | 16009 s | 21.75 cm | 1599 | 16329 s | 21.59 cm | 1631 | 16649 s | 21.42 cm |
| 1536 | 15699 s | 21.91 cm | 1568 | 16019 s | 21.75 cm | 1600 | 16339 s | 21.58 cm | 1632 | 16659 s | 21.42 cm |
| 1537 | 15709 s | 21.91 cm | 1569 | 16029 s | 21.74 cm | 1601 | 16349 s | 21.58 cm | 1633 | 16669 s | 21.41 cm |
| 1538 | 15719 s | 21.9 cm | 1570 | 16039 s | 21.74 cm | 1602 | 16359 s | 21.57 cm | 1634 | 16679 s | 21.41 cm |
| 1539 | 15729 s | 21.9 cm | 1571 | 16049 s | 21.73 cm | 1603 | 16369 s | 21.57 cm | 1635 | 16689 s | 21.4 cm |
| 1540 | 15739 s | 21.89 cm | 1572 | 16059 s | 21.73 cm | 1604 | 16379 s | 21.56 cm | 1636 | 16699 s | 21.4 cm |

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### kerber a Readings continued

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 1637 | 16709 s | 21.39 cm | 1669 | 17029 s | 21.22 cm | 1701 | 17349 s | 21.04 cm | 1733 | 17669 s | 20.86 cm |
| 1638 | 16719 s | 21.39 cm | 1670 | 17039 s | 21.21 cm | 1702 | 17359 s | 21.04 cm | 1734 | 17679 s | 20.85 cm |
| 1639 | 16729 s | 21.38 cm | 1671 | 17049 s | 21.21 cm | 1703 | 17369 s | 21.03 cm | 1735 | 17689 s | 20.85 cm |
| 1640 | 16739 s | 21.38 cm | 1672 | 17059 s | 21.2 cm | 1704 | 17379 s | 21.03 cm | 1736 | 17699 s | 20.84 cm |
| 1641 | 16749 s | 21.37 cm | 1673 | 17069 s | 21.2 cm | 1705 | 17389 s | 21.02 cm | 1737 | 17709 s | 20.84 cm |
| 1642 | 16759 s | 21.37 cm | 1674 | 17079 s | 21.19 cm | 1706 | 17399 s | 21.01 cm | 1738 | 17719 s | 20.83 cm |
| 1643 | 16769 s | 21.36 cm | 1675 | 17089 s | 21.19 cm | 1707 | 17409 s | 21.01 cm | 1739 | 17729 s | 20.83 cm |
| 1644 | 16779 s | 21.36 cm | 1676 | 17099 s | 21.18 cm | 1708 | 17419 s | 21.0 cm | 1740 | 17739 s | 20.82 cm |
| 1645 | 16789 s | 21.35 cm | 1677 | 17109 s | 21.18 cm | 1709 | 17429 s | 21.0 cm | 1741 | 17749 s | 20.82 cm |
| 1646 | 16799 s | 21.35 cm | 1678 | 17119 s | 21.17 cm | 1710 | 17439 s | 20.99 cm | 1742 | 17759 s | 20.81 cm |
| 1647 | 16809 s | 21.34 cm | 1679 | 17129 s | 21.17 cm | 1711 | 17449 s | 20.99 cm | 1743 | 17769 s | 20.81 cm |
| 1648 | 16819 s | 21.34 cm | 1680 | 17139 s | 21.16 cm | 1712 | 17459 s | 20.98 cm | 1744 | 17779 s | 20.8 cm |
| 1649 | 16829 s | 21.33 cm | 1681 | 17149 s | 21.16 cm | 1713 | 17469 s | 20.98 cm | 1745 | 17789 s | 20.78 cm |
| 1650 | 16839 s | 21.33 cm | 1682 | 17159 s | 21.15 cm | 1714 | 17479 s | 20.97 cm | 1746 | 17799 s | 20.78 cm |
| 1651 | 16849 s | 21.32 cm | 1683 | 17169 s | 21.15 cm | 1715 | 17489 s | 20.97 cm | 1747 | 17809 s | 20.77 cm |
| 1652 | 16859 s | 21.32 cm | 1684 | 17179 s | 21.14 cm | 1716 | 17499 s | 20.96 cm | 1748 | 17819 s | 20.77 cm |
| 1653 | 16869 s | 21.31 cm | 1685 | 17189 s | 21.14 cm | 1717 | 17509 s | 20.96 cm | 1749 | 17829 s | 20.76 cm |
| 1654 | 16879 s | 21.31 cm | 1686 | 17199 s | 21.13 cm | 1718 | 17519 s | 20.94 cm | 1750 | 17839 s | 20.76 cm |
| 1655 | 16889 s | 21.3 cm | 1687 | 17209 s | 21.13 cm | 1719 | 17529 s | 20.93 cm | 1751 | 17849 s | 20.75 cm |
| 1656 | 16899 s | 21.3 cm | 1688 | 17219 s | 21.12 cm | 1720 | 17539 s | 20.93 cm | 1752 | 17859 s | 20.75 cm |
| 1657 | 16909 s | 21.29 cm | 1689 | 17229 s | 21.12 cm | 1721 | 17549 s | 20.93 cm | 1753 | 17869 s | 20.74 cm |
| 1658 | 16919 s | 21.29 cm | 1690 | 17239 s | 21.1 cm | 1722 | 17559 s | 20.92 cm | 1754 | 17879 s | 20.74 cm |
| 1659 | 16929 s | 21.27 cm | 1691 | 17249 s | 21.09 cm | 1723 | 17569 s | 20.91 cm | 1755 | 17889 s | 20.73 cm |
| 1660 | 16939 s | 21.27 cm | 1692 | 17259 s | 21.09 cm | 1724 | 17579 s | 20.91 cm | 1756 | 17899 s | 20.73 cm |
| 1661 | 16949 s | 21.26 cm | 1693 | 17269 s | 21.08 cm | 1725 | 17589 s | 20.9 cm | 1757 | 17909 s | 20.72 cm |
| 1662 | 16959 s | 21.26 cm | 1694 | 17279 s | 21.08 cm | 1726 | 17599 s | 20.9 cm | 1758 | 17919 s | 20.72 cm |
| 1663 | 16969 s | 21.25 cm | 1695 | 17289 s | 21.07 cm | 1727 | 17609 s | 20.89 cm | 1759 | 17929 s | 20.71 cm |
| 1664 | 16979 s | 21.25 cm | 1696 | 17299 s | 21.07 cm | 1728 | 17619 s | 20.89 cm | 1760 | 17939 s | 20.7 cm |
| 1665 | 16989 s | 21.24 cm | 1697 | 17309 s | 21.06 cm | 1729 | 17629 s | 20.88 cm | 1761 | 17949 s | 20.7 cm |
| 1666 | 16999 s | 21.24 cm | 1698 | 17319 s | 21.06 cm | 1730 | 17639 s | 20.88 cm | 1762 | 17959 s | 20.69 cm |
| 1667 | 17009 s | 21.23 cm | 1699 | 17329 s | 21.05 cm | 1731 | 17649 s | 20.87 cm | 1763 | 17969 s | 20.69 cm |
| 1668 | 17019 s | 21.22 cm | 1700 | 17339 s | 21.05 cm | 1732 | 17659 s | 20.87 cm | 1764 | 17979 s | 20.68 cm |

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| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1765 | 17989 s | 20.68 cm | 1797 | 18309 s | 20.49 cm | 1829 | 18629 s | 20.31 cm | 1861 | 18949 s | 20.11 cm |
| 1766 | 17999 s | 20.67 cm | 1798 | 18319 s | 20.49 cm | 1830 | 18639 s | 20.3 cm | 1862 | 18959 s | 20.11 cm |
| 1767 | 18009 s | 20.67 cm | 1799 | 18329 s | 20.48 cm | 1831 | 18649 s | 20.3 cm | 1863 | 18969 s | 20.1 cm |
| 1768 | 18019 s | 20.66 cm | 1800 | 18339 s | 20.48 cm | 1832 | 18659 s | 20.28 cm | 1864 | 18979 s | 20.1 cm |
| 1769 | 18029 s | 20.66 cm | 1801 | 18349 s | 20.47 cm | 1833 | 18669 s | 20.28 cm | 1865 | 18989 s | 20.09 cm |
| 1770 | 18039 s | 20.65 cm | 1802 | 18359 s | 20.47 cm | 1834 | 18679 s | 20.27 cm | 1866 | 18999 s | 20.08 cm |
| 1771 | 18049 s | 20.65 cm | 1803 | 18369 s | 20.45 cm | 1835 | 18689 s | 20.27 cm | 1867 | 19009 s | 20.08 cm |
| 1772 | 18059 s | 20.64 cm | 1804 | 18379 s | 20.44 cm | 1836 | 18699 s | 20.26 cm | 1868 | 19019 s | 20.07 cm |
| 1773 | 18069 s | 20.63 cm | 1805 | 18389 s | 20.44 cm | 1837 | 18709 s | 20.25 cm | 1869 | 19029 s | 20.07 cm |
| 1774 | 18079 s | 20.63 cm | 1806 | 18399 s | 20.43 cm | 1838 | 18719 s | 20.25 cm | 1870 | 19039 s | 20.06 cm |
| 1775 | 18089 s | 20.61 cm | 1807 | 18409 s | 20.43 cm | 1839 | 18729 s | 20.24 cm | 1871 | 19049 s | 20.06 cm |
| 1776 | 18099 s | 20.61 cm | 1808 | 18419 s | 20.42 cm | 1840 | 18739 s | 20.24 cm | 1872 | 19059 s | 20.05 cm |
| 1777 | 18109 s | 20.6 cm | 1809 | 18429 s | 20.42 cm | 1841 | 18749 s | 20.23 cm | 1873 | 19069 s | 20.05 cm |
| 1778 | 18119 s | 20.6 cm | 1810 | 18439 s | 20.41 cm | 1842 | 18759 s | 20.23 cm | 1874 | 19079 s | 20.04 cm |
| 1779 | 18129 s | 20.59 cm | 1811 | 18449 s | 20.41 cm | 1843 | 18769 s | 20.22 cm | 1875 | 19089 s | 20.04 cm |
| 1780 | 18139 s | 20.59 cm | 1812 | 18459 s | 20.4 cm | 1844 | 18779 s | 20.22 cm | 1876 | 19099 s | 20.03 cm |
| 1781 | 18149 s | 20.58 cm | 1813 | 18469 s | 20.4 cm | 1845 | 18789 s | 20.21 cm | 1877 | 19109 s | 20.02 cm |
| 1782 | 18159 s | 20.58 cm | 1814 | 18479 s | 20.39 cm | 1846 | 18799 s | 20.21 cm | 1878 | 19119 s | 20.02 cm |
| 1783 | 18169 s | 20.57 cm | 1815 | 18489 s | 20.38 cm | 1847 | 18809 s | 20.2 cm | 1879 | 19129 s | 20.01 cm |
| 1784 | 18179 s | 20.57 cm | 1816 | 18499 s | 20.38 cm | 1848 | 18819 s | 20.19 cm | 1880 | 19139 s | 20.01 cm |
| 1785 | 18189 s | 20.56 cm | 1817 | 18509 s | 20.37 cm | 1849 | 18829 s | 20.19 cm | 1881 | 19149 s | 20.0 cm |
| 1786 | 18199 s | 20.55 cm | 1818 | 18519 s | 20.37 cm | 1850 | 18839 s | 20.18 cm | 1882 | 19159 s | 20.0 cm |
| 1787 | 18209 s | 20.55 cm | 1819 | 18529 s | 20.36 cm | 1851 | 18849 s | 20.18 cm | 1883 | 19169 s | 19.99 cm |
| 1788 | 18219 s | 20.54 cm | 1820 | 18539 s | 20.36 cm | 1852 | 18859 s | 20.17 cm | 1884 | 19179 s | 19.99 cm |
| 1789 | 18229 s | 20.54 cm | 1821 | 18549 s | 20.35 cm | 1853 | 18869 s | 20.17 cm | 1885 | 19189 s | 19.98 cm |
| 1790 | 18239 s | 20.53 cm | 1822 | 18559 s | 20.35 cm | 1854 | 18879 s | 20.16 cm | 1886 | 19199 s | 19.96 cm |
| 1791 | 18249 s | 20.53 cm | 1823 | 18569 s | 20.34 cm | 1855 | 18889 s | 20.16 cm | 1887 | 19209 s | 19.96 cm |
| 1792 | 18259 s | 20.52 cm | 1824 | 18579 s | 20.34 cm | 1856 | 18899 s | 20.15 cm | 1888 | 19219 s | 19.95 cm |
| 1793 | 18269 s | 20.52 cm | 1825 | 18589 s | 20.33 cm | 1857 | 18909 s | 20.15 cm | 1889 | 19229 s | 19.95 cm |
| 1794 | 18279 s | 20.51 cm | 1826 | 18599 s | 20.33 cm | 1858 | 18919 s | 20.14 cm | 1890 | 19239 s | 19.94 cm |
| 1795 | 18289 s | 20.51 cm | 1827 | 18609 s | 20.32 cm | 1859 | 18929 s | 20.12 cm | 1891 | 19249 s | 19.94 cm |
| 1796 | 18299 s | 20.5 cm | 1828 | 18619 s | 20.31 cm | 1860 | 18939 s | 20.12 cm | 1892 | 19259 s | 19.93 cm |

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|---|---|---|---|---|---|---|---|---|---|---|---|
| 1893 | 19269 s | 19.92 cm | 1925 | 19589 s | 19.74 cm | 1957 | 19909 s | 19.55 cm | 1989 | 20229 s | 19.38 cm |
| 1894 | 19279 s | 19.92 cm | 1926 | 19599 s | 19.73 cm | 1958 | 19919 s | 19.55 cm | 1990 | 20239 s | 19.37 cm |
| 1895 | 19289 s | 19.91 cm | 1927 | 19609 s | 19.73 cm | 1959 | 19929 s | 19.54 cm | 1991 | 20249 s | 19.37 cm |
| 1896 | 19299 s | 19.91 cm | 1928 | 19619 s | 19.72 cm | 1960 | 19939 s | 19.54 cm | 1992 | 20259 s | 19.36 cm |
| 1897 | 19309 s | 19.9 cm | 1929 | 19629 s | 19.71 cm | 1961 | 19949 s | 19.53 cm | 1993 | 20269 s | 19.36 cm |
| 1898 | 19319 s | 19.9 cm | 1930 | 19639 s | 19.71 cm | 1962 | 19959 s | 19.53 cm | 1994 | 20279 s | 19.35 cm |
| 1899 | 19329 s | 19.89 cm | 1931 | 19649 s | 19.7 cm | 1963 | 19969 s | 19.52 cm | 1995 | 20289 s | 19.34 cm |
| 1900 | 19339 s | 19.89 cm | 1932 | 19659 s | 19.7 cm | 1964 | 19979 s | 19.52 cm | 1996 | 20299 s | 19.34 cm |
| 1901 | 19349 s | 19.88 cm | 1933 | 19669 s | 19.69 cm | 1965 | 19989 s | 19.51 cm | 1997 | 20309 s | 19.33 cm |
| 1902 | 19359 s | 19.87 cm | 1934 | 19679 s | 19.69 cm | 1966 | 19999 s | 19.51 cm | 1998 | 20319 s | 19.33 cm |
| 1903 | 19369 s | 19.87 cm | 1935 | 19689 s | 19.68 cm | 1967 | 20009 s | 19.5 cm | 1999 | 20329 s | 19.32 cm |
| 1904 | 19379 s | 19.86 cm | 1936 | 19699 s | 19.68 cm | 1968 | 20019 s | 19.5 cm | 2000 | 20339 s | 19.32 cm |
| 1905 | 19389 s | 19.86 cm | 1937 | 19709 s | 19.67 cm | 1969 | 20029 s | 19.49 cm | 2001 | 20349 s | 19.3 cm |
| 1906 | 19399 s | 19.85 cm | 1938 | 19719 s | 19.66 cm | 1970 | 20039 s | 19.48 cm | 2002 | 20359 s | 19.3 cm |
| 1907 | 19409 s | 19.85 cm | 1939 | 19729 s | 19.66 cm | 1971 | 20049 s | 19.48 cm | 2003 | 20369 s | 19.29 cm |
| 1908 | 19419 s | 19.84 cm | 1940 | 19739 s | 19.65 cm | 1972 | 20059 s | 19.46 cm | 2004 | 20379 s | 19.29 cm |
| 1909 | 19429 s | 19.83 cm | 1941 | 19749 s | 19.65 cm | 1973 | 20069 s | 19.46 cm | 2005 | 20389 s | 19.28 cm |
| 1910 | 19439 s | 19.83 cm | 1942 | 19759 s | 19.63 cm | 1974 | 20079 s | 19.45 cm | 2006 | 20399 s | 19.28 cm |
| 1911 | 19449 s | 19.82 cm | 1943 | 19769 s | 19.63 cm | 1975 | 20089 s | 19.45 cm | 2007 | 20409 s | 19.27 cm |
| 1912 | 19459 s | 19.82 cm | 1944 | 19779 s | 19.62 cm | 1976 | 20099 s | 19.44 cm | 2008 | 20419 s | 19.27 cm |
| 1913 | 19469 s | 19.81 cm | 1945 | 19789 s | 19.62 cm | 1977 | 20109 s | 19.44 cm | 2009 | 20429 s | 19.26 cm |
| 1914 | 19479 s | 19.81 cm | 1946 | 19799 s | 19.61 cm | 1978 | 20119 s | 19.43 cm | 2010 | 20439 s | 19.25 cm |
| 1915 | 19489 s | 19.79 cm | 1947 | 19809 s | 19.61 cm | 1979 | 20129 s | 19.43 cm | 2011 | 20449 s | 19.25 cm |
| 1916 | 19499 s | 19.79 cm | 1948 | 19819 s | 19.6 cm | 1980 | 20139 s | 19.42 cm | 2012 | 20459 s | 19.24 cm |
| 1917 | 19509 s | 19.78 cm | 1949 | 19829 s | 19.6 cm | 1981 | 20149 s | 19.42 cm | 2013 | 20469 s | 19.24 cm |
| 1918 | 19519 s | 19.77 cm | 1950 | 19839 s | 19.59 cm | 1982 | 20159 s | 19.41 cm | 2014 | 20479 s | 19.23 cm |
| 1919 | 19529 s | 19.77 cm | 1951 | 19849 s | 19.59 cm | 1983 | 20169 s | 19.41 cm | 2015 | 20489 s | 19.23 cm |
| 1920 | 19539 s | 19.76 cm | 1952 | 19859 s | 19.58 cm | 1984 | 20179 s | 19.4 cm | 2016 | 20499 s | 19.22 cm |
| 1921 | 19549 s | 19.76 cm | 1953 | 19869 s | 19.58 cm | 1985 | 20189 s | 19.4 cm | 2017 | 20509 s | 19.22 cm |
| 1922 | 19559 s | 19.75 cm | 1954 | 19879 s | 19.57 cm | 1986 | 20199 s | 19.39 cm | 2018 | 20519 s | 19.21 cm |
| 1923 | 19569 s | 19.75 cm | 1955 | 19889 s | 19.57 cm | 1987 | 20209 s | 19.39 cm | 2019 | 20529 s | 19.21 cm |
| 1924 | 19579 s | 19.74 cm | 1956 | 19899 s | 19.56 cm | 1988 | 20219 s | 19.38 cm | 2020 | 20539 s | 19.2 cm |

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| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2021 | 20549 s | 19.19 cm | 2053 | 20869 s | 19.01 cm | 2085 | 21189 s | 18.83 cm | 2117 | 21509 s | 18.64 cm |
| 2022 | 20559 s | 19.19 cm | 2054 | 20879 s | 19.01 cm | 2086 | 21199 s | 18.83 cm | 2118 | 21519 s | 18.64 cm |
| 2023 | 20569 s | 19.18 cm | 2055 | 20889 s | 19.0 cm | 2087 | 21209 s | 18.81 cm | 2119 | 21529 s | 18.63 cm |
| 2024 | 20579 s | 19.18 cm | 2056 | 20899 s | 19.0 cm | 2088 | 21219 s | 18.81 cm | 2120 | 21539 s | 18.63 cm |
| 2025 | 20589 s | 19.17 cm | 2057 | 20909 s | 18.99 cm | 2089 | 21229 s | 18.8 cm | 2121 | 21549 s | 18.62 cm |
| 2026 | 20599 s | 19.17 cm | 2058 | 20919 s | 18.99 cm | 2090 | 21239 s | 18.8 cm | 2122 | 21559 s | 18.61 cm |
| 2027 | 20609 s | 19.16 cm | 2059 | 20929 s | 18.97 cm | 2091 | 21249 s | 18.79 cm | 2123 | 21569 s | 18.61 cm |
| 2028 | 20619 s | 19.16 cm | 2060 | 20939 s | 18.97 cm | 2092 | 21259 s | 18.79 cm | 2124 | 21579 s | 18.6 cm |
| 2029 | 20629 s | 19.14 cm | 2061 | 20949 s | 18.96 cm | 2093 | 21269 s | 18.78 cm | 2125 | 21589 s | 18.6 cm |
| 2030 | 20639 s | 19.14 cm | 2062 | 20959 s | 18.96 cm | 2094 | 21279 s | 18.78 cm | 2126 | 21599 s | 18.59 cm |
| 2031 | 20649 s | 19.13 cm | 2063 | 20969 s | 18.95 cm | 2095 | 21289 s | 18.77 cm | 2127 | 21609 s | 18.59 cm |
| 2032 | 20659 s | 19.12 cm | 2064 | 20979 s | 18.95 cm | 2096 | 21299 s | 18.77 cm | 2128 | 21619 s | 18.58 cm |
| 2033 | 20669 s | 19.12 cm | 2065 | 20989 s | 18.94 cm | 2097 | 21309 s | 18.76 cm | 2129 | 21629 s | 18.58 cm |
| 2034 | 20679 s | 19.11 cm | 2066 | 20999 s | 18.93 cm | 2098 | 21319 s | 18.76 cm | 2130 | 21639 s | 18.57 cm |
| 2035 | 20689 s | 19.11 cm | 2067 | 21009 s | 18.93 cm | 2099 | 21329 s | 18.75 cm | 2131 | 21649 s | 18.57 cm |
| 2036 | 20699 s | 19.1 cm | 2068 | 21019 s | 18.92 cm | 2100 | 21339 s | 18.75 cm | 2132 | 21659 s | 18.56 cm |
| 2037 | 20709 s | 19.1 cm | 2069 | 21029 s | 18.92 cm | 2101 | 21349 s | 18.74 cm | 2133 | 21669 s | 18.56 cm |
| 2038 | 20719 s | 19.09 cm | 2070 | 21039 s | 18.91 cm | 2102 | 21359 s | 18.73 cm | 2134 | 21679 s | 18.55 cm |
| 2039 | 20729 s | 19.09 cm | 2071 | 21049 s | 18.91 cm | 2103 | 21369 s | 18.73 cm | 2135 | 21689 s | 18.55 cm |
| 2040 | 20739 s | 19.08 cm | 2072 | 21059 s | 18.9 cm | 2104 | 21379 s | 18.72 cm | 2136 | 21699 s | 18.54 cm |
| 2041 | 20749 s | 19.08 cm | 2073 | 21069 s | 18.9 cm | 2105 | 21389 s | 18.72 cm | 2137 | 21709 s | 18.53 cm |
| 2042 | 20759 s | 19.07 cm | 2074 | 21079 s | 18.89 cm | 2106 | 21399 s | 18.71 cm | 2138 | 21719 s | 18.53 cm |
| 2043 | 20769 s | 19.06 cm | 2075 | 21089 s | 18.89 cm | 2107 | 21409 s | 18.71 cm | 2139 | 21729 s | 18.52 cm |
| 2044 | 20779 s | 19.06 cm | 2076 | 21099 s | 18.88 cm | 2108 | 21419 s | 18.7 cm | 2140 | 21739 s | 18.52 cm |
| 2045 | 20789 s | 19.05 cm | 2077 | 21109 s | 18.88 cm | 2109 | 21429 s | 18.7 cm | 2141 | 21749 s | 18.51 cm |
| 2046 | 20799 s | 19.05 cm | 2078 | 21119 s | 18.87 cm | 2110 | 21439 s | 18.69 cm | 2142 | 21759 s | 18.51 cm |
| 2047 | 20809 s | 19.04 cm | 2079 | 21129 s | 18.87 cm | 2111 | 21449 s | 18.69 cm | 2143 | 21769 s | 18.5 cm |
| 2048 | 20819 s | 19.04 cm | 2080 | 21139 s | 18.86 cm | 2112 | 21459 s | 18.68 cm | 2144 | 21779 s | 18.5 cm |
| 2049 | 20829 s | 19.03 cm | 2081 | 21149 s | 18.86 cm | 2113 | 21469 s | 18.67 cm | 2145 | 21789 s | 18.48 cm |
| 2050 | 20839 s | 19.03 cm | 2082 | 21159 s | 18.85 cm | 2114 | 21479 s | 18.67 cm | 2146 | 21799 s | 18.48 cm |
| 2051 | 20849 s | 19.02 cm | 2083 | 21169 s | 18.85 cm | 2115 | 21489 s | 18.65 cm | 2147 | 21809 s | 18.47 cm |
| 2052 | 20859 s | 19.02 cm | 2084 | 21179 s | 18.84 cm | 2116 | 21499 s | 18.65 cm | 2148 | 21819 s | 18.47 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2149 | 21829 s | 18.46 cm | 2181 | 22149 s | 18.28 cm | 2213 | 22469 s | 18.1 cm | 2245 | 22789 s | 17.92 cm |
| 2150 | 21839 s | 18.46 cm | 2182 | 22159 s | 18.28 cm | 2214 | 22479 s | 18.09 cm | 2246 | 22799 s | 17.91 cm |
| 2151 | 21849 s | 18.45 cm | 2183 | 22169 s | 18.27 cm | 2215 | 22489 s | 18.09 cm | 2247 | 22809 s | 17.91 cm |
| 2152 | 21859 s | 18.45 cm | 2184 | 22179 s | 18.27 cm | 2216 | 22499 s | 18.08 cm | 2248 | 22819 s | 17.9 cm |
| 2153 | 21869 s | 18.44 cm | 2185 | 22189 s | 18.26 cm | 2217 | 22509 s | 18.08 cm | 2249 | 22829 s | 17.89 cm |
| 2154 | 21879 s | 18.43 cm | 2186 | 22199 s | 18.26 cm | 2218 | 22519 s | 18.07 cm | 2250 | 22839 s | 17.89 cm |
| 2155 | 21889 s | 18.43 cm | 2187 | 22209 s | 18.25 cm | 2219 | 22529 s | 18.07 cm | 2251 | 22849 s | 17.88 cm |
| 2156 | 21899 s | 18.42 cm | 2188 | 22219 s | 18.25 cm | 2220 | 22539 s | 18.06 cm | 2252 | 22859 s | 17.88 cm |
| 2157 | 21909 s | 18.42 cm | 2189 | 22229 s | 18.24 cm | 2221 | 22549 s | 18.06 cm | 2253 | 22869 s | 17.87 cm |
| 2158 | 21919 s | 18.41 cm | 2190 | 22239 s | 18.23 cm | 2222 | 22559 s | 18.05 cm | 2254 | 22879 s | 17.87 cm |
| 2159 | 21929 s | 18.41 cm | 2191 | 22249 s | 18.23 cm | 2223 | 22569 s | 18.05 cm | 2255 | 22889 s | 17.86 cm |
| 2160 | 21939 s | 18.4 cm | 2192 | 22259 s | 18.22 cm | 2224 | 22579 s | 18.04 cm | 2256 | 22899 s | 17.86 cm |
| 2161 | 21949 s | 18.4 cm | 2193 | 22269 s | 18.22 cm | 2225 | 22589 s | 18.03 cm | 2257 | 22909 s | 17.85 cm |
| 2162 | 21959 s | 18.39 cm | 2194 | 22279 s | 18.21 cm | 2226 | 22599 s | 18.03 cm | 2258 | 22919 s | 17.85 cm |
| 2163 | 21969 s | 18.39 cm | 2195 | 22289 s | 18.21 cm | 2227 | 22609 s | 18.02 cm | 2259 | 22929 s | 17.83 cm |
| 2164 | 21979 s | 18.38 cm | 2196 | 22299 s | 18.2 cm | 2228 | 22619 s | 18.02 cm | 2260 | 22939 s | 17.83 cm |
| 2165 | 21989 s | 18.38 cm | 2197 | 22309 s | 18.2 cm | 2229 | 22629 s | 18.01 cm | 2261 | 22949 s | 17.82 cm |
| 2166 | 21999 s | 18.37 cm | 2198 | 22319 s | 18.19 cm | 2230 | 22639 s | 18.01 cm | 2262 | 22959 s | 17.82 cm |
| 2167 | 22009 s | 18.37 cm | 2199 | 22329 s | 18.18 cm | 2231 | 22649 s | 17.99 cm | 2263 | 22969 s | 17.81 cm |
| 2168 | 22019 s | 18.36 cm | 2200 | 22339 s | 18.18 cm | 2232 | 22659 s | 17.99 cm | 2264 | 22979 s | 17.81 cm |
| 2169 | 22029 s | 18.36 cm | 2201 | 22349 s | 18.17 cm | 2233 | 22669 s | 17.98 cm | 2265 | 22989 s | 17.8 cm |
| 2170 | 22039 s | 18.35 cm | 2202 | 22359 s | 18.17 cm | 2234 | 22679 s | 17.98 cm | 2266 | 22999 s | 17.8 cm |
| 2171 | 22049 s | 18.35 cm | 2203 | 22369 s | 18.15 cm | 2235 | 22689 s | 17.97 cm | 2267 | 23009 s | 17.79 cm |
| 2172 | 22059 s | 18.34 cm | 2204 | 22379 s | 18.15 cm | 2236 | 22699 s | 17.97 cm | 2268 | 23019 s | 17.78 cm |
| 2173 | 22069 s | 18.32 cm | 2205 | 22389 s | 18.14 cm | 2237 | 22709 s | 17.96 cm | 2269 | 23029 s | 17.78 cm |
| 2174 | 22079 s | 18.32 cm | 2206 | 22399 s | 18.14 cm | 2238 | 22719 s | 17.96 cm | 2270 | 23039 s | 17.77 cm |
| 2175 | 22089 s | 18.31 cm | 2207 | 22409 s | 18.13 cm | 2239 | 22729 s | 17.95 cm | 2271 | 23049 s | 17.77 cm |
| 2176 | 22099 s | 18.31 cm | 2208 | 22419 s | 18.13 cm | 2240 | 22739 s | 17.94 cm | 2272 | 23059 s | 17.76 cm |
| 2177 | 22109 s | 18.3 cm | 2209 | 22429 s | 18.12 cm | 2241 | 22749 s | 17.94 cm | 2273 | 23069 s | 17.76 cm |
| 2178 | 22119 s | 18.3 cm | 2210 | 22439 s | 18.12 cm | 2242 | 22759 s | 17.93 cm | 2274 | 23079 s | 17.75 cm |
| 2179 | 22129 s | 18.29 cm | 2211 | 22449 s | 18.11 cm | 2243 | 22769 s | 17.93 cm | 2275 | 23089 s | 17.75 cm |
| 2180 | 22139 s | 18.29 cm | 2212 | 22459 s | 18.1 cm | 2244 | 22779 s | 17.92 cm | 2276 | 23099 s | 17.74 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2277 | 23109 s | 17.74 cm | 2309 | 23429 s | 17.56 cm | 2341 | 23749 s | 17.37 cm | 2373 | 24069 s | 17.19 cm |
| 2278 | 23119 s | 17.73 cm | 2310 | 23439 s | 17.55 cm | 2342 | 23759 s | 17.37 cm | 2374 | 24079 s | 17.17 cm |
| 2279 | 23129 s | 17.73 cm | 2311 | 23449 s | 17.55 cm | 2343 | 23769 s | 17.36 cm | 2375 | 24089 s | 17.17 cm |
| 2280 | 23139 s | 17.72 cm | 2312 | 23459 s | 17.54 cm | 2344 | 23779 s | 17.36 cm | 2376 | 24099 s | 17.16 cm |
| 2281 | 23149 s | 17.71 cm | 2313 | 23469 s | 17.54 cm | 2345 | 23789 s | 17.35 cm | 2377 | 24109 s | 17.16 cm |
| 2282 | 23159 s | 17.71 cm | 2314 | 23479 s | 17.53 cm | 2346 | 23799 s | 17.35 cm | 2378 | 24119 s | 17.15 cm |
| 2283 | 23169 s | 17.7 cm | 2315 | 23489 s | 17.52 cm | 2347 | 23809 s | 17.33 cm | 2379 | 24129 s | 17.15 cm |
| 2284 | 23179 s | 17.7 cm | 2316 | 23499 s | 17.52 cm | 2348 | 23819 s | 17.33 cm | 2380 | 24139 s | 17.14 cm |
| 2285 | 23189 s | 17.69 cm | 2317 | 23509 s | 17.5 cm | 2349 | 23829 s | 17.32 cm | 2381 | 24149 s | 17.13 cm |
| 2286 | 23199 s | 17.69 cm | 2318 | 23519 s | 17.5 cm | 2350 | 23839 s | 17.31 cm | 2382 | 24159 s | 17.13 cm |
| 2287 | 23209 s | 17.68 cm | 2319 | 23529 s | 17.49 cm | 2351 | 23849 s | 17.31 cm | 2383 | 24169 s | 17.12 cm |
| 2288 | 23219 s | 17.68 cm | 2320 | 23539 s | 17.49 cm | 2352 | 23859 s | 17.3 cm | 2384 | 24179 s | 17.12 cm |
| 2289 | 23229 s | 17.66 cm | 2321 | 23549 s | 17.48 cm | 2353 | 23869 s | 17.3 cm | 2385 | 24189 s | 17.11 cm |
| 2290 | 23239 s | 17.66 cm | 2322 | 23559 s | 17.48 cm | 2354 | 23879 s | 17.29 cm | 2386 | 24199 s | 17.11 cm |
| 2291 | 23249 s | 17.65 cm | 2323 | 23569 s | 17.47 cm | 2355 | 23889 s | 17.29 cm | 2387 | 24209 s | 17.1 cm |
| 2292 | 23259 s | 17.65 cm | 2324 | 23579 s | 17.47 cm | 2356 | 23899 s | 17.28 cm | 2388 | 24219 s | 17.1 cm |
| 2293 | 23269 s | 17.64 cm | 2325 | 23589 s | 17.46 cm | 2357 | 23909 s | 17.28 cm | 2389 | 24229 s | 17.09 cm |
| 2294 | 23279 s | 17.64 cm | 2326 | 23599 s | 17.46 cm | 2358 | 23919 s | 17.27 cm | 2390 | 24239 s | 17.09 cm |
| 2295 | 23289 s | 17.63 cm | 2327 | 23609 s | 17.45 cm | 2359 | 23929 s | 17.27 cm | 2391 | 24249 s | 17.08 cm |
| 2296 | 23299 s | 17.63 cm | 2328 | 23619 s | 17.44 cm | 2360 | 23939 s | 17.26 cm | 2392 | 24259 s | 17.08 cm |
| 2297 | 23309 s | 17.62 cm | 2329 | 23629 s | 17.44 cm | 2361 | 23949 s | 17.25 cm | 2393 | 24269 s | 17.07 cm |
| 2298 | 23319 s | 17.61 cm | 2330 | 23639 s | 17.43 cm | 2362 | 23959 s | 17.25 cm | 2394 | 24279 s | 17.06 cm |
| 2299 | 23329 s | 17.61 cm | 2331 | 23649 s | 17.43 cm | 2363 | 23969 s | 17.24 cm | 2395 | 24289 s | 17.06 cm |
| 2300 | 23339 s | 17.6 cm | 2332 | 23659 s | 17.42 cm | 2364 | 23979 s | 17.24 cm | 2396 | 24299 s | 17.05 cm |
| 2301 | 23349 s | 17.6 cm | 2333 | 23669 s | 17.42 cm | 2365 | 23989 s | 17.23 cm | 2397 | 24309 s | 17.05 cm |
| 2302 | 23359 s | 17.59 cm | 2334 | 23679 s | 17.41 cm | 2366 | 23999 s | 17.23 cm | 2398 | 24319 s | 17.04 cm |
| 2303 | 23369 s | 17.59 cm | 2335 | 23689 s | 17.41 cm | 2367 | 24009 s | 17.22 cm | 2399 | 24329 s | 17.04 cm |
| 2304 | 23379 s | 17.58 cm | 2336 | 23699 s | 17.4 cm | 2368 | 24019 s | 17.21 cm | 2400 | 24339 s | 17.03 cm |
| 2305 | 23389 s | 17.58 cm | 2337 | 23709 s | 17.4 cm | 2369 | 24029 s | 17.21 cm | 2401 | 24349 s | 17.03 cm |
| 2306 | 23399 s | 17.57 cm | 2338 | 23719 s | 17.39 cm | 2370 | 24039 s | 17.2 cm | 2402 | 24359 s | 17.01 cm |
| 2307 | 23409 s | 17.57 cm | 2339 | 23729 s | 17.38 cm | 2371 | 24049 s | 17.2 cm | 2403 | 24369 s | 17.01 cm |
| 2308 | 23419 s | 17.56 cm | 2340 | 23739 s | 17.38 cm | 2372 | 24059 s | 17.19 cm | 2404 | 24379 s | 17.0 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2405 | 24389 s | 17.0 cm | 2437 | 24709 s | 16.82 cm | 2469 | 25029 s | 16.63 cm | 2501 | 25349 s | 16.45 cm |
| 2406 | 24399 s | 16.99 cm | 2438 | 24719 s | 16.81 cm | 2470 | 25039 s | 16.63 cm | 2502 | 25359 s | 16.45 cm |
| 2407 | 24409 s | 16.98 cm | 2439 | 24729 s | 16.81 cm | 2471 | 25049 s | 16.62 cm | 2503 | 25369 s | 16.44 cm |
| 2408 | 24419 s | 16.98 cm | 2440 | 24739 s | 16.8 cm | 2472 | 25059 s | 16.62 cm | 2504 | 25379 s | 16.44 cm |
| 2409 | 24429 s | 16.97 cm | 2441 | 24749 s | 16.8 cm | 2473 | 25069 s | 16.61 cm | 2505 | 25389 s | 16.43 cm |
| 2410 | 24439 s | 16.97 cm | 2442 | 24759 s | 16.79 cm | 2474 | 25079 s | 16.6 cm | 2506 | 25399 s | 16.43 cm |
| 2411 | 24449 s | 16.96 cm | 2443 | 24769 s | 16.78 cm | 2475 | 25089 s | 16.6 cm | 2507 | 25409 s | 16.42 cm |
| 2412 | 24459 s | 16.96 cm | 2444 | 24779 s | 16.78 cm | 2476 | 25099 s | 16.59 cm | 2508 | 25419 s | 16.41 cm |
| 2413 | 24469 s | 16.95 cm | 2445 | 24789 s | 16.77 cm | 2477 | 25109 s | 16.59 cm | 2509 | 25429 s | 16.41 cm |
| 2414 | 24479 s | 16.95 cm | 2446 | 24799 s | 16.77 cm | 2478 | 25119 s | 16.58 cm | 2510 | 25439 s | 16.4 cm |
| 2415 | 24489 s | 16.94 cm | 2447 | 24809 s | 16.76 cm | 2479 | 25129 s | 16.58 cm | 2511 | 25449 s | 16.4 cm |
| 2416 | 24499 s | 16.94 cm | 2448 | 24819 s | 16.76 cm | 2480 | 25139 s | 16.57 cm | 2512 | 25459 s | 16.39 cm |
| 2417 | 24509 s | 16.93 cm | 2449 | 24829 s | 16.75 cm | 2481 | 25149 s | 16.57 cm | 2513 | 25469 s | 16.39 cm |
| 2418 | 24519 s | 16.93 cm | 2450 | 24839 s | 16.75 cm | 2482 | 25159 s | 16.56 cm | 2514 | 25479 s | 16.38 cm |
| 2419 | 24529 s | 16.92 cm | 2451 | 24849 s | 16.74 cm | 2483 | 25169 s | 16.56 cm | 2515 | 25489 s | 16.38 cm |
| 2420 | 24539 s | 16.92 cm | 2452 | 24859 s | 16.73 cm | 2484 | 25179 s | 16.55 cm | 2516 | 25499 s | 16.37 cm |
| 2421 | 24549 s | 16.91 cm | 2453 | 24869 s | 16.73 cm | 2485 | 25189 s | 16.55 cm | 2517 | 25509 s | 16.37 cm |
| 2422 | 24559 s | 16.91 cm | 2454 | 24879 s | 16.72 cm | 2486 | 25199 s | 16.54 cm | 2518 | 25519 s | 16.35 cm |
| 2423 | 24569 s | 16.9 cm | 2455 | 24889 s | 16.72 cm | 2487 | 25209 s | 16.54 cm | 2519 | 25529 s | 16.35 cm |
| 2424 | 24579 s | 16.9 cm | 2456 | 24899 s | 16.71 cm | 2488 | 25219 s | 16.52 cm | 2520 | 25539 s | 16.34 cm |
| 2425 | 24589 s | 16.89 cm | 2457 | 24909 s | 16.71 cm | 2489 | 25229 s | 16.51 cm | 2521 | 25549 s | 16.34 cm |
| 2426 | 24599 s | 16.89 cm | 2458 | 24919 s | 16.7 cm | 2490 | 25239 s | 16.51 cm | 2522 | 25559 s | 16.33 cm |
| 2427 | 24609 s | 16.88 cm | 2459 | 24929 s | 16.7 cm | 2491 | 25249 s | 16.5 cm | 2523 | 25569 s | 16.33 cm |
| 2428 | 24619 s | 16.87 cm | 2460 | 24939 s | 16.68 cm | 2492 | 25259 s | 16.5 cm | 2524 | 25579 s | 16.32 cm |
| 2429 | 24629 s | 16.87 cm | 2461 | 24949 s | 16.68 cm | 2493 | 25269 s | 16.49 cm | 2525 | 25589 s | 16.31 cm |
| 2430 | 24639 s | 16.86 cm | 2462 | 24959 s | 16.67 cm | 2494 | 25279 s | 16.49 cm | 2526 | 25599 s | 16.31 cm |
| 2431 | 24649 s | 16.86 cm | 2463 | 24969 s | 16.66 cm | 2495 | 25289 s | 16.48 cm | 2527 | 25609 s | 16.3 cm |
| 2432 | 24659 s | 16.84 cm | 2464 | 24979 s | 16.66 cm | 2496 | 25299 s | 16.48 cm | 2528 | 25619 s | 16.3 cm |
| 2433 | 24669 s | 16.84 cm | 2465 | 24989 s | 16.65 cm | 2497 | 25309 s | 16.47 cm | 2529 | 25629 s | 16.29 cm |
| 2434 | 24679 s | 16.83 cm | 2466 | 24999 s | 16.65 cm | 2498 | 25319 s | 16.47 cm | 2530 | 25639 s | 16.29 cm |
| 2435 | 24689 s | 16.83 cm | 2467 | 25009 s | 16.64 cm | 2499 | 25329 s | 16.46 cm | 2531 | 25649 s | 16.28 cm |
| 2436 | 24699 s | 16.82 cm | 2468 | 25019 s | 16.64 cm | 2500 | 25339 s | 16.46 cm | 2532 | 25659 s | 16.28 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -



### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2533 | 25669 s | 16.27 cm | 2565 | 25989 s | 16.09 cm | 2597 | 26309 s | 15.91 cm | 2629 | 26629 s | 15.73 cm |
| 2534 | 25679 s | 16.27 cm | 2566 | 25999 s | 16.09 cm | 2598 | 26319 s | 15.91 cm | 2630 | 26639 s | 15.73 cm |
| 2535 | 25689 s | 16.26 cm | 2567 | 26009 s | 16.08 cm | 2599 | 26329 s | 15.9 cm | 2631 | 26649 s | 15.72 cm |
| 2536 | 25699 s | 16.26 cm | 2568 | 26019 s | 16.08 cm | 2600 | 26339 s | 15.9 cm | 2632 | 26659 s | 15.72 cm |
| 2537 | 25709 s | 16.25 cm | 2569 | 26029 s | 16.07 cm | 2601 | 26349 s | 15.89 cm | 2633 | 26669 s | 15.7 cm |
| 2538 | 25719 s | 16.25 cm | 2570 | 26039 s | 16.07 cm | 2602 | 26359 s | 15.89 cm | 2634 | 26679 s | 15.7 cm |
| 2539 | 25729 s | 16.24 cm | 2571 | 26049 s | 16.06 cm | 2603 | 26369 s | 15.88 cm | 2635 | 26689 s | 15.69 cm |
| 2540 | 25739 s | 16.24 cm | 2572 | 26059 s | 16.05 cm | 2604 | 26379 s | 15.88 cm | 2636 | 26699 s | 15.69 cm |
| 2541 | 25749 s | 16.23 cm | 2573 | 26069 s | 16.05 cm | 2605 | 26389 s | 15.86 cm | 2637 | 26709 s | 15.68 cm |
| 2542 | 25759 s | 16.23 cm | 2574 | 26079 s | 16.04 cm | 2606 | 26399 s | 15.86 cm | 2638 | 26719 s | 15.67 cm |
| 2543 | 25769 s | 16.22 cm | 2575 | 26089 s | 16.04 cm | 2607 | 26409 s | 15.85 cm | 2639 | 26729 s | 15.67 cm |
| 2544 | 25779 s | 16.21 cm | 2576 | 26099 s | 16.02 cm | 2608 | 26419 s | 15.84 cm | 2640 | 26739 s | 15.66 cm |
| 2545 | 25789 s | 16.21 cm | 2577 | 26109 s | 16.02 cm | 2609 | 26429 s | 15.84 cm | 2641 | 26749 s | 15.66 cm |
| 2546 | 25799 s | 16.19 cm | 2578 | 26119 s | 16.01 cm | 2610 | 26439 s | 15.83 cm | 2642 | 26759 s | 15.65 cm |
| 2547 | 25809 s | 16.19 cm | 2579 | 26129 s | 16.01 cm | 2611 | 26449 s | 15.83 cm | 2643 | 26769 s | 15.65 cm |
| 2548 | 25819 s | 16.18 cm | 2580 | 26139 s | 16.0 cm | 2612 | 26459 s | 15.82 cm | 2644 | 26779 s | 15.64 cm |
| 2549 | 25829 s | 16.18 cm | 2581 | 26149 s | 16.0 cm | 2613 | 26469 s | 15.82 cm | 2645 | 26789 s | 15.64 cm |
| 2550 | 25839 s | 16.17 cm | 2582 | 26159 s | 15.99 cm | 2614 | 26479 s | 15.81 cm | 2646 | 26799 s | 15.63 cm |
| 2551 | 25849 s | 16.17 cm | 2583 | 26169 s | 15.99 cm | 2615 | 26489 s | 15.81 cm | 2647 | 26809 s | 15.63 cm |
| 2552 | 25859 s | 16.16 cm | 2584 | 26179 s | 15.98 cm | 2616 | 26499 s | 15.8 cm | 2648 | 26819 s | 15.62 cm |
| 2553 | 25869 s | 16.16 cm | 2585 | 26189 s | 15.98 cm | 2617 | 26509 s | 15.8 cm | 2649 | 26829 s | 15.62 cm |
| 2554 | 25879 s | 16.15 cm | 2586 | 26199 s | 15.97 cm | 2618 | 26519 s | 15.79 cm | 2650 | 26839 s | 15.61 cm |
| 2555 | 25889 s | 16.15 cm | 2587 | 26209 s | 15.96 cm | 2619 | 26529 s | 15.78 cm | 2651 | 26849 s | 15.61 cm |
| 2556 | 25899 s | 16.14 cm | 2588 | 26219 s | 15.96 cm | 2620 | 26539 s | 15.78 cm | 2652 | 26859 s | 15.6 cm |
| 2557 | 25909 s | 16.13 cm | 2589 | 26229 s | 15.95 cm | 2621 | 26549 s | 15.77 cm | 2653 | 26869 s | 15.6 cm |
| 2558 | 25919 s | 16.13 cm | 2590 | 26239 s | 15.95 cm | 2622 | 26559 s | 15.77 cm | 2654 | 26879 s | 15.59 cm |
| 2559 | 25929 s | 16.12 cm | 2591 | 26249 s | 15.94 cm | 2623 | 26569 s | 15.76 cm | 2655 | 26889 s | 15.59 cm |
| 2560 | 25939 s | 16.12 cm | 2592 | 26259 s | 15.94 cm | 2624 | 26579 s | 15.76 cm | 2656 | 26899 s | 15.58 cm |
| 2561 | 25949 s | 16.11 cm | 2593 | 26269 s | 15.93 cm | 2625 | 26589 s | 15.75 cm | 2657 | 26909 s | 15.58 cm |
| 2562 | 25959 s | 16.11 cm | 2594 | 26279 s | 15.93 cm | 2626 | 26599 s | 15.75 cm | 2658 | 26919 s | 15.57 cm |
| 2563 | 25969 s | 16.1 cm | 2595 | 26289 s | 15.92 cm | 2627 | 26609 s | 15.74 cm | 2659 | 26929 s | 15.57 cm |
| 2564 | 25979 s | 16.1 cm | 2596 | 26299 s | 15.92 cm | 2628 | 26619 s | 15.74 cm | 2660 | 26939 s | 15.56 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2661 | 26949 s | 15.56 cm | 2693 | 27269 s | 15.37 cm | 2725 | 27589 s | 15.19 cm | 2757 | 27909 s | 15.01 cm |
| 2662 | 26959 s | 15.55 cm | 2694 | 27279 s | 15.37 cm | 2726 | 27599 s | 15.19 cm | 2758 | 27919 s | 15.01 cm |
| 2663 | 26969 s | 15.55 cm | 2695 | 27289 s | 15.36 cm | 2727 | 27609 s | 15.18 cm | 2759 | 27929 s | 15.0 cm |
| 2664 | 26979 s | 15.53 cm | 2696 | 27299 s | 15.36 cm | 2728 | 27619 s | 15.18 cm | 2760 | 27939 s | 15.0 cm |
| 2665 | 26989 s | 15.53 cm | 2697 | 27309 s | 15.35 cm | 2729 | 27629 s | 15.17 cm | 2761 | 27949 s | 14.99 cm |
| 2666 | 26999 s | 15.52 cm | 2698 | 27319 s | 15.35 cm | 2730 | 27639 s | 15.17 cm | 2762 | 27959 s | 14.99 cm |
| 2667 | 27009 s | 15.52 cm | 2699 | 27329 s | 15.34 cm | 2731 | 27649 s | 15.16 cm | 2763 | 27969 s | 14.98 cm |
| 2668 | 27019 s | 15.51 cm | 2700 | 27339 s | 15.34 cm | 2732 | 27659 s | 15.15 cm | 2764 | 27979 s | 14.98 cm |
| 2669 | 27029 s | 15.51 cm | 2701 | 27349 s | 15.33 cm | 2733 | 27669 s | 15.15 cm | 2765 | 27989 s | 14.97 cm |
| 2670 | 27039 s | 15.5 cm | 2702 | 27359 s | 15.33 cm | 2734 | 27679 s | 15.14 cm | 2766 | 27999 s | 14.97 cm |
| 2671 | 27049 s | 15.5 cm | 2703 | 27369 s | 15.32 cm | 2735 | 27689 s | 15.14 cm | 2767 | 28009 s | 14.96 cm |
| 2672 | 27059 s | 15.49 cm | 2704 | 27379 s | 15.32 cm | 2736 | 27699 s | 15.13 cm | 2768 | 28019 s | 14.96 cm |
| 2673 | 27069 s | 15.49 cm | 2705 | 27389 s | 15.31 cm | 2737 | 27709 s | 15.13 cm | 2769 | 28029 s | 14.95 cm |
| 2674 | 27079 s | 15.48 cm | 2706 | 27399 s | 15.3 cm | 2738 | 27719 s | 15.12 cm | 2770 | 28039 s | 14.95 cm |
| 2675 | 27089 s | 15.48 cm | 2707 | 27409 s | 15.3 cm | 2739 | 27729 s | 15.12 cm | 2771 | 28049 s | 14.94 cm |
| 2676 | 27099 s | 15.47 cm | 2708 | 27419 s | 15.29 cm | 2740 | 27739 s | 15.11 cm | 2772 | 28059 s | 14.93 cm |
| 2677 | 27109 s | 15.47 cm | 2709 | 27429 s | 15.29 cm | 2741 | 27749 s | 15.11 cm | 2773 | 28069 s | 14.93 cm |
| 2678 | 27119 s | 15.46 cm | 2710 | 27439 s | 15.28 cm | 2742 | 27759 s | 15.1 cm | 2774 | 28079 s | 14.92 cm |
| 2679 | 27129 s | 15.46 cm | 2711 | 27449 s | 15.28 cm | 2743 | 27769 s | 15.1 cm | 2775 | 28089 s | 14.92 cm |
| 2680 | 27139 s | 15.45 cm | 2712 | 27459 s | 15.27 cm | 2744 | 27779 s | 15.09 cm | 2776 | 28099 s | 14.91 cm |
| 2681 | 27149 s | 15.45 cm | 2713 | 27469 s | 15.27 cm | 2745 | 27789 s | 15.09 cm | 2777 | 28109 s | 14.91 cm |
| 2682 | 27159 s | 15.44 cm | 2714 | 27479 s | 15.26 cm | 2746 | 27799 s | 15.08 cm | 2778 | 28119 s | 14.9 cm |
| 2683 | 27169 s | 15.44 cm | 2715 | 27489 s | 15.26 cm | 2747 | 27809 s | 15.08 cm | 2779 | 28129 s | 14.9 cm |
| 2684 | 27179 s | 15.43 cm | 2716 | 27499 s | 15.25 cm | 2748 | 27819 s | 15.07 cm | 2780 | 28139 s | 14.88 cm |
| 2685 | 27189 s | 15.43 cm | 2717 | 27509 s | 15.25 cm | 2749 | 27829 s | 15.07 cm | 2781 | 28149 s | 14.88 cm |
| 2686 | 27199 s | 15.42 cm | 2718 | 27519 s | 15.24 cm | 2750 | 27839 s | 15.06 cm | 2782 | 28159 s | 14.87 cm |
| 2687 | 27209 s | 15.42 cm | 2719 | 27529 s | 15.23 cm | 2751 | 27849 s | 15.06 cm | 2783 | 28169 s | 14.87 cm |
| 2688 | 27219 s | 15.41 cm | 2720 | 27539 s | 15.23 cm | 2752 | 27859 s | 15.04 cm | 2784 | 28179 s | 14.86 cm |
| 2689 | 27229 s | 15.41 cm | 2721 | 27549 s | 15.22 cm | 2753 | 27869 s | 15.03 cm | 2785 | 28189 s | 14.86 cm |
| 2690 | 27239 s | 15.4 cm | 2722 | 27559 s | 15.22 cm | 2754 | 27879 s | 15.03 cm | 2786 | 28199 s | 14.85 cm |
| 2691 | 27249 s | 15.4 cm | 2723 | 27569 s | 15.2 cm | 2755 | 27889 s | 15.02 cm | 2787 | 28209 s | 14.84 cm |
| 2692 | 27259 s | 15.39 cm | 2724 | 27579 s | 15.2 cm | 2756 | 27899 s | 15.02 cm | 2788 | 28219 s | 14.84 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2789 | 28229 s | 14.84 cm | 2821 | 28549 s | 14.66 cm | 2853 | 28869 s | 14.49 cm | 2885 | 29189 s | 14.31 cm |
| 2790 | 28239 s | 14.83 cm | 2822 | 28559 s | 14.65 cm | 2854 | 28879 s | 14.48 cm | 2886 | 29199 s | 14.31 cm |
| 2791 | 28249 s | 14.82 cm | 2823 | 28569 s | 14.65 cm | 2855 | 28889 s | 14.48 cm | 2887 | 29209 s | 14.3 cm |
| 2792 | 28259 s | 14.82 cm | 2824 | 28579 s | 14.64 cm | 2856 | 28899 s | 14.47 cm | 2888 | 29219 s | 14.29 cm |
| 2793 | 28269 s | 14.81 cm | 2825 | 28589 s | 14.64 cm | 2857 | 28909 s | 14.47 cm | 2889 | 29229 s | 14.29 cm |
| 2794 | 28279 s | 14.81 cm | 2826 | 28599 s | 14.63 cm | 2858 | 28919 s | 14.46 cm | 2890 | 29239 s | 14.28 cm |
| 2795 | 28289 s | 14.8 cm | 2827 | 28609 s | 14.63 cm | 2859 | 28929 s | 14.46 cm | 2891 | 29249 s | 14.28 cm |
| 2796 | 28299 s | 14.8 cm | 2828 | 28619 s | 14.62 cm | 2860 | 28939 s | 14.45 cm | 2892 | 29259 s | 14.27 cm |
| 2797 | 28309 s | 14.79 cm | 2829 | 28629 s | 14.62 cm | 2861 | 28949 s | 14.44 cm | 2893 | 29269 s | 14.27 cm |
| 2798 | 28319 s | 14.79 cm | 2830 | 28639 s | 14.61 cm | 2862 | 28959 s | 14.44 cm | 2894 | 29279 s | 14.26 cm |
| 2799 | 28329 s | 14.78 cm | 2831 | 28649 s | 14.61 cm | 2863 | 28969 s | 14.43 cm | 2895 | 29289 s | 14.26 cm |
| 2800 | 28339 s | 14.78 cm | 2832 | 28659 s | 14.6 cm | 2864 | 28979 s | 14.43 cm | 2896 | 29299 s | 14.25 cm |
| 2801 | 28349 s | 14.77 cm | 2833 | 28669 s | 14.6 cm | 2865 | 28989 s | 14.42 cm | 2897 | 29309 s | 14.25 cm |
| 2802 | 28359 s | 14.77 cm | 2834 | 28679 s | 14.59 cm | 2866 | 28999 s | 14.42 cm | 2898 | 29319 s | 14.24 cm |
| 2803 | 28369 s | 14.76 cm | 2835 | 28689 s | 14.59 cm | 2867 | 29009 s | 14.41 cm | 2899 | 29329 s | 14.24 cm |
| 2804 | 28379 s | 14.76 cm | 2836 | 28699 s | 14.58 cm | 2868 | 29019 s | 14.41 cm | 2900 | 29339 s | 14.22 cm |
| 2805 | 28389 s | 14.75 cm | 2837 | 28709 s | 14.58 cm | 2869 | 29029 s | 14.39 cm | 2901 | 29349 s | 14.22 cm |
| 2806 | 28399 s | 14.75 cm | 2838 | 28719 s | 14.57 cm | 2870 | 29039 s | 14.39 cm | 2902 | 29359 s | 14.21 cm |
| 2807 | 28409 s | 14.74 cm | 2839 | 28729 s | 14.57 cm | 2871 | 29049 s | 14.38 cm | 2903 | 29369 s | 14.21 cm |
| 2808 | 28419 s | 14.74 cm | 2840 | 28739 s | 14.55 cm | 2872 | 29059 s | 14.38 cm | 2904 | 29379 s | 14.2 cm |
| 2809 | 28429 s | 14.73 cm | 2841 | 28749 s | 14.55 cm | 2873 | 29069 s | 14.37 cm | 2905 | 29389 s | 14.2 cm |
| 2810 | 28439 s | 14.73 cm | 2842 | 28759 s | 14.54 cm | 2874 | 29079 s | 14.37 cm | 2906 | 29399 s | 14.19 cm |
| 2811 | 28449 s | 14.71 cm | 2843 | 28769 s | 14.54 cm | 2875 | 29089 s | 14.36 cm | 2907 | 29409 s | 14.19 cm |
| 2812 | 28459 s | 14.71 cm | 2844 | 28779 s | 14.53 cm | 2876 | 29099 s | 14.36 cm | 2908 | 29419 s | 14.18 cm |
| 2813 | 28469 s | 14.7 cm | 2845 | 28789 s | 14.53 cm | 2877 | 29109 s | 14.35 cm | 2909 | 29429 s | 14.18 cm |
| 2814 | 28479 s | 14.7 cm | 2846 | 28799 s | 14.52 cm | 2878 | 29119 s | 14.35 cm | 2910 | 29439 s | 14.17 cm |
| 2815 | 28489 s | 14.69 cm | 2847 | 28809 s | 14.52 cm | 2879 | 29129 s | 14.34 cm | 2911 | 29449 s | 14.17 cm |
| 2816 | 28499 s | 14.69 cm | 2848 | 28819 s | 14.51 cm | 2880 | 29139 s | 14.34 cm | 2912 | 29459 s | 14.16 cm |
| 2817 | 28509 s | 14.68 cm | 2849 | 28829 s | 14.51 cm | 2881 | 29149 s | 14.33 cm | 2913 | 29469 s | 14.16 cm |
| 2818 | 28519 s | 14.67 cm | 2850 | 28839 s | 14.5 cm | 2882 | 29159 s | 14.33 cm | 2914 | 29479 s | 14.15 cm |
| 2819 | 28529 s | 14.67 cm | 2851 | 28849 s | 14.5 cm | 2883 | 29169 s | 14.32 cm | 2915 | 29489 s | 14.15 cm |
| 2820 | 28539 s | 14.66 cm | 2852 | 28859 s | 14.49 cm | 2884 | 29179 s | 14.32 cm | 2916 | 29499 s | 14.14 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -



### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|
| 2917 | 29509 s | 14.14 cm | 2949 | 29829 s | 13.97 cm | 2981 | 30149 s | 13.79 cm |
| 2918 | 29519 s | 14.13 cm | 2950 | 29839 s | 13.96 cm | 2982 | 30159 s | 13.78 cm |
| 2919 | 29529 s | 14.13 cm | 2951 | 29849 s | 13.96 cm | 2983 | 30169 s | 13.78 cm |
| 2920 | 29539 s | 14.12 cm | 2952 | 29859 s | 13.95 cm | 2984 | 30179 s | 13.77 cm |
| 2921 | 29549 s | 14.12 cm | 2953 | 29869 s | 13.95 cm | 2985 | 30189 s | 13.77 cm |
| 2922 | 29559 s | 14.11 cm | 2954 | 29879 s | 13.94 cm | 2986 | 30199 s | 13.76 cm |
| 2923 | 29569 s | 14.11 cm | 2955 | 29889 s | 13.94 cm | 2987 | 30209 s | 13.76 cm |
| 2924 | 29579 s | 14.1 cm | 2956 | 29899 s | 13.93 cm | 2988 | 30219 s | 13.75 cm |
| 2925 | 29589 s | 14.1 cm | 2957 | 29909 s | 13.92 cm | 2989 | 30229 s | 13.75 cm |
| 2926 | 29599 s | 14.09 cm | 2958 | 29919 s | 13.92 cm | 2990 | 30239 s | 13.73 cm |
| 2927 | 29609 s | 14.09 cm | 2959 | 29929 s | 13.92 cm | 2991 | 30249 s | 13.73 cm |
| 2928 | 29619 s | 14.08 cm | 2960 | 29939 s | 13.91 cm | | | |
| 2929 | 29629 s | 14.08 cm | 2961 | 29949 s | 13.89 cm | | | |
| 2930 | 29639 s | 14.06 cm | 2962 | 29959 s | 13.89 cm | | | |
| 2931 | 29649 s | 14.06 cm | 2963 | 29969 s | 13.88 cm | | | |
| 2932 | 29659 s | 14.05 cm | 2964 | 29979 s | 13.88 cm | | | |
| 2933 | 29669 s | 14.05 cm | 2965 | 29989 s | 13.87 cm | | | |
| 2934 | 29679 s | 14.04 cm | 2966 | 29999 s | 13.87 cm | | | |
| 2935 | 29689 s | 14.04 cm | 2967 | 30009 s | 13.86 cm | | | |
| 2936 | 29699 s | 14.03 cm | 2968 | 30019 s | 13.86 cm | | | |
| 2937 | 29709 s | 14.03 cm | 2969 | 30029 s | 13.85 cm | | | |
| 2938 | 29719 s | 14.02 cm | 2970 | 30039 s | 13.85 cm | | | |
| 2939 | 29729 s | 14.02 cm | 2971 | 30049 s | 13.84 cm | | | |
| 2940 | 29739 s | 14.01 cm | 2972 | 30059 s | 13.84 cm | | | |
| 2941 | 29749 s | 14.01 cm | 2973 | 30069 s | 13.83 cm | | | |
| 2942 | 29759 s | 14.0 cm | 2974 | 30079 s | 13.83 cm | | | |
| 2943 | 29769 s | 14.0 cm | 2975 | 30089 s | 13.82 cm | | | |
| 2944 | 29779 s | 13.99 cm | 2976 | 30099 s | 13.82 cm | | | |
| 2945 | 29789 s | 13.99 cm | 2977 | 30109 s | 13.81 cm | | | |
| 2946 | 29799 s | 13.98 cm | 2978 | 30119 s | 13.81 cm | | | |
| 2947 | 29809 s | 13.98 cm | 2979 | 30129 s | 13.8 cm | | | |
| 2948 | 29819 s | 13.97 cm | 2980 | 30139 s | 13.8 cm | | | |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

www.upstreamtechnologies.us

651.237.5123

### kerber b

| | |
|---|---|
| Date | 6/14/2023 |
| Time | 2:02 PM |
| Latitude | 44.873015 |
| Longitude | -93.533850 |
| Initial Volumetric Moisture | 80.00 % |
| Final Volumetric Moisture | 81.00 % |
| Cylinder Size | 3 Liter |

### kerber b Results

| | |
|---|---|
| Map Pin # | 2 |
| Test Number | 24755 |
| Ksat - mm/hr | 24 |
| Ksat - in/hr | 0.961 |
| Capillary Pressure C mm | -23.6 |
| RMS Error of Regression | 367 |
| Normalized RMS | 2.8% |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 s | 30.27 cm | 26 | 250 s | 28.91 cm | 51 | 500 s | 27.84 cm | 76 | 750 s | 26.87 cm |
| 2 | 10 s | 30.18 cm | 27 | 260 s | 28.87 cm | 52 | 510 s | 27.79 cm | 77 | 760 s | 26.82 cm |
| 3 | 20 s | 30.09 cm | 28 | 270 s | 28.83 cm | 53 | 520 s | 27.76 cm | 78 | 770 s | 26.79 cm |
| 4 | 30 s | 30.03 cm | 29 | 280 s | 28.77 cm | 54 | 530 s | 27.72 cm | 79 | 780 s | 26.76 cm |
| 5 | 40 s | 29.98 cm | 30 | 290 s | 28.73 cm | 55 | 540 s | 27.68 cm | 80 | 790 s | 26.72 cm |
| 6 | 50 s | 29.91 cm | 31 | 300 s | 28.69 cm | 56 | 550 s | 27.63 cm | 81 | 800 s | 26.69 cm |
| 7 | 60 s | 29.86 cm | 32 | 310 s | 28.64 cm | 57 | 560 s | 27.6 cm | 82 | 810 s | 26.64 cm |
| 8 | 70 s | 29.81 cm | 33 | 320 s | 28.6 cm | 58 | 570 s | 27.56 cm | 83 | 820 s | 26.61 cm |
| 9 | 80 s | 29.73 cm | 34 | 330 s | 28.56 cm | 59 | 580 s | 27.52 cm | 84 | 830 s | 26.57 cm |
| 10 | 90 s | 29.69 cm | 35 | 340 s | 28.52 cm | 60 | 590 s | 27.48 cm | 85 | 840 s | 26.54 cm |
| 11 | 100 s | 29.64 cm | 36 | 350 s | 28.46 cm | 61 | 600 s | 27.44 cm | 86 | 850 s | 26.49 cm |
| 12 | 110 s | 29.58 cm | 37 | 360 s | 28.42 cm | 62 | 610 s | 27.4 cm | 87 | 860 s | 26.46 cm |
| 13 | 120 s | 29.53 cm | 38 | 370 s | 28.38 cm | 63 | 620 s | 27.37 cm | 88 | 870 s | 26.42 cm |
| 14 | 130 s | 29.48 cm | 39 | 380 s | 28.34 cm | 64 | 630 s | 27.32 cm | 89 | 880 s | 26.39 cm |
| 15 | 140 s | 29.43 cm | 40 | 390 s | 28.29 cm | 65 | 640 s | 27.28 cm | 90 | 890 s | 26.35 cm |
| 16 | 150 s | 29.38 cm | 41 | 400 s | 28.25 cm | 66 | 650 s | 27.25 cm | 91 | 900 s | 26.31 cm |
| 17 | 160 s | 29.34 cm | 42 | 410 s | 28.21 cm | 67 | 660 s | 27.21 cm | 92 | 910 s | 26.28 cm |
| 18 | 170 s | 29.28 cm | 43 | 420 s | 28.17 cm | 68 | 670 s | 27.17 cm | 93 | 920 s | 26.24 cm |
| 19 | 180 s | 29.24 cm | 44 | 430 s | 28.12 cm | 69 | 680 s | 27.13 cm | 94 | 930 s | 26.21 cm |
| 20 | 190 s | 29.19 cm | 45 | 440 s | 28.08 cm | 70 | 690 s | 27.09 cm | 95 | 940 s | 26.17 cm |
| 21 | 200 s | 29.15 cm | 46 | 450 s | 28.04 cm | 71 | 700 s | 27.06 cm | 96 | 950 s | 26.13 cm |
| 22 | 210 s | 29.1 cm | 47 | 460 s | 28.01 cm | 72 | 710 s | 27.02 cm | 97 | 960 s | 26.1 cm |
| 23 | 220 s | 29.05 cm | 48 | 470 s | 27.96 cm | 73 | 720 s | 26.97 cm | 98 | 970 s | 26.07 cm |
| 24 | 230 s | 29.01 cm | 49 | 480 s | 27.92 cm | 74 | 730 s | 26.94 cm | 99 | 980 s | 26.04 cm |
| 25 | 240 s | 28.95 cm | 50 | 490 s | 27.88 cm | 75 | 740 s | 26.9 cm | 100 | 990 s | 25.99 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

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651.237.5123

### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | 1000 s | 25.96 cm | 133 | 1320 s | 24.91 cm | 165 | 1640 s | 23.94 cm | 197 | 1960 s | 23.05 cm |
| 102 | 1010 s | 25.93 cm | 134 | 1330 s | 24.87 cm | 166 | 1650 s | 23.91 cm | 198 | 1970 s | 23.03 cm |
| 103 | 1020 s | 25.9 cm | 135 | 1340 s | 24.85 cm | 167 | 1660 s | 23.87 cm | 199 | 1980 s | 23.0 cm |
| 104 | 1030 s | 25.85 cm | 136 | 1350 s | 24.82 cm | 168 | 1670 s | 23.85 cm | 200 | 1990 s | 22.98 cm |
| 105 | 1040 s | 25.82 cm | 137 | 1360 s | 24.79 cm | 169 | 1680 s | 23.82 cm | 201 | 2000 s | 22.95 cm |
| 106 | 1050 s | 25.79 cm | 138 | 1370 s | 24.76 cm | 170 | 1690 s | 23.79 cm | 202 | 2010 s | 22.93 cm |
| 107 | 1060 s | 25.76 cm | 139 | 1380 s | 24.73 cm | 171 | 1700 s | 23.76 cm | 203 | 2020 s | 22.9 cm |
| 108 | 1070 s | 25.73 cm | 140 | 1390 s | 24.69 cm | 172 | 1710 s | 23.74 cm | 204 | 2030 s | 22.87 cm |
| 109 | 1080 s | 25.68 cm | 141 | 1400 s | 24.66 cm | 173 | 1720 s | 23.7 cm | 205 | 2040 s | 22.85 cm |
| 110 | 1090 s | 25.65 cm | 142 | 1410 s | 24.63 cm | 174 | 1730 s | 23.67 cm | 206 | 2050 s | 22.83 cm |
| 111 | 1100 s | 25.62 cm | 143 | 1420 s | 24.6 cm | 175 | 1740 s | 23.65 cm | 207 | 2060 s | 22.8 cm |
| 112 | 1110 s | 25.59 cm | 144 | 1430 s | 24.57 cm | 176 | 1750 s | 23.62 cm | 208 | 2070 s | 22.78 cm |
| 113 | 1120 s | 25.56 cm | 145 | 1440 s | 24.53 cm | 177 | 1760 s | 23.59 cm | 209 | 2080 s | 22.74 cm |
| 114 | 1130 s | 25.52 cm | 146 | 1450 s | 24.5 cm | 178 | 1770 s | 23.56 cm | 210 | 2090 s | 22.72 cm |
| 115 | 1140 s | 25.49 cm | 147 | 1460 s | 24.48 cm | 179 | 1780 s | 23.53 cm | 211 | 2100 s | 22.7 cm |
| 116 | 1150 s | 25.46 cm | 148 | 1470 s | 24.45 cm | 180 | 1790 s | 23.51 cm | 212 | 2110 s | 22.67 cm |
| 117 | 1160 s | 25.43 cm | 149 | 1480 s | 24.42 cm | 181 | 1800 s | 23.48 cm | 213 | 2120 s | 22.65 cm |
| 118 | 1170 s | 25.4 cm | 150 | 1490 s | 24.38 cm | 182 | 1810 s | 23.46 cm | 214 | 2130 s | 22.63 cm |
| 119 | 1180 s | 25.36 cm | 151 | 1500 s | 24.35 cm | 183 | 1820 s | 23.43 cm | 215 | 2140 s | 22.6 cm |
| 120 | 1190 s | 25.33 cm | 152 | 1510 s | 24.32 cm | 184 | 1830 s | 23.4 cm | 216 | 2150 s | 22.57 cm |
| 121 | 1200 s | 25.3 cm | 153 | 1520 s | 24.29 cm | 185 | 1840 s | 23.37 cm | 217 | 2160 s | 22.55 cm |
| 122 | 1210 s | 25.27 cm | 154 | 1530 s | 24.27 cm | 186 | 1850 s | 23.35 cm | 218 | 2170 s | 22.52 cm |
| 123 | 1220 s | 25.24 cm | 155 | 1540 s | 24.24 cm | 187 | 1860 s | 23.32 cm | 219 | 2180 s | 22.5 cm |
| 124 | 1230 s | 25.2 cm | 156 | 1550 s | 24.2 cm | 188 | 1870 s | 23.3 cm | 220 | 2190 s | 22.48 cm |
| 125 | 1240 s | 25.17 cm | 157 | 1560 s | 24.17 cm | 189 | 1880 s | 23.27 cm | 221 | 2200 s | 22.45 cm |
| 126 | 1250 s | 25.13 cm | 158 | 1570 s | 24.14 cm | 190 | 1890 s | 23.25 cm | 222 | 2210 s | 22.43 cm |
| 127 | 1260 s | 25.1 cm | 159 | 1580 s | 24.12 cm | 191 | 1900 s | 23.21 cm | 223 | 2220 s | 22.39 cm |
| 128 | 1270 s | 25.07 cm | 160 | 1590 s | 24.09 cm | 192 | 1910 s | 23.19 cm | 224 | 2230 s | 22.37 cm |
| 129 | 1280 s | 25.03 cm | 161 | 1600 s | 24.05 cm | 193 | 1920 s | 23.16 cm | 225 | 2240 s | 22.35 cm |
| 130 | 1290 s | 25.0 cm | 162 | 1610 s | 24.02 cm | 194 | 1930 s | 23.14 cm | 226 | 2250 s | 22.33 cm |
| 131 | 1300 s | 24.97 cm | 163 | 1620 s | 23.99 cm | 195 | 1940 s | 23.11 cm | 227 | 2260 s | 22.3 cm |
| 132 | 1310 s | 24.94 cm | 164 | 1630 s | 23.96 cm | 196 | 1950 s | 23.09 cm | 228 | 2270 s | 22.28 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 229 | 2280 s | 22.25 cm | 261 | 2600 s | 21.4 cm | 293 | 2920 s | 20.78 cm | 325 | 3240 s | 20.17 cm |
| 230 | 2290 s | 22.22 cm | 262 | 2610 s | 21.38 cm | 294 | 2930 s | 20.76 cm | 326 | 3250 s | 20.15 cm |
| 231 | 2300 s | 22.2 cm | 263 | 2620 s | 21.36 cm | 295 | 2940 s | 20.74 cm | 327 | 3260 s | 20.12 cm |
| 232 | 2310 s | 22.18 cm | 264 | 2630 s | 21.34 cm | 296 | 2950 s | 20.72 cm | 328 | 3270 s | 20.11 cm |
| 233 | 2320 s | 22.16 cm | 265 | 2640 s | 21.32 cm | 297 | 2960 s | 20.7 cm | 329 | 3280 s | 20.09 cm |
| 234 | 2330 s | 22.13 cm | 266 | 2650 s | 21.3 cm | 298 | 2970 s | 20.69 cm | 330 | 3290 s | 20.07 cm |
| 235 | 2340 s | 22.11 cm | 267 | 2660 s | 21.29 cm | 299 | 2980 s | 20.67 cm | 331 | 3300 s | 20.05 cm |
| 236 | 2350 s | 22.08 cm | 268 | 2670 s | 21.26 cm | 300 | 2990 s | 20.65 cm | 332 | 3310 s | 20.04 cm |
| 237 | 2360 s | 21.86 cm | 269 | 2680 s | 21.24 cm | 301 | 3000 s | 20.63 cm | 333 | 3320 s | 20.02 cm |
| 238 | 2370 s | 21.86 cm | 270 | 2690 s | 21.22 cm | 302 | 3010 s | 20.6 cm | 334 | 3330 s | 20.0 cm |
| 239 | 2380 s | 21.84 cm | 271 | 2700 s | 21.2 cm | 303 | 3020 s | 20.59 cm | 335 | 3340 s | 19.98 cm |
| 240 | 2390 s | 21.83 cm | 272 | 2710 s | 21.18 cm | 304 | 3030 s | 20.57 cm | 336 | 3350 s | 19.95 cm |
| 241 | 2400 s | 21.81 cm | 273 | 2720 s | 21.17 cm | 305 | 3040 s | 20.55 cm | 337 | 3360 s | 19.94 cm |
| 242 | 2410 s | 21.79 cm | 274 | 2730 s | 21.15 cm | 306 | 3050 s | 20.53 cm | 338 | 3370 s | 19.92 cm |
| 243 | 2420 s | 21.76 cm | 275 | 2740 s | 21.13 cm | 307 | 3060 s | 20.51 cm | 339 | 3380 s | 19.9 cm |
| 244 | 2430 s | 21.74 cm | 276 | 2750 s | 21.1 cm | 308 | 3070 s | 20.49 cm | 340 | 3390 s | 19.89 cm |
| 245 | 2440 s | 21.72 cm | 277 | 2760 s | 21.08 cm | 309 | 3080 s | 20.48 cm | 341 | 3400 s | 19.87 cm |
| 246 | 2450 s | 21.7 cm | 278 | 2770 s | 21.06 cm | 310 | 3090 s | 20.45 cm | 342 | 3410 s | 19.85 cm |
| 247 | 2460 s | 21.68 cm | 279 | 2780 s | 21.05 cm | 311 | 3100 s | 20.43 cm | 343 | 3420 s | 19.84 cm |
| 248 | 2470 s | 21.66 cm | 280 | 2790 s | 21.03 cm | 312 | 3110 s | 20.41 cm | 344 | 3430 s | 19.82 cm |
| 249 | 2480 s | 21.65 cm | 281 | 2800 s | 21.01 cm | 313 | 3120 s | 20.39 cm | 345 | 3440 s | 19.81 cm |
| 250 | 2490 s | 21.63 cm | 282 | 2810 s | 20.99 cm | 314 | 3130 s | 20.37 cm | 346 | 3450 s | 19.78 cm |
| 251 | 2500 s | 21.61 cm | 283 | 2820 s | 20.97 cm | 315 | 3140 s | 20.36 cm | 347 | 3460 s | 19.77 cm |
| 252 | 2510 s | 21.58 cm | 284 | 2830 s | 20.96 cm | 316 | 3150 s | 20.34 cm | 348 | 3470 s | 19.75 cm |
| 253 | 2520 s | 21.56 cm | 285 | 2840 s | 20.93 cm | 317 | 3160 s | 20.32 cm | 349 | 3480 s | 19.74 cm |
| 254 | 2530 s | 21.54 cm | 286 | 2850 s | 20.91 cm | 318 | 3170 s | 20.3 cm | 350 | 3490 s | 19.72 cm |
| 255 | 2540 s | 21.52 cm | 287 | 2860 s | 20.89 cm | 319 | 3180 s | 20.27 cm | 351 | 3500 s | 19.71 cm |
| 256 | 2550 s | 21.5 cm | 288 | 2870 s | 20.87 cm | 320 | 3190 s | 20.26 cm | 352 | 3510 s | 19.69 cm |
| 257 | 2560 s | 21.48 cm | 289 | 2880 s | 20.86 cm | 321 | 3200 s | 20.24 cm | 353 | 3520 s | 19.68 cm |
| 258 | 2570 s | 21.46 cm | 290 | 2890 s | 20.84 cm | 322 | 3210 s | 20.22 cm | 354 | 3530 s | 19.67 cm |
| 259 | 2580 s | 21.43 cm | 291 | 2900 s | 20.82 cm | 323 | 3220 s | 20.2 cm | 355 | 3540 s | 19.65 cm |
| 260 | 2590 s | 21.42 cm | 292 | 2910 s | 20.8 cm | 324 | 3230 s | 20.18 cm | 356 | 3550 s | 19.63 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 357 | 3560 s | 19.61 cm | 389 | 3880 s | 19.14 cm | 421 | 4200 s | 18.71 cm | 453 | 4520 s | 18.26 cm |
| 358 | 3570 s | 19.6 cm | 390 | 3890 s | 19.13 cm | 422 | 4210 s | 18.7 cm | 454 | 4530 s | 18.25 cm |
| 359 | 3580 s | 19.58 cm | 391 | 3900 s | 19.12 cm | 423 | 4220 s | 18.68 cm | 455 | 4540 s | 18.24 cm |
| 360 | 3590 s | 19.57 cm | 392 | 3910 s | 19.1 cm | 424 | 4230 s | 18.67 cm | 456 | 4550 s | 18.22 cm |
| 361 | 3600 s | 19.56 cm | 393 | 3920 s | 19.09 cm | 425 | 4240 s | 18.65 cm | 457 | 4560 s | 18.21 cm |
| 362 | 3610 s | 19.54 cm | 394 | 3930 s | 19.08 cm | 426 | 4250 s | 18.63 cm | 458 | 4570 s | 18.2 cm |
| 363 | 3620 s | 19.53 cm | 395 | 3940 s | 19.07 cm | 427 | 4260 s | 18.62 cm | 459 | 4580 s | 18.18 cm |
| 364 | 3630 s | 19.51 cm | 396 | 3950 s | 19.05 cm | 428 | 4270 s | 18.61 cm | 460 | 4590 s | 18.17 cm |
| 365 | 3640 s | 19.5 cm | 397 | 3960 s | 19.04 cm | 429 | 4280 s | 18.59 cm | 461 | 4600 s | 18.15 cm |
| 366 | 3650 s | 19.49 cm | 398 | 3970 s | 19.03 cm | 430 | 4290 s | 18.58 cm | 462 | 4610 s | 18.13 cm |
| 367 | 3660 s | 19.48 cm | 399 | 3980 s | 19.02 cm | 431 | 4300 s | 18.57 cm | 463 | 4620 s | 18.12 cm |
| 368 | 3670 s | 19.45 cm | 400 | 3990 s | 19.0 cm | 432 | 4310 s | 18.55 cm | 464 | 4630 s | 18.11 cm |
| 369 | 3680 s | 19.44 cm | 401 | 4000 s | 18.99 cm | 433 | 4320 s | 18.54 cm | 465 | 4640 s | 18.1 cm |
| 370 | 3690 s | 19.42 cm | 402 | 4010 s | 18.97 cm | 434 | 4330 s | 18.53 cm | 466 | 4650 s | 18.08 cm |
| 371 | 3700 s | 19.41 cm | 403 | 4020 s | 18.95 cm | 435 | 4340 s | 18.51 cm | 467 | 4660 s | 18.07 cm |
| 372 | 3710 s | 19.39 cm | 404 | 4030 s | 18.94 cm | 436 | 4350 s | 18.5 cm | 468 | 4670 s | 18.06 cm |
| 373 | 3720 s | 19.38 cm | 405 | 4040 s | 18.93 cm | 437 | 4360 s | 18.48 cm | 469 | 4680 s | 18.05 cm |
| 374 | 3730 s | 19.37 cm | 406 | 4050 s | 18.92 cm | 438 | 4370 s | 18.47 cm | 470 | 4690 s | 18.03 cm |
| 375 | 3740 s | 19.35 cm | 407 | 4060 s | 18.9 cm | 439 | 4380 s | 18.45 cm | 471 | 4700 s | 18.02 cm |
| 376 | 3750 s | 19.34 cm | 408 | 4070 s | 18.89 cm | 440 | 4390 s | 18.44 cm | 472 | 4710 s | 18.01 cm |
| 377 | 3760 s | 19.32 cm | 409 | 4080 s | 18.88 cm | 441 | 4400 s | 18.43 cm | 473 | 4720 s | 17.99 cm |
| 378 | 3770 s | 19.3 cm | 410 | 4090 s | 18.86 cm | 442 | 4410 s | 18.42 cm | 474 | 4730 s | 17.97 cm |
| 379 | 3780 s | 19.29 cm | 411 | 4100 s | 18.85 cm | 443 | 4420 s | 18.4 cm | 475 | 4740 s | 17.96 cm |
| 380 | 3790 s | 19.27 cm | 412 | 4110 s | 18.84 cm | 444 | 4430 s | 18.39 cm | 476 | 4750 s | 17.95 cm |
| 381 | 3800 s | 19.26 cm | 413 | 4120 s | 18.81 cm | 445 | 4440 s | 18.38 cm | 477 | 4760 s | 17.94 cm |
| 382 | 3810 s | 19.25 cm | 414 | 4130 s | 18.8 cm | 446 | 4450 s | 18.36 cm | 478 | 4770 s | 17.92 cm |
| 383 | 3820 s | 19.23 cm | 415 | 4140 s | 18.79 cm | 447 | 4460 s | 18.35 cm | 479 | 4780 s | 17.91 cm |
| 384 | 3830 s | 19.22 cm | 416 | 4150 s | 18.77 cm | 448 | 4470 s | 18.34 cm | 480 | 4790 s | 17.9 cm |
| 385 | 3840 s | 19.21 cm | 417 | 4160 s | 18.76 cm | 449 | 4480 s | 18.31 cm | 481 | 4800 s | 17.89 cm |
| 386 | 3850 s | 19.19 cm | 418 | 4170 s | 18.75 cm | 450 | 4490 s | 18.3 cm | 482 | 4810 s | 17.87 cm |
| 387 | 3860 s | 19.18 cm | 419 | 4180 s | 18.73 cm | 451 | 4500 s | 18.29 cm | 483 | 4820 s | 17.86 cm |
| 388 | 3870 s | 19.17 cm | 420 | 4190 s | 18.72 cm | 452 | 4510 s | 18.28 cm | 484 | 4830 s | 17.85 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

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### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 485 | 4840 s | 17.83 cm | 517 | 5160 s | 17.4 cm | 549 | 5480 s | 16.96 cm | 581 | 5800 s | 16.52 cm |
| 486 | 4850 s | 17.82 cm | 518 | 5170 s | 17.39 cm | 550 | 5490 s | 16.95 cm | 582 | 5810 s | 16.51 cm |
| 487 | 4860 s | 17.8 cm | 519 | 5180 s | 17.37 cm | 551 | 5500 s | 16.94 cm | 583 | 5820 s | 16.49 cm |
| 488 | 4870 s | 17.79 cm | 520 | 5190 s | 17.36 cm | 552 | 5510 s | 16.92 cm | 584 | 5830 s | 16.48 cm |
| 489 | 4880 s | 17.77 cm | 521 | 5200 s | 17.35 cm | 553 | 5520 s | 16.91 cm | 585 | 5840 s | 16.46 cm |
| 490 | 4890 s | 17.76 cm | 522 | 5210 s | 17.33 cm | 554 | 5530 s | 16.9 cm | 586 | 5850 s | 16.45 cm |
| 491 | 4900 s | 17.75 cm | 523 | 5220 s | 17.31 cm | 555 | 5540 s | 16.88 cm | 587 | 5860 s | 16.44 cm |
| 492 | 4910 s | 17.74 cm | 524 | 5230 s | 17.3 cm | 556 | 5550 s | 16.87 cm | 588 | 5870 s | 16.43 cm |
| 493 | 4920 s | 17.72 cm | 525 | 5240 s | 17.29 cm | 557 | 5560 s | 16.86 cm | 589 | 5880 s | 16.41 cm |
| 494 | 4930 s | 17.71 cm | 526 | 5250 s | 17.28 cm | 558 | 5570 s | 16.84 cm | 590 | 5890 s | 16.4 cm |
| 495 | 4940 s | 17.7 cm | 527 | 5260 s | 17.26 cm | 559 | 5580 s | 16.82 cm | 591 | 5900 s | 16.39 cm |
| 496 | 4950 s | 17.68 cm | 528 | 5270 s | 17.25 cm | 560 | 5590 s | 16.81 cm | 592 | 5910 s | 16.38 cm |
| 497 | 4960 s | 17.66 cm | 529 | 5280 s | 17.24 cm | 561 | 5600 s | 16.8 cm | 593 | 5920 s | 16.35 cm |
| 498 | 4970 s | 17.65 cm | 530 | 5290 s | 17.23 cm | 562 | 5610 s | 16.78 cm | 594 | 5930 s | 16.34 cm |
| 499 | 4980 s | 17.64 cm | 531 | 5300 s | 17.21 cm | 563 | 5620 s | 16.77 cm | 595 | 5940 s | 16.33 cm |
| 500 | 4990 s | 17.63 cm | 532 | 5310 s | 17.2 cm | 564 | 5630 s | 16.76 cm | 596 | 5950 s | 16.31 cm |
| 501 | 5000 s | 17.61 cm | 533 | 5320 s | 17.19 cm | 565 | 5640 s | 16.75 cm | 597 | 5960 s | 16.3 cm |
| 502 | 5010 s | 17.6 cm | 534 | 5330 s | 17.17 cm | 566 | 5650 s | 16.73 cm | 598 | 5970 s | 16.29 cm |
| 503 | 5020 s | 17.59 cm | 535 | 5340 s | 17.15 cm | 567 | 5660 s | 16.72 cm | 599 | 5980 s | 16.28 cm |
| 504 | 5030 s | 17.57 cm | 536 | 5350 s | 17.14 cm | 568 | 5670 s | 16.71 cm | 600 | 5990 s | 16.26 cm |
| 505 | 5040 s | 17.56 cm | 537 | 5360 s | 17.13 cm | 569 | 5680 s | 16.68 cm | 601 | 6000 s | 16.25 cm |
| 506 | 5050 s | 17.55 cm | 538 | 5370 s | 17.12 cm | 570 | 5690 s | 16.67 cm | 602 | 6010 s | 16.24 cm |
| 507 | 5060 s | 17.54 cm | 539 | 5380 s | 17.1 cm | 571 | 5700 s | 16.66 cm | 603 | 6020 s | 16.23 cm |
| 508 | 5070 s | 17.53 cm | 540 | 5390 s | 17.09 cm | 572 | 5710 s | 16.64 cm | 604 | 6030 s | 16.21 cm |
| 509 | 5080 s | 17.5 cm | 541 | 5400 s | 17.08 cm | 573 | 5720 s | 16.63 cm | 605 | 6040 s | 16.19 cm |
| 510 | 5090 s | 17.49 cm | 542 | 5410 s | 17.06 cm | 574 | 5730 s | 16.62 cm | 606 | 6050 s | 16.18 cm |
| 511 | 5100 s | 17.48 cm | 543 | 5420 s | 17.05 cm | 575 | 5740 s | 16.61 cm | 607 | 6060 s | 16.16 cm |
| 512 | 5110 s | 17.46 cm | 544 | 5430 s | 17.04 cm | 576 | 5750 s | 16.59 cm | 608 | 6070 s | 16.15 cm |
| 513 | 5120 s | 17.45 cm | 545 | 5440 s | 17.01 cm | 577 | 5760 s | 16.58 cm | 609 | 6080 s | 16.14 cm |
| 514 | 5130 s | 17.44 cm | 546 | 5450 s | 17.0 cm | 578 | 5770 s | 16.57 cm | 610 | 6090 s | 16.13 cm |
| 515 | 5140 s | 17.42 cm | 547 | 5460 s | 16.99 cm | 579 | 5780 s | 16.55 cm | 611 | 6100 s | 16.11 cm |
| 516 | 5150 s | 17.41 cm | 548 | 5470 s | 16.98 cm | 580 | 5790 s | 16.54 cm | 612 | 6110 s | 16.1 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 613 | 6120 s | 16.09 cm | 645 | 6440 s | 15.65 cm | 677 | 6760 s | 15.24 cm | 709 | 7080 s | 14.81 cm |
| 614 | 6130 s | 16.07 cm | 646 | 6450 s | 15.64 cm | 678 | 6770 s | 15.22 cm | 710 | 7090 s | 14.79 cm |
| 615 | 6140 s | 16.06 cm | 647 | 6460 s | 15.63 cm | 679 | 6780 s | 15.2 cm | 711 | 7100 s | 14.78 cm |
| 616 | 6150 s | 16.05 cm | 648 | 6470 s | 15.62 cm | 680 | 6790 s | 15.19 cm | 712 | 7110 s | 14.77 cm |
| 617 | 6160 s | 16.04 cm | 649 | 6480 s | 15.6 cm | 681 | 6800 s | 15.17 cm | 713 | 7120 s | 14.76 cm |
| 618 | 6170 s | 16.01 cm | 650 | 6490 s | 15.59 cm | 682 | 6810 s | 15.16 cm | 714 | 7130 s | 14.74 cm |
| 619 | 6180 s | 16.0 cm | 651 | 6500 s | 15.58 cm | 683 | 6820 s | 15.15 cm | 715 | 7140 s | 14.73 cm |
| 620 | 6190 s | 15.99 cm | 652 | 6510 s | 15.57 cm | 684 | 6830 s | 15.14 cm | 716 | 7150 s | 14.71 cm |
| 621 | 6200 s | 15.98 cm | 653 | 6520 s | 15.55 cm | 685 | 6840 s | 15.12 cm | 717 | 7160 s | 14.7 cm |
| 622 | 6210 s | 15.96 cm | 654 | 6530 s | 15.53 cm | 686 | 6850 s | 15.11 cm | 718 | 7170 s | 14.69 cm |
| 623 | 6220 s | 15.95 cm | 655 | 6540 s | 15.52 cm | 687 | 6860 s | 15.1 cm | 719 | 7180 s | 14.67 cm |
| 624 | 6230 s | 15.94 cm | 656 | 6550 s | 15.51 cm | 688 | 6870 s | 15.09 cm | 720 | 7190 s | 14.66 cm |
| 625 | 6240 s | 15.92 cm | 657 | 6560 s | 15.5 cm | 689 | 6880 s | 15.08 cm | 721 | 7200 s | 14.65 cm |
| 626 | 6250 s | 15.91 cm | 658 | 6570 s | 15.48 cm | 690 | 6890 s | 15.06 cm | 722 | 7210 s | 14.63 cm |
| 627 | 6260 s | 15.9 cm | 659 | 6580 s | 15.47 cm | 691 | 6900 s | 15.04 cm | 723 | 7220 s | 14.62 cm |
| 628 | 6270 s | 15.89 cm | 660 | 6590 s | 15.46 cm | 692 | 6910 s | 15.03 cm | 724 | 7230 s | 14.61 cm |
| 629 | 6280 s | 15.88 cm | 661 | 6600 s | 15.45 cm | 693 | 6920 s | 15.02 cm | 725 | 7240 s | 14.6 cm |
| 630 | 6290 s | 15.85 cm | 662 | 6610 s | 15.43 cm | 694 | 6930 s | 15.0 cm | 726 | 7250 s | 14.58 cm |
| 631 | 6300 s | 15.84 cm | 663 | 6620 s | 15.42 cm | 695 | 6940 s | 14.99 cm | 727 | 7260 s | 14.57 cm |
| 632 | 6310 s | 15.83 cm | 664 | 6630 s | 15.41 cm | 696 | 6950 s | 14.98 cm | 728 | 7270 s | 14.55 cm |
| 633 | 6320 s | 15.81 cm | 665 | 6640 s | 15.4 cm | 697 | 6960 s | 14.97 cm | 729 | 7280 s | 14.53 cm |
| 634 | 6330 s | 15.8 cm | 666 | 6650 s | 15.37 cm | 698 | 6970 s | 14.95 cm | 730 | 7290 s | 14.52 cm |
| 635 | 6340 s | 15.79 cm | 667 | 6660 s | 15.36 cm | 699 | 6980 s | 14.94 cm | 731 | 7300 s | 14.51 cm |
| 636 | 6350 s | 15.78 cm | 668 | 6670 s | 15.35 cm | 700 | 6990 s | 14.93 cm | 732 | 7310 s | 14.5 cm |
| 637 | 6360 s | 15.76 cm | 669 | 6680 s | 15.34 cm | 701 | 7000 s | 14.92 cm | 733 | 7320 s | 14.48 cm |
| 638 | 6370 s | 15.75 cm | 670 | 6690 s | 15.32 cm | 702 | 7010 s | 14.9 cm | 734 | 7330 s | 14.47 cm |
| 639 | 6380 s | 15.74 cm | 671 | 6700 s | 15.31 cm | 703 | 7020 s | 14.88 cm | 735 | 7340 s | 14.46 cm |
| 640 | 6390 s | 15.73 cm | 672 | 6710 s | 15.3 cm | 704 | 7030 s | 14.87 cm | 736 | 7350 s | 14.44 cm |
| 641 | 6400 s | 15.7 cm | 673 | 6720 s | 15.29 cm | 705 | 7040 s | 14.85 cm | 737 | 7360 s | 14.43 cm |
| 642 | 6410 s | 15.69 cm | 674 | 6730 s | 15.27 cm | 706 | 7050 s | 14.84 cm | 738 | 7370 s | 14.42 cm |
| 643 | 6420 s | 15.68 cm | 675 | 6740 s | 15.26 cm | 707 | 7060 s | 14.83 cm | 739 | 7380 s | 14.39 cm |
| 644 | 6430 s | 15.67 cm | 676 | 6750 s | 15.25 cm | 708 | 7070 s | 14.82 cm | 740 | 7390 s | 14.38 cm |

# Infiltration Report

**RPBCWD**

**Kerber Ravine June 2023 -**

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## kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 741 | 7400 s | 14.37 cm | 773 | 7720 s | 13.92 cm | 805 | 8040 s | 13.48 cm | 837 | 8360 s | 13.04 cm |
| 742 | 7410 s | 14.35 cm | 774 | 7730 s | 13.91 cm | 806 | 8050 s | 13.47 cm | 838 | 8370 s | 13.03 cm |
| 743 | 7420 s | 14.34 cm | 775 | 7740 s | 13.89 cm | 807 | 8060 s | 13.46 cm | 839 | 8380 s | 13.01 cm |
| 744 | 7430 s | 14.33 cm | 776 | 7750 s | 13.88 cm | 808 | 8070 s | 13.44 cm | 840 | 8390 s | 13.0 cm |
| 745 | 7440 s | 14.31 cm | 777 | 7760 s | 13.86 cm | 809 | 8080 s | 13.43 cm | 841 | 8400 s | 12.99 cm |
| 746 | 7450 s | 14.3 cm | 778 | 7770 s | 13.85 cm | 810 | 8090 s | 13.42 cm | 842 | 8410 s | 12.97 cm |
| 747 | 7460 s | 14.29 cm | 779 | 7780 s | 13.84 cm | 811 | 8100 s | 13.39 cm | 843 | 8420 s | 12.96 cm |
| 748 | 7470 s | 14.28 cm | 780 | 7790 s | 13.82 cm | 812 | 8110 s | 13.38 cm | 844 | 8430 s | 12.95 cm |
| 749 | 7480 s | 14.26 cm | 781 | 7800 s | 13.81 cm | 813 | 8120 s | 13.37 cm | 845 | 8440 s | 12.94 cm |
| 750 | 7490 s | 14.25 cm | 782 | 7810 s | 13.8 cm | 814 | 8130 s | 13.35 cm | 846 | 8450 s | 12.91 cm |
| 751 | 7500 s | 14.24 cm | 783 | 7820 s | 13.79 cm | 815 | 8140 s | 13.34 cm | 847 | 8460 s | 12.9 cm |
| 752 | 7510 s | 14.21 cm | 784 | 7830 s | 13.77 cm | 816 | 8150 s | 13.33 cm | 848 | 8470 s | 12.89 cm |
| 753 | 7520 s | 14.2 cm | 785 | 7840 s | 13.76 cm | 817 | 8160 s | 13.32 cm | 849 | 8480 s | 12.87 cm |
| 754 | 7530 s | 14.18 cm | 786 | 7850 s | 13.75 cm | 818 | 8170 s | 13.3 cm | 850 | 8490 s | 12.86 cm |
| 755 | 7540 s | 14.17 cm | 787 | 7860 s | 13.72 cm | 819 | 8180 s | 13.29 cm | 851 | 8500 s | 12.85 cm |
| 756 | 7550 s | 14.16 cm | 788 | 7870 s | 13.71 cm | 820 | 8190 s | 13.28 cm | 852 | 8510 s | 12.84 cm |
| 757 | 7560 s | 14.15 cm | 789 | 7880 s | 13.7 cm | 821 | 8200 s | 13.26 cm | 853 | 8520 s | 12.82 cm |
| 758 | 7570 s | 14.13 cm | 790 | 7890 s | 13.68 cm | 822 | 8210 s | 13.24 cm | 854 | 8530 s | 12.81 cm |
| 759 | 7580 s | 14.12 cm | 791 | 7900 s | 13.67 cm | 823 | 8220 s | 13.23 cm | 855 | 8540 s | 12.8 cm |
| 760 | 7590 s | 14.11 cm | 792 | 7910 s | 13.66 cm | 824 | 8230 s | 13.22 cm | 856 | 8550 s | 12.78 cm |
| 761 | 7600 s | 14.09 cm | 793 | 7920 s | 13.65 cm | 825 | 8240 s | 13.2 cm | 857 | 8560 s | 12.77 cm |
| 762 | 7610 s | 14.08 cm | 794 | 7930 s | 13.63 cm | 826 | 8250 s | 13.19 cm | 858 | 8570 s | 12.75 cm |
| 763 | 7620 s | 14.06 cm | 795 | 7940 s | 13.62 cm | 827 | 8260 s | 13.18 cm | 859 | 8580 s | 12.74 cm |
| 764 | 7630 s | 14.05 cm | 796 | 7950 s | 13.61 cm | 828 | 8270 s | 13.17 cm | 860 | 8590 s | 12.72 cm |
| 765 | 7640 s | 14.03 cm | 797 | 7960 s | 13.59 cm | 829 | 8280 s | 13.15 cm | 861 | 8600 s | 12.71 cm |
| 766 | 7650 s | 14.02 cm | 798 | 7970 s | 13.57 cm | 830 | 8290 s | 13.14 cm | 862 | 8610 s | 12.7 cm |
| 767 | 7660 s | 14.01 cm | 799 | 7980 s | 13.56 cm | 831 | 8300 s | 13.13 cm | 863 | 8620 s | 12.69 cm |
| 768 | 7670 s | 13.99 cm | 800 | 7990 s | 13.54 cm | 832 | 8310 s | 13.11 cm | 864 | 8630 s | 12.67 cm |
| 769 | 7680 s | 13.98 cm | 801 | 8000 s | 13.53 cm | 833 | 8320 s | 13.1 cm | 865 | 8640 s | 12.66 cm |
| 770 | 7690 s | 13.97 cm | 802 | 8010 s | 13.52 cm | 834 | 8330 s | 13.09 cm | 866 | 8650 s | 12.65 cm |
| 771 | 7700 s | 13.95 cm | 803 | 8020 s | 13.51 cm | 835 | 8340 s | 13.06 cm | 867 | 8660 s | 12.64 cm |
| 772 | 7710 s | 13.94 cm | 804 | 8030 s | 13.49 cm | 836 | 8350 s | 13.05 cm | 868 | 8670 s | 12.62 cm |

# Infiltration Report

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## Kerber Ravine June 2023 -

### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 869 | 8680 s | 12.61 cm | 901 | 9000 s | 12.18 cm | 933 | 9320 s | 11.75 cm | 965 | 9640 s | 11.34 cm |
| 870 | 8690 s | 12.6 cm | 902 | 9010 s | 12.17 cm | 934 | 9330 s | 11.74 cm | 966 | 9650 s | 11.33 cm |
| 871 | 8700 s | 12.58 cm | 903 | 9020 s | 12.15 cm | 935 | 9340 s | 11.73 cm | 967 | 9660 s | 11.32 cm |
| 872 | 8710 s | 12.56 cm | 904 | 9030 s | 12.14 cm | 936 | 9350 s | 11.72 cm | 968 | 9670 s | 11.3 cm |
| 873 | 8720 s | 12.55 cm | 905 | 9040 s | 12.13 cm | 937 | 9360 s | 11.7 cm | 969 | 9680 s | 11.29 cm |
| 874 | 8730 s | 12.54 cm | 906 | 9050 s | 12.12 cm | 938 | 9370 s | 11.69 cm | 970 | 9690 s | 11.27 cm |
| 875 | 8740 s | 12.52 cm | 907 | 9060 s | 12.11 cm | 939 | 9380 s | 11.68 cm | 971 | 9700 s | 11.26 cm |
| 876 | 8750 s | 12.51 cm | 908 | 9070 s | 12.08 cm | 940 | 9390 s | 11.67 cm | 972 | 9710 s | 11.24 cm |
| 877 | 8760 s | 12.5 cm | 909 | 9080 s | 12.07 cm | 941 | 9400 s | 11.65 cm | 973 | 9720 s | 11.23 cm |
| 878 | 8770 s | 12.49 cm | 910 | 9090 s | 12.06 cm | 942 | 9410 s | 11.64 cm | 974 | 9730 s | 11.22 cm |
| 879 | 8780 s | 12.47 cm | 911 | 9100 s | 12.05 cm | 943 | 9420 s | 11.63 cm | 975 | 9740 s | 11.21 cm |
| 880 | 8790 s | 12.46 cm | 912 | 9110 s | 12.04 cm | 944 | 9430 s | 11.62 cm | 976 | 9750 s | 11.19 cm |
| 881 | 8800 s | 12.45 cm | 913 | 9120 s | 12.02 cm | 945 | 9440 s | 11.6 cm | 977 | 9760 s | 11.18 cm |
| 882 | 8810 s | 12.44 cm | 914 | 9130 s | 12.01 cm | 946 | 9450 s | 11.58 cm | 978 | 9770 s | 11.17 cm |
| 883 | 8820 s | 12.41 cm | 915 | 9140 s | 12.0 cm | 947 | 9460 s | 11.57 cm | 979 | 9780 s | 11.16 cm |
| 884 | 8830 s | 12.4 cm | 916 | 9150 s | 11.98 cm | 948 | 9470 s | 11.56 cm | 980 | 9790 s | 11.15 cm |
| 885 | 8840 s | 12.39 cm | 917 | 9160 s | 11.97 cm | 949 | 9480 s | 11.55 cm | 981 | 9800 s | 11.13 cm |
| 886 | 8850 s | 12.38 cm | 918 | 9170 s | 11.96 cm | 950 | 9490 s | 11.53 cm | 982 | 9810 s | 11.11 cm |
| 887 | 8860 s | 12.36 cm | 919 | 9180 s | 11.95 cm | 951 | 9500 s | 11.52 cm | 983 | 9820 s | 11.1 cm |
| 888 | 8870 s | 12.35 cm | 920 | 9190 s | 11.92 cm | 952 | 9510 s | 11.51 cm | 984 | 9830 s | 11.09 cm |
| 889 | 8880 s | 12.34 cm | 921 | 9200 s | 11.91 cm | 953 | 9520 s | 11.5 cm | 985 | 9840 s | 11.07 cm |
| 890 | 8890 s | 12.33 cm | 922 | 9210 s | 11.9 cm | 954 | 9530 s | 11.49 cm | 986 | 9850 s | 11.06 cm |
| 891 | 8900 s | 12.31 cm | 923 | 9220 s | 11.89 cm | 955 | 9540 s | 11.47 cm | 987 | 9860 s | 11.05 cm |
| 892 | 8910 s | 12.3 cm | 924 | 9230 s | 11.88 cm | 956 | 9550 s | 11.46 cm | 988 | 9870 s | 11.04 cm |
| 893 | 8920 s | 12.29 cm | 925 | 9240 s | 11.86 cm | 957 | 9560 s | 11.44 cm | 989 | 9880 s | 11.02 cm |
| 894 | 8930 s | 12.28 cm | 926 | 9250 s | 11.85 cm | 958 | 9570 s | 11.43 cm | 990 | 9890 s | 11.01 cm |
| 895 | 8940 s | 12.25 cm | 927 | 9260 s | 11.84 cm | 959 | 9580 s | 11.41 cm | 991 | 9900 s | 11.0 cm |
| 896 | 8950 s | 12.24 cm | 928 | 9270 s | 11.83 cm | 960 | 9590 s | 11.4 cm | 992 | 9910 s | 10.99 cm |
| 897 | 8960 s | 12.23 cm | 929 | 9280 s | 11.81 cm | 961 | 9600 s | 11.39 cm | 993 | 9920 s | 10.98 cm |
| 898 | 8970 s | 12.22 cm | 930 | 9290 s | 11.8 cm | 962 | 9610 s | 11.38 cm | 994 | 9930 s | 10.96 cm |
| 899 | 8980 s | 12.2 cm | 931 | 9300 s | 11.79 cm | 963 | 9620 s | 11.36 cm | 995 | 9940 s | 10.94 cm |
| 900 | 8990 s | 12.19 cm | 932 | 9310 s | 11.78 cm | 964 | 9630 s | 11.35 cm | 996 | 9950 s | 10.93 cm |

# Infiltration Report

**RPBCWD**

**Kerber Ravine June 2023 -**

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## kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 997 | 9960 s | 10.92 cm | 1029 | 10280 s | 10.5 cm | 1061 | 10600 s | 10.07 cm | 1093 | 10920 s | 9.65 cm |
| 998 | 9970 s | 10.9 cm | 1030 | 10290 s | 10.49 cm | 1062 | 10610 s | 10.06 cm | 1094 | 10930 s | 9.63 cm |
| 999 | 9980 s | 10.89 cm | 1031 | 10300 s | 10.47 cm | 1063 | 10620 s | 10.04 cm | 1095 | 10940 s | 9.61 cm |
| 1000 | 9990 s | 10.88 cm | 1032 | 10310 s | 10.45 cm | 1064 | 10630 s | 10.03 cm | 1096 | 10950 s | 9.6 cm |
| 1001 | 10000 s | 10.87 cm | 1033 | 10320 s | 10.44 cm | 1065 | 10640 s | 10.02 cm | 1097 | 10960 s | 9.59 cm |
| 1002 | 10010 s | 10.85 cm | 1034 | 10330 s | 10.42 cm | 1066 | 10650 s | 10.01 cm | 1098 | 10970 s | 9.58 cm |
| 1003 | 10020 s | 10.84 cm | 1035 | 10340 s | 10.41 cm | 1067 | 10660 s | 9.99 cm | 1099 | 10980 s | 9.57 cm |
| 1004 | 10030 s | 10.83 cm | 1036 | 10350 s | 10.4 cm | 1068 | 10670 s | 9.98 cm | 1100 | 10990 s | 9.55 cm |
| 1005 | 10040 s | 10.82 cm | 1037 | 10360 s | 10.39 cm | 1069 | 10680 s | 9.96 cm | 1101 | 11000 s | 9.54 cm |
| 1006 | 10050 s | 10.8 cm | 1038 | 10370 s | 10.37 cm | 1070 | 10690 s | 9.95 cm | 1102 | 11010 s | 9.53 cm |
| 1007 | 10060 s | 10.78 cm | 1039 | 10380 s | 10.36 cm | 1071 | 10700 s | 9.93 cm | 1103 | 11020 s | 9.52 cm |
| 1008 | 10070 s | 10.77 cm | 1040 | 10390 s | 10.35 cm | 1072 | 10710 s | 9.92 cm | 1104 | 11030 s | 9.5 cm |
| 1009 | 10080 s | 10.76 cm | 1041 | 10400 s | 10.34 cm | 1073 | 10720 s | 9.91 cm | 1105 | 11040 s | 9.49 cm |
| 1010 | 10090 s | 10.74 cm | 1042 | 10410 s | 10.32 cm | 1074 | 10730 s | 9.9 cm | 1106 | 11050 s | 9.47 cm |
| 1011 | 10100 s | 10.73 cm | 1043 | 10420 s | 10.31 cm | 1075 | 10740 s | 9.89 cm | 1107 | 11060 s | 9.46 cm |
| 1012 | 10110 s | 10.72 cm | 1044 | 10430 s | 10.29 cm | 1076 | 10750 s | 9.87 cm | 1108 | 11070 s | 9.44 cm |
| 1013 | 10120 s | 10.71 cm | 1045 | 10440 s | 10.28 cm | 1077 | 10760 s | 9.86 cm | 1109 | 11080 s | 9.43 cm |
| 1014 | 10130 s | 10.69 cm | 1046 | 10450 s | 10.26 cm | 1078 | 10770 s | 9.85 cm | 1110 | 11090 s | 9.42 cm |
| 1015 | 10140 s | 10.68 cm | 1047 | 10460 s | 10.25 cm | 1079 | 10780 s | 9.84 cm | 1111 | 11100 s | 9.41 cm |
| 1016 | 10150 s | 10.67 cm | 1048 | 10470 s | 10.24 cm | 1080 | 10790 s | 9.82 cm | 1112 | 11110 s | 9.39 cm |
| 1017 | 10160 s | 10.66 cm | 1049 | 10480 s | 10.23 cm | 1081 | 10800 s | 9.8 cm | 1113 | 11120 s | 9.38 cm |
| 1018 | 10170 s | 10.64 cm | 1050 | 10490 s | 10.22 cm | 1082 | 10810 s | 9.79 cm | 1114 | 11130 s | 9.37 cm |
| 1019 | 10180 s | 10.62 cm | 1051 | 10500 s | 10.2 cm | 1083 | 10820 s | 9.78 cm | 1115 | 11140 s | 9.36 cm |
| 1020 | 10190 s | 10.61 cm | 1052 | 10510 s | 10.19 cm | 1084 | 10830 s | 9.76 cm | 1116 | 11150 s | 9.34 cm |
| 1021 | 10200 s | 10.6 cm | 1053 | 10520 s | 10.18 cm | 1085 | 10840 s | 9.75 cm | 1117 | 11160 s | 9.33 cm |
| 1022 | 10210 s | 10.58 cm | 1054 | 10530 s | 10.17 cm | 1086 | 10850 s | 9.74 cm | 1118 | 11170 s | 9.31 cm |
| 1023 | 10220 s | 10.57 cm | 1055 | 10540 s | 10.15 cm | 1087 | 10860 s | 9.73 cm | 1119 | 11180 s | 9.3 cm |
| 1024 | 10230 s | 10.56 cm | 1056 | 10550 s | 10.13 cm | 1088 | 10870 s | 9.71 cm | 1120 | 11190 s | 9.28 cm |
| 1025 | 10240 s | 10.55 cm | 1057 | 10560 s | 10.12 cm | 1089 | 10880 s | 9.7 cm | 1121 | 11200 s | 9.27 cm |
| 1026 | 10250 s | 10.53 cm | 1058 | 10570 s | 10.11 cm | 1090 | 10890 s | 9.69 cm | 1122 | 11210 s | 9.26 cm |
| 1027 | 10260 s | 10.52 cm | 1059 | 10580 s | 10.1 cm | 1091 | 10900 s | 9.68 cm | 1123 | 11220 s | 9.25 cm |
| 1028 | 10270 s | 10.51 cm | 1060 | 10590 s | 10.08 cm | 1092 | 10910 s | 9.66 cm | 1124 | 11230 s | 9.23 cm |

# Infiltration Report
## RPBCWD
## Kerber Ravine June 2023 -

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### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1125 | 11240 s | 9.22 cm | 1157 | 11560 s | 8.79 cm | 1189 | 11880 s | 8.38 cm | 1221 | 12200 s | 7.96 cm |
| 1126 | 11250 s | 9.21 cm | 1158 | 11570 s | 8.78 cm | 1190 | 11890 s | 8.37 cm | 1222 | 12210 s | 7.94 cm |
| 1127 | 11260 s | 9.2 cm | 1159 | 11580 s | 8.77 cm | 1191 | 11900 s | 8.36 cm | 1223 | 12220 s | 7.93 cm |
| 1128 | 11270 s | 9.19 cm | 1160 | 11590 s | 8.76 cm | 1192 | 11910 s | 8.34 cm | 1224 | 12230 s | 7.92 cm |
| 1129 | 11280 s | 9.17 cm | 1161 | 11600 s | 8.74 cm | 1193 | 11920 s | 8.32 cm | 1225 | 12240 s | 7.91 cm |
| 1130 | 11290 s | 9.16 cm | 1162 | 11610 s | 8.73 cm | 1194 | 11930 s | 8.31 cm | 1226 | 12250 s | 7.89 cm |
| 1131 | 11300 s | 9.14 cm | 1163 | 11620 s | 8.72 cm | 1195 | 11940 s | 8.3 cm | 1227 | 12260 s | 7.88 cm |
| 1132 | 11310 s | 9.13 cm | 1164 | 11630 s | 8.71 cm | 1196 | 11950 s | 8.28 cm | 1228 | 12270 s | 7.87 cm |
| 1133 | 11320 s | 9.11 cm | 1165 | 11640 s | 8.69 cm | 1197 | 11960 s | 8.27 cm | 1229 | 12280 s | 7.86 cm |
| 1134 | 11330 s | 9.1 cm | 1166 | 11650 s | 8.68 cm | 1198 | 11970 s | 8.26 cm | 1230 | 12290 s | 7.85 cm |
| 1135 | 11340 s | 9.09 cm | 1167 | 11660 s | 8.67 cm | 1199 | 11980 s | 8.25 cm | 1231 | 12300 s | 7.82 cm |
| 1136 | 11350 s | 9.07 cm | 1168 | 11670 s | 8.65 cm | 1200 | 11990 s | 8.23 cm | 1232 | 12310 s | 7.81 cm |
| 1137 | 11360 s | 9.06 cm | 1169 | 11680 s | 8.64 cm | 1201 | 12000 s | 8.22 cm | 1233 | 12320 s | 7.8 cm |
| 1138 | 11370 s | 9.05 cm | 1170 | 11690 s | 8.62 cm | 1202 | 12010 s | 8.21 cm | 1234 | 12330 s | 7.79 cm |
| 1139 | 11380 s | 9.04 cm | 1171 | 11700 s | 8.61 cm | 1203 | 12020 s | 8.2 cm | 1235 | 12340 s | 7.77 cm |
| 1140 | 11390 s | 9.03 cm | 1172 | 11710 s | 8.6 cm | 1204 | 12030 s | 8.18 cm | 1236 | 12350 s | 7.76 cm |
| 1141 | 11400 s | 9.01 cm | 1173 | 11720 s | 8.59 cm | 1205 | 12040 s | 8.16 cm | 1237 | 12360 s | 7.75 cm |
| 1142 | 11410 s | 9.0 cm | 1174 | 11730 s | 8.57 cm | 1206 | 12050 s | 8.15 cm | 1238 | 12370 s | 7.74 cm |
| 1143 | 11420 s | 8.98 cm | 1175 | 11740 s | 8.56 cm | 1207 | 12060 s | 8.14 cm | 1239 | 12380 s | 7.73 cm |
| 1144 | 11430 s | 8.97 cm | 1176 | 11750 s | 8.55 cm | 1208 | 12070 s | 8.13 cm | 1240 | 12390 s | 7.71 cm |
| 1145 | 11440 s | 8.95 cm | 1177 | 11760 s | 8.54 cm | 1209 | 12080 s | 8.11 cm | 1241 | 12400 s | 7.7 cm |
| 1146 | 11450 s | 8.94 cm | 1178 | 11770 s | 8.53 cm | 1210 | 12090 s | 8.1 cm | 1242 | 12410 s | 7.69 cm |
| 1147 | 11460 s | 8.93 cm | 1179 | 11780 s | 8.51 cm | 1211 | 12100 s | 8.09 cm | 1243 | 12420 s | 7.67 cm |
| 1148 | 11470 s | 8.92 cm | 1180 | 11790 s | 8.49 cm | 1212 | 12110 s | 8.08 cm | 1244 | 12430 s | 7.65 cm |
| 1149 | 11480 s | 8.9 cm | 1181 | 11800 s | 8.48 cm | 1213 | 12120 s | 8.06 cm | 1245 | 12440 s | 7.64 cm |
| 1150 | 11490 s | 8.89 cm | 1182 | 11810 s | 8.47 cm | 1214 | 12130 s | 8.05 cm | 1246 | 12450 s | 7.63 cm |
| 1151 | 11500 s | 8.88 cm | 1183 | 11820 s | 8.45 cm | 1215 | 12140 s | 8.04 cm | 1247 | 12460 s | 7.62 cm |
| 1152 | 11510 s | 8.87 cm | 1184 | 11830 s | 8.44 cm | 1216 | 12150 s | 8.03 cm | 1248 | 12470 s | 7.6 cm |
| 1153 | 11520 s | 8.85 cm | 1185 | 11840 s | 8.43 cm | 1217 | 12160 s | 8.02 cm | 1249 | 12480 s | 7.59 cm |
| 1154 | 11530 s | 8.84 cm | 1186 | 11850 s | 8.42 cm | 1218 | 12170 s | 7.99 cm | 1250 | 12490 s | 7.58 cm |
| 1155 | 11540 s | 8.83 cm | 1187 | 11860 s | 8.41 cm | 1219 | 12180 s | 7.98 cm | 1251 | 12500 s | 7.57 cm |
| 1156 | 11550 s | 8.81 cm | 1188 | 11870 s | 8.39 cm | 1220 | 12190 s | 7.97 cm | 1252 | 12510 s | 7.55 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1253 | 12520 s | 7.54 cm | 1285 | 12840 s | 7.13 cm | 1317 | 13160 s | 6.73 cm | 1349 | 13480 s | 6.31 cm |
| 1254 | 12530 s | 7.53 cm | 1286 | 12850 s | 7.12 cm | 1318 | 13170 s | 6.72 cm | 1350 | 13490 s | 6.3 cm |
| 1255 | 12540 s | 7.52 cm | 1287 | 12860 s | 7.11 cm | 1319 | 13180 s | 6.7 cm | 1351 | 13500 s | 6.29 cm |
| 1256 | 12550 s | 7.5 cm | 1288 | 12870 s | 7.09 cm | 1320 | 13190 s | 6.68 cm | 1352 | 13510 s | 6.28 cm |
| 1257 | 12560 s | 7.49 cm | 1289 | 12880 s | 7.08 cm | 1321 | 13200 s | 6.67 cm | 1353 | 13520 s | 6.26 cm |
| 1258 | 12570 s | 7.47 cm | 1290 | 12890 s | 7.07 cm | 1322 | 13210 s | 6.66 cm | 1354 | 13530 s | 6.25 cm |
| 1259 | 12580 s | 7.46 cm | 1291 | 12900 s | 7.06 cm | 1323 | 13220 s | 6.64 cm | 1355 | 13540 s | 6.24 cm |
| 1260 | 12590 s | 7.45 cm | 1292 | 12910 s | 7.05 cm | 1324 | 13230 s | 6.63 cm | 1356 | 13550 s | 6.23 cm |
| 1261 | 12600 s | 7.44 cm | 1293 | 12920 s | 7.03 cm | 1325 | 13240 s | 6.62 cm | 1357 | 13560 s | 6.22 cm |
| 1262 | 12610 s | 7.43 cm | 1294 | 12930 s | 7.01 cm | 1326 | 13250 s | 6.61 cm | 1358 | 13570 s | 6.21 cm |
| 1263 | 12620 s | 7.41 cm | 1295 | 12940 s | 7.0 cm | 1327 | 13260 s | 6.6 cm | 1359 | 13580 s | 6.18 cm |
| 1264 | 12630 s | 7.4 cm | 1296 | 12950 s | 6.99 cm | 1328 | 13270 s | 6.58 cm | 1360 | 13590 s | 6.17 cm |
| 1265 | 12640 s | 7.39 cm | 1297 | 12960 s | 6.98 cm | 1329 | 13280 s | 6.57 cm | 1361 | 13600 s | 6.16 cm |
| 1266 | 12650 s | 7.38 cm | 1298 | 12970 s | 6.96 cm | 1330 | 13290 s | 6.56 cm | 1362 | 13610 s | 6.15 cm |
| 1267 | 12660 s | 7.37 cm | 1299 | 12980 s | 6.95 cm | 1331 | 13300 s | 6.55 cm | 1363 | 13620 s | 6.13 cm |
| 1268 | 12670 s | 7.34 cm | 1300 | 12990 s | 6.94 cm | 1332 | 13310 s | 6.54 cm | 1364 | 13630 s | 6.12 cm |
| 1269 | 12680 s | 7.33 cm | 1301 | 13000 s | 6.93 cm | 1333 | 13320 s | 6.51 cm | 1365 | 13640 s | 6.11 cm |
| 1270 | 12690 s | 7.32 cm | 1302 | 13010 s | 6.92 cm | 1334 | 13330 s | 6.5 cm | 1366 | 13650 s | 6.1 cm |
| 1271 | 12700 s | 7.31 cm | 1303 | 13020 s | 6.91 cm | 1335 | 13340 s | 6.49 cm | 1367 | 13660 s | 6.09 cm |
| 1272 | 12710 s | 7.29 cm | 1304 | 13030 s | 6.89 cm | 1336 | 13350 s | 6.48 cm | 1368 | 13670 s | 6.08 cm |
| 1273 | 12720 s | 7.28 cm | 1305 | 13040 s | 6.88 cm | 1337 | 13360 s | 6.47 cm | 1369 | 13680 s | 6.06 cm |
| 1274 | 12730 s | 7.27 cm | 1306 | 13050 s | 6.87 cm | 1338 | 13370 s | 6.45 cm | 1370 | 13690 s | 6.05 cm |
| 1275 | 12740 s | 7.26 cm | 1307 | 13060 s | 6.85 cm | 1339 | 13380 s | 6.44 cm | 1371 | 13700 s | 6.03 cm |
| 1276 | 12750 s | 7.25 cm | 1308 | 13070 s | 6.84 cm | 1340 | 13390 s | 6.43 cm | 1372 | 13710 s | 6.02 cm |
| 1277 | 12760 s | 7.24 cm | 1309 | 13080 s | 6.82 cm | 1341 | 13400 s | 6.42 cm | 1373 | 13720 s | 6.01 cm |
| 1278 | 12770 s | 7.22 cm | 1310 | 13090 s | 6.81 cm | 1342 | 13410 s | 6.41 cm | 1374 | 13730 s | 5.99 cm |
| 1279 | 12780 s | 7.21 cm | 1311 | 13100 s | 6.8 cm | 1343 | 13420 s | 6.39 cm | 1375 | 13740 s | 5.98 cm |
| 1280 | 12790 s | 7.2 cm | 1312 | 13110 s | 6.79 cm | 1344 | 13430 s | 6.38 cm | 1376 | 13750 s | 5.97 cm |
| 1281 | 12800 s | 7.18 cm | 1313 | 13120 s | 6.77 cm | 1345 | 13440 s | 6.36 cm | 1377 | 13760 s | 5.96 cm |
| 1282 | 12810 s | 7.17 cm | 1314 | 13130 s | 6.76 cm | 1346 | 13450 s | 6.35 cm | 1378 | 13770 s | 5.95 cm |
| 1283 | 12820 s | 7.15 cm | 1315 | 13140 s | 6.75 cm | 1347 | 13460 s | 6.34 cm | 1379 | 13780 s | 5.93 cm |
| 1284 | 12830 s | 7.14 cm | 1316 | 13150 s | 6.74 cm | 1348 | 13470 s | 6.33 cm | 1380 | 13790 s | 5.92 cm |

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## RPBCWD

## Kerber Ravine June 2023 -

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### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|
| 1381 | 13800 s | 5.91 cm | 1413 | 14120 s | 5.51 cm | 1445 | 14440 s | 5.13 cm |
| 1382 | 13810 s | 5.9 cm | 1414 | 14130 s | 5.5 cm | 1446 | 14450 s | 5.12 cm |
| 1383 | 13820 s | 5.89 cm | 1415 | 14140 s | 5.49 cm | 1447 | 14460 s | 5.1 cm |
| 1384 | 13830 s | 5.86 cm | 1416 | 14150 s | 5.48 cm | 1448 | 14470 s | 5.09 cm |
| 1385 | 13840 s | 5.85 cm | 1417 | 14160 s | 5.47 cm | 1449 | 14480 s | 5.08 cm |
| 1386 | 13850 s | 5.84 cm | 1418 | 14170 s | 5.46 cm | 1450 | 14490 s | 5.07 cm |
| 1387 | 13860 s | 5.83 cm | 1419 | 14180 s | 5.45 cm | 1451 | 14500 s | 5.05 cm |
| 1388 | 13870 s | 5.82 cm | 1420 | 14190 s | 5.43 cm | 1452 | 14510 s | 5.04 cm |
| 1389 | 13880 s | 5.81 cm | 1421 | 14200 s | 5.42 cm | 1453 | 14520 s | 5.02 cm |
| 1390 | 13890 s | 5.79 cm | 1422 | 14210 s | 5.41 cm | 1454 | 14530 s | 5.01 cm |
| 1391 | 13900 s | 5.78 cm | 1423 | 14220 s | 5.4 cm | 1455 | 14540 s | 5.0 cm |
| 1392 | 13910 s | 5.77 cm | 1424 | 14230 s | 5.39 cm | 1456 | 14550 s | 4.99 cm |
| 1393 | 13920 s | 5.76 cm | 1425 | 14240 s | 5.37 cm | 1457 | 14560 s | 4.98 cm |
| 1394 | 13930 s | 5.75 cm | 1426 | 14250 s | 5.35 cm | 1458 | 14570 s | 4.97 cm |
| 1395 | 13940 s | 5.74 cm | 1427 | 14260 s | 5.34 cm | 1459 | 14580 s | 4.95 cm |
| 1396 | 13950 s | 5.73 cm | 1428 | 14270 s | 5.33 cm | 1460 | 14590 s | 4.94 cm |
| 1397 | 13960 s | 5.72 cm | 1429 | 14280 s | 5.32 cm | 1461 | 14600 s | 4.93 cm |
| 1398 | 13970 s | 5.69 cm | 1430 | 14290 s | 5.31 cm | 1462 | 14610 s | 4.92 cm |
| 1399 | 13980 s | 5.68 cm | 1431 | 14300 s | 5.3 cm | | | |
| 1400 | 13990 s | 5.67 cm | 1432 | 14310 s | 5.29 cm | | | |
| 1401 | 14000 s | 5.66 cm | 1433 | 14320 s | 5.27 cm | | | |
| 1402 | 14010 s | 5.65 cm | 1434 | 14330 s | 5.26 cm | | | |
| 1403 | 14020 s | 5.64 cm | 1435 | 14340 s | 5.25 cm | | | |
| 1404 | 14030 s | 5.63 cm | 1436 | 14350 s | 5.24 cm | | | |
| 1405 | 14040 s | 5.61 cm | 1437 | 14360 s | 5.23 cm | | | |
| 1406 | 14050 s | 5.6 cm | 1438 | 14370 s | 5.21 cm | | | |
| 1407 | 14060 s | 5.59 cm | 1439 | 14380 s | 5.2 cm | | | |
| 1408 | 14070 s | 5.58 cm | 1440 | 14390 s | 5.18 cm | | | |
| 1409 | 14080 s | 5.57 cm | 1441 | 14400 s | 5.17 cm | | | |
| 1410 | 14090 s | 5.56 cm | 1442 | 14410 s | 5.16 cm | | | |
| 1411 | 14100 s | 5.54 cm | 1443 | 14420 s | 5.15 cm | | | |
| 1412 | 14110 s | 5.53 cm | 1444 | 14430 s | 5.14 cm | | | |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

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### kerber c

| | |
|---|---|
| Date | 6/14/2023 |
| Time | 2:03 PM |
| Latitude | 44.873013 |
| Longitude | -93.533853 |
| Initial Volumetric Moisture | 80.00 % |
| Final Volumetric Moisture | 81.00 % |
| Cylinder Size | 3 Liter |

### kerber c Results

| | |
|---|---|
| Map Pin # | 3 |
| Test Number | 24756 |
| Ksat - mm/hr | 73 |
| Ksat - in/hr | 2.88 |
| Capillary Pressure C mm | -68.6 |
| RMS Error of Regression | 67 |
| Normalized RMS | 1.8% |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 s | 30.59 cm | 26 | 247 s | 27.51 cm | 51 | 497 s | 24.97 cm | 76 | 747 s | 22.84 cm |
| 2 | 7 s | 30.43 cm | 27 | 257 s | 27.4 cm | 52 | 507 s | 24.87 cm | 77 | 757 s | 22.77 cm |
| 3 | 17 s | 30.28 cm | 28 | 267 s | 27.28 cm | 53 | 517 s | 24.79 cm | 78 | 767 s | 22.68 cm |
| 4 | 27 s | 30.15 cm | 29 | 277 s | 27.17 cm | 54 | 527 s | 24.69 cm | 79 | 777 s | 22.61 cm |
| 5 | 37 s | 30.01 cm | 30 | 287 s | 27.07 cm | 55 | 537 s | 24.61 cm | 80 | 787 s | 22.53 cm |
| 6 | 47 s | 29.87 cm | 31 | 297 s | 26.96 cm | 56 | 547 s | 24.51 cm | 81 | 797 s | 22.46 cm |
| 7 | 57 s | 29.74 cm | 32 | 307 s | 26.86 cm | 57 | 557 s | 24.43 cm | 82 | 807 s | 22.38 cm |
| 8 | 67 s | 29.61 cm | 33 | 317 s | 26.75 cm | 58 | 567 s | 24.33 cm | 83 | 817 s | 22.3 cm |
| 9 | 77 s | 29.5 cm | 34 | 327 s | 26.65 cm | 59 | 577 s | 24.25 cm | 84 | 827 s | 22.22 cm |
| 10 | 87 s | 29.37 cm | 35 | 337 s | 26.55 cm | 60 | 587 s | 24.16 cm | 85 | 837 s | 22.15 cm |
| 11 | 97 s | 29.25 cm | 36 | 347 s | 26.44 cm | 61 | 597 s | 24.07 cm | 86 | 847 s | 22.07 cm |
| 12 | 107 s | 29.12 cm | 37 | 357 s | 26.34 cm | 62 | 607 s | 23.98 cm | 87 | 857 s | 22.0 cm |
| 13 | 117 s | 29.01 cm | 38 | 367 s | 26.24 cm | 63 | 617 s | 23.89 cm | 88 | 867 s | 21.92 cm |
| 14 | 127 s | 28.88 cm | 39 | 377 s | 26.14 cm | 64 | 627 s | 23.81 cm | 89 | 877 s | 21.86 cm |
| 15 | 137 s | 28.76 cm | 40 | 387 s | 26.04 cm | 65 | 637 s | 23.72 cm | 90 | 887 s | 21.79 cm |
| 16 | 147 s | 28.64 cm | 41 | 397 s | 25.93 cm | 66 | 647 s | 23.64 cm | 91 | 897 s | 21.71 cm |
| 17 | 157 s | 28.53 cm | 42 | 407 s | 25.83 cm | 67 | 657 s | 23.55 cm | 92 | 907 s | 21.64 cm |
| 18 | 167 s | 28.41 cm | 43 | 417 s | 25.74 cm | 68 | 667 s | 23.47 cm | 93 | 917 s | 21.56 cm |
| 19 | 177 s | 28.29 cm | 44 | 427 s | 25.64 cm | 69 | 677 s | 23.38 cm | 94 | 927 s | 21.5 cm |
| 20 | 187 s | 28.18 cm | 45 | 437 s | 25.55 cm | 70 | 687 s | 23.3 cm | 95 | 937 s | 21.42 cm |
| 21 | 197 s | 28.07 cm | 46 | 447 s | 25.45 cm | 71 | 697 s | 23.22 cm | 96 | 947 s | 21.35 cm |
| 22 | 207 s | 27.95 cm | 47 | 457 s | 25.35 cm | 72 | 707 s | 23.15 cm | 97 | 957 s | 21.27 cm |
| 23 | 217 s | 27.84 cm | 48 | 467 s | 25.26 cm | 73 | 717 s | 23.06 cm | 98 | 967 s | 21.21 cm |
| 24 | 227 s | 27.73 cm | 49 | 477 s | 25.16 cm | 74 | 727 s | 22.99 cm | 99 | 977 s | 21.14 cm |
| 25 | 237 s | 27.61 cm | 50 | 487 s | 25.07 cm | 75 | 737 s | 22.91 cm | 100 | 987 s | 21.07 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

Upstream Technologies
651.237.5123

### kerber c Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | 997 s | 21.0 cm | 133 | 1317 s | 18.86 cm | 165 | 1637 s | 16.91 cm | 197 | 1957 s | 15.1 cm |
| 102 | 1007 s | 20.92 cm | 134 | 1327 s | 18.79 cm | 166 | 1647 s | 16.86 cm | 198 | 1967 s | 15.03 cm |
| 103 | 1017 s | 20.86 cm | 135 | 1337 s | 18.73 cm | 167 | 1657 s | 16.79 cm | 199 | 1977 s | 14.98 cm |
| 104 | 1027 s | 20.78 cm | 136 | 1347 s | 18.67 cm | 168 | 1667 s | 16.73 cm | 200 | 1987 s | 14.93 cm |
| 105 | 1037 s | 20.72 cm | 137 | 1357 s | 18.6 cm | 169 | 1677 s | 16.67 cm | 201 | 1997 s | 14.87 cm |
| 106 | 1047 s | 20.65 cm | 138 | 1367 s | 18.54 cm | 170 | 1687 s | 16.62 cm | 202 | 2007 s | 14.82 cm |
| 107 | 1057 s | 20.58 cm | 139 | 1377 s | 18.47 cm | 171 | 1697 s | 16.56 cm | 203 | 2017 s | 14.77 cm |
| 108 | 1067 s | 20.51 cm | 140 | 1387 s | 18.41 cm | 172 | 1707 s | 16.5 cm | 204 | 2027 s | 14.71 cm |
| 109 | 1077 s | 20.44 cm | 141 | 1397 s | 18.35 cm | 173 | 1717 s | 16.44 cm | 205 | 2037 s | 14.66 cm |
| 110 | 1087 s | 20.37 cm | 142 | 1407 s | 18.28 cm | 174 | 1727 s | 16.39 cm | 206 | 2047 s | 14.61 cm |
| 111 | 1097 s | 20.31 cm | 143 | 1417 s | 18.23 cm | 175 | 1737 s | 16.32 cm | 207 | 2057 s | 14.55 cm |
| 112 | 1107 s | 20.23 cm | 144 | 1427 s | 18.17 cm | 176 | 1747 s | 16.27 cm | 208 | 2067 s | 14.5 cm |
| 113 | 1117 s | 20.17 cm | 145 | 1437 s | 18.1 cm | 177 | 1757 s | 16.22 cm | 209 | 2077 s | 14.45 cm |
| 114 | 1127 s | 20.1 cm | 146 | 1447 s | 18.04 cm | 178 | 1767 s | 16.15 cm | 210 | 2087 s | 14.39 cm |
| 115 | 1137 s | 20.04 cm | 147 | 1457 s | 17.97 cm | 179 | 1777 s | 16.1 cm | 211 | 2097 s | 14.34 cm |
| 116 | 1147 s | 19.96 cm | 148 | 1467 s | 17.91 cm | 180 | 1787 s | 16.05 cm | 212 | 2107 s | 14.29 cm |
| 117 | 1157 s | 19.9 cm | 149 | 1477 s | 17.86 cm | 181 | 1797 s | 15.98 cm | 213 | 2117 s | 14.24 cm |
| 118 | 1167 s | 19.83 cm | 150 | 1487 s | 17.79 cm | 182 | 1807 s | 15.93 cm | 214 | 2127 s | 14.17 cm |
| 119 | 1177 s | 19.76 cm | 151 | 1497 s | 17.73 cm | 183 | 1817 s | 15.88 cm | 215 | 2137 s | 14.12 cm |
| 120 | 1187 s | 19.7 cm | 152 | 1507 s | 17.66 cm | 184 | 1827 s | 15.81 cm | 216 | 2147 s | 14.08 cm |
| 121 | 1197 s | 19.63 cm | 153 | 1517 s | 17.61 cm | 185 | 1837 s | 15.76 cm | 217 | 2157 s | 14.01 cm |
| 122 | 1207 s | 19.57 cm | 154 | 1527 s | 17.55 cm | 186 | 1847 s | 15.7 cm | 218 | 2167 s | 13.97 cm |
| 123 | 1217 s | 19.51 cm | 155 | 1537 s | 17.48 cm | 187 | 1857 s | 15.65 cm | 219 | 2177 s | 13.92 cm |
| 124 | 1227 s | 19.43 cm | 156 | 1547 s | 17.43 cm | 188 | 1867 s | 15.59 cm | 220 | 2187 s | 13.86 cm |
| 125 | 1237 s | 19.37 cm | 157 | 1557 s | 17.37 cm | 189 | 1877 s | 15.53 cm | 221 | 2197 s | 13.81 cm |
| 126 | 1247 s | 19.3 cm | 158 | 1567 s | 17.31 cm | 190 | 1887 s | 15.48 cm | 222 | 2207 s | 13.76 cm |
| 127 | 1257 s | 19.24 cm | 159 | 1577 s | 17.25 cm | 191 | 1897 s | 15.43 cm | 223 | 2217 s | 13.7 cm |
| 128 | 1267 s | 19.18 cm | 160 | 1587 s | 17.19 cm | 192 | 1907 s | 15.36 cm | 224 | 2227 s | 13.65 cm |
| 129 | 1277 s | 19.11 cm | 161 | 1597 s | 17.13 cm | 193 | 1917 s | 15.31 cm | 225 | 2237 s | 13.6 cm |
| 130 | 1287 s | 19.05 cm | 162 | 1607 s | 17.07 cm | 194 | 1927 s | 15.26 cm | 226 | 2247 s | 13.54 cm |
| 131 | 1297 s | 18.99 cm | 163 | 1617 s | 17.01 cm | 195 | 1937 s | 15.2 cm | 227 | 2257 s | 13.49 cm |
| 132 | 1307 s | 18.92 cm | 164 | 1627 s | 16.95 cm | 196 | 1947 s | 15.15 cm | 228 | 2267 s | 13.44 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -



### kerber c Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 229 | 2277 s | 13.38 cm | 261 | 2597 s | 11.79 cm | 293 | 2917 s | 10.27 cm | 325 | 3237 s | 8.81 cm |
| 230 | 2287 s | 13.34 cm | 262 | 2607 s | 11.74 cm | 294 | 2927 s | 10.22 cm | 326 | 3247 s | 8.77 cm |
| 231 | 2297 s | 13.29 cm | 263 | 2617 s | 11.69 cm | 295 | 2937 s | 10.18 cm | 327 | 3257 s | 8.73 cm |
| 232 | 2307 s | 13.23 cm | 264 | 2627 s | 11.64 cm | 296 | 2947 s | 10.13 cm | 328 | 3267 s | 8.68 cm |
| 233 | 2317 s | 13.18 cm | 265 | 2637 s | 11.59 cm | 297 | 2957 s | 10.08 cm | 329 | 3277 s | 8.63 cm |
| 234 | 2327 s | 13.13 cm | 266 | 2647 s | 11.55 cm | 298 | 2967 s | 10.04 cm | 330 | 3287 s | 8.59 cm |
| 235 | 2337 s | 13.09 cm | 267 | 2657 s | 11.5 cm | 299 | 2977 s | 10.0 cm | 331 | 3297 s | 8.55 cm |
| 236 | 2347 s | 13.03 cm | 268 | 2667 s | 11.46 cm | 300 | 2987 s | 9.94 cm | 332 | 3307 s | 8.51 cm |
| 237 | 2357 s | 12.98 cm | 269 | 2677 s | 11.4 cm | 301 | 2997 s | 9.9 cm | 333 | 3317 s | 8.46 cm |
| 238 | 2367 s | 12.93 cm | 270 | 2687 s | 11.35 cm | 302 | 3007 s | 9.86 cm | 334 | 3327 s | 8.42 cm |
| 239 | 2377 s | 12.88 cm | 271 | 2697 s | 11.31 cm | 303 | 3017 s | 9.82 cm | 335 | 3337 s | 8.38 cm |
| 240 | 2387 s | 12.83 cm | 272 | 2707 s | 11.26 cm | 304 | 3027 s | 9.76 cm | 336 | 3347 s | 8.34 cm |
| 241 | 2397 s | 12.78 cm | 273 | 2717 s | 11.21 cm | 305 | 3037 s | 9.72 cm | 337 | 3357 s | 8.29 cm |
| 242 | 2407 s | 12.72 cm | 274 | 2727 s | 11.17 cm | 306 | 3047 s | 9.68 cm | 338 | 3367 s | 8.25 cm |
| 243 | 2417 s | 12.68 cm | 275 | 2737 s | 11.11 cm | 307 | 3057 s | 9.62 cm | 339 | 3377 s | 8.2 cm |
| 244 | 2427 s | 12.63 cm | 276 | 2747 s | 11.07 cm | 308 | 3067 s | 9.58 cm | 340 | 3387 s | 8.15 cm |
| 245 | 2437 s | 12.57 cm | 277 | 2757 s | 11.02 cm | 309 | 3077 s | 9.54 cm | 341 | 3397 s | 8.11 cm |
| 246 | 2447 s | 12.53 cm | 278 | 2767 s | 10.98 cm | 310 | 3087 s | 9.5 cm | 342 | 3407 s | 8.07 cm |
| 247 | 2457 s | 12.48 cm | 279 | 2777 s | 10.92 cm | 311 | 3097 s | 9.44 cm | 343 | 3417 s | 8.03 cm |
| 248 | 2467 s | 12.42 cm | 280 | 2787 s | 10.88 cm | 312 | 3107 s | 9.4 cm | 344 | 3427 s | 7.98 cm |
| 249 | 2477 s | 12.38 cm | 281 | 2797 s | 10.84 cm | 313 | 3117 s | 9.36 cm | 345 | 3437 s | 7.94 cm |
| 250 | 2487 s | 12.33 cm | 282 | 2807 s | 10.78 cm | 314 | 3127 s | 9.31 cm | 346 | 3447 s | 7.9 cm |
| 251 | 2497 s | 12.28 cm | 283 | 2817 s | 10.74 cm | 315 | 3137 s | 9.28 cm | 347 | 3457 s | 7.86 cm |
| 252 | 2507 s | 12.22 cm | 284 | 2827 s | 10.69 cm | 316 | 3147 s | 9.23 cm | 348 | 3467 s | 7.81 cm |
| 253 | 2517 s | 12.17 cm | 285 | 2837 s | 10.65 cm | 317 | 3157 s | 9.17 cm | 349 | 3477 s | 7.77 cm |
| 254 | 2527 s | 12.13 cm | 286 | 2847 s | 10.59 cm | 318 | 3167 s | 9.12 cm | 350 | 3487 s | 7.73 cm |
| 255 | 2537 s | 12.07 cm | 287 | 2857 s | 10.55 cm | 319 | 3177 s | 9.08 cm | 351 | 3497 s | 7.69 cm |
| 256 | 2547 s | 12.03 cm | 288 | 2867 s | 10.51 cm | 320 | 3187 s | 9.04 cm | 352 | 3507 s | 7.64 cm |
| 257 | 2557 s | 11.98 cm | 289 | 2877 s | 10.45 cm | 321 | 3197 s | 8.98 cm | 353 | 3517 s | 7.6 cm |
| 258 | 2567 s | 11.93 cm | 290 | 2887 s | 10.41 cm | 322 | 3207 s | 8.94 cm | 354 | 3527 s | 7.56 cm |
| 259 | 2577 s | 11.88 cm | 291 | 2897 s | 10.36 cm | 323 | 3217 s | 8.9 cm | 355 | 3537 s | 7.52 cm |
| 260 | 2587 s | 11.84 cm | 292 | 2907 s | 10.32 cm | 324 | 3227 s | 8.86 cm | 356 | 3547 s | 7.47 cm |

# Infiltration Report

## RPBCWD

## Kerber Ravine June 2023 -

MPD INFILTROMETER
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Upstream Technologies
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### kerber c Readings continued

| # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|
| 357 | 3557 s | 7.43 cm | 389 | 3877 s | 6.1 cm |
| 358 | 3567 s | 7.39 cm | 390 | 3887 s | 6.06 cm |
| 359 | 3577 s | 7.34 cm | 391 | 3897 s | 6.01 cm |
| 360 | 3587 s | 7.31 cm | 392 | 3907 s | 5.97 cm |
| 361 | 3597 s | 7.26 cm | 393 | 3917 s | 5.93 cm |
| 362 | 3607 s | 7.23 cm | 394 | 3927 s | 5.89 cm |
| 363 | 3617 s | 7.18 cm | 395 | 3937 s | 5.84 cm |
| 364 | 3627 s | 7.14 cm | 396 | 3947 s | 5.79 cm |
| 365 | 3637 s | 7.1 cm | 397 | 3957 s | 5.75 cm |
| 366 | 3647 s | 7.06 cm | 398 | 3967 s | 5.7 cm |
| 367 | 3657 s | 7.01 cm | 399 | 3977 s | 5.66 cm |
| 368 | 3667 s | 6.97 cm | 400 | 3987 s | 5.61 cm |
| 369 | 3677 s | 6.93 cm | 401 | 3997 s | 5.57 cm |
| 370 | 3687 s | 6.89 cm | 402 | 4007 s | 5.51 cm |
| 371 | 3697 s | 6.84 cm | 403 | 4017 s | 5.47 cm |
| 372 | 3707 s | 6.8 cm | 404 | 4027 s | 5.42 cm |
| 373 | 3717 s | 6.76 cm | 405 | 4037 s | 5.36 cm |
| 374 | 3727 s | 6.73 cm | 406 | 4047 s | 5.31 cm |
| 375 | 3737 s | 6.68 cm | 407 | 4057 s | 5.27 cm |
| 376 | 3747 s | 6.64 cm | 408 | 4067 s | 5.21 cm |
| 377 | 3757 s | 6.6 cm | 409 | 4077 s | 5.16 cm |
| 378 | 3767 s | 6.56 cm | 410 | 4087 s | 5.11 cm |
| 379 | 3777 s | 6.51 cm | 411 | 4097 s | 5.04 cm |
| 380 | 3787 s | 6.47 cm | 412 | 4107 s | 4.99 cm |
| 381 | 3797 s | 6.44 cm | | | |
| 382 | 3807 s | 6.4 cm | | | |
| 383 | 3817 s | 6.35 cm | | | |
| 384 | 3827 s | 6.31 cm | | | |
| 385 | 3837 s | 6.27 cm | | | |
| 386 | 3847 s | 6.23 cm | | | |
| 387 | 3857 s | 6.18 cm | | | |
| 388 | 3867 s | 6.14 cm | | | |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP - Kerber - Kerber Pond

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## $K_{sat}$ best-fit site average: 15 mm/hr or 0.574 in/hr

### *GPS Infiltration Test Site Map*


| Map Pin # | Test # | Test Name | Ksat (mm/hr) | Ksat (in/hr) | C (mm) | RMS Error of Regression (s) | Normalized RMS |
|---|---|---|---|---|---|---|---|
| 1 | 24754 | kerber a | 0.13 | 0.005 | -11,168.0 | 147 | 0.7% |
| 2 | 24755 | kerber b | 24 | 0.961 | -23.6 | 367 | 2.8% |
| 3 | 24756 | kerber c | 73 | 2.88 | -68.6 | 67 | 1.8% |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP - Kerber - Kerber Pond

This report summarizes the results of a set of Modified Philip Dunne (MPD) Infiltrometer tests performed at the above referenced site. RPBCWD personnel performed the field tests. The software used to compute saturated hydraulic conductivity ($K_{sat}$) and generate this report assumes that the field personnel used infiltrometers manufactured by Upstream Technologies Inc. and followed the procedures outlined in “Manual – Modified Philip - Dunne Infiltrometer” by Ahmed, Gulliver, and Nieber.

The following paragraphs describe the individual tests, input values used in the analysis, and methods used to compute the $K_{sat}$ value.

After individual $K_{sat}$ values were calculated, the method used to determine the overall site $K_{sat}$value ($K_{best\text{-}fit}$) is described in "Effective Saturated Hydraulic Conductivity of an Infiltration-Based Stormwater Control Measure" by Weiss and Gulliver 2015, "A relationship to more consistently and accurately predict the best-fit value of saturated hydraulic conductivity used a weighted sum of 0.32 times the arithmetic mean and 0.68 times the geometric mean."

### METHOD USED TO COMPUTE $K_{sat}$

The MPD Infiltrometer software uses the following procedure described in "The Comparison of Infiltration Devices and Modification of the Philip-Dunne Permeameter for the Assessment of Rain Gardens" by Rebecca Nestigen, University of Minnesota, November 2007.

The steps are as follows:

1. For each measurement of head, use the following equation to find the corresponding distance to the sharp wetting front.

$$[H_0 - H(t)]r_1^2 = \frac{\theta_1 - \theta_2}{3}[2[R(t)]^3 + 3[R(t)]^2 L_{max} - L_{max}^3 - 4r_0^3]$$

2. Estimate the change in head with respect to time and the change in wetting front distance with respect to time by using the backward difference for all values of R(t) equal to or greater than the distance

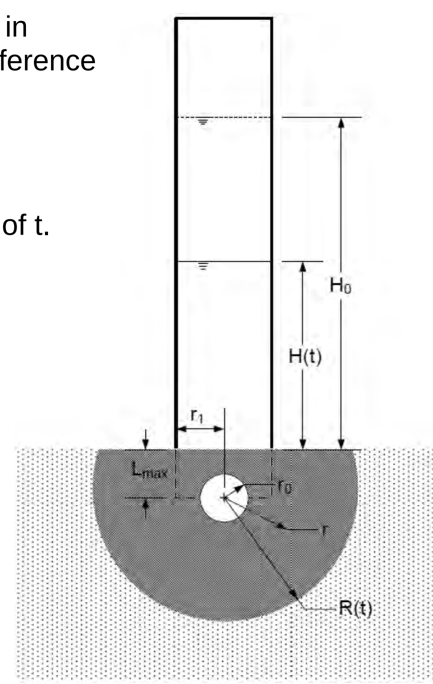
$$\sqrt{r_1^2 + L_{max}^2}$$

3. Make initial guesses for K and C.
4. Solve the following equations for ΔP(t) at each incremental value of t.

$$\Delta P(t) = \frac{\pi^2}{8}\left\{\theta_1 - \theta_0 \frac{[R(t)^2] + [R(t)]L_{max}}{K}\frac{dr}{dt} - 2r_0^2\right\} \frac{ln[\frac{R(t)[r_0+L_{max}]}{r_0[R(t)+L_{max}]}]}{L_{max}}$$

$$\Delta P(t) = C - H(t) - L_{max} + \frac{L_{max}}{K}\frac{dh}{dt}$$

5. Minimize the absolute difference between the two solutions found in Step 4 by adjusting the values of K and C.




*Parameters for Equations*

$\Theta_0$ = volumetric water content of soil before MPD test

$\Theta_1$ = volumetric water content of soil after MPD test

# Infiltration Report

## RPBCWD

## Lotus Lake WIP - Kerber - Kerber Pond

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### kerber a

| | |
|---|---|
| Date | 6/14/2023 |
| Time | 2:01 PM |
| Latitude | 44.873025 |
| Longitude | -93.533856 |
| Initial Volumetric Moisture | 62.00 % |
| Final Volumetric Moisture | 80.00 % |
| Cylinder Size | 3 Liter |

### kerber a Results

| | |
|---|---|
| Map Pin # | 1 |
| Test Number | 24754 |
| Ksat - mm/hr | 0.13 |
| Ksat - in/hr | 0.005 |
| Capillary Pressure C mm | -11,168.0 |
| RMS Error of Regression | 147 |
| Normalized RMS | 0.7% |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 s | 30.49 cm | 26 | 248 s | 30.32 cm | 51 | 498 s | 30.2 cm | 76 | 748 s | 30.08 cm |
| 2 | 8 s | 30.46 cm | 27 | 258 s | 30.31 cm | 52 | 508 s | 30.19 cm | 77 | 758 s | 30.08 cm |
| 3 | 18 s | 30.44 cm | 28 | 268 s | 30.31 cm | 53 | 518 s | 30.19 cm | 78 | 768 s | 30.07 cm |
| 4 | 28 s | 30.43 cm | 29 | 278 s | 30.3 cm | 54 | 528 s | 30.19 cm | 79 | 778 s | 30.07 cm |
| 5 | 38 s | 30.42 cm | 30 | 288 s | 30.3 cm | 55 | 538 s | 30.18 cm | 80 | 788 s | 30.06 cm |
| 6 | 48 s | 30.42 cm | 31 | 298 s | 30.28 cm | 56 | 548 s | 30.18 cm | 81 | 798 s | 30.06 cm |
| 7 | 58 s | 30.41 cm | 32 | 308 s | 30.28 cm | 57 | 558 s | 30.17 cm | 82 | 808 s | 30.05 cm |
| 8 | 68 s | 30.4 cm | 33 | 318 s | 30.28 cm | 58 | 568 s | 30.17 cm | 83 | 818 s | 30.05 cm |
| 9 | 78 s | 30.39 cm | 34 | 328 s | 30.27 cm | 59 | 578 s | 30.16 cm | 84 | 828 s | 30.05 cm |
| 10 | 88 s | 30.39 cm | 35 | 338 s | 30.27 cm | 60 | 588 s | 30.16 cm | 85 | 838 s | 30.04 cm |
| 11 | 98 s | 30.38 cm | 36 | 348 s | 30.26 cm | 61 | 598 s | 30.16 cm | 86 | 848 s | 30.04 cm |
| 12 | 108 s | 30.38 cm | 37 | 358 s | 30.26 cm | 62 | 608 s | 30.15 cm | 87 | 858 s | 30.03 cm |
| 13 | 118 s | 30.37 cm | 38 | 368 s | 30.26 cm | 63 | 618 s | 30.15 cm | 88 | 868 s | 30.03 cm |
| 14 | 128 s | 30.36 cm | 39 | 378 s | 30.25 cm | 64 | 628 s | 30.14 cm | 89 | 878 s | 30.02 cm |
| 15 | 138 s | 30.36 cm | 40 | 388 s | 30.25 cm | 65 | 638 s | 30.14 cm | 90 | 888 s | 30.02 cm |
| 16 | 148 s | 30.35 cm | 41 | 398 s | 30.24 cm | 66 | 648 s | 30.14 cm | 91 | 898 s | 30.01 cm |
| 17 | 158 s | 30.35 cm | 42 | 408 s | 30.23 cm | 67 | 658 s | 30.13 cm | 92 | 908 s | 30.01 cm |
| 18 | 168 s | 30.35 cm | 43 | 418 s | 30.23 cm | 68 | 668 s | 30.13 cm | 93 | 918 s | 30.0 cm |
| 19 | 178 s | 30.35 cm | 44 | 428 s | 30.23 cm | 69 | 678 s | 30.11 cm | 94 | 928 s | 30.0 cm |
| 20 | 188 s | 30.34 cm | 45 | 438 s | 30.22 cm | 70 | 688 s | 30.11 cm | 95 | 938 s | 29.99 cm |
| 21 | 198 s | 30.34 cm | 46 | 448 s | 30.21 cm | 71 | 698 s | 30.1 cm | 96 | 948 s | 29.99 cm |
| 22 | 208 s | 30.33 cm | 47 | 458 s | 30.21 cm | 72 | 708 s | 30.1 cm | 97 | 958 s | 29.98 cm |
| 23 | 218 s | 30.33 cm | 48 | 468 s | 30.21 cm | 73 | 718 s | 30.09 cm | 98 | 968 s | 29.98 cm |
| 24 | 228 s | 30.32 cm | 49 | 478 s | 30.2 cm | 74 | 728 s | 30.09 cm | 99 | 978 s | 29.97 cm |
| 25 | 238 s | 30.32 cm | 50 | 488 s | 30.2 cm | 75 | 738 s | 30.09 cm | 100 | 988 s | 29.95 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP - Kerber - Kerber Pond

MPD INFILTROMETER
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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | 998 s | 29.95 cm | 133 | 1318 s | 29.78 cm | 165 | 1638 s | 29.6 cm | 197 | 1958 s | 29.42 cm |
| 102 | 1008 s | 29.95 cm | 134 | 1328 s | 29.78 cm | 166 | 1648 s | 29.6 cm | 198 | 1968 s | 29.41 cm |
| 103 | 1018 s | 29.94 cm | 135 | 1338 s | 29.77 cm | 167 | 1658 s | 29.59 cm | 199 | 1978 s | 29.41 cm |
| 104 | 1028 s | 29.93 cm | 136 | 1348 s | 29.77 cm | 168 | 1668 s | 29.59 cm | 200 | 1988 s | 29.4 cm |
| 105 | 1038 s | 29.93 cm | 137 | 1358 s | 29.76 cm | 169 | 1678 s | 29.58 cm | 201 | 1998 s | 29.39 cm |
| 106 | 1048 s | 29.93 cm | 138 | 1368 s | 29.76 cm | 170 | 1688 s | 29.58 cm | 202 | 2008 s | 29.39 cm |
| 107 | 1058 s | 29.92 cm | 139 | 1378 s | 29.75 cm | 171 | 1698 s | 29.57 cm | 203 | 2018 s | 29.51 cm |
| 108 | 1068 s | 29.91 cm | 140 | 1388 s | 29.75 cm | 172 | 1708 s | 29.57 cm | 204 | 2028 s | 29.5 cm |
| 109 | 1078 s | 29.91 cm | 141 | 1398 s | 29.74 cm | 173 | 1718 s | 29.56 cm | 205 | 2038 s | 29.49 cm |
| 110 | 1088 s | 29.91 cm | 142 | 1408 s | 29.74 cm | 174 | 1728 s | 29.55 cm | 206 | 2048 s | 29.49 cm |
| 111 | 1098 s | 29.9 cm | 143 | 1418 s | 29.73 cm | 175 | 1738 s | 29.55 cm | 207 | 2058 s | 29.48 cm |
| 112 | 1108 s | 29.9 cm | 144 | 1428 s | 29.73 cm | 176 | 1748 s | 29.54 cm | 208 | 2068 s | 29.48 cm |
| 113 | 1118 s | 29.88 cm | 145 | 1438 s | 29.72 cm | 177 | 1758 s | 29.54 cm | 209 | 2078 s | 29.46 cm |
| 114 | 1128 s | 29.89 cm | 146 | 1448 s | 29.72 cm | 178 | 1768 s | 29.53 cm | 210 | 2088 s | 29.46 cm |
| 115 | 1138 s | 29.88 cm | 147 | 1458 s | 29.71 cm | 179 | 1778 s | 29.53 cm | 211 | 2098 s | 29.45 cm |
| 116 | 1148 s | 29.88 cm | 148 | 1468 s | 29.71 cm | 180 | 1788 s | 29.52 cm | 212 | 2108 s | 29.45 cm |
| 117 | 1158 s | 29.87 cm | 149 | 1478 s | 29.7 cm | 181 | 1798 s | 29.52 cm | 213 | 2118 s | 29.44 cm |
| 118 | 1168 s | 29.87 cm | 150 | 1488 s | 29.69 cm | 182 | 1808 s | 29.51 cm | 214 | 2479 s | 29.27 cm |
| 119 | 1178 s | 29.87 cm | 151 | 1498 s | 29.69 cm | 183 | 1818 s | 29.51 cm | 215 | 2489 s | 29.26 cm |
| 120 | 1188 s | 29.86 cm | 152 | 1508 s | 29.68 cm | 184 | 1828 s | 29.5 cm | 216 | 2499 s | 29.25 cm |
| 121 | 1198 s | 29.85 cm | 153 | 1518 s | 29.68 cm | 185 | 1838 s | 29.49 cm | 217 | 2509 s | 29.25 cm |
| 122 | 1208 s | 29.85 cm | 154 | 1528 s | 29.67 cm | 186 | 1848 s | 29.49 cm | 218 | 2519 s | 29.24 cm |
| 123 | 1218 s | 29.84 cm | 155 | 1538 s | 29.67 cm | 187 | 1858 s | 29.48 cm | 219 | 2529 s | 29.24 cm |
| 124 | 1228 s | 29.84 cm | 156 | 1548 s | 29.66 cm | 188 | 1868 s | 29.48 cm | 220 | 2539 s | 29.23 cm |
| 125 | 1238 s | 29.83 cm | 157 | 1558 s | 29.66 cm | 189 | 1878 s | 29.46 cm | 221 | 2549 s | 29.23 cm |
| 126 | 1248 s | 29.83 cm | 158 | 1568 s | 29.65 cm | 190 | 1888 s | 29.46 cm | 222 | 2559 s | 29.22 cm |
| 127 | 1258 s | 29.82 cm | 159 | 1578 s | 29.65 cm | 191 | 1898 s | 29.45 cm | 223 | 2569 s | 29.22 cm |
| 128 | 1268 s | 29.82 cm | 160 | 1588 s | 29.64 cm | 192 | 1908 s | 29.45 cm | 224 | 2579 s | 29.21 cm |
| 129 | 1278 s | 29.81 cm | 161 | 1598 s | 29.64 cm | 193 | 1918 s | 29.44 cm | 225 | 2589 s | 29.21 cm |
| 130 | 1288 s | 29.81 cm | 162 | 1608 s | 29.62 cm | 194 | 1928 s | 29.44 cm | 226 | 2599 s | 29.2 cm |
| 131 | 1298 s | 29.79 cm | 163 | 1618 s | 29.62 cm | 195 | 1938 s | 29.43 cm | 227 | 2609 s | 29.2 cm |
| 132 | 1308 s | 29.79 cm | 164 | 1628 s | 29.61 cm | 196 | 1948 s | 29.42 cm | 228 | 2619 s | 29.19 cm |

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## Lotus Lake WIP - Kerber - Kerber Pond

### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 229 | 2629 s | 29.16 cm | 261 | 2949 s | 28.99 cm | 293 | 3269 s | 28.8 cm | 325 | 3589 s | 28.61 cm |
| 230 | 2639 s | 29.16 cm | 262 | 2959 s | 28.99 cm | 294 | 3279 s | 28.8 cm | 326 | 3599 s | 28.6 cm |
| 231 | 2649 s | 29.15 cm | 263 | 2969 s | 28.97 cm | 295 | 3289 s | 28.79 cm | 327 | 3609 s | 28.6 cm |
| 232 | 2659 s | 29.15 cm | 264 | 2979 s | 28.97 cm | 296 | 3299 s | 28.79 cm | 328 | 3619 s | 28.59 cm |
| 233 | 2669 s | 29.13 cm | 265 | 2989 s | 28.96 cm | 297 | 3309 s | 28.78 cm | 329 | 3629 s | 28.58 cm |
| 234 | 2679 s | 29.13 cm | 266 | 2999 s | 28.96 cm | 298 | 3319 s | 28.78 cm | 330 | 3639 s | 28.58 cm |
| 235 | 2689 s | 29.12 cm | 267 | 3009 s | 28.95 cm | 299 | 3329 s | 28.77 cm | 331 | 3649 s | 28.57 cm |
| 236 | 2699 s | 29.11 cm | 268 | 3019 s | 28.94 cm | 300 | 3339 s | 28.77 cm | 332 | 3659 s | 28.57 cm |
| 237 | 2709 s | 29.11 cm | 269 | 3029 s | 28.94 cm | 301 | 3349 s | 28.76 cm | 333 | 3669 s | 28.56 cm |
| 238 | 2719 s | 29.11 cm | 270 | 3039 s | 28.93 cm | 302 | 3359 s | 28.76 cm | 334 | 3679 s | 28.56 cm |
| 239 | 2729 s | 29.1 cm | 271 | 3049 s | 28.93 cm | 303 | 3369 s | 28.75 cm | 335 | 3689 s | 28.55 cm |
| 240 | 2739 s | 29.1 cm | 272 | 3059 s | 28.93 cm | 304 | 3379 s | 28.74 cm | 336 | 3699 s | 28.55 cm |
| 241 | 2749 s | 29.09 cm | 273 | 3069 s | 28.92 cm | 305 | 3389 s | 28.74 cm | 337 | 3709 s | 28.54 cm |
| 242 | 2759 s | 29.09 cm | 274 | 3079 s | 28.91 cm | 306 | 3399 s | 28.73 cm | 338 | 3719 s | 28.53 cm |
| 243 | 2769 s | 29.08 cm | 275 | 3089 s | 28.91 cm | 307 | 3409 s | 28.73 cm | 339 | 3729 s | 28.53 cm |
| 244 | 2779 s | 29.08 cm | 276 | 3099 s | 28.91 cm | 308 | 3419 s | 28.72 cm | 340 | 3739 s | 28.52 cm |
| 245 | 2789 s | 29.07 cm | 277 | 3109 s | 28.9 cm | 309 | 3429 s | 28.72 cm | 341 | 3749 s | 28.52 cm |
| 246 | 2799 s | 29.07 cm | 278 | 3119 s | 28.9 cm | 310 | 3439 s | 28.71 cm | 342 | 3759 s | 28.51 cm |
| 247 | 2809 s | 29.06 cm | 279 | 3129 s | 28.89 cm | 311 | 3449 s | 28.7 cm | 343 | 3769 s | 28.51 cm |
| 248 | 2819 s | 29.06 cm | 280 | 3139 s | 28.89 cm | 312 | 3459 s | 28.69 cm | 344 | 3779 s | 28.5 cm |
| 249 | 2829 s | 29.05 cm | 281 | 3149 s | 28.88 cm | 313 | 3469 s | 28.69 cm | 345 | 3789 s | 28.5 cm |
| 250 | 2839 s | 29.05 cm | 282 | 3159 s | 28.87 cm | 314 | 3479 s | 28.68 cm | 346 | 3799 s | 28.48 cm |
| 251 | 2849 s | 29.04 cm | 283 | 3169 s | 28.87 cm | 315 | 3489 s | 28.67 cm | 347 | 3809 s | 28.48 cm |
| 252 | 2859 s | 29.04 cm | 284 | 3179 s | 28.86 cm | 316 | 3499 s | 28.67 cm | 348 | 3819 s | 28.47 cm |
| 253 | 2869 s | 29.03 cm | 285 | 3189 s | 28.86 cm | 317 | 3509 s | 28.66 cm | 349 | 3829 s | 28.46 cm |
| 254 | 2879 s | 29.03 cm | 286 | 3199 s | 28.85 cm | 318 | 3519 s | 28.66 cm | 350 | 3839 s | 28.46 cm |
| 255 | 2889 s | 29.02 cm | 287 | 3209 s | 28.85 cm | 319 | 3529 s | 28.64 cm | 351 | 3849 s | 28.45 cm |
| 256 | 2899 s | 29.01 cm | 288 | 3219 s | 28.84 cm | 320 | 3539 s | 28.64 cm | 352 | 3859 s | 28.45 cm |
| 257 | 2909 s | 29.01 cm | 289 | 3229 s | 28.84 cm | 321 | 3549 s | 28.63 cm | 353 | 3869 s | 28.44 cm |
| 258 | 2919 s | 29.0 cm | 290 | 3239 s | 28.83 cm | 322 | 3559 s | 28.62 cm | 354 | 3879 s | 28.44 cm |
| 259 | 2929 s | 29.0 cm | 291 | 3249 s | 28.83 cm | 323 | 3569 s | 28.62 cm | 355 | 3889 s | 28.43 cm |
| 260 | 2939 s | 29.0 cm | 292 | 3259 s | 28.82 cm | 324 | 3579 s | 28.61 cm | 356 | 3899 s | 28.43 cm |

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## RPBCWD
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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 357 | 3909 s | 28.42 cm | 389 | 4229 s | 28.23 cm | 421 | 4549 s | 28.05 cm | 453 | 4869 s | 27.87 cm |
| 358 | 3919 s | 28.42 cm | 390 | 4239 s | 28.23 cm | 422 | 4559 s | 28.05 cm | 454 | 4879 s | 27.86 cm |
| 359 | 3929 s | 28.41 cm | 391 | 4249 s | 28.22 cm | 423 | 4569 s | 28.04 cm | 455 | 4889 s | 27.85 cm |
| 360 | 3939 s | 28.4 cm | 392 | 4259 s | 28.22 cm | 424 | 4579 s | 28.04 cm | 456 | 4899 s | 27.85 cm |
| 361 | 3949 s | 28.4 cm | 393 | 4269 s | 28.21 cm | 425 | 4589 s | 28.03 cm | 457 | 4909 s | 27.84 cm |
| 362 | 3959 s | 28.39 cm | 394 | 4279 s | 28.21 cm | 426 | 4599 s | 28.02 cm | 458 | 4919 s | 27.84 cm |
| 363 | 3969 s | 28.39 cm | 395 | 4289 s | 28.2 cm | 427 | 4609 s | 28.02 cm | 459 | 4929 s | 27.82 cm |
| 364 | 3979 s | 28.38 cm | 396 | 4299 s | 28.2 cm | 428 | 4619 s | 28.01 cm | 460 | 4939 s | 27.82 cm |
| 365 | 3989 s | 28.38 cm | 397 | 4309 s | 28.19 cm | 429 | 4629 s | 28.01 cm | 461 | 4949 s | 27.81 cm |
| 366 | 3999 s | 28.37 cm | 398 | 4319 s | 28.19 cm | 430 | 4639 s | 28.0 cm | 462 | 4959 s | 27.81 cm |
| 367 | 4009 s | 28.36 cm | 399 | 4329 s | 28.18 cm | 431 | 4649 s | 28.0 cm | 463 | 4969 s | 27.8 cm |
| 368 | 4019 s | 28.36 cm | 400 | 4339 s | 28.18 cm | 432 | 4659 s | 27.98 cm | 464 | 4979 s | 27.8 cm |
| 369 | 4029 s | 28.35 cm | 401 | 4349 s | 28.17 cm | 433 | 4669 s | 27.98 cm | 465 | 4989 s | 27.79 cm |
| 370 | 4039 s | 28.35 cm | 402 | 4359 s | 28.17 cm | 434 | 4679 s | 27.97 cm | 466 | 4999 s | 27.79 cm |
| 371 | 4049 s | 28.34 cm | 403 | 4369 s | 28.15 cm | 435 | 4689 s | 27.97 cm | 467 | 5009 s | 27.78 cm |
| 372 | 4059 s | 28.34 cm | 404 | 4379 s | 28.14 cm | 436 | 4699 s | 27.96 cm | 468 | 5019 s | 27.77 cm |
| 373 | 4069 s | 28.33 cm | 405 | 4389 s | 28.14 cm | 437 | 4709 s | 27.95 cm | 469 | 5029 s | 27.77 cm |
| 374 | 4079 s | 28.33 cm | 406 | 4399 s | 28.13 cm | 438 | 4719 s | 27.95 cm | 470 | 5039 s | 27.76 cm |
| 375 | 4089 s | 28.31 cm | 407 | 4409 s | 28.13 cm | 439 | 4729 s | 27.94 cm | 471 | 5049 s | 27.76 cm |
| 376 | 4099 s | 28.3 cm | 408 | 4419 s | 28.12 cm | 440 | 4739 s | 27.94 cm | 472 | 5059 s | 27.75 cm |
| 377 | 4109 s | 28.3 cm | 409 | 4429 s | 28.12 cm | 441 | 4749 s | 27.93 cm | 473 | 5069 s | 27.75 cm |
| 378 | 4119 s | 28.29 cm | 410 | 4439 s | 28.11 cm | 442 | 4759 s | 27.93 cm | 474 | 5079 s | 27.74 cm |
| 379 | 4129 s | 28.29 cm | 411 | 4449 s | 28.11 cm | 443 | 4769 s | 27.92 cm | 475 | 5089 s | 27.74 cm |
| 380 | 4139 s | 28.28 cm | 412 | 4459 s | 28.1 cm | 444 | 4779 s | 27.92 cm | 476 | 5099 s | 27.73 cm |
| 381 | 4149 s | 28.28 cm | 413 | 4469 s | 28.1 cm | 445 | 4789 s | 27.91 cm | 477 | 5109 s | 27.73 cm |
| 382 | 4159 s | 28.27 cm | 414 | 4479 s | 28.09 cm | 446 | 4799 s | 27.9 cm | 478 | 5119 s | 27.72 cm |
| 383 | 4169 s | 28.27 cm | 415 | 4489 s | 28.09 cm | 447 | 4809 s | 27.9 cm | 479 | 5129 s | 27.72 cm |
| 384 | 4179 s | 28.26 cm | 416 | 4499 s | 28.08 cm | 448 | 4819 s | 27.89 cm | 480 | 5139 s | 27.71 cm |
| 385 | 4189 s | 28.26 cm | 417 | 4509 s | 28.07 cm | 449 | 4829 s | 27.89 cm | 481 | 5149 s | 27.71 cm |
| 386 | 4199 s | 28.25 cm | 418 | 4519 s | 28.07 cm | 450 | 4839 s | 27.88 cm | 482 | 5159 s | 27.7 cm |
| 387 | 4209 s | 28.24 cm | 419 | 4529 s | 28.06 cm | 451 | 4849 s | 27.88 cm | 483 | 5169 s | 27.7 cm |
| 388 | 4219 s | 28.24 cm | 420 | 4539 s | 28.06 cm | 452 | 4859 s | 27.87 cm | 484 | 5179 s | 27.69 cm |

# Infiltration Report

## RPBCWD

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 485 | 5189 s | 27.69 cm | 517 | 5509 s | 27.49 cm | 549 | 5829 s | 27.3 cm | 581 | 6149 s | 27.12 cm |
| 486 | 5199 s | 27.68 cm | 518 | 5519 s | 27.48 cm | 550 | 5839 s | 27.3 cm | 582 | 6159 s | 27.11 cm |
| 487 | 5209 s | 27.66 cm | 519 | 5529 s | 27.47 cm | 551 | 5849 s | 27.29 cm | 583 | 6169 s | 27.11 cm |
| 488 | 5219 s | 27.66 cm | 520 | 5539 s | 27.47 cm | 552 | 5859 s | 27.29 cm | 584 | 6179 s | 27.1 cm |
| 489 | 5229 s | 27.57 cm | 521 | 5549 s | 27.46 cm | 553 | 5869 s | 27.28 cm | 585 | 6189 s | 27.1 cm |
| 490 | 5239 s | 27.64 cm | 522 | 5559 s | 27.46 cm | 554 | 5879 s | 27.28 cm | 586 | 6199 s | 27.09 cm |
| 491 | 5249 s | 27.63 cm | 523 | 5569 s | 27.45 cm | 555 | 5889 s | 27.27 cm | 587 | 6209 s | 27.08 cm |
| 492 | 5259 s | 27.62 cm | 524 | 5579 s | 27.45 cm | 556 | 5899 s | 27.27 cm | 588 | 6219 s | 27.08 cm |
| 493 | 5269 s | 27.62 cm | 525 | 5589 s | 27.44 cm | 557 | 5909 s | 27.26 cm | 589 | 6229 s | 27.07 cm |
| 494 | 5279 s | 27.61 cm | 526 | 5599 s | 27.44 cm | 558 | 5919 s | 27.25 cm | 590 | 6239 s | 27.07 cm |
| 495 | 5289 s | 27.61 cm | 527 | 5609 s | 27.43 cm | 559 | 5929 s | 27.25 cm | 591 | 6249 s | 27.06 cm |
| 496 | 5299 s | 27.6 cm | 528 | 5619 s | 27.42 cm | 560 | 5939 s | 27.24 cm | 592 | 6259 s | 27.06 cm |
| 497 | 5309 s | 27.6 cm | 529 | 5629 s | 27.42 cm | 561 | 5949 s | 27.24 cm | 593 | 6269 s | 27.05 cm |
| 498 | 5319 s | 27.59 cm | 530 | 5639 s | 27.41 cm | 562 | 5959 s | 27.23 cm | 594 | 6279 s | 27.05 cm |
| 499 | 5329 s | 27.59 cm | 531 | 5649 s | 27.41 cm | 563 | 5969 s | 27.23 cm | 595 | 6289 s | 27.04 cm |
| 500 | 5339 s | 27.58 cm | 532 | 5659 s | 27.4 cm | 564 | 5979 s | 27.22 cm | 596 | 6299 s | 27.03 cm |
| 501 | 5349 s | 27.58 cm | 533 | 5669 s | 27.4 cm | 565 | 5989 s | 27.22 cm | 597 | 6309 s | 27.03 cm |
| 502 | 5359 s | 27.57 cm | 534 | 5679 s | 27.39 cm | 566 | 5999 s | 27.21 cm | 598 | 6319 s | 27.02 cm |
| 503 | 5369 s | 27.57 cm | 535 | 5689 s | 27.39 cm | 567 | 6009 s | 27.21 cm | 599 | 6329 s | 27.02 cm |
| 504 | 5379 s | 27.56 cm | 536 | 5699 s | 27.38 cm | 568 | 6019 s | 27.2 cm | 600 | 6339 s | 27.0 cm |
| 505 | 5389 s | 27.56 cm | 537 | 5709 s | 27.38 cm | 569 | 6029 s | 27.19 cm | 601 | 6349 s | 27.0 cm |
| 506 | 5399 s | 27.56 cm | 538 | 5719 s | 27.37 cm | 570 | 6039 s | 27.19 cm | 602 | 6359 s | 26.99 cm |
| 507 | 5409 s | 27.55 cm | 539 | 5729 s | 27.37 cm | 571 | 6049 s | 27.17 cm | 603 | 6369 s | 26.98 cm |
| 508 | 5419 s | 27.54 cm | 540 | 5739 s | 27.36 cm | 572 | 6059 s | 27.17 cm | 604 | 6379 s | 26.98 cm |
| 509 | 5429 s | 27.54 cm | 541 | 5749 s | 27.36 cm | 573 | 6069 s | 27.16 cm | 605 | 6389 s | 26.97 cm |
| 510 | 5439 s | 27.53 cm | 542 | 5759 s | 27.35 cm | 574 | 6079 s | 27.16 cm | 606 | 6399 s | 26.97 cm |
| 511 | 5449 s | 27.53 cm | 543 | 5769 s | 27.35 cm | 575 | 6089 s | 27.15 cm | 607 | 6409 s | 26.96 cm |
| 512 | 5459 s | 27.52 cm | 544 | 5779 s | 27.33 cm | 576 | 6099 s | 27.15 cm | 608 | 6419 s | 26.96 cm |
| 513 | 5469 s | 27.52 cm | 545 | 5789 s | 27.33 cm | 577 | 6109 s | 27.14 cm | 609 | 6429 s | 26.95 cm |
| 514 | 5479 s | 27.51 cm | 546 | 5799 s | 27.32 cm | 578 | 6119 s | 27.13 cm | 610 | 6439 s | 26.95 cm |
| 515 | 5489 s | 27.51 cm | 547 | 5809 s | 27.31 cm | 579 | 6129 s | 27.13 cm | 611 | 6449 s | 26.94 cm |
| 516 | 5499 s | 27.49 cm | 548 | 5819 s | 27.31 cm | 580 | 6139 s | 27.12 cm | 612 | 6459 s | 26.93 cm |

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# Infiltration Report

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## RPBCWD

## Lotus Lake WIP - Kerber - Kerber Pond

### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 613 | 6469 s | 26.93 cm | 645 | 6789 s | 26.74 cm | 677 | 7109 s | 26.56 cm | 709 | 7429 s | 26.37 cm |
| 614 | 6479 s | 26.92 cm | 646 | 6799 s | 26.74 cm | 678 | 7119 s | 26.55 cm | 710 | 7439 s | 26.37 cm |
| 615 | 6489 s | 26.92 cm | 647 | 6809 s | 26.73 cm | 679 | 7129 s | 26.55 cm | 711 | 7449 s | 26.35 cm |
| 616 | 6499 s | 26.91 cm | 648 | 6819 s | 26.72 cm | 680 | 7139 s | 26.54 cm | 712 | 7459 s | 26.35 cm |
| 617 | 6509 s | 26.9 cm | 649 | 6829 s | 26.72 cm | 681 | 7149 s | 26.54 cm | 713 | 7469 s | 26.34 cm |
| 618 | 6519 s | 26.9 cm | 650 | 6839 s | 26.71 cm | 682 | 7159 s | 26.53 cm | 714 | 7479 s | 26.33 cm |
| 619 | 6529 s | 26.89 cm | 651 | 6849 s | 26.71 cm | 683 | 7169 s | 26.51 cm | 715 | 7489 s | 26.33 cm |
| 620 | 6539 s | 26.89 cm | 652 | 6859 s | 26.7 cm | 684 | 7179 s | 26.51 cm | 716 | 7499 s | 26.32 cm |
| 621 | 6549 s | 26.88 cm | 653 | 6869 s | 26.7 cm | 685 | 7189 s | 26.5 cm | 717 | 7509 s | 26.32 cm |
| 622 | 6559 s | 26.88 cm | 654 | 6879 s | 26.69 cm | 686 | 7199 s | 26.5 cm | 718 | 7519 s | 26.31 cm |
| 623 | 6569 s | 26.87 cm | 655 | 6889 s | 26.69 cm | 687 | 7209 s | 26.49 cm | 719 | 7529 s | 26.3 cm |
| 624 | 6579 s | 26.87 cm | 656 | 6899 s | 26.67 cm | 688 | 7219 s | 26.49 cm | 720 | 7539 s | 26.3 cm |
| 625 | 6589 s | 26.86 cm | 657 | 6909 s | 26.67 cm | 689 | 7229 s | 26.48 cm | 721 | 7549 s | 26.29 cm |
| 626 | 6599 s | 26.86 cm | 658 | 6919 s | 26.66 cm | 690 | 7239 s | 26.48 cm | 722 | 7559 s | 26.29 cm |
| 627 | 6609 s | 26.84 cm | 659 | 6929 s | 26.66 cm | 691 | 7249 s | 26.47 cm | 723 | 7569 s | 26.28 cm |
| 628 | 6619 s | 26.83 cm | 660 | 6939 s | 26.65 cm | 692 | 7259 s | 26.47 cm | 724 | 7579 s | 26.28 cm |
| 629 | 6629 s | 26.83 cm | 661 | 6949 s | 26.64 cm | 693 | 7269 s | 26.46 cm | 725 | 7589 s | 26.27 cm |
| 630 | 6639 s | 26.82 cm | 662 | 6959 s | 26.64 cm | 694 | 7279 s | 26.45 cm | 726 | 7599 s | 26.26 cm |
| 631 | 6649 s | 26.82 cm | 663 | 6969 s | 26.63 cm | 695 | 7289 s | 26.45 cm | 727 | 7609 s | 26.26 cm |
| 632 | 6659 s | 26.81 cm | 664 | 6979 s | 26.63 cm | 696 | 7299 s | 26.44 cm | 728 | 7619 s | 26.25 cm |
| 633 | 6669 s | 26.81 cm | 665 | 6989 s | 26.62 cm | 697 | 7309 s | 26.44 cm | 729 | 7629 s | 26.25 cm |
| 634 | 6679 s | 26.8 cm | 666 | 6999 s | 26.62 cm | 698 | 7319 s | 26.43 cm | 730 | 7639 s | 26.24 cm |
| 635 | 6689 s | 26.79 cm | 667 | 7009 s | 26.61 cm | 699 | 7329 s | 26.43 cm | 731 | 7649 s | 26.24 cm |
| 636 | 6699 s | 26.79 cm | 668 | 7019 s | 26.61 cm | 700 | 7339 s | 26.42 cm | 732 | 7659 s | 26.23 cm |
| 637 | 6709 s | 26.78 cm | 669 | 7029 s | 26.6 cm | 701 | 7349 s | 26.42 cm | 733 | 7669 s | 26.23 cm |
| 638 | 6719 s | 26.78 cm | 670 | 7039 s | 26.59 cm | 702 | 7359 s | 26.41 cm | 734 | 7679 s | 26.22 cm |
| 639 | 6729 s | 26.77 cm | 671 | 7049 s | 26.59 cm | 703 | 7369 s | 26.41 cm | 735 | 7689 s | 26.21 cm |
| 640 | 6739 s | 26.77 cm | 672 | 7059 s | 26.58 cm | 704 | 7379 s | 26.4 cm | 736 | 7699 s | 26.21 cm |
| 641 | 6749 s | 26.76 cm | 673 | 7069 s | 26.58 cm | 705 | 7389 s | 26.39 cm | 737 | 7709 s | 26.2 cm |
| 642 | 6759 s | 26.76 cm | 674 | 7079 s | 26.57 cm | 706 | 7399 s | 26.39 cm | 738 | 7719 s | 26.2 cm |
| 643 | 6769 s | 26.75 cm | 675 | 7089 s | 26.57 cm | 707 | 7409 s | 26.38 cm | 739 | 7729 s | 26.18 cm |
| 644 | 6779 s | 26.75 cm | 676 | 7099 s | 26.56 cm | 708 | 7419 s | 26.38 cm | 740 | 7739 s | 26.18 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP - Kerber - Kerber Pond

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 741 | 7749 s | 26.17 cm | 773 | 8069 s | 25.99 cm | 805 | 8389 s | 25.81 cm | 837 | 8709 s | 25.63 cm |
| 742 | 7759 s | 26.17 cm | 774 | 8079 s | 25.98 cm | 806 | 8399 s | 25.8 cm | 838 | 8719 s | 25.62 cm |
| 743 | 7769 s | 26.16 cm | 775 | 8089 s | 25.97 cm | 807 | 8409 s | 25.79 cm | 839 | 8729 s | 25.61 cm |
| 744 | 7779 s | 26.16 cm | 776 | 8099 s | 25.97 cm | 808 | 8419 s | 25.79 cm | 840 | 8739 s | 25.61 cm |
| 745 | 7789 s | 26.15 cm | 777 | 8109 s | 25.96 cm | 809 | 8429 s | 25.78 cm | 841 | 8749 s | 25.61 cm |
| 746 | 7799 s | 26.15 cm | 778 | 8119 s | 25.96 cm | 810 | 8439 s | 25.78 cm | 842 | 8759 s | 25.6 cm |
| 747 | 7809 s | 26.14 cm | 779 | 8129 s | 25.95 cm | 811 | 8449 s | 25.77 cm | 843 | 8769 s | 25.6 cm |
| 748 | 7819 s | 26.13 cm | 780 | 8139 s | 25.95 cm | 812 | 8459 s | 25.77 cm | 844 | 8779 s | 25.59 cm |
| 749 | 7829 s | 26.13 cm | 781 | 8149 s | 25.94 cm | 813 | 8469 s | 25.76 cm | 845 | 8789 s | 25.59 cm |
| 750 | 7839 s | 26.12 cm | 782 | 8159 s | 25.94 cm | 814 | 8479 s | 25.76 cm | 846 | 8799 s | 25.58 cm |
| 751 | 7849 s | 26.12 cm | 783 | 8169 s | 25.93 cm | 815 | 8489 s | 25.75 cm | 847 | 8809 s | 25.58 cm |
| 752 | 7859 s | 26.11 cm | 784 | 8179 s | 25.93 cm | 816 | 8499 s | 25.75 cm | 848 | 8819 s | 25.57 cm |
| 753 | 7869 s | 26.1 cm | 785 | 8189 s | 25.92 cm | 817 | 8509 s | 25.74 cm | 849 | 8829 s | 25.57 cm |
| 754 | 7879 s | 26.1 cm | 786 | 8199 s | 25.92 cm | 818 | 8519 s | 25.73 cm | 850 | 8839 s | 25.56 cm |
| 755 | 7889 s | 26.09 cm | 787 | 8209 s | 25.91 cm | 819 | 8529 s | 25.73 cm | 851 | 8849 s | 25.56 cm |
| 756 | 7899 s | 26.09 cm | 788 | 8219 s | 25.91 cm | 820 | 8539 s | 25.72 cm | 852 | 8859 s | 25.55 cm |
| 757 | 7909 s | 26.08 cm | 789 | 8229 s | 25.9 cm | 821 | 8549 s | 25.72 cm | 853 | 8869 s | 25.55 cm |
| 758 | 7919 s | 26.08 cm | 790 | 8239 s | 25.89 cm | 822 | 8559 s | 25.71 cm | 854 | 8879 s | 25.53 cm |
| 759 | 7929 s | 26.07 cm | 791 | 8249 s | 25.89 cm | 823 | 8569 s | 25.71 cm | 855 | 8889 s | 25.53 cm |
| 760 | 7939 s | 26.07 cm | 792 | 8259 s | 25.88 cm | 824 | 8579 s | 25.69 cm | 856 | 8899 s | 25.52 cm |
| 761 | 7949 s | 26.06 cm | 793 | 8269 s | 25.88 cm | 825 | 8589 s | 25.69 cm | 857 | 8909 s | 25.52 cm |
| 762 | 7959 s | 26.06 cm | 794 | 8279 s | 25.87 cm | 826 | 8599 s | 25.68 cm | 858 | 8919 s | 25.51 cm |
| 763 | 7969 s | 26.05 cm | 795 | 8289 s | 25.87 cm | 827 | 8609 s | 25.68 cm | 859 | 8929 s | 25.51 cm |
| 764 | 7979 s | 26.04 cm | 796 | 8299 s | 25.85 cm | 828 | 8619 s | 25.67 cm | 860 | 8939 s | 25.5 cm |
| 765 | 7989 s | 26.04 cm | 797 | 8309 s | 25.85 cm | 829 | 8629 s | 25.67 cm | 861 | 8949 s | 25.5 cm |
| 766 | 7999 s | 26.02 cm | 798 | 8319 s | 25.84 cm | 830 | 8639 s | 25.66 cm | 862 | 8959 s | 25.49 cm |
| 767 | 8009 s | 26.02 cm | 799 | 8329 s | 25.84 cm | 831 | 8649 s | 25.66 cm | 863 | 8969 s | 25.49 cm |
| 768 | 8019 s | 26.01 cm | 800 | 8339 s | 25.83 cm | 832 | 8659 s | 25.65 cm | 864 | 8979 s | 25.48 cm |
| 769 | 8029 s | 26.01 cm | 801 | 8349 s | 25.83 cm | 833 | 8669 s | 25.65 cm | 865 | 8989 s | 25.48 cm |
| 770 | 8039 s | 26.0 cm | 802 | 8359 s | 25.82 cm | 834 | 8679 s | 25.64 cm | 866 | 8999 s | 25.47 cm |
| 771 | 8049 s | 26.0 cm | 803 | 8369 s | 25.82 cm | 835 | 8689 s | 25.63 cm | 867 | 9009 s | 25.47 cm |
| 772 | 8059 s | 25.99 cm | 804 | 8379 s | 25.81 cm | 836 | 8699 s | 25.63 cm | 868 | 9019 s | 25.46 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP - Kerber - Kerber Pond

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 869 | 9029 s | 25.46 cm | 901 | 9349 s | 25.29 cm | 933 | 9669 s | 25.12 cm | 965 | 9989 s | 24.95 cm |
| 870 | 9039 s | 25.45 cm | 902 | 9359 s | 25.28 cm | 934 | 9679 s | 25.11 cm | 966 | 9999 s | 24.95 cm |
| 871 | 9049 s | 25.45 cm | 903 | 9369 s | 25.28 cm | 935 | 9689 s | 25.11 cm | 967 | 10009 s | 24.94 cm |
| 872 | 9059 s | 25.44 cm | 904 | 9379 s | 25.27 cm | 936 | 9699 s | 25.1 cm | 968 | 10019 s | 24.94 cm |
| 873 | 9069 s | 25.44 cm | 905 | 9389 s | 25.27 cm | 937 | 9709 s | 25.1 cm | 969 | 10029 s | 24.93 cm |
| 874 | 9079 s | 25.43 cm | 906 | 9399 s | 25.26 cm | 938 | 9719 s | 25.1 cm | 970 | 10039 s | 24.93 cm |
| 875 | 9089 s | 25.43 cm | 907 | 9409 s | 25.26 cm | 939 | 9729 s | 25.09 cm | 971 | 10049 s | 24.92 cm |
| 876 | 9099 s | 25.42 cm | 908 | 9419 s | 25.25 cm | 940 | 9739 s | 25.09 cm | 972 | 10059 s | 24.92 cm |
| 877 | 9109 s | 25.42 cm | 909 | 9429 s | 25.25 cm | 941 | 9749 s | 25.08 cm | 973 | 10069 s | 24.91 cm |
| 878 | 9119 s | 25.41 cm | 910 | 9439 s | 25.24 cm | 942 | 9759 s | 25.08 cm | 974 | 10079 s | 24.91 cm |
| 879 | 9129 s | 25.41 cm | 911 | 9449 s | 25.24 cm | 943 | 9769 s | 25.07 cm | 975 | 10089 s | 24.9 cm |
| 880 | 9139 s | 25.4 cm | 912 | 9459 s | 25.23 cm | 944 | 9779 s | 25.07 cm | 976 | 10099 s | 24.9 cm |
| 881 | 9149 s | 25.4 cm | 913 | 9469 s | 25.23 cm | 945 | 9789 s | 25.06 cm | 977 | 10109 s | 24.89 cm |
| 882 | 9159 s | 25.39 cm | 914 | 9479 s | 25.22 cm | 946 | 9799 s | 25.06 cm | 978 | 10119 s | 24.89 cm |
| 883 | 9169 s | 25.39 cm | 915 | 9489 s | 25.22 cm | 947 | 9809 s | 25.04 cm | 979 | 10129 s | 24.87 cm |
| 884 | 9179 s | 25.38 cm | 916 | 9499 s | 25.2 cm | 948 | 9819 s | 25.04 cm | 980 | 10139 s | 24.87 cm |
| 885 | 9189 s | 25.38 cm | 917 | 9509 s | 25.2 cm | 949 | 9829 s | 25.03 cm | 981 | 10149 s | 24.86 cm |
| 886 | 9199 s | 25.36 cm | 918 | 9519 s | 25.19 cm | 950 | 9839 s | 25.03 cm | 982 | 10159 s | 24.86 cm |
| 887 | 9209 s | 25.36 cm | 919 | 9529 s | 25.19 cm | 951 | 9849 s | 25.02 cm | 983 | 10169 s | 24.85 cm |
| 888 | 9219 s | 25.35 cm | 920 | 9539 s | 25.18 cm | 952 | 9859 s | 25.02 cm | 984 | 10179 s | 24.85 cm |
| 889 | 9229 s | 25.35 cm | 921 | 9549 s | 25.18 cm | 953 | 9869 s | 25.01 cm | 985 | 10189 s | 24.84 cm |
| 890 | 9239 s | 25.34 cm | 922 | 9559 s | 25.17 cm | 954 | 9879 s | 25.01 cm | 986 | 10199 s | 24.84 cm |
| 891 | 9249 s | 25.34 cm | 923 | 9569 s | 25.17 cm | 955 | 9889 s | 25.0 cm | 987 | 10209 s | 24.83 cm |
| 892 | 9259 s | 25.33 cm | 924 | 9579 s | 25.16 cm | 956 | 9899 s | 25.0 cm | 988 | 10219 s | 24.83 cm |
| 893 | 9269 s | 25.33 cm | 925 | 9589 s | 25.16 cm | 957 | 9909 s | 24.99 cm | 989 | 10229 s | 24.82 cm |
| 894 | 9279 s | 25.32 cm | 926 | 9599 s | 25.15 cm | 958 | 9919 s | 24.99 cm | 990 | 10239 s | 24.82 cm |
| 895 | 9289 s | 25.32 cm | 927 | 9609 s | 25.15 cm | 959 | 9929 s | 24.98 cm | 991 | 10249 s | 24.81 cm |
| 896 | 9299 s | 25.31 cm | 928 | 9619 s | 25.14 cm | 960 | 9939 s | 24.98 cm | 992 | 10259 s | 24.81 cm |
| 897 | 9309 s | 25.31 cm | 929 | 9629 s | 25.14 cm | 961 | 9949 s | 24.97 cm | 993 | 10269 s | 24.8 cm |
| 898 | 9319 s | 25.3 cm | 930 | 9639 s | 25.13 cm | 962 | 9959 s | 24.97 cm | 994 | 10279 s | 24.8 cm |
| 899 | 9329 s | 25.3 cm | 931 | 9649 s | 25.13 cm | 963 | 9969 s | 24.96 cm | 995 | 10289 s | 24.79 cm |
| 900 | 9339 s | 25.29 cm | 932 | 9659 s | 25.12 cm | 964 | 9979 s | 24.96 cm | 996 | 10299 s | 24.79 cm |

# Infiltration Report

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 997 | 10309 s | 24.78 cm | 1029 | 10629 s | 24.61 cm | 1061 | 10949 s | 24.44 cm | 1093 | 11269 s | 24.27 cm |
| 998 | 10319 s | 24.78 cm | 1030 | 10639 s | 24.6 cm | 1062 | 10959 s | 24.43 cm | 1094 | 11279 s | 24.26 cm |
| 999 | 10329 s | 24.77 cm | 1031 | 10649 s | 24.6 cm | 1063 | 10969 s | 24.43 cm | 1095 | 11289 s | 24.26 cm |
| 1000 | 10339 s | 24.77 cm | 1032 | 10659 s | 24.59 cm | 1064 | 10979 s | 24.42 cm | 1096 | 11299 s | 24.25 cm |
| 1001 | 10349 s | 24.76 cm | 1033 | 10669 s | 24.59 cm | 1065 | 10989 s | 24.42 cm | 1097 | 11309 s | 24.24 cm |
| 1002 | 10359 s | 24.75 cm | 1034 | 10679 s | 24.58 cm | 1066 | 10999 s | 24.41 cm | 1098 | 11319 s | 24.24 cm |
| 1003 | 10369 s | 24.75 cm | 1035 | 10689 s | 24.58 cm | 1067 | 11009 s | 24.41 cm | 1099 | 11329 s | 24.24 cm |
| 1004 | 10379 s | 24.75 cm | 1036 | 10699 s | 24.57 cm | 1068 | 11019 s | 24.4 cm | 1100 | 11339 s | 24.22 cm |
| 1005 | 10389 s | 24.74 cm | 1037 | 10709 s | 24.57 cm | 1069 | 11029 s | 24.4 cm | 1101 | 11349 s | 24.22 cm |
| 1006 | 10399 s | 24.73 cm | 1038 | 10719 s | 24.56 cm | 1070 | 11039 s | 24.38 cm | 1102 | 11359 s | 24.21 cm |
| 1007 | 10409 s | 24.73 cm | 1039 | 10729 s | 24.56 cm | 1071 | 11049 s | 24.38 cm | 1103 | 11369 s | 24.21 cm |
| 1008 | 10419 s | 24.71 cm | 1040 | 10739 s | 24.54 cm | 1072 | 11059 s | 24.38 cm | 1104 | 11379 s | 24.2 cm |
| 1009 | 10429 s | 24.71 cm | 1041 | 10749 s | 24.54 cm | 1073 | 11069 s | 24.37 cm | 1105 | 11389 s | 24.2 cm |
| 1010 | 10439 s | 24.7 cm | 1042 | 10759 s | 24.53 cm | 1074 | 11079 s | 24.36 cm | 1106 | 11399 s | 24.19 cm |
| 1011 | 10449 s | 24.7 cm | 1043 | 10769 s | 24.53 cm | 1075 | 11089 s | 24.36 cm | 1107 | 11409 s | 24.19 cm |
| 1012 | 10459 s | 24.69 cm | 1044 | 10779 s | 24.52 cm | 1076 | 11099 s | 24.35 cm | 1108 | 11419 s | 24.18 cm |
| 1013 | 10469 s | 24.69 cm | 1045 | 10789 s | 24.52 cm | 1077 | 11109 s | 24.35 cm | 1109 | 11429 s | 24.18 cm |
| 1014 | 10479 s | 24.68 cm | 1046 | 10799 s | 24.51 cm | 1078 | 11119 s | 24.34 cm | 1110 | 11439 s | 24.17 cm |
| 1015 | 10489 s | 24.68 cm | 1047 | 10809 s | 24.51 cm | 1079 | 11129 s | 24.34 cm | 1111 | 11449 s | 24.16 cm |
| 1016 | 10499 s | 24.67 cm | 1048 | 10819 s | 24.5 cm | 1080 | 11139 s | 24.33 cm | 1112 | 11459 s | 24.16 cm |
| 1017 | 10509 s | 24.67 cm | 1049 | 10829 s | 24.5 cm | 1081 | 11149 s | 24.33 cm | 1113 | 11469 s | 24.16 cm |
| 1018 | 10519 s | 24.66 cm | 1050 | 10839 s | 24.49 cm | 1082 | 11159 s | 24.32 cm | 1114 | 11479 s | 24.15 cm |
| 1019 | 10529 s | 24.66 cm | 1051 | 10849 s | 24.49 cm | 1083 | 11169 s | 24.32 cm | 1115 | 11489 s | 24.15 cm |
| 1020 | 10539 s | 24.65 cm | 1052 | 10859 s | 24.48 cm | 1084 | 11179 s | 24.31 cm | 1116 | 11499 s | 24.14 cm |
| 1021 | 10549 s | 24.65 cm | 1053 | 10869 s | 24.48 cm | 1085 | 11189 s | 24.31 cm | 1117 | 11509 s | 24.14 cm |
| 1022 | 10559 s | 24.64 cm | 1054 | 10879 s | 24.47 cm | 1086 | 11199 s | 24.3 cm | 1118 | 11519 s | 24.13 cm |
| 1023 | 10569 s | 24.64 cm | 1055 | 10889 s | 24.47 cm | 1087 | 11209 s | 24.3 cm | 1119 | 11529 s | 24.13 cm |
| 1024 | 10579 s | 24.63 cm | 1056 | 10899 s | 24.46 cm | 1088 | 11219 s | 24.29 cm | 1120 | 11539 s | 24.12 cm |
| 1025 | 10589 s | 24.63 cm | 1057 | 10909 s | 24.46 cm | 1089 | 11229 s | 24.29 cm | 1121 | 11549 s | 24.12 cm |
| 1026 | 10599 s | 24.62 cm | 1058 | 10919 s | 24.45 cm | 1090 | 11239 s | 24.28 cm | 1122 | 11559 s | 24.11 cm |
| 1027 | 10609 s | 24.62 cm | 1059 | 10929 s | 24.45 cm | 1091 | 11249 s | 24.28 cm | 1123 | 11569 s | 24.11 cm |
| 1028 | 10619 s | 24.61 cm | 1060 | 10939 s | 24.44 cm | 1092 | 11259 s | 24.27 cm | 1124 | 11579 s | 24.1 cm |

# Infiltration Report

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1125 | 11589 s | 24.1 cm | 1157 | 11909 s | 23.92 cm | 1189 | 12229 s | 23.76 cm | 1221 | 12549 s | 23.59 cm |
| 1126 | 11599 s | 24.09 cm | 1158 | 11919 s | 23.92 cm | 1190 | 12239 s | 23.75 cm | 1222 | 12559 s | 23.58 cm |
| 1127 | 11609 s | 24.09 cm | 1159 | 11929 s | 23.91 cm | 1191 | 12249 s | 23.75 cm | 1223 | 12569 s | 23.58 cm |
| 1128 | 11619 s | 24.08 cm | 1160 | 11939 s | 23.91 cm | 1192 | 12259 s | 23.74 cm | 1224 | 12579 s | 23.56 cm |
| 1129 | 11629 s | 24.08 cm | 1161 | 11949 s | 23.89 cm | 1193 | 12269 s | 23.74 cm | 1225 | 12589 s | 23.55 cm |
| 1130 | 11639 s | 24.07 cm | 1162 | 11959 s | 23.89 cm | 1194 | 12279 s | 23.72 cm | 1226 | 12599 s | 23.55 cm |
| 1131 | 11649 s | 24.07 cm | 1163 | 11969 s | 23.88 cm | 1195 | 12289 s | 23.72 cm | 1227 | 12609 s | 23.54 cm |
| 1132 | 11659 s | 24.05 cm | 1164 | 11979 s | 23.88 cm | 1196 | 12299 s | 23.71 cm | 1228 | 12619 s | 23.54 cm |
| 1133 | 11669 s | 24.05 cm | 1165 | 11989 s | 23.87 cm | 1197 | 12309 s | 23.71 cm | 1229 | 12629 s | 23.53 cm |
| 1134 | 11679 s | 24.04 cm | 1166 | 11999 s | 23.87 cm | 1198 | 12319 s | 23.7 cm | 1230 | 12639 s | 23.53 cm |
| 1135 | 11689 s | 24.04 cm | 1167 | 12009 s | 23.86 cm | 1199 | 12329 s | 23.7 cm | 1231 | 12649 s | 23.52 cm |
| 1136 | 11699 s | 24.03 cm | 1168 | 12019 s | 23.86 cm | 1200 | 12339 s | 23.69 cm | 1232 | 12659 s | 23.52 cm |
| 1137 | 11709 s | 24.03 cm | 1169 | 12029 s | 23.85 cm | 1201 | 12349 s | 23.69 cm | 1233 | 12669 s | 23.51 cm |
| 1138 | 11719 s | 24.02 cm | 1170 | 12039 s | 23.85 cm | 1202 | 12359 s | 23.68 cm | 1234 | 12679 s | 23.51 cm |
| 1139 | 11729 s | 24.02 cm | 1171 | 12049 s | 23.85 cm | 1203 | 12369 s | 23.68 cm | 1235 | 12689 s | 23.5 cm |
| 1140 | 11739 s | 24.01 cm | 1172 | 12059 s | 23.84 cm | 1204 | 12379 s | 23.67 cm | 1236 | 12699 s | 23.5 cm |
| 1141 | 11749 s | 24.01 cm | 1173 | 12069 s | 23.84 cm | 1205 | 12389 s | 23.67 cm | 1237 | 12709 s | 23.49 cm |
| 1142 | 11759 s | 24.0 cm | 1174 | 12079 s | 23.83 cm | 1206 | 12399 s | 23.66 cm | 1238 | 12719 s | 23.49 cm |
| 1143 | 11769 s | 23.99 cm | 1175 | 12089 s | 23.83 cm | 1207 | 12409 s | 23.66 cm | 1239 | 12729 s | 23.48 cm |
| 1144 | 11779 s | 23.99 cm | 1176 | 12099 s | 23.82 cm | 1208 | 12419 s | 23.65 cm | 1240 | 12739 s | 23.48 cm |
| 1145 | 11789 s | 23.98 cm | 1177 | 12109 s | 23.82 cm | 1209 | 12429 s | 23.65 cm | 1241 | 12749 s | 23.47 cm |
| 1146 | 11799 s | 23.98 cm | 1178 | 12119 s | 23.81 cm | 1210 | 12439 s | 23.64 cm | 1242 | 12759 s | 23.47 cm |
| 1147 | 11809 s | 23.97 cm | 1179 | 12129 s | 23.8 cm | 1211 | 12449 s | 23.64 cm | 1243 | 12769 s | 23.46 cm |
| 1148 | 11819 s | 23.97 cm | 1180 | 12139 s | 23.8 cm | 1212 | 12459 s | 23.63 cm | 1244 | 12779 s | 23.46 cm |
| 1149 | 11829 s | 23.96 cm | 1181 | 12149 s | 23.8 cm | 1213 | 12469 s | 23.63 cm | 1245 | 12789 s | 23.45 cm |
| 1150 | 11839 s | 23.96 cm | 1182 | 12159 s | 23.79 cm | 1214 | 12479 s | 23.62 cm | 1246 | 12799 s | 23.45 cm |
| 1151 | 11849 s | 23.95 cm | 1183 | 12169 s | 23.78 cm | 1215 | 12489 s | 23.62 cm | 1247 | 12809 s | 23.44 cm |
| 1152 | 11859 s | 23.95 cm | 1184 | 12179 s | 23.78 cm | 1216 | 12499 s | 23.61 cm | 1248 | 12819 s | 23.44 cm |
| 1153 | 11869 s | 23.94 cm | 1185 | 12189 s | 23.78 cm | 1217 | 12509 s | 23.61 cm | 1249 | 12829 s | 23.43 cm |
| 1154 | 11879 s | 23.94 cm | 1186 | 12199 s | 23.77 cm | 1218 | 12519 s | 23.6 cm | 1250 | 12839 s | 23.43 cm |
| 1155 | 11889 s | 23.93 cm | 1187 | 12209 s | 23.77 cm | 1219 | 12529 s | 23.6 cm | 1251 | 12849 s | 23.42 cm |
| 1156 | 11899 s | 23.93 cm | 1188 | 12219 s | 23.76 cm | 1220 | 12539 s | 23.59 cm | 1252 | 12859 s | 23.42 cm |

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1253 | 12869 s | 23.4 cm | 1285 | 13189 s | 23.23 cm | 1317 | 13509 s | 23.06 cm | 1349 | 13829 s | 22.89 cm |
| 1254 | 12879 s | 23.4 cm | 1286 | 13199 s | 23.23 cm | 1318 | 13519 s | 23.06 cm | 1350 | 13839 s | 22.89 cm |
| 1255 | 12889 s | 23.39 cm | 1287 | 13209 s | 23.22 cm | 1319 | 13529 s | 23.05 cm | 1351 | 13849 s | 22.88 cm |
| 1256 | 12899 s | 23.39 cm | 1288 | 13219 s | 23.22 cm | 1320 | 13539 s | 23.05 cm | 1352 | 13859 s | 22.88 cm |
| 1257 | 12909 s | 23.38 cm | 1289 | 13229 s | 23.21 cm | 1321 | 13549 s | 23.04 cm | 1353 | 13869 s | 22.87 cm |
| 1258 | 12919 s | 23.38 cm | 1290 | 13239 s | 23.21 cm | 1322 | 13559 s | 23.04 cm | 1354 | 13879 s | 22.87 cm |
| 1259 | 12929 s | 23.37 cm | 1291 | 13249 s | 23.2 cm | 1323 | 13569 s | 23.03 cm | 1355 | 13889 s | 22.86 cm |
| 1260 | 12939 s | 23.37 cm | 1292 | 13259 s | 23.2 cm | 1324 | 13579 s | 23.03 cm | 1356 | 13899 s | 22.86 cm |
| 1261 | 12949 s | 23.36 cm | 1293 | 13269 s | 23.19 cm | 1325 | 13589 s | 23.02 cm | 1357 | 13909 s | 22.85 cm |
| 1262 | 12959 s | 23.36 cm | 1294 | 13279 s | 23.19 cm | 1326 | 13599 s | 23.02 cm | 1358 | 13919 s | 22.85 cm |
| 1263 | 12969 s | 23.35 cm | 1295 | 13289 s | 23.18 cm | 1327 | 13609 s | 23.01 cm | 1359 | 13929 s | 22.84 cm |
| 1264 | 12979 s | 23.35 cm | 1296 | 13299 s | 23.18 cm | 1328 | 13619 s | 23.01 cm | 1360 | 13939 s | 22.84 cm |
| 1265 | 12989 s | 23.34 cm | 1297 | 13309 s | 23.17 cm | 1329 | 13629 s | 23.0 cm | 1361 | 13949 s | 22.84 cm |
| 1266 | 12999 s | 23.34 cm | 1298 | 13319 s | 23.17 cm | 1330 | 13639 s | 23.0 cm | 1362 | 13959 s | 22.83 cm |
| 1267 | 13009 s | 23.33 cm | 1299 | 13329 s | 23.16 cm | 1331 | 13649 s | 22.99 cm | 1363 | 13969 s | 22.82 cm |
| 1268 | 13019 s | 23.33 cm | 1300 | 13339 s | 23.16 cm | 1332 | 13659 s | 22.99 cm | 1364 | 13979 s | 22.82 cm |
| 1269 | 13029 s | 23.32 cm | 1301 | 13349 s | 23.15 cm | 1333 | 13669 s | 22.98 cm | 1365 | 13989 s | 22.81 cm |
| 1270 | 13039 s | 23.32 cm | 1302 | 13359 s | 23.15 cm | 1334 | 13679 s | 22.98 cm | 1366 | 13999 s | 22.81 cm |
| 1271 | 13049 s | 23.31 cm | 1303 | 13369 s | 23.14 cm | 1335 | 13689 s | 22.97 cm | 1367 | 14009 s | 22.8 cm |
| 1272 | 13059 s | 23.31 cm | 1304 | 13379 s | 23.14 cm | 1336 | 13699 s | 22.97 cm | 1368 | 14019 s | 22.8 cm |
| 1273 | 13069 s | 23.3 cm | 1305 | 13389 s | 23.13 cm | 1337 | 13709 s | 22.96 cm | 1369 | 14029 s | 22.8 cm |
| 1274 | 13079 s | 23.3 cm | 1306 | 13399 s | 23.13 cm | 1338 | 13719 s | 22.96 cm | 1370 | 14039 s | 22.79 cm |
| 1275 | 13089 s | 23.29 cm | 1307 | 13409 s | 23.12 cm | 1339 | 13729 s | 22.96 cm | 1371 | 14049 s | 22.79 cm |
| 1276 | 13099 s | 23.29 cm | 1308 | 13419 s | 23.12 cm | 1340 | 13739 s | 22.95 cm | 1372 | 14059 s | 22.78 cm |
| 1277 | 13109 s | 23.28 cm | 1309 | 13429 s | 23.11 cm | 1341 | 13749 s | 22.94 cm | 1373 | 14069 s | 22.78 cm |
| 1278 | 13119 s | 23.28 cm | 1310 | 13439 s | 23.11 cm | 1342 | 13759 s | 22.94 cm | 1374 | 14079 s | 22.77 cm |
| 1279 | 13129 s | 23.27 cm | 1311 | 13449 s | 23.1 cm | 1343 | 13769 s | 22.94 cm | 1375 | 14089 s | 22.76 cm |
| 1280 | 13139 s | 23.27 cm | 1312 | 13459 s | 23.1 cm | 1344 | 13779 s | 22.93 cm | 1376 | 14099 s | 22.76 cm |
| 1281 | 13149 s | 23.26 cm | 1313 | 13469 s | 23.09 cm | 1345 | 13789 s | 22.91 cm | 1377 | 14109 s | 22.74 cm |
| 1282 | 13159 s | 23.26 cm | 1314 | 13479 s | 23.09 cm | 1346 | 13799 s | 22.91 cm | 1378 | 14119 s | 22.74 cm |
| 1283 | 13169 s | 23.25 cm | 1315 | 13489 s | 23.07 cm | 1347 | 13809 s | 22.9 cm | 1379 | 14129 s | 22.73 cm |
| 1284 | 13179 s | 23.25 cm | 1316 | 13499 s | 23.07 cm | 1348 | 13819 s | 22.9 cm | 1380 | 14139 s | 22.73 cm |

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1381 | 14149 s | 22.72 cm | 1413 | 14469 s | 22.56 cm | 1445 | 14789 s | 22.39 cm | 1477 | 15109 s | 22.22 cm |
| 1382 | 14159 s | 22.72 cm | 1414 | 14479 s | 22.56 cm | 1446 | 14799 s | 22.38 cm | 1478 | 15119 s | 22.22 cm |
| 1383 | 14169 s | 22.71 cm | 1415 | 14489 s | 22.55 cm | 1447 | 14809 s | 22.38 cm | 1479 | 15129 s | 22.21 cm |
| 1384 | 14179 s | 22.71 cm | 1416 | 14499 s | 22.55 cm | 1448 | 14819 s | 22.37 cm | 1480 | 15139 s | 22.21 cm |
| 1385 | 14189 s | 22.7 cm | 1417 | 14509 s | 22.54 cm | 1449 | 14829 s | 22.37 cm | 1481 | 15149 s | 22.2 cm |
| 1386 | 14199 s | 22.7 cm | 1418 | 14519 s | 22.54 cm | 1450 | 14839 s | 22.37 cm | 1482 | 15159 s | 22.19 cm |
| 1387 | 14209 s | 22.69 cm | 1419 | 14529 s | 22.53 cm | 1451 | 14849 s | 22.36 cm | 1483 | 15169 s | 22.19 cm |
| 1388 | 14219 s | 22.69 cm | 1420 | 14539 s | 22.53 cm | 1452 | 14859 s | 22.36 cm | 1484 | 15179 s | 22.18 cm |
| 1389 | 14229 s | 22.68 cm | 1421 | 14549 s | 22.52 cm | 1453 | 14869 s | 22.35 cm | 1485 | 15189 s | 22.18 cm |
| 1390 | 14239 s | 22.68 cm | 1422 | 14559 s | 22.51 cm | 1454 | 14879 s | 22.35 cm | 1486 | 15199 s | 22.17 cm |
| 1391 | 14249 s | 22.67 cm | 1423 | 14569 s | 22.51 cm | 1455 | 14889 s | 22.34 cm | 1487 | 15209 s | 22.17 cm |
| 1392 | 14259 s | 22.67 cm | 1424 | 14579 s | 22.5 cm | 1456 | 14899 s | 22.34 cm | 1488 | 15219 s | 22.16 cm |
| 1393 | 14269 s | 22.66 cm | 1425 | 14589 s | 22.5 cm | 1457 | 14909 s | 22.33 cm | 1489 | 15229 s | 22.16 cm |
| 1394 | 14279 s | 22.66 cm | 1426 | 14599 s | 22.49 cm | 1458 | 14919 s | 22.33 cm | 1490 | 15239 s | 22.15 cm |
| 1395 | 14289 s | 22.66 cm | 1427 | 14609 s | 22.49 cm | 1459 | 14929 s | 22.32 cm | 1491 | 15249 s | 22.15 cm |
| 1396 | 14299 s | 22.65 cm | 1428 | 14619 s | 22.48 cm | 1460 | 14939 s | 22.31 cm | 1492 | 15259 s | 22.14 cm |
| 1397 | 14309 s | 22.65 cm | 1429 | 14629 s | 22.48 cm | 1461 | 14949 s | 22.31 cm | 1493 | 15269 s | 22.14 cm |
| 1398 | 14319 s | 22.64 cm | 1430 | 14639 s | 22.48 cm | 1462 | 14959 s | 22.31 cm | 1494 | 15279 s | 22.13 cm |
| 1399 | 14329 s | 22.64 cm | 1431 | 14649 s | 22.47 cm | 1463 | 14969 s | 22.3 cm | 1495 | 15289 s | 22.13 cm |
| 1400 | 14339 s | 22.63 cm | 1432 | 14659 s | 22.46 cm | 1464 | 14979 s | 22.3 cm | 1496 | 15299 s | 22.13 cm |
| 1401 | 14349 s | 22.63 cm | 1433 | 14669 s | 22.46 cm | 1465 | 14989 s | 22.29 cm | 1497 | 15309 s | 22.12 cm |
| 1402 | 14359 s | 22.62 cm | 1434 | 14679 s | 22.45 cm | 1466 | 14999 s | 22.29 cm | 1498 | 15319 s | 22.12 cm |
| 1403 | 14369 s | 22.62 cm | 1435 | 14689 s | 22.45 cm | 1467 | 15009 s | 22.28 cm | 1499 | 15329 s | 22.11 cm |
| 1404 | 14379 s | 22.61 cm | 1436 | 14699 s | 22.44 cm | 1468 | 15019 s | 22.28 cm | 1500 | 15339 s | 22.11 cm |
| 1405 | 14389 s | 22.61 cm | 1437 | 14709 s | 22.44 cm | 1469 | 15029 s | 22.27 cm | 1501 | 15349 s | 22.09 cm |
| 1406 | 14399 s | 22.6 cm | 1438 | 14719 s | 22.43 cm | 1470 | 15039 s | 22.27 cm | 1502 | 15359 s | 22.09 cm |
| 1407 | 14409 s | 22.6 cm | 1439 | 14729 s | 22.43 cm | 1471 | 15049 s | 22.25 cm | 1503 | 15369 s | 22.08 cm |
| 1408 | 14419 s | 22.6 cm | 1440 | 14739 s | 22.41 cm | 1472 | 15059 s | 22.25 cm | 1504 | 15379 s | 22.08 cm |
| 1409 | 14429 s | 22.58 cm | 1441 | 14749 s | 22.41 cm | 1473 | 15069 s | 22.24 cm | 1505 | 15389 s | 22.07 cm |
| 1410 | 14439 s | 22.58 cm | 1442 | 14759 s | 22.4 cm | 1474 | 15079 s | 22.24 cm | 1506 | 15399 s | 22.07 cm |
| 1411 | 14449 s | 22.57 cm | 1443 | 14769 s | 22.4 cm | 1475 | 15089 s | 22.23 cm | 1507 | 15409 s | 22.06 cm |
| 1412 | 14459 s | 22.57 cm | 1444 | 14779 s | 22.39 cm | 1476 | 15099 s | 22.23 cm | 1508 | 15419 s | 22.06 cm |

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## Lotus Lake WIP - Kerber - Kerber Pond

### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1509 | 15429 s | 22.05 cm | 1541 | 15749 s | 21.89 cm | 1573 | 16069 s | 21.72 cm | 1605 | 16389 s | 21.56 cm |
| 1510 | 15439 s | 22.05 cm | 1542 | 15759 s | 21.88 cm | 1574 | 16079 s | 21.72 cm | 1606 | 16399 s | 21.55 cm |
| 1511 | 15449 s | 22.04 cm | 1543 | 15769 s | 21.88 cm | 1575 | 16089 s | 21.71 cm | 1607 | 16409 s | 21.55 cm |
| 1512 | 15459 s | 22.04 cm | 1544 | 15779 s | 21.87 cm | 1576 | 16099 s | 21.71 cm | 1608 | 16419 s | 21.54 cm |
| 1513 | 15469 s | 22.03 cm | 1545 | 15789 s | 21.87 cm | 1577 | 16109 s | 21.7 cm | 1609 | 16429 s | 21.54 cm |
| 1514 | 15479 s | 22.03 cm | 1546 | 15799 s | 21.86 cm | 1578 | 16119 s | 21.7 cm | 1610 | 16439 s | 21.53 cm |
| 1515 | 15489 s | 22.02 cm | 1547 | 15809 s | 21.86 cm | 1579 | 16129 s | 21.69 cm | 1611 | 16449 s | 21.53 cm |
| 1516 | 15499 s | 22.02 cm | 1548 | 15819 s | 21.85 cm | 1580 | 16139 s | 21.69 cm | 1612 | 16459 s | 21.52 cm |
| 1517 | 15509 s | 22.01 cm | 1549 | 15829 s | 21.85 cm | 1581 | 16149 s | 21.68 cm | 1613 | 16469 s | 21.52 cm |
| 1518 | 15519 s | 22.01 cm | 1550 | 15839 s | 21.84 cm | 1582 | 16159 s | 21.68 cm | 1614 | 16479 s | 21.51 cm |
| 1519 | 15529 s | 22.0 cm | 1551 | 15849 s | 21.84 cm | 1583 | 16169 s | 21.67 cm | 1615 | 16489 s | 21.51 cm |
| 1520 | 15539 s | 22.0 cm | 1552 | 15859 s | 21.83 cm | 1584 | 16179 s | 21.67 cm | 1616 | 16499 s | 21.5 cm |
| 1521 | 15549 s | 21.99 cm | 1553 | 15869 s | 21.83 cm | 1585 | 16189 s | 21.66 cm | 1617 | 16509 s | 21.5 cm |
| 1522 | 15559 s | 21.99 cm | 1554 | 15879 s | 21.82 cm | 1586 | 16199 s | 21.66 cm | 1618 | 16519 s | 21.49 cm |
| 1523 | 15569 s | 21.98 cm | 1555 | 15889 s | 21.82 cm | 1587 | 16209 s | 21.65 cm | 1619 | 16529 s | 21.49 cm |
| 1524 | 15579 s | 21.98 cm | 1556 | 15899 s | 21.81 cm | 1588 | 16219 s | 21.65 cm | 1620 | 16539 s | 21.48 cm |
| 1525 | 15589 s | 21.97 cm | 1557 | 15909 s | 21.81 cm | 1589 | 16229 s | 21.64 cm | 1621 | 16549 s | 21.48 cm |
| 1526 | 15599 s | 21.97 cm | 1558 | 15919 s | 21.8 cm | 1590 | 16239 s | 21.64 cm | 1622 | 16559 s | 21.47 cm |
| 1527 | 15609 s | 21.97 cm | 1559 | 15929 s | 21.8 cm | 1591 | 16249 s | 21.64 cm | 1623 | 16569 s | 21.47 cm |
| 1528 | 15619 s | 21.96 cm | 1560 | 15939 s | 21.8 cm | 1592 | 16259 s | 21.63 cm | 1624 | 16579 s | 21.46 cm |
| 1529 | 15629 s | 21.96 cm | 1561 | 15949 s | 21.79 cm | 1593 | 16269 s | 21.63 cm | 1625 | 16589 s | 21.46 cm |
| 1530 | 15639 s | 21.95 cm | 1562 | 15959 s | 21.79 cm | 1594 | 16279 s | 21.62 cm | 1626 | 16599 s | 21.46 cm |
| 1531 | 15649 s | 21.95 cm | 1563 | 15969 s | 21.78 cm | 1595 | 16289 s | 21.62 cm | 1627 | 16609 s | 21.45 cm |
| 1532 | 15659 s | 21.94 cm | 1564 | 15979 s | 21.78 cm | 1596 | 16299 s | 21.61 cm | 1628 | 16619 s | 21.45 cm |
| 1533 | 15669 s | 21.94 cm | 1565 | 15989 s | 21.76 cm | 1597 | 16309 s | 21.61 cm | 1629 | 16629 s | 21.43 cm |
| 1534 | 15679 s | 21.92 cm | 1566 | 15999 s | 21.75 cm | 1598 | 16319 s | 21.59 cm | 1630 | 16639 s | 21.43 cm |
| 1535 | 15689 s | 21.92 cm | 1567 | 16009 s | 21.75 cm | 1599 | 16329 s | 21.59 cm | 1631 | 16649 s | 21.42 cm |
| 1536 | 15699 s | 21.91 cm | 1568 | 16019 s | 21.75 cm | 1600 | 16339 s | 21.58 cm | 1632 | 16659 s | 21.42 cm |
| 1537 | 15709 s | 21.91 cm | 1569 | 16029 s | 21.74 cm | 1601 | 16349 s | 21.58 cm | 1633 | 16669 s | 21.41 cm |
| 1538 | 15719 s | 21.9 cm | 1570 | 16039 s | 21.74 cm | 1602 | 16359 s | 21.57 cm | 1634 | 16679 s | 21.41 cm |
| 1539 | 15729 s | 21.9 cm | 1571 | 16049 s | 21.73 cm | 1603 | 16369 s | 21.57 cm | 1635 | 16689 s | 21.4 cm |
| 1540 | 15739 s | 21.89 cm | 1572 | 16059 s | 21.73 cm | 1604 | 16379 s | 21.56 cm | 1636 | 16699 s | 21.4 cm |

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1637 | 16709 s | 21.39 cm | 1669 | 17029 s | 21.22 cm | 1701 | 17349 s | 21.04 cm | 1733 | 17669 s | 20.86 cm |
| 1638 | 16719 s | 21.39 cm | 1670 | 17039 s | 21.21 cm | 1702 | 17359 s | 21.04 cm | 1734 | 17679 s | 20.85 cm |
| 1639 | 16729 s | 21.38 cm | 1671 | 17049 s | 21.21 cm | 1703 | 17369 s | 21.03 cm | 1735 | 17689 s | 20.85 cm |
| 1640 | 16739 s | 21.38 cm | 1672 | 17059 s | 21.2 cm | 1704 | 17379 s | 21.03 cm | 1736 | 17699 s | 20.84 cm |
| 1641 | 16749 s | 21.37 cm | 1673 | 17069 s | 21.2 cm | 1705 | 17389 s | 21.02 cm | 1737 | 17709 s | 20.84 cm |
| 1642 | 16759 s | 21.37 cm | 1674 | 17079 s | 21.19 cm | 1706 | 17399 s | 21.01 cm | 1738 | 17719 s | 20.83 cm |
| 1643 | 16769 s | 21.36 cm | 1675 | 17089 s | 21.19 cm | 1707 | 17409 s | 21.01 cm | 1739 | 17729 s | 20.83 cm |
| 1644 | 16779 s | 21.36 cm | 1676 | 17099 s | 21.18 cm | 1708 | 17419 s | 21.0 cm | 1740 | 17739 s | 20.82 cm |
| 1645 | 16789 s | 21.35 cm | 1677 | 17109 s | 21.18 cm | 1709 | 17429 s | 21.0 cm | 1741 | 17749 s | 20.82 cm |
| 1646 | 16799 s | 21.35 cm | 1678 | 17119 s | 21.17 cm | 1710 | 17439 s | 20.99 cm | 1742 | 17759 s | 20.81 cm |
| 1647 | 16809 s | 21.34 cm | 1679 | 17129 s | 21.17 cm | 1711 | 17449 s | 20.99 cm | 1743 | 17769 s | 20.81 cm |
| 1648 | 16819 s | 21.34 cm | 1680 | 17139 s | 21.16 cm | 1712 | 17459 s | 20.98 cm | 1744 | 17779 s | 20.8 cm |
| 1649 | 16829 s | 21.33 cm | 1681 | 17149 s | 21.16 cm | 1713 | 17469 s | 20.98 cm | 1745 | 17789 s | 20.78 cm |
| 1650 | 16839 s | 21.33 cm | 1682 | 17159 s | 21.15 cm | 1714 | 17479 s | 20.97 cm | 1746 | 17799 s | 20.78 cm |
| 1651 | 16849 s | 21.32 cm | 1683 | 17169 s | 21.15 cm | 1715 | 17489 s | 20.97 cm | 1747 | 17809 s | 20.77 cm |
| 1652 | 16859 s | 21.32 cm | 1684 | 17179 s | 21.14 cm | 1716 | 17499 s | 20.96 cm | 1748 | 17819 s | 20.77 cm |
| 1653 | 16869 s | 21.31 cm | 1685 | 17189 s | 21.14 cm | 1717 | 17509 s | 20.96 cm | 1749 | 17829 s | 20.76 cm |
| 1654 | 16879 s | 21.31 cm | 1686 | 17199 s | 21.13 cm | 1718 | 17519 s | 20.94 cm | 1750 | 17839 s | 20.76 cm |
| 1655 | 16889 s | 21.3 cm | 1687 | 17209 s | 21.13 cm | 1719 | 17529 s | 20.93 cm | 1751 | 17849 s | 20.75 cm |
| 1656 | 16899 s | 21.3 cm | 1688 | 17219 s | 21.12 cm | 1720 | 17539 s | 20.93 cm | 1752 | 17859 s | 20.75 cm |
| 1657 | 16909 s | 21.29 cm | 1689 | 17229 s | 21.12 cm | 1721 | 17549 s | 20.93 cm | 1753 | 17869 s | 20.74 cm |
| 1658 | 16919 s | 21.29 cm | 1690 | 17239 s | 21.1 cm | 1722 | 17559 s | 20.92 cm | 1754 | 17879 s | 20.74 cm |
| 1659 | 16929 s | 21.27 cm | 1691 | 17249 s | 21.09 cm | 1723 | 17569 s | 20.91 cm | 1755 | 17889 s | 20.73 cm |
| 1660 | 16939 s | 21.27 cm | 1692 | 17259 s | 21.09 cm | 1724 | 17579 s | 20.91 cm | 1756 | 17899 s | 20.73 cm |
| 1661 | 16949 s | 21.26 cm | 1693 | 17269 s | 21.08 cm | 1725 | 17589 s | 20.9 cm | 1757 | 17909 s | 20.72 cm |
| 1662 | 16959 s | 21.26 cm | 1694 | 17279 s | 21.08 cm | 1726 | 17599 s | 20.9 cm | 1758 | 17919 s | 20.72 cm |
| 1663 | 16969 s | 21.25 cm | 1695 | 17289 s | 21.07 cm | 1727 | 17609 s | 20.89 cm | 1759 | 17929 s | 20.71 cm |
| 1664 | 16979 s | 21.25 cm | 1696 | 17299 s | 21.07 cm | 1728 | 17619 s | 20.89 cm | 1760 | 17939 s | 20.7 cm |
| 1665 | 16989 s | 21.24 cm | 1697 | 17309 s | 21.06 cm | 1729 | 17629 s | 20.88 cm | 1761 | 17949 s | 20.7 cm |
| 1666 | 16999 s | 21.24 cm | 1698 | 17319 s | 21.06 cm | 1730 | 17639 s | 20.88 cm | 1762 | 17959 s | 20.69 cm |
| 1667 | 17009 s | 21.23 cm | 1699 | 17329 s | 21.05 cm | 1731 | 17649 s | 20.87 cm | 1763 | 17969 s | 20.69 cm |
| 1668 | 17019 s | 21.22 cm | 1700 | 17339 s | 21.05 cm | 1732 | 17659 s | 20.87 cm | 1764 | 17979 s | 20.68 cm |

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## Lotus Lake WIP - Kerber - Kerber Pond

### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1765 | 17989 s | 20.68 cm | 1797 | 18309 s | 20.49 cm | 1829 | 18629 s | 20.31 cm | 1861 | 18949 s | 20.11 cm |
| 1766 | 17999 s | 20.67 cm | 1798 | 18319 s | 20.49 cm | 1830 | 18639 s | 20.3 cm | 1862 | 18959 s | 20.11 cm |
| 1767 | 18009 s | 20.67 cm | 1799 | 18329 s | 20.48 cm | 1831 | 18649 s | 20.3 cm | 1863 | 18969 s | 20.1 cm |
| 1768 | 18019 s | 20.66 cm | 1800 | 18339 s | 20.48 cm | 1832 | 18659 s | 20.28 cm | 1864 | 18979 s | 20.1 cm |
| 1769 | 18029 s | 20.66 cm | 1801 | 18349 s | 20.47 cm | 1833 | 18669 s | 20.28 cm | 1865 | 18989 s | 20.09 cm |
| 1770 | 18039 s | 20.65 cm | 1802 | 18359 s | 20.47 cm | 1834 | 18679 s | 20.27 cm | 1866 | 18999 s | 20.08 cm |
| 1771 | 18049 s | 20.65 cm | 1803 | 18369 s | 20.45 cm | 1835 | 18689 s | 20.27 cm | 1867 | 19009 s | 20.08 cm |
| 1772 | 18059 s | 20.64 cm | 1804 | 18379 s | 20.44 cm | 1836 | 18699 s | 20.26 cm | 1868 | 19019 s | 20.07 cm |
| 1773 | 18069 s | 20.63 cm | 1805 | 18389 s | 20.44 cm | 1837 | 18709 s | 20.25 cm | 1869 | 19029 s | 20.07 cm |
| 1774 | 18079 s | 20.63 cm | 1806 | 18399 s | 20.43 cm | 1838 | 18719 s | 20.25 cm | 1870 | 19039 s | 20.06 cm |
| 1775 | 18089 s | 20.61 cm | 1807 | 18409 s | 20.43 cm | 1839 | 18729 s | 20.24 cm | 1871 | 19049 s | 20.06 cm |
| 1776 | 18099 s | 20.61 cm | 1808 | 18419 s | 20.42 cm | 1840 | 18739 s | 20.24 cm | 1872 | 19059 s | 20.05 cm |
| 1777 | 18109 s | 20.6 cm | 1809 | 18429 s | 20.42 cm | 1841 | 18749 s | 20.23 cm | 1873 | 19069 s | 20.05 cm |
| 1778 | 18119 s | 20.6 cm | 1810 | 18439 s | 20.41 cm | 1842 | 18759 s | 20.23 cm | 1874 | 19079 s | 20.04 cm |
| 1779 | 18129 s | 20.59 cm | 1811 | 18449 s | 20.41 cm | 1843 | 18769 s | 20.22 cm | 1875 | 19089 s | 20.04 cm |
| 1780 | 18139 s | 20.59 cm | 1812 | 18459 s | 20.4 cm | 1844 | 18779 s | 20.22 cm | 1876 | 19099 s | 20.03 cm |
| 1781 | 18149 s | 20.58 cm | 1813 | 18469 s | 20.4 cm | 1845 | 18789 s | 20.21 cm | 1877 | 19109 s | 20.02 cm |
| 1782 | 18159 s | 20.58 cm | 1814 | 18479 s | 20.39 cm | 1846 | 18799 s | 20.21 cm | 1878 | 19119 s | 20.02 cm |
| 1783 | 18169 s | 20.57 cm | 1815 | 18489 s | 20.38 cm | 1847 | 18809 s | 20.2 cm | 1879 | 19129 s | 20.01 cm |
| 1784 | 18179 s | 20.57 cm | 1816 | 18499 s | 20.38 cm | 1848 | 18819 s | 20.19 cm | 1880 | 19139 s | 20.01 cm |
| 1785 | 18189 s | 20.56 cm | 1817 | 18509 s | 20.37 cm | 1849 | 18829 s | 20.19 cm | 1881 | 19149 s | 20.0 cm |
| 1786 | 18199 s | 20.55 cm | 1818 | 18519 s | 20.37 cm | 1850 | 18839 s | 20.18 cm | 1882 | 19159 s | 20.0 cm |
| 1787 | 18209 s | 20.55 cm | 1819 | 18529 s | 20.36 cm | 1851 | 18849 s | 20.18 cm | 1883 | 19169 s | 19.99 cm |
| 1788 | 18219 s | 20.54 cm | 1820 | 18539 s | 20.36 cm | 1852 | 18859 s | 20.17 cm | 1884 | 19179 s | 19.99 cm |
| 1789 | 18229 s | 20.54 cm | 1821 | 18549 s | 20.35 cm | 1853 | 18869 s | 20.17 cm | 1885 | 19189 s | 19.98 cm |
| 1790 | 18239 s | 20.53 cm | 1822 | 18559 s | 20.35 cm | 1854 | 18879 s | 20.16 cm | 1886 | 19199 s | 19.96 cm |
| 1791 | 18249 s | 20.53 cm | 1823 | 18569 s | 20.34 cm | 1855 | 18889 s | 20.16 cm | 1887 | 19209 s | 19.96 cm |
| 1792 | 18259 s | 20.52 cm | 1824 | 18579 s | 20.34 cm | 1856 | 18899 s | 20.15 cm | 1888 | 19219 s | 19.95 cm |
| 1793 | 18269 s | 20.52 cm | 1825 | 18589 s | 20.33 cm | 1857 | 18909 s | 20.15 cm | 1889 | 19229 s | 19.95 cm |
| 1794 | 18279 s | 20.51 cm | 1826 | 18599 s | 20.33 cm | 1858 | 18919 s | 20.14 cm | 1890 | 19239 s | 19.94 cm |
| 1795 | 18289 s | 20.51 cm | 1827 | 18609 s | 20.32 cm | 1859 | 18929 s | 20.12 cm | 1891 | 19249 s | 19.94 cm |
| 1796 | 18299 s | 20.5 cm | 1828 | 18619 s | 20.31 cm | 1860 | 18939 s | 20.12 cm | 1892 | 19259 s | 19.93 cm |

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1893 | 19269 s | 19.92 cm | 1925 | 19589 s | 19.74 cm | 1957 | 19909 s | 19.55 cm | 1989 | 20229 s | 19.38 cm |
| 1894 | 19279 s | 19.92 cm | 1926 | 19599 s | 19.73 cm | 1958 | 19919 s | 19.55 cm | 1990 | 20239 s | 19.37 cm |
| 1895 | 19289 s | 19.91 cm | 1927 | 19609 s | 19.73 cm | 1959 | 19929 s | 19.54 cm | 1991 | 20249 s | 19.37 cm |
| 1896 | 19299 s | 19.91 cm | 1928 | 19619 s | 19.72 cm | 1960 | 19939 s | 19.54 cm | 1992 | 20259 s | 19.36 cm |
| 1897 | 19309 s | 19.9 cm | 1929 | 19629 s | 19.71 cm | 1961 | 19949 s | 19.53 cm | 1993 | 20269 s | 19.36 cm |
| 1898 | 19319 s | 19.9 cm | 1930 | 19639 s | 19.71 cm | 1962 | 19959 s | 19.53 cm | 1994 | 20279 s | 19.35 cm |
| 1899 | 19329 s | 19.89 cm | 1931 | 19649 s | 19.7 cm | 1963 | 19969 s | 19.52 cm | 1995 | 20289 s | 19.34 cm |
| 1900 | 19339 s | 19.89 cm | 1932 | 19659 s | 19.7 cm | 1964 | 19979 s | 19.52 cm | 1996 | 20299 s | 19.34 cm |
| 1901 | 19349 s | 19.88 cm | 1933 | 19669 s | 19.69 cm | 1965 | 19989 s | 19.51 cm | 1997 | 20309 s | 19.33 cm |
| 1902 | 19359 s | 19.87 cm | 1934 | 19679 s | 19.69 cm | 1966 | 19999 s | 19.51 cm | 1998 | 20319 s | 19.33 cm |
| 1903 | 19369 s | 19.87 cm | 1935 | 19689 s | 19.68 cm | 1967 | 20009 s | 19.5 cm | 1999 | 20329 s | 19.32 cm |
| 1904 | 19379 s | 19.86 cm | 1936 | 19699 s | 19.68 cm | 1968 | 20019 s | 19.5 cm | 2000 | 20339 s | 19.32 cm |
| 1905 | 19389 s | 19.86 cm | 1937 | 19709 s | 19.67 cm | 1969 | 20029 s | 19.49 cm | 2001 | 20349 s | 19.3 cm |
| 1906 | 19399 s | 19.85 cm | 1938 | 19719 s | 19.66 cm | 1970 | 20039 s | 19.48 cm | 2002 | 20359 s | 19.3 cm |
| 1907 | 19409 s | 19.85 cm | 1939 | 19729 s | 19.66 cm | 1971 | 20049 s | 19.48 cm | 2003 | 20369 s | 19.29 cm |
| 1908 | 19419 s | 19.84 cm | 1940 | 19739 s | 19.65 cm | 1972 | 20059 s | 19.46 cm | 2004 | 20379 s | 19.29 cm |
| 1909 | 19429 s | 19.83 cm | 1941 | 19749 s | 19.65 cm | 1973 | 20069 s | 19.46 cm | 2005 | 20389 s | 19.28 cm |
| 1910 | 19439 s | 19.83 cm | 1942 | 19759 s | 19.63 cm | 1974 | 20079 s | 19.45 cm | 2006 | 20399 s | 19.28 cm |
| 1911 | 19449 s | 19.82 cm | 1943 | 19769 s | 19.63 cm | 1975 | 20089 s | 19.45 cm | 2007 | 20409 s | 19.27 cm |
| 1912 | 19459 s | 19.82 cm | 1944 | 19779 s | 19.62 cm | 1976 | 20099 s | 19.44 cm | 2008 | 20419 s | 19.27 cm |
| 1913 | 19469 s | 19.81 cm | 1945 | 19789 s | 19.62 cm | 1977 | 20109 s | 19.44 cm | 2009 | 20429 s | 19.26 cm |
| 1914 | 19479 s | 19.81 cm | 1946 | 19799 s | 19.61 cm | 1978 | 20119 s | 19.43 cm | 2010 | 20439 s | 19.25 cm |
| 1915 | 19489 s | 19.79 cm | 1947 | 19809 s | 19.61 cm | 1979 | 20129 s | 19.43 cm | 2011 | 20449 s | 19.25 cm |
| 1916 | 19499 s | 19.79 cm | 1948 | 19819 s | 19.6 cm | 1980 | 20139 s | 19.42 cm | 2012 | 20459 s | 19.24 cm |
| 1917 | 19509 s | 19.78 cm | 1949 | 19829 s | 19.6 cm | 1981 | 20149 s | 19.42 cm | 2013 | 20469 s | 19.24 cm |
| 1918 | 19519 s | 19.77 cm | 1950 | 19839 s | 19.59 cm | 1982 | 20159 s | 19.41 cm | 2014 | 20479 s | 19.23 cm |
| 1919 | 19529 s | 19.77 cm | 1951 | 19849 s | 19.59 cm | 1983 | 20169 s | 19.41 cm | 2015 | 20489 s | 19.23 cm |
| 1920 | 19539 s | 19.76 cm | 1952 | 19859 s | 19.58 cm | 1984 | 20179 s | 19.4 cm | 2016 | 20499 s | 19.22 cm |
| 1921 | 19549 s | 19.76 cm | 1953 | 19869 s | 19.58 cm | 1985 | 20189 s | 19.4 cm | 2017 | 20509 s | 19.22 cm |
| 1922 | 19559 s | 19.75 cm | 1954 | 19879 s | 19.57 cm | 1986 | 20199 s | 19.39 cm | 2018 | 20519 s | 19.21 cm |
| 1923 | 19569 s | 19.75 cm | 1955 | 19889 s | 19.57 cm | 1987 | 20209 s | 19.39 cm | 2019 | 20529 s | 19.21 cm |
| 1924 | 19579 s | 19.74 cm | 1956 | 19899 s | 19.56 cm | 1988 | 20219 s | 19.38 cm | 2020 | 20539 s | 19.2 cm |

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2021 | 20549 s | 19.19 cm | 2053 | 20869 s | 19.01 cm | 2085 | 21189 s | 18.83 cm | 2117 | 21509 s | 18.64 cm |
| 2022 | 20559 s | 19.19 cm | 2054 | 20879 s | 19.01 cm | 2086 | 21199 s | 18.83 cm | 2118 | 21519 s | 18.64 cm |
| 2023 | 20569 s | 19.18 cm | 2055 | 20889 s | 19.0 cm | 2087 | 21209 s | 18.81 cm | 2119 | 21529 s | 18.63 cm |
| 2024 | 20579 s | 19.18 cm | 2056 | 20899 s | 19.0 cm | 2088 | 21219 s | 18.81 cm | 2120 | 21539 s | 18.63 cm |
| 2025 | 20589 s | 19.17 cm | 2057 | 20909 s | 18.99 cm | 2089 | 21229 s | 18.8 cm | 2121 | 21549 s | 18.62 cm |
| 2026 | 20599 s | 19.17 cm | 2058 | 20919 s | 18.99 cm | 2090 | 21239 s | 18.8 cm | 2122 | 21559 s | 18.61 cm |
| 2027 | 20609 s | 19.16 cm | 2059 | 20929 s | 18.97 cm | 2091 | 21249 s | 18.79 cm | 2123 | 21569 s | 18.61 cm |
| 2028 | 20619 s | 19.16 cm | 2060 | 20939 s | 18.97 cm | 2092 | 21259 s | 18.79 cm | 2124 | 21579 s | 18.6 cm |
| 2029 | 20629 s | 19.14 cm | 2061 | 20949 s | 18.96 cm | 2093 | 21269 s | 18.78 cm | 2125 | 21589 s | 18.6 cm |
| 2030 | 20639 s | 19.14 cm | 2062 | 20959 s | 18.96 cm | 2094 | 21279 s | 18.78 cm | 2126 | 21599 s | 18.59 cm |
| 2031 | 20649 s | 19.13 cm | 2063 | 20969 s | 18.95 cm | 2095 | 21289 s | 18.77 cm | 2127 | 21609 s | 18.59 cm |
| 2032 | 20659 s | 19.12 cm | 2064 | 20979 s | 18.95 cm | 2096 | 21299 s | 18.77 cm | 2128 | 21619 s | 18.58 cm |
| 2033 | 20669 s | 19.12 cm | 2065 | 20989 s | 18.94 cm | 2097 | 21309 s | 18.76 cm | 2129 | 21629 s | 18.58 cm |
| 2034 | 20679 s | 19.11 cm | 2066 | 20999 s | 18.93 cm | 2098 | 21319 s | 18.76 cm | 2130 | 21639 s | 18.57 cm |
| 2035 | 20689 s | 19.11 cm | 2067 | 21009 s | 18.93 cm | 2099 | 21329 s | 18.75 cm | 2131 | 21649 s | 18.57 cm |
| 2036 | 20699 s | 19.1 cm | 2068 | 21019 s | 18.92 cm | 2100 | 21339 s | 18.75 cm | 2132 | 21659 s | 18.56 cm |
| 2037 | 20709 s | 19.1 cm | 2069 | 21029 s | 18.92 cm | 2101 | 21349 s | 18.74 cm | 2133 | 21669 s | 18.56 cm |
| 2038 | 20719 s | 19.09 cm | 2070 | 21039 s | 18.91 cm | 2102 | 21359 s | 18.73 cm | 2134 | 21679 s | 18.55 cm |
| 2039 | 20729 s | 19.09 cm | 2071 | 21049 s | 18.91 cm | 2103 | 21369 s | 18.73 cm | 2135 | 21689 s | 18.55 cm |
| 2040 | 20739 s | 19.08 cm | 2072 | 21059 s | 18.9 cm | 2104 | 21379 s | 18.72 cm | 2136 | 21699 s | 18.54 cm |
| 2041 | 20749 s | 19.08 cm | 2073 | 21069 s | 18.9 cm | 2105 | 21389 s | 18.72 cm | 2137 | 21709 s | 18.53 cm |
| 2042 | 20759 s | 19.07 cm | 2074 | 21079 s | 18.89 cm | 2106 | 21399 s | 18.71 cm | 2138 | 21719 s | 18.53 cm |
| 2043 | 20769 s | 19.06 cm | 2075 | 21089 s | 18.89 cm | 2107 | 21409 s | 18.71 cm | 2139 | 21729 s | 18.52 cm |
| 2044 | 20779 s | 19.06 cm | 2076 | 21099 s | 18.88 cm | 2108 | 21419 s | 18.7 cm | 2140 | 21739 s | 18.52 cm |
| 2045 | 20789 s | 19.05 cm | 2077 | 21109 s | 18.88 cm | 2109 | 21429 s | 18.7 cm | 2141 | 21749 s | 18.51 cm |
| 2046 | 20799 s | 19.05 cm | 2078 | 21119 s | 18.87 cm | 2110 | 21439 s | 18.69 cm | 2142 | 21759 s | 18.51 cm |
| 2047 | 20809 s | 19.04 cm | 2079 | 21129 s | 18.87 cm | 2111 | 21449 s | 18.69 cm | 2143 | 21769 s | 18.5 cm |
| 2048 | 20819 s | 19.04 cm | 2080 | 21139 s | 18.86 cm | 2112 | 21459 s | 18.68 cm | 2144 | 21779 s | 18.5 cm |
| 2049 | 20829 s | 19.03 cm | 2081 | 21149 s | 18.86 cm | 2113 | 21469 s | 18.67 cm | 2145 | 21789 s | 18.48 cm |
| 2050 | 20839 s | 19.03 cm | 2082 | 21159 s | 18.85 cm | 2114 | 21479 s | 18.67 cm | 2146 | 21799 s | 18.48 cm |
| 2051 | 20849 s | 19.02 cm | 2083 | 21169 s | 18.85 cm | 2115 | 21489 s | 18.65 cm | 2147 | 21809 s | 18.47 cm |
| 2052 | 20859 s | 19.02 cm | 2084 | 21179 s | 18.84 cm | 2116 | 21499 s | 18.65 cm | 2148 | 21819 s | 18.47 cm |

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2149 | 21829 s | 18.46 cm | 2181 | 22149 s | 18.28 cm | 2213 | 22469 s | 18.1 cm | 2245 | 22789 s | 17.92 cm |
| 2150 | 21839 s | 18.46 cm | 2182 | 22159 s | 18.28 cm | 2214 | 22479 s | 18.09 cm | 2246 | 22799 s | 17.91 cm |
| 2151 | 21849 s | 18.45 cm | 2183 | 22169 s | 18.27 cm | 2215 | 22489 s | 18.09 cm | 2247 | 22809 s | 17.91 cm |
| 2152 | 21859 s | 18.45 cm | 2184 | 22179 s | 18.27 cm | 2216 | 22499 s | 18.08 cm | 2248 | 22819 s | 17.9 cm |
| 2153 | 21869 s | 18.44 cm | 2185 | 22189 s | 18.26 cm | 2217 | 22509 s | 18.08 cm | 2249 | 22829 s | 17.89 cm |
| 2154 | 21879 s | 18.43 cm | 2186 | 22199 s | 18.26 cm | 2218 | 22519 s | 18.07 cm | 2250 | 22839 s | 17.89 cm |
| 2155 | 21889 s | 18.43 cm | 2187 | 22209 s | 18.25 cm | 2219 | 22529 s | 18.07 cm | 2251 | 22849 s | 17.88 cm |
| 2156 | 21899 s | 18.42 cm | 2188 | 22219 s | 18.25 cm | 2220 | 22539 s | 18.06 cm | 2252 | 22859 s | 17.88 cm |
| 2157 | 21909 s | 18.42 cm | 2189 | 22229 s | 18.24 cm | 2221 | 22549 s | 18.06 cm | 2253 | 22869 s | 17.87 cm |
| 2158 | 21919 s | 18.41 cm | 2190 | 22239 s | 18.23 cm | 2222 | 22559 s | 18.05 cm | 2254 | 22879 s | 17.87 cm |
| 2159 | 21929 s | 18.41 cm | 2191 | 22249 s | 18.23 cm | 2223 | 22569 s | 18.05 cm | 2255 | 22889 s | 17.86 cm |
| 2160 | 21939 s | 18.4 cm | 2192 | 22259 s | 18.22 cm | 2224 | 22579 s | 18.04 cm | 2256 | 22899 s | 17.86 cm |
| 2161 | 21949 s | 18.4 cm | 2193 | 22269 s | 18.22 cm | 2225 | 22589 s | 18.03 cm | 2257 | 22909 s | 17.85 cm |
| 2162 | 21959 s | 18.39 cm | 2194 | 22279 s | 18.21 cm | 2226 | 22599 s | 18.03 cm | 2258 | 22919 s | 17.85 cm |
| 2163 | 21969 s | 18.39 cm | 2195 | 22289 s | 18.21 cm | 2227 | 22609 s | 18.02 cm | 2259 | 22929 s | 17.83 cm |
| 2164 | 21979 s | 18.38 cm | 2196 | 22299 s | 18.2 cm | 2228 | 22619 s | 18.02 cm | 2260 | 22939 s | 17.83 cm |
| 2165 | 21989 s | 18.38 cm | 2197 | 22309 s | 18.2 cm | 2229 | 22629 s | 18.01 cm | 2261 | 22949 s | 17.82 cm |
| 2166 | 21999 s | 18.37 cm | 2198 | 22319 s | 18.19 cm | 2230 | 22639 s | 18.01 cm | 2262 | 22959 s | 17.82 cm |
| 2167 | 22009 s | 18.37 cm | 2199 | 22329 s | 18.18 cm | 2231 | 22649 s | 17.99 cm | 2263 | 22969 s | 17.81 cm |
| 2168 | 22019 s | 18.36 cm | 2200 | 22339 s | 18.18 cm | 2232 | 22659 s | 17.99 cm | 2264 | 22979 s | 17.81 cm |
| 2169 | 22029 s | 18.36 cm | 2201 | 22349 s | 18.17 cm | 2233 | 22669 s | 17.98 cm | 2265 | 22989 s | 17.8 cm |
| 2170 | 22039 s | 18.35 cm | 2202 | 22359 s | 18.17 cm | 2234 | 22679 s | 17.98 cm | 2266 | 22999 s | 17.8 cm |
| 2171 | 22049 s | 18.35 cm | 2203 | 22369 s | 18.15 cm | 2235 | 22689 s | 17.97 cm | 2267 | 23009 s | 17.79 cm |
| 2172 | 22059 s | 18.34 cm | 2204 | 22379 s | 18.15 cm | 2236 | 22699 s | 17.97 cm | 2268 | 23019 s | 17.78 cm |
| 2173 | 22069 s | 18.32 cm | 2205 | 22389 s | 18.14 cm | 2237 | 22709 s | 17.96 cm | 2269 | 23029 s | 17.78 cm |
| 2174 | 22079 s | 18.32 cm | 2206 | 22399 s | 18.14 cm | 2238 | 22719 s | 17.96 cm | 2270 | 23039 s | 17.77 cm |
| 2175 | 22089 s | 18.31 cm | 2207 | 22409 s | 18.13 cm | 2239 | 22729 s | 17.95 cm | 2271 | 23049 s | 17.77 cm |
| 2176 | 22099 s | 18.31 cm | 2208 | 22419 s | 18.13 cm | 2240 | 22739 s | 17.94 cm | 2272 | 23059 s | 17.76 cm |
| 2177 | 22109 s | 18.3 cm | 2209 | 22429 s | 18.12 cm | 2241 | 22749 s | 17.94 cm | 2273 | 23069 s | 17.76 cm |
| 2178 | 22119 s | 18.3 cm | 2210 | 22439 s | 18.12 cm | 2242 | 22759 s | 17.93 cm | 2274 | 23079 s | 17.75 cm |
| 2179 | 22129 s | 18.29 cm | 2211 | 22449 s | 18.11 cm | 2243 | 22769 s | 17.93 cm | 2275 | 23089 s | 17.75 cm |
| 2180 | 22139 s | 18.29 cm | 2212 | 22459 s | 18.1 cm | 2244 | 22779 s | 17.92 cm | 2276 | 23099 s | 17.74 cm |

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2277 | 23109 s | 17.74 cm | 2309 | 23429 s | 17.56 cm | 2341 | 23749 s | 17.37 cm | 2373 | 24069 s | 17.19 cm |
| 2278 | 23119 s | 17.73 cm | 2310 | 23439 s | 17.55 cm | 2342 | 23759 s | 17.37 cm | 2374 | 24079 s | 17.17 cm |
| 2279 | 23129 s | 17.73 cm | 2311 | 23449 s | 17.55 cm | 2343 | 23769 s | 17.36 cm | 2375 | 24089 s | 17.17 cm |
| 2280 | 23139 s | 17.72 cm | 2312 | 23459 s | 17.54 cm | 2344 | 23779 s | 17.36 cm | 2376 | 24099 s | 17.16 cm |
| 2281 | 23149 s | 17.71 cm | 2313 | 23469 s | 17.54 cm | 2345 | 23789 s | 17.35 cm | 2377 | 24109 s | 17.16 cm |
| 2282 | 23159 s | 17.71 cm | 2314 | 23479 s | 17.53 cm | 2346 | 23799 s | 17.35 cm | 2378 | 24119 s | 17.15 cm |
| 2283 | 23169 s | 17.7 cm | 2315 | 23489 s | 17.52 cm | 2347 | 23809 s | 17.33 cm | 2379 | 24129 s | 17.15 cm |
| 2284 | 23179 s | 17.7 cm | 2316 | 23499 s | 17.52 cm | 2348 | 23819 s | 17.33 cm | 2380 | 24139 s | 17.14 cm |
| 2285 | 23189 s | 17.69 cm | 2317 | 23509 s | 17.5 cm | 2349 | 23829 s | 17.32 cm | 2381 | 24149 s | 17.13 cm |
| 2286 | 23199 s | 17.69 cm | 2318 | 23519 s | 17.5 cm | 2350 | 23839 s | 17.31 cm | 2382 | 24159 s | 17.13 cm |
| 2287 | 23209 s | 17.68 cm | 2319 | 23529 s | 17.49 cm | 2351 | 23849 s | 17.31 cm | 2383 | 24169 s | 17.12 cm |
| 2288 | 23219 s | 17.68 cm | 2320 | 23539 s | 17.49 cm | 2352 | 23859 s | 17.3 cm | 2384 | 24179 s | 17.12 cm |
| 2289 | 23229 s | 17.66 cm | 2321 | 23549 s | 17.48 cm | 2353 | 23869 s | 17.3 cm | 2385 | 24189 s | 17.11 cm |
| 2290 | 23239 s | 17.66 cm | 2322 | 23559 s | 17.48 cm | 2354 | 23879 s | 17.29 cm | 2386 | 24199 s | 17.11 cm |
| 2291 | 23249 s | 17.65 cm | 2323 | 23569 s | 17.47 cm | 2355 | 23889 s | 17.29 cm | 2387 | 24209 s | 17.1 cm |
| 2292 | 23259 s | 17.65 cm | 2324 | 23579 s | 17.47 cm | 2356 | 23899 s | 17.28 cm | 2388 | 24219 s | 17.1 cm |
| 2293 | 23269 s | 17.64 cm | 2325 | 23589 s | 17.46 cm | 2357 | 23909 s | 17.28 cm | 2389 | 24229 s | 17.09 cm |
| 2294 | 23279 s | 17.64 cm | 2326 | 23599 s | 17.46 cm | 2358 | 23919 s | 17.27 cm | 2390 | 24239 s | 17.09 cm |
| 2295 | 23289 s | 17.63 cm | 2327 | 23609 s | 17.45 cm | 2359 | 23929 s | 17.27 cm | 2391 | 24249 s | 17.08 cm |
| 2296 | 23299 s | 17.63 cm | 2328 | 23619 s | 17.44 cm | 2360 | 23939 s | 17.26 cm | 2392 | 24259 s | 17.08 cm |
| 2297 | 23309 s | 17.62 cm | 2329 | 23629 s | 17.44 cm | 2361 | 23949 s | 17.25 cm | 2393 | 24269 s | 17.07 cm |
| 2298 | 23319 s | 17.61 cm | 2330 | 23639 s | 17.43 cm | 2362 | 23959 s | 17.25 cm | 2394 | 24279 s | 17.06 cm |
| 2299 | 23329 s | 17.61 cm | 2331 | 23649 s | 17.43 cm | 2363 | 23969 s | 17.24 cm | 2395 | 24289 s | 17.06 cm |
| 2300 | 23339 s | 17.6 cm | 2332 | 23659 s | 17.42 cm | 2364 | 23979 s | 17.24 cm | 2396 | 24299 s | 17.05 cm |
| 2301 | 23349 s | 17.6 cm | 2333 | 23669 s | 17.42 cm | 2365 | 23989 s | 17.23 cm | 2397 | 24309 s | 17.05 cm |
| 2302 | 23359 s | 17.59 cm | 2334 | 23679 s | 17.41 cm | 2366 | 23999 s | 17.23 cm | 2398 | 24319 s | 17.04 cm |
| 2303 | 23369 s | 17.59 cm | 2335 | 23689 s | 17.41 cm | 2367 | 24009 s | 17.22 cm | 2399 | 24329 s | 17.04 cm |
| 2304 | 23379 s | 17.58 cm | 2336 | 23699 s | 17.4 cm | 2368 | 24019 s | 17.21 cm | 2400 | 24339 s | 17.03 cm |
| 2305 | 23389 s | 17.58 cm | 2337 | 23709 s | 17.4 cm | 2369 | 24029 s | 17.21 cm | 2401 | 24349 s | 17.03 cm |
| 2306 | 23399 s | 17.57 cm | 2338 | 23719 s | 17.39 cm | 2370 | 24039 s | 17.2 cm | 2402 | 24359 s | 17.01 cm |
| 2307 | 23409 s | 17.57 cm | 2339 | 23729 s | 17.38 cm | 2371 | 24049 s | 17.2 cm | 2403 | 24369 s | 17.01 cm |
| 2308 | 23419 s | 17.56 cm | 2340 | 23739 s | 17.38 cm | 2372 | 24059 s | 17.19 cm | 2404 | 24379 s | 17.0 cm |

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2405 | 24389 s | 17.0 cm | 2437 | 24709 s | 16.82 cm | 2469 | 25029 s | 16.63 cm | 2501 | 25349 s | 16.45 cm |
| 2406 | 24399 s | 16.99 cm | 2438 | 24719 s | 16.81 cm | 2470 | 25039 s | 16.63 cm | 2502 | 25359 s | 16.45 cm |
| 2407 | 24409 s | 16.98 cm | 2439 | 24729 s | 16.81 cm | 2471 | 25049 s | 16.62 cm | 2503 | 25369 s | 16.44 cm |
| 2408 | 24419 s | 16.98 cm | 2440 | 24739 s | 16.8 cm | 2472 | 25059 s | 16.62 cm | 2504 | 25379 s | 16.44 cm |
| 2409 | 24429 s | 16.97 cm | 2441 | 24749 s | 16.8 cm | 2473 | 25069 s | 16.61 cm | 2505 | 25389 s | 16.43 cm |
| 2410 | 24439 s | 16.97 cm | 2442 | 24759 s | 16.79 cm | 2474 | 25079 s | 16.6 cm | 2506 | 25399 s | 16.43 cm |
| 2411 | 24449 s | 16.96 cm | 2443 | 24769 s | 16.78 cm | 2475 | 25089 s | 16.6 cm | 2507 | 25409 s | 16.42 cm |
| 2412 | 24459 s | 16.96 cm | 2444 | 24779 s | 16.78 cm | 2476 | 25099 s | 16.59 cm | 2508 | 25419 s | 16.41 cm |
| 2413 | 24469 s | 16.95 cm | 2445 | 24789 s | 16.77 cm | 2477 | 25109 s | 16.59 cm | 2509 | 25429 s | 16.41 cm |
| 2414 | 24479 s | 16.95 cm | 2446 | 24799 s | 16.77 cm | 2478 | 25119 s | 16.58 cm | 2510 | 25439 s | 16.4 cm |
| 2415 | 24489 s | 16.94 cm | 2447 | 24809 s | 16.76 cm | 2479 | 25129 s | 16.58 cm | 2511 | 25449 s | 16.4 cm |
| 2416 | 24499 s | 16.94 cm | 2448 | 24819 s | 16.76 cm | 2480 | 25139 s | 16.57 cm | 2512 | 25459 s | 16.39 cm |
| 2417 | 24509 s | 16.93 cm | 2449 | 24829 s | 16.75 cm | 2481 | 25149 s | 16.57 cm | 2513 | 25469 s | 16.39 cm |
| 2418 | 24519 s | 16.93 cm | 2450 | 24839 s | 16.75 cm | 2482 | 25159 s | 16.56 cm | 2514 | 25479 s | 16.38 cm |
| 2419 | 24529 s | 16.92 cm | 2451 | 24849 s | 16.74 cm | 2483 | 25169 s | 16.56 cm | 2515 | 25489 s | 16.38 cm |
| 2420 | 24539 s | 16.92 cm | 2452 | 24859 s | 16.73 cm | 2484 | 25179 s | 16.55 cm | 2516 | 25499 s | 16.37 cm |
| 2421 | 24549 s | 16.91 cm | 2453 | 24869 s | 16.73 cm | 2485 | 25189 s | 16.55 cm | 2517 | 25509 s | 16.37 cm |
| 2422 | 24559 s | 16.91 cm | 2454 | 24879 s | 16.72 cm | 2486 | 25199 s | 16.54 cm | 2518 | 25519 s | 16.35 cm |
| 2423 | 24569 s | 16.9 cm | 2455 | 24889 s | 16.72 cm | 2487 | 25209 s | 16.54 cm | 2519 | 25529 s | 16.35 cm |
| 2424 | 24579 s | 16.9 cm | 2456 | 24899 s | 16.71 cm | 2488 | 25219 s | 16.52 cm | 2520 | 25539 s | 16.34 cm |
| 2425 | 24589 s | 16.89 cm | 2457 | 24909 s | 16.71 cm | 2489 | 25229 s | 16.51 cm | 2521 | 25549 s | 16.34 cm |
| 2426 | 24599 s | 16.89 cm | 2458 | 24919 s | 16.7 cm | 2490 | 25239 s | 16.51 cm | 2522 | 25559 s | 16.33 cm |
| 2427 | 24609 s | 16.88 cm | 2459 | 24929 s | 16.7 cm | 2491 | 25249 s | 16.5 cm | 2523 | 25569 s | 16.33 cm |
| 2428 | 24619 s | 16.87 cm | 2460 | 24939 s | 16.68 cm | 2492 | 25259 s | 16.5 cm | 2524 | 25579 s | 16.32 cm |
| 2429 | 24629 s | 16.87 cm | 2461 | 24949 s | 16.68 cm | 2493 | 25269 s | 16.49 cm | 2525 | 25589 s | 16.31 cm |
| 2430 | 24639 s | 16.86 cm | 2462 | 24959 s | 16.67 cm | 2494 | 25279 s | 16.49 cm | 2526 | 25599 s | 16.31 cm |
| 2431 | 24649 s | 16.86 cm | 2463 | 24969 s | 16.66 cm | 2495 | 25289 s | 16.48 cm | 2527 | 25609 s | 16.3 cm |
| 2432 | 24659 s | 16.84 cm | 2464 | 24979 s | 16.66 cm | 2496 | 25299 s | 16.48 cm | 2528 | 25619 s | 16.3 cm |
| 2433 | 24669 s | 16.84 cm | 2465 | 24989 s | 16.65 cm | 2497 | 25309 s | 16.47 cm | 2529 | 25629 s | 16.29 cm |
| 2434 | 24679 s | 16.83 cm | 2466 | 24999 s | 16.65 cm | 2498 | 25319 s | 16.47 cm | 2530 | 25639 s | 16.29 cm |
| 2435 | 24689 s | 16.83 cm | 2467 | 25009 s | 16.64 cm | 2499 | 25329 s | 16.46 cm | 2531 | 25649 s | 16.28 cm |
| 2436 | 24699 s | 16.82 cm | 2468 | 25019 s | 16.64 cm | 2500 | 25339 s | 16.46 cm | 2532 | 25659 s | 16.28 cm |

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## RPBCWD

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2533 | 25669 s | 16.27 cm | 2565 | 25989 s | 16.09 cm | 2597 | 26309 s | 15.91 cm | 2629 | 26629 s | 15.73 cm |
| 2534 | 25679 s | 16.27 cm | 2566 | 25999 s | 16.09 cm | 2598 | 26319 s | 15.91 cm | 2630 | 26639 s | 15.73 cm |
| 2535 | 25689 s | 16.26 cm | 2567 | 26009 s | 16.08 cm | 2599 | 26329 s | 15.9 cm | 2631 | 26649 s | 15.72 cm |
| 2536 | 25699 s | 16.26 cm | 2568 | 26019 s | 16.08 cm | 2600 | 26339 s | 15.9 cm | 2632 | 26659 s | 15.72 cm |
| 2537 | 25709 s | 16.25 cm | 2569 | 26029 s | 16.07 cm | 2601 | 26349 s | 15.89 cm | 2633 | 26669 s | 15.7 cm |
| 2538 | 25719 s | 16.25 cm | 2570 | 26039 s | 16.07 cm | 2602 | 26359 s | 15.89 cm | 2634 | 26679 s | 15.7 cm |
| 2539 | 25729 s | 16.24 cm | 2571 | 26049 s | 16.06 cm | 2603 | 26369 s | 15.88 cm | 2635 | 26689 s | 15.69 cm |
| 2540 | 25739 s | 16.24 cm | 2572 | 26059 s | 16.05 cm | 2604 | 26379 s | 15.88 cm | 2636 | 26699 s | 15.69 cm |
| 2541 | 25749 s | 16.23 cm | 2573 | 26069 s | 16.05 cm | 2605 | 26389 s | 15.86 cm | 2637 | 26709 s | 15.68 cm |
| 2542 | 25759 s | 16.23 cm | 2574 | 26079 s | 16.04 cm | 2606 | 26399 s | 15.86 cm | 2638 | 26719 s | 15.67 cm |
| 2543 | 25769 s | 16.22 cm | 2575 | 26089 s | 16.04 cm | 2607 | 26409 s | 15.85 cm | 2639 | 26729 s | 15.67 cm |
| 2544 | 25779 s | 16.21 cm | 2576 | 26099 s | 16.02 cm | 2608 | 26419 s | 15.84 cm | 2640 | 26739 s | 15.66 cm |
| 2545 | 25789 s | 16.21 cm | 2577 | 26109 s | 16.02 cm | 2609 | 26429 s | 15.84 cm | 2641 | 26749 s | 15.66 cm |
| 2546 | 25799 s | 16.19 cm | 2578 | 26119 s | 16.01 cm | 2610 | 26439 s | 15.83 cm | 2642 | 26759 s | 15.65 cm |
| 2547 | 25809 s | 16.19 cm | 2579 | 26129 s | 16.01 cm | 2611 | 26449 s | 15.83 cm | 2643 | 26769 s | 15.65 cm |
| 2548 | 25819 s | 16.18 cm | 2580 | 26139 s | 16.0 cm | 2612 | 26459 s | 15.82 cm | 2644 | 26779 s | 15.64 cm |
| 2549 | 25829 s | 16.18 cm | 2581 | 26149 s | 16.0 cm | 2613 | 26469 s | 15.82 cm | 2645 | 26789 s | 15.64 cm |
| 2550 | 25839 s | 16.17 cm | 2582 | 26159 s | 15.99 cm | 2614 | 26479 s | 15.81 cm | 2646 | 26799 s | 15.63 cm |
| 2551 | 25849 s | 16.17 cm | 2583 | 26169 s | 15.99 cm | 2615 | 26489 s | 15.81 cm | 2647 | 26809 s | 15.63 cm |
| 2552 | 25859 s | 16.16 cm | 2584 | 26179 s | 15.98 cm | 2616 | 26499 s | 15.8 cm | 2648 | 26819 s | 15.62 cm |
| 2553 | 25869 s | 16.16 cm | 2585 | 26189 s | 15.98 cm | 2617 | 26509 s | 15.8 cm | 2649 | 26829 s | 15.62 cm |
| 2554 | 25879 s | 16.15 cm | 2586 | 26199 s | 15.97 cm | 2618 | 26519 s | 15.79 cm | 2650 | 26839 s | 15.61 cm |
| 2555 | 25889 s | 16.15 cm | 2587 | 26209 s | 15.96 cm | 2619 | 26529 s | 15.78 cm | 2651 | 26849 s | 15.61 cm |
| 2556 | 25899 s | 16.14 cm | 2588 | 26219 s | 15.96 cm | 2620 | 26539 s | 15.78 cm | 2652 | 26859 s | 15.6 cm |
| 2557 | 25909 s | 16.13 cm | 2589 | 26229 s | 15.95 cm | 2621 | 26549 s | 15.77 cm | 2653 | 26869 s | 15.6 cm |
| 2558 | 25919 s | 16.13 cm | 2590 | 26239 s | 15.95 cm | 2622 | 26559 s | 15.77 cm | 2654 | 26879 s | 15.59 cm |
| 2559 | 25929 s | 16.12 cm | 2591 | 26249 s | 15.94 cm | 2623 | 26569 s | 15.76 cm | 2655 | 26889 s | 15.59 cm |
| 2560 | 25939 s | 16.12 cm | 2592 | 26259 s | 15.94 cm | 2624 | 26579 s | 15.76 cm | 2656 | 26899 s | 15.58 cm |
| 2561 | 25949 s | 16.11 cm | 2593 | 26269 s | 15.93 cm | 2625 | 26589 s | 15.75 cm | 2657 | 26909 s | 15.58 cm |
| 2562 | 25959 s | 16.11 cm | 2594 | 26279 s | 15.93 cm | 2626 | 26599 s | 15.75 cm | 2658 | 26919 s | 15.57 cm |
| 2563 | 25969 s | 16.1 cm | 2595 | 26289 s | 15.92 cm | 2627 | 26609 s | 15.74 cm | 2659 | 26929 s | 15.57 cm |
| 2564 | 25979 s | 16.1 cm | 2596 | 26299 s | 15.92 cm | 2628 | 26619 s | 15.74 cm | 2660 | 26939 s | 15.56 cm |

# Infiltration Report

## RPBCWD

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2661 | 26949 s | 15.56 cm | 2693 | 27269 s | 15.37 cm | 2725 | 27589 s | 15.19 cm | 2757 | 27909 s | 15.01 cm |
| 2662 | 26959 s | 15.55 cm | 2694 | 27279 s | 15.37 cm | 2726 | 27599 s | 15.19 cm | 2758 | 27919 s | 15.01 cm |
| 2663 | 26969 s | 15.55 cm | 2695 | 27289 s | 15.36 cm | 2727 | 27609 s | 15.18 cm | 2759 | 27929 s | 15.0 cm |
| 2664 | 26979 s | 15.53 cm | 2696 | 27299 s | 15.36 cm | 2728 | 27619 s | 15.18 cm | 2760 | 27939 s | 15.0 cm |
| 2665 | 26989 s | 15.53 cm | 2697 | 27309 s | 15.35 cm | 2729 | 27629 s | 15.17 cm | 2761 | 27949 s | 14.99 cm |
| 2666 | 26999 s | 15.52 cm | 2698 | 27319 s | 15.35 cm | 2730 | 27639 s | 15.17 cm | 2762 | 27959 s | 14.99 cm |
| 2667 | 27009 s | 15.52 cm | 2699 | 27329 s | 15.34 cm | 2731 | 27649 s | 15.16 cm | 2763 | 27969 s | 14.98 cm |
| 2668 | 27019 s | 15.51 cm | 2700 | 27339 s | 15.34 cm | 2732 | 27659 s | 15.15 cm | 2764 | 27979 s | 14.98 cm |
| 2669 | 27029 s | 15.51 cm | 2701 | 27349 s | 15.33 cm | 2733 | 27669 s | 15.15 cm | 2765 | 27989 s | 14.97 cm |
| 2670 | 27039 s | 15.5 cm | 2702 | 27359 s | 15.33 cm | 2734 | 27679 s | 15.14 cm | 2766 | 27999 s | 14.97 cm |
| 2671 | 27049 s | 15.5 cm | 2703 | 27369 s | 15.32 cm | 2735 | 27689 s | 15.14 cm | 2767 | 28009 s | 14.96 cm |
| 2672 | 27059 s | 15.49 cm | 2704 | 27379 s | 15.32 cm | 2736 | 27699 s | 15.13 cm | 2768 | 28019 s | 14.96 cm |
| 2673 | 27069 s | 15.49 cm | 2705 | 27389 s | 15.31 cm | 2737 | 27709 s | 15.13 cm | 2769 | 28029 s | 14.95 cm |
| 2674 | 27079 s | 15.48 cm | 2706 | 27399 s | 15.3 cm | 2738 | 27719 s | 15.12 cm | 2770 | 28039 s | 14.95 cm |
| 2675 | 27089 s | 15.48 cm | 2707 | 27409 s | 15.3 cm | 2739 | 27729 s | 15.12 cm | 2771 | 28049 s | 14.94 cm |
| 2676 | 27099 s | 15.47 cm | 2708 | 27419 s | 15.29 cm | 2740 | 27739 s | 15.11 cm | 2772 | 28059 s | 14.93 cm |
| 2677 | 27109 s | 15.47 cm | 2709 | 27429 s | 15.29 cm | 2741 | 27749 s | 15.11 cm | 2773 | 28069 s | 14.93 cm |
| 2678 | 27119 s | 15.46 cm | 2710 | 27439 s | 15.28 cm | 2742 | 27759 s | 15.1 cm | 2774 | 28079 s | 14.92 cm |
| 2679 | 27129 s | 15.46 cm | 2711 | 27449 s | 15.28 cm | 2743 | 27769 s | 15.1 cm | 2775 | 28089 s | 14.92 cm |
| 2680 | 27139 s | 15.45 cm | 2712 | 27459 s | 15.27 cm | 2744 | 27779 s | 15.09 cm | 2776 | 28099 s | 14.91 cm |
| 2681 | 27149 s | 15.45 cm | 2713 | 27469 s | 15.27 cm | 2745 | 27789 s | 15.09 cm | 2777 | 28109 s | 14.91 cm |
| 2682 | 27159 s | 15.44 cm | 2714 | 27479 s | 15.26 cm | 2746 | 27799 s | 15.08 cm | 2778 | 28119 s | 14.9 cm |
| 2683 | 27169 s | 15.44 cm | 2715 | 27489 s | 15.26 cm | 2747 | 27809 s | 15.08 cm | 2779 | 28129 s | 14.9 cm |
| 2684 | 27179 s | 15.43 cm | 2716 | 27499 s | 15.25 cm | 2748 | 27819 s | 15.07 cm | 2780 | 28139 s | 14.88 cm |
| 2685 | 27189 s | 15.43 cm | 2717 | 27509 s | 15.25 cm | 2749 | 27829 s | 15.07 cm | 2781 | 28149 s | 14.88 cm |
| 2686 | 27199 s | 15.42 cm | 2718 | 27519 s | 15.24 cm | 2750 | 27839 s | 15.06 cm | 2782 | 28159 s | 14.87 cm |
| 2687 | 27209 s | 15.42 cm | 2719 | 27529 s | 15.23 cm | 2751 | 27849 s | 15.06 cm | 2783 | 28169 s | 14.87 cm |
| 2688 | 27219 s | 15.41 cm | 2720 | 27539 s | 15.23 cm | 2752 | 27859 s | 15.04 cm | 2784 | 28179 s | 14.86 cm |
| 2689 | 27229 s | 15.41 cm | 2721 | 27549 s | 15.22 cm | 2753 | 27869 s | 15.03 cm | 2785 | 28189 s | 14.86 cm |
| 2690 | 27239 s | 15.4 cm | 2722 | 27559 s | 15.22 cm | 2754 | 27879 s | 15.03 cm | 2786 | 28199 s | 14.85 cm |
| 2691 | 27249 s | 15.4 cm | 2723 | 27569 s | 15.2 cm | 2755 | 27889 s | 15.02 cm | 2787 | 28209 s | 14.84 cm |
| 2692 | 27259 s | 15.39 cm | 2724 | 27579 s | 15.2 cm | 2756 | 27899 s | 15.02 cm | 2788 | 28219 s | 14.84 cm |

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 2789 | 28229 s | 14.84 cm | 2821 | 28549 s | 14.66 cm | 2853 | 28869 s | 14.49 cm | 2885 | 29189 s | 14.31 cm |
| 2790 | 28239 s | 14.83 cm | 2822 | 28559 s | 14.65 cm | 2854 | 28879 s | 14.48 cm | 2886 | 29199 s | 14.31 cm |
| 2791 | 28249 s | 14.82 cm | 2823 | 28569 s | 14.65 cm | 2855 | 28889 s | 14.48 cm | 2887 | 29209 s | 14.3 cm |
| 2792 | 28259 s | 14.82 cm | 2824 | 28579 s | 14.64 cm | 2856 | 28899 s | 14.47 cm | 2888 | 29219 s | 14.29 cm |
| 2793 | 28269 s | 14.81 cm | 2825 | 28589 s | 14.64 cm | 2857 | 28909 s | 14.47 cm | 2889 | 29229 s | 14.29 cm |
| 2794 | 28279 s | 14.81 cm | 2826 | 28599 s | 14.63 cm | 2858 | 28919 s | 14.46 cm | 2890 | 29239 s | 14.28 cm |
| 2795 | 28289 s | 14.8 cm | 2827 | 28609 s | 14.63 cm | 2859 | 28929 s | 14.46 cm | 2891 | 29249 s | 14.28 cm |
| 2796 | 28299 s | 14.8 cm | 2828 | 28619 s | 14.62 cm | 2860 | 28939 s | 14.45 cm | 2892 | 29259 s | 14.27 cm |
| 2797 | 28309 s | 14.79 cm | 2829 | 28629 s | 14.62 cm | 2861 | 28949 s | 14.44 cm | 2893 | 29269 s | 14.27 cm |
| 2798 | 28319 s | 14.79 cm | 2830 | 28639 s | 14.61 cm | 2862 | 28959 s | 14.44 cm | 2894 | 29279 s | 14.26 cm |
| 2799 | 28329 s | 14.78 cm | 2831 | 28649 s | 14.61 cm | 2863 | 28969 s | 14.43 cm | 2895 | 29289 s | 14.26 cm |
| 2800 | 28339 s | 14.78 cm | 2832 | 28659 s | 14.6 cm | 2864 | 28979 s | 14.43 cm | 2896 | 29299 s | 14.25 cm |
| 2801 | 28349 s | 14.77 cm | 2833 | 28669 s | 14.6 cm | 2865 | 28989 s | 14.42 cm | 2897 | 29309 s | 14.25 cm |
| 2802 | 28359 s | 14.77 cm | 2834 | 28679 s | 14.59 cm | 2866 | 28999 s | 14.42 cm | 2898 | 29319 s | 14.24 cm |
| 2803 | 28369 s | 14.76 cm | 2835 | 28689 s | 14.59 cm | 2867 | 29009 s | 14.41 cm | 2899 | 29329 s | 14.24 cm |
| 2804 | 28379 s | 14.76 cm | 2836 | 28699 s | 14.58 cm | 2868 | 29019 s | 14.41 cm | 2900 | 29339 s | 14.22 cm |
| 2805 | 28389 s | 14.75 cm | 2837 | 28709 s | 14.58 cm | 2869 | 29029 s | 14.39 cm | 2901 | 29349 s | 14.22 cm |
| 2806 | 28399 s | 14.75 cm | 2838 | 28719 s | 14.57 cm | 2870 | 29039 s | 14.39 cm | 2902 | 29359 s | 14.21 cm |
| 2807 | 28409 s | 14.74 cm | 2839 | 28729 s | 14.57 cm | 2871 | 29049 s | 14.38 cm | 2903 | 29369 s | 14.21 cm |
| 2808 | 28419 s | 14.74 cm | 2840 | 28739 s | 14.55 cm | 2872 | 29059 s | 14.38 cm | 2904 | 29379 s | 14.2 cm |
| 2809 | 28429 s | 14.73 cm | 2841 | 28749 s | 14.55 cm | 2873 | 29069 s | 14.37 cm | 2905 | 29389 s | 14.2 cm |
| 2810 | 28439 s | 14.73 cm | 2842 | 28759 s | 14.54 cm | 2874 | 29079 s | 14.37 cm | 2906 | 29399 s | 14.19 cm |
| 2811 | 28449 s | 14.71 cm | 2843 | 28769 s | 14.54 cm | 2875 | 29089 s | 14.36 cm | 2907 | 29409 s | 14.19 cm |
| 2812 | 28459 s | 14.71 cm | 2844 | 28779 s | 14.53 cm | 2876 | 29099 s | 14.36 cm | 2908 | 29419 s | 14.18 cm |
| 2813 | 28469 s | 14.7 cm | 2845 | 28789 s | 14.53 cm | 2877 | 29109 s | 14.35 cm | 2909 | 29429 s | 14.18 cm |
| 2814 | 28479 s | 14.7 cm | 2846 | 28799 s | 14.52 cm | 2878 | 29119 s | 14.35 cm | 2910 | 29439 s | 14.17 cm |
| 2815 | 28489 s | 14.69 cm | 2847 | 28809 s | 14.52 cm | 2879 | 29129 s | 14.34 cm | 2911 | 29449 s | 14.17 cm |
| 2816 | 28499 s | 14.69 cm | 2848 | 28819 s | 14.51 cm | 2880 | 29139 s | 14.34 cm | 2912 | 29459 s | 14.16 cm |
| 2817 | 28509 s | 14.68 cm | 2849 | 28829 s | 14.51 cm | 2881 | 29149 s | 14.33 cm | 2913 | 29469 s | 14.16 cm |
| 2818 | 28519 s | 14.67 cm | 2850 | 28839 s | 14.5 cm | 2882 | 29159 s | 14.33 cm | 2914 | 29479 s | 14.15 cm |
| 2819 | 28529 s | 14.67 cm | 2851 | 28849 s | 14.5 cm | 2883 | 29169 s | 14.32 cm | 2915 | 29489 s | 14.15 cm |
| 2820 | 28539 s | 14.66 cm | 2852 | 28859 s | 14.49 cm | 2884 | 29179 s | 14.32 cm | 2916 | 29499 s | 14.14 cm |

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### kerber a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|
| 2917 | 29509 s | 14.14 cm | 2949 | 29829 s | 13.97 cm | 2981 | 30149 s | 13.79 cm |
| 2918 | 29519 s | 14.13 cm | 2950 | 29839 s | 13.96 cm | 2982 | 30159 s | 13.78 cm |
| 2919 | 29529 s | 14.13 cm | 2951 | 29849 s | 13.96 cm | 2983 | 30169 s | 13.78 cm |
| 2920 | 29539 s | 14.12 cm | 2952 | 29859 s | 13.95 cm | 2984 | 30179 s | 13.77 cm |
| 2921 | 29549 s | 14.12 cm | 2953 | 29869 s | 13.95 cm | 2985 | 30189 s | 13.77 cm |
| 2922 | 29559 s | 14.11 cm | 2954 | 29879 s | 13.94 cm | 2986 | 30199 s | 13.76 cm |
| 2923 | 29569 s | 14.11 cm | 2955 | 29889 s | 13.94 cm | 2987 | 30209 s | 13.76 cm |
| 2924 | 29579 s | 14.1 cm | 2956 | 29899 s | 13.93 cm | 2988 | 30219 s | 13.75 cm |
| 2925 | 29589 s | 14.1 cm | 2957 | 29909 s | 13.92 cm | 2989 | 30229 s | 13.75 cm |
| 2926 | 29599 s | 14.09 cm | 2958 | 29919 s | 13.92 cm | 2990 | 30239 s | 13.73 cm |
| 2927 | 29609 s | 14.09 cm | 2959 | 29929 s | 13.92 cm | 2991 | 30249 s | 13.73 cm |
| 2928 | 29619 s | 14.08 cm | 2960 | 29939 s | 13.91 cm | | | |
| 2929 | 29629 s | 14.08 cm | 2961 | 29949 s | 13.89 cm | | | |
| 2930 | 29639 s | 14.06 cm | 2962 | 29959 s | 13.89 cm | | | |
| 2931 | 29649 s | 14.06 cm | 2963 | 29969 s | 13.88 cm | | | |
| 2932 | 29659 s | 14.05 cm | 2964 | 29979 s | 13.88 cm | | | |
| 2933 | 29669 s | 14.05 cm | 2965 | 29989 s | 13.87 cm | | | |
| 2934 | 29679 s | 14.04 cm | 2966 | 29999 s | 13.87 cm | | | |
| 2935 | 29689 s | 14.04 cm | 2967 | 30009 s | 13.86 cm | | | |
| 2936 | 29699 s | 14.03 cm | 2968 | 30019 s | 13.86 cm | | | |
| 2937 | 29709 s | 14.03 cm | 2969 | 30029 s | 13.85 cm | | | |
| 2938 | 29719 s | 14.02 cm | 2970 | 30039 s | 13.85 cm | | | |
| 2939 | 29729 s | 14.02 cm | 2971 | 30049 s | 13.84 cm | | | |
| 2940 | 29739 s | 14.01 cm | 2972 | 30059 s | 13.84 cm | | | |
| 2941 | 29749 s | 14.01 cm | 2973 | 30069 s | 13.83 cm | | | |
| 2942 | 29759 s | 14.0 cm | 2974 | 30079 s | 13.83 cm | | | |
| 2943 | 29769 s | 14.0 cm | 2975 | 30089 s | 13.82 cm | | | |
| 2944 | 29779 s | 13.99 cm | 2976 | 30099 s | 13.82 cm | | | |
| 2945 | 29789 s | 13.99 cm | 2977 | 30109 s | 13.81 cm | | | |
| 2946 | 29799 s | 13.98 cm | 2978 | 30119 s | 13.81 cm | | | |
| 2947 | 29809 s | 13.98 cm | 2979 | 30129 s | 13.8 cm | | | |
| 2948 | 29819 s | 13.97 cm | 2980 | 30139 s | 13.8 cm | | | |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP - Kerber - Kerber Pond

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### kerber b

| | |
|---|---|
| Date | 6/14/2023 |
| Time | 2:02 PM |
| Latitude | 44.873015 |
| Longitude | -93.533850 |
| Initial Volumetric Moisture | 80.00 % |
| Final Volumetric Moisture | 81.00 % |
| Cylinder Size | 3 Liter |

### kerber b Results

| | |
|---|---|
| Map Pin # | 2 |
| Test Number | 24755 |
| Ksat - mm/hr | 24 |
| Ksat - in/hr | 0.961 |
| Capillary Pressure C mm | -23.6 |
| RMS Error of Regression | 367 |
| Normalized RMS | 2.8% |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 s | 30.27 cm | 26 | 250 s | 28.91 cm | 51 | 500 s | 27.84 cm | 76 | 750 s | 26.87 cm |
| 2 | 10 s | 30.18 cm | 27 | 260 s | 28.87 cm | 52 | 510 s | 27.79 cm | 77 | 760 s | 26.82 cm |
| 3 | 20 s | 30.09 cm | 28 | 270 s | 28.83 cm | 53 | 520 s | 27.76 cm | 78 | 770 s | 26.79 cm |
| 4 | 30 s | 30.03 cm | 29 | 280 s | 28.77 cm | 54 | 530 s | 27.72 cm | 79 | 780 s | 26.76 cm |
| 5 | 40 s | 29.98 cm | 30 | 290 s | 28.73 cm | 55 | 540 s | 27.68 cm | 80 | 790 s | 26.72 cm |
| 6 | 50 s | 29.91 cm | 31 | 300 s | 28.69 cm | 56 | 550 s | 27.63 cm | 81 | 800 s | 26.69 cm |
| 7 | 60 s | 29.86 cm | 32 | 310 s | 28.64 cm | 57 | 560 s | 27.6 cm | 82 | 810 s | 26.64 cm |
| 8 | 70 s | 29.81 cm | 33 | 320 s | 28.6 cm | 58 | 570 s | 27.56 cm | 83 | 820 s | 26.61 cm |
| 9 | 80 s | 29.73 cm | 34 | 330 s | 28.56 cm | 59 | 580 s | 27.52 cm | 84 | 830 s | 26.57 cm |
| 10 | 90 s | 29.69 cm | 35 | 340 s | 28.52 cm | 60 | 590 s | 27.48 cm | 85 | 840 s | 26.54 cm |
| 11 | 100 s | 29.64 cm | 36 | 350 s | 28.46 cm | 61 | 600 s | 27.44 cm | 86 | 850 s | 26.49 cm |
| 12 | 110 s | 29.58 cm | 37 | 360 s | 28.42 cm | 62 | 610 s | 27.4 cm | 87 | 860 s | 26.46 cm |
| 13 | 120 s | 29.53 cm | 38 | 370 s | 28.38 cm | 63 | 620 s | 27.37 cm | 88 | 870 s | 26.42 cm |
| 14 | 130 s | 29.48 cm | 39 | 380 s | 28.34 cm | 64 | 630 s | 27.32 cm | 89 | 880 s | 26.39 cm |
| 15 | 140 s | 29.43 cm | 40 | 390 s | 28.29 cm | 65 | 640 s | 27.28 cm | 90 | 890 s | 26.35 cm |
| 16 | 150 s | 29.38 cm | 41 | 400 s | 28.25 cm | 66 | 650 s | 27.25 cm | 91 | 900 s | 26.31 cm |
| 17 | 160 s | 29.34 cm | 42 | 410 s | 28.21 cm | 67 | 660 s | 27.21 cm | 92 | 910 s | 26.28 cm |
| 18 | 170 s | 29.28 cm | 43 | 420 s | 28.17 cm | 68 | 670 s | 27.17 cm | 93 | 920 s | 26.24 cm |
| 19 | 180 s | 29.24 cm | 44 | 430 s | 28.12 cm | 69 | 680 s | 27.13 cm | 94 | 930 s | 26.21 cm |
| 20 | 190 s | 29.19 cm | 45 | 440 s | 28.08 cm | 70 | 690 s | 27.09 cm | 95 | 940 s | 26.17 cm |
| 21 | 200 s | 29.15 cm | 46 | 450 s | 28.04 cm | 71 | 700 s | 27.06 cm | 96 | 950 s | 26.13 cm |
| 22 | 210 s | 29.1 cm | 47 | 460 s | 28.01 cm | 72 | 710 s | 27.02 cm | 97 | 960 s | 26.1 cm |
| 23 | 220 s | 29.05 cm | 48 | 470 s | 27.96 cm | 73 | 720 s | 26.97 cm | 98 | 970 s | 26.07 cm |
| 24 | 230 s | 29.01 cm | 49 | 480 s | 27.92 cm | 74 | 730 s | 26.94 cm | 99 | 980 s | 26.04 cm |
| 25 | 240 s | 28.95 cm | 50 | 490 s | 27.88 cm | 75 | 740 s | 26.9 cm | 100 | 990 s | 25.99 cm |

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### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | 1000 s | 25.96 cm | 133 | 1320 s | 24.91 cm | 165 | 1640 s | 23.94 cm | 197 | 1960 s | 23.05 cm |
| 102 | 1010 s | 25.93 cm | 134 | 1330 s | 24.87 cm | 166 | 1650 s | 23.91 cm | 198 | 1970 s | 23.03 cm |
| 103 | 1020 s | 25.9 cm | 135 | 1340 s | 24.85 cm | 167 | 1660 s | 23.87 cm | 199 | 1980 s | 23.0 cm |
| 104 | 1030 s | 25.85 cm | 136 | 1350 s | 24.82 cm | 168 | 1670 s | 23.85 cm | 200 | 1990 s | 22.98 cm |
| 105 | 1040 s | 25.82 cm | 137 | 1360 s | 24.79 cm | 169 | 1680 s | 23.82 cm | 201 | 2000 s | 22.95 cm |
| 106 | 1050 s | 25.79 cm | 138 | 1370 s | 24.76 cm | 170 | 1690 s | 23.79 cm | 202 | 2010 s | 22.93 cm |
| 107 | 1060 s | 25.76 cm | 139 | 1380 s | 24.73 cm | 171 | 1700 s | 23.76 cm | 203 | 2020 s | 22.9 cm |
| 108 | 1070 s | 25.73 cm | 140 | 1390 s | 24.69 cm | 172 | 1710 s | 23.74 cm | 204 | 2030 s | 22.87 cm |
| 109 | 1080 s | 25.68 cm | 141 | 1400 s | 24.66 cm | 173 | 1720 s | 23.7 cm | 205 | 2040 s | 22.85 cm |
| 110 | 1090 s | 25.65 cm | 142 | 1410 s | 24.63 cm | 174 | 1730 s | 23.67 cm | 206 | 2050 s | 22.83 cm |
| 111 | 1100 s | 25.62 cm | 143 | 1420 s | 24.6 cm | 175 | 1740 s | 23.65 cm | 207 | 2060 s | 22.8 cm |
| 112 | 1110 s | 25.59 cm | 144 | 1430 s | 24.57 cm | 176 | 1750 s | 23.62 cm | 208 | 2070 s | 22.78 cm |
| 113 | 1120 s | 25.56 cm | 145 | 1440 s | 24.53 cm | 177 | 1760 s | 23.59 cm | 209 | 2080 s | 22.74 cm |
| 114 | 1130 s | 25.52 cm | 146 | 1450 s | 24.5 cm | 178 | 1770 s | 23.56 cm | 210 | 2090 s | 22.72 cm |
| 115 | 1140 s | 25.49 cm | 147 | 1460 s | 24.48 cm | 179 | 1780 s | 23.53 cm | 211 | 2100 s | 22.7 cm |
| 116 | 1150 s | 25.46 cm | 148 | 1470 s | 24.45 cm | 180 | 1790 s | 23.51 cm | 212 | 2110 s | 22.67 cm |
| 117 | 1160 s | 25.43 cm | 149 | 1480 s | 24.42 cm | 181 | 1800 s | 23.48 cm | 213 | 2120 s | 22.65 cm |
| 118 | 1170 s | 25.4 cm | 150 | 1490 s | 24.38 cm | 182 | 1810 s | 23.46 cm | 214 | 2130 s | 22.63 cm |
| 119 | 1180 s | 25.36 cm | 151 | 1500 s | 24.35 cm | 183 | 1820 s | 23.43 cm | 215 | 2140 s | 22.6 cm |
| 120 | 1190 s | 25.33 cm | 152 | 1510 s | 24.32 cm | 184 | 1830 s | 23.4 cm | 216 | 2150 s | 22.57 cm |
| 121 | 1200 s | 25.3 cm | 153 | 1520 s | 24.29 cm | 185 | 1840 s | 23.37 cm | 217 | 2160 s | 22.55 cm |
| 122 | 1210 s | 25.27 cm | 154 | 1530 s | 24.27 cm | 186 | 1850 s | 23.35 cm | 218 | 2170 s | 22.52 cm |
| 123 | 1220 s | 25.24 cm | 155 | 1540 s | 24.24 cm | 187 | 1860 s | 23.32 cm | 219 | 2180 s | 22.5 cm |
| 124 | 1230 s | 25.2 cm | 156 | 1550 s | 24.2 cm | 188 | 1870 s | 23.3 cm | 220 | 2190 s | 22.48 cm |
| 125 | 1240 s | 25.17 cm | 157 | 1560 s | 24.17 cm | 189 | 1880 s | 23.27 cm | 221 | 2200 s | 22.45 cm |
| 126 | 1250 s | 25.13 cm | 158 | 1570 s | 24.14 cm | 190 | 1890 s | 23.25 cm | 222 | 2210 s | 22.43 cm |
| 127 | 1260 s | 25.1 cm | 159 | 1580 s | 24.12 cm | 191 | 1900 s | 23.21 cm | 223 | 2220 s | 22.39 cm |
| 128 | 1270 s | 25.07 cm | 160 | 1590 s | 24.09 cm | 192 | 1910 s | 23.19 cm | 224 | 2230 s | 22.37 cm |
| 129 | 1280 s | 25.03 cm | 161 | 1600 s | 24.05 cm | 193 | 1920 s | 23.16 cm | 225 | 2240 s | 22.35 cm |
| 130 | 1290 s | 25.0 cm | 162 | 1610 s | 24.02 cm | 194 | 1930 s | 23.14 cm | 226 | 2250 s | 22.33 cm |
| 131 | 1300 s | 24.97 cm | 163 | 1620 s | 23.99 cm | 195 | 1940 s | 23.11 cm | 227 | 2260 s | 22.3 cm |
| 132 | 1310 s | 24.94 cm | 164 | 1630 s | 23.96 cm | 196 | 1950 s | 23.09 cm | 228 | 2270 s | 22.28 cm |

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### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 229 | 2280 s | 22.25 cm | 261 | 2600 s | 21.4 cm | 293 | 2920 s | 20.78 cm | 325 | 3240 s | 20.17 cm |
| 230 | 2290 s | 22.22 cm | 262 | 2610 s | 21.38 cm | 294 | 2930 s | 20.76 cm | 326 | 3250 s | 20.15 cm |
| 231 | 2300 s | 22.2 cm | 263 | 2620 s | 21.36 cm | 295 | 2940 s | 20.74 cm | 327 | 3260 s | 20.12 cm |
| 232 | 2310 s | 22.18 cm | 264 | 2630 s | 21.34 cm | 296 | 2950 s | 20.72 cm | 328 | 3270 s | 20.11 cm |
| 233 | 2320 s | 22.16 cm | 265 | 2640 s | 21.32 cm | 297 | 2960 s | 20.7 cm | 329 | 3280 s | 20.09 cm |
| 234 | 2330 s | 22.13 cm | 266 | 2650 s | 21.3 cm | 298 | 2970 s | 20.69 cm | 330 | 3290 s | 20.07 cm |
| 235 | 2340 s | 22.11 cm | 267 | 2660 s | 21.29 cm | 299 | 2980 s | 20.67 cm | 331 | 3300 s | 20.05 cm |
| 236 | 2350 s | 22.08 cm | 268 | 2670 s | 21.26 cm | 300 | 2990 s | 20.65 cm | 332 | 3310 s | 20.04 cm |
| 237 | 2360 s | 21.86 cm | 269 | 2680 s | 21.24 cm | 301 | 3000 s | 20.63 cm | 333 | 3320 s | 20.02 cm |
| 238 | 2370 s | 21.86 cm | 270 | 2690 s | 21.22 cm | 302 | 3010 s | 20.6 cm | 334 | 3330 s | 20.0 cm |
| 239 | 2380 s | 21.84 cm | 271 | 2700 s | 21.2 cm | 303 | 3020 s | 20.59 cm | 335 | 3340 s | 19.98 cm |
| 240 | 2390 s | 21.83 cm | 272 | 2710 s | 21.18 cm | 304 | 3030 s | 20.57 cm | 336 | 3350 s | 19.95 cm |
| 241 | 2400 s | 21.81 cm | 273 | 2720 s | 21.17 cm | 305 | 3040 s | 20.55 cm | 337 | 3360 s | 19.94 cm |
| 242 | 2410 s | 21.79 cm | 274 | 2730 s | 21.15 cm | 306 | 3050 s | 20.53 cm | 338 | 3370 s | 19.92 cm |
| 243 | 2420 s | 21.76 cm | 275 | 2740 s | 21.13 cm | 307 | 3060 s | 20.51 cm | 339 | 3380 s | 19.9 cm |
| 244 | 2430 s | 21.74 cm | 276 | 2750 s | 21.1 cm | 308 | 3070 s | 20.49 cm | 340 | 3390 s | 19.89 cm |
| 245 | 2440 s | 21.72 cm | 277 | 2760 s | 21.08 cm | 309 | 3080 s | 20.48 cm | 341 | 3400 s | 19.87 cm |
| 246 | 2450 s | 21.7 cm | 278 | 2770 s | 21.06 cm | 310 | 3090 s | 20.45 cm | 342 | 3410 s | 19.85 cm |
| 247 | 2460 s | 21.68 cm | 279 | 2780 s | 21.05 cm | 311 | 3100 s | 20.43 cm | 343 | 3420 s | 19.84 cm |
| 248 | 2470 s | 21.66 cm | 280 | 2790 s | 21.03 cm | 312 | 3110 s | 20.41 cm | 344 | 3430 s | 19.82 cm |
| 249 | 2480 s | 21.65 cm | 281 | 2800 s | 21.01 cm | 313 | 3120 s | 20.39 cm | 345 | 3440 s | 19.81 cm |
| 250 | 2490 s | 21.63 cm | 282 | 2810 s | 20.99 cm | 314 | 3130 s | 20.37 cm | 346 | 3450 s | 19.78 cm |
| 251 | 2500 s | 21.61 cm | 283 | 2820 s | 20.97 cm | 315 | 3140 s | 20.36 cm | 347 | 3460 s | 19.77 cm |
| 252 | 2510 s | 21.58 cm | 284 | 2830 s | 20.96 cm | 316 | 3150 s | 20.34 cm | 348 | 3470 s | 19.75 cm |
| 253 | 2520 s | 21.56 cm | 285 | 2840 s | 20.93 cm | 317 | 3160 s | 20.32 cm | 349 | 3480 s | 19.74 cm |
| 254 | 2530 s | 21.54 cm | 286 | 2850 s | 20.91 cm | 318 | 3170 s | 20.3 cm | 350 | 3490 s | 19.72 cm |
| 255 | 2540 s | 21.52 cm | 287 | 2860 s | 20.89 cm | 319 | 3180 s | 20.27 cm | 351 | 3500 s | 19.71 cm |
| 256 | 2550 s | 21.5 cm | 288 | 2870 s | 20.87 cm | 320 | 3190 s | 20.26 cm | 352 | 3510 s | 19.69 cm |
| 257 | 2560 s | 21.48 cm | 289 | 2880 s | 20.86 cm | 321 | 3200 s | 20.24 cm | 353 | 3520 s | 19.68 cm |
| 258 | 2570 s | 21.46 cm | 290 | 2890 s | 20.84 cm | 322 | 3210 s | 20.22 cm | 354 | 3530 s | 19.67 cm |
| 259 | 2580 s | 21.43 cm | 291 | 2900 s | 20.82 cm | 323 | 3220 s | 20.2 cm | 355 | 3540 s | 19.65 cm |
| 260 | 2590 s | 21.42 cm | 292 | 2910 s | 20.8 cm | 324 | 3230 s | 20.18 cm | 356 | 3550 s | 19.63 cm |

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### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 357 | 3560 s | 19.61 cm | 389 | 3880 s | 19.14 cm | 421 | 4200 s | 18.71 cm | 453 | 4520 s | 18.26 cm |
| 358 | 3570 s | 19.6 cm | 390 | 3890 s | 19.13 cm | 422 | 4210 s | 18.7 cm | 454 | 4530 s | 18.25 cm |
| 359 | 3580 s | 19.58 cm | 391 | 3900 s | 19.12 cm | 423 | 4220 s | 18.68 cm | 455 | 4540 s | 18.24 cm |
| 360 | 3590 s | 19.57 cm | 392 | 3910 s | 19.1 cm | 424 | 4230 s | 18.67 cm | 456 | 4550 s | 18.22 cm |
| 361 | 3600 s | 19.56 cm | 393 | 3920 s | 19.09 cm | 425 | 4240 s | 18.65 cm | 457 | 4560 s | 18.21 cm |
| 362 | 3610 s | 19.54 cm | 394 | 3930 s | 19.08 cm | 426 | 4250 s | 18.63 cm | 458 | 4570 s | 18.2 cm |
| 363 | 3620 s | 19.53 cm | 395 | 3940 s | 19.07 cm | 427 | 4260 s | 18.62 cm | 459 | 4580 s | 18.18 cm |
| 364 | 3630 s | 19.51 cm | 396 | 3950 s | 19.05 cm | 428 | 4270 s | 18.61 cm | 460 | 4590 s | 18.17 cm |
| 365 | 3640 s | 19.5 cm | 397 | 3960 s | 19.04 cm | 429 | 4280 s | 18.59 cm | 461 | 4600 s | 18.15 cm |
| 366 | 3650 s | 19.49 cm | 398 | 3970 s | 19.03 cm | 430 | 4290 s | 18.58 cm | 462 | 4610 s | 18.13 cm |
| 367 | 3660 s | 19.48 cm | 399 | 3980 s | 19.02 cm | 431 | 4300 s | 18.57 cm | 463 | 4620 s | 18.12 cm |
| 368 | 3670 s | 19.45 cm | 400 | 3990 s | 19.0 cm | 432 | 4310 s | 18.55 cm | 464 | 4630 s | 18.11 cm |
| 369 | 3680 s | 19.44 cm | 401 | 4000 s | 18.99 cm | 433 | 4320 s | 18.54 cm | 465 | 4640 s | 18.1 cm |
| 370 | 3690 s | 19.42 cm | 402 | 4010 s | 18.97 cm | 434 | 4330 s | 18.53 cm | 466 | 4650 s | 18.08 cm |
| 371 | 3700 s | 19.41 cm | 403 | 4020 s | 18.95 cm | 435 | 4340 s | 18.51 cm | 467 | 4660 s | 18.07 cm |
| 372 | 3710 s | 19.39 cm | 404 | 4030 s | 18.94 cm | 436 | 4350 s | 18.5 cm | 468 | 4670 s | 18.06 cm |
| 373 | 3720 s | 19.38 cm | 405 | 4040 s | 18.93 cm | 437 | 4360 s | 18.48 cm | 469 | 4680 s | 18.05 cm |
| 374 | 3730 s | 19.37 cm | 406 | 4050 s | 18.92 cm | 438 | 4370 s | 18.47 cm | 470 | 4690 s | 18.03 cm |
| 375 | 3740 s | 19.35 cm | 407 | 4060 s | 18.9 cm | 439 | 4380 s | 18.45 cm | 471 | 4700 s | 18.02 cm |
| 376 | 3750 s | 19.34 cm | 408 | 4070 s | 18.89 cm | 440 | 4390 s | 18.44 cm | 472 | 4710 s | 18.01 cm |
| 377 | 3760 s | 19.32 cm | 409 | 4080 s | 18.88 cm | 441 | 4400 s | 18.43 cm | 473 | 4720 s | 17.99 cm |
| 378 | 3770 s | 19.3 cm | 410 | 4090 s | 18.86 cm | 442 | 4410 s | 18.42 cm | 474 | 4730 s | 17.97 cm |
| 379 | 3780 s | 19.29 cm | 411 | 4100 s | 18.85 cm | 443 | 4420 s | 18.4 cm | 475 | 4740 s | 17.96 cm |
| 380 | 3790 s | 19.27 cm | 412 | 4110 s | 18.84 cm | 444 | 4430 s | 18.39 cm | 476 | 4750 s | 17.95 cm |
| 381 | 3800 s | 19.26 cm | 413 | 4120 s | 18.81 cm | 445 | 4440 s | 18.38 cm | 477 | 4760 s | 17.94 cm |
| 382 | 3810 s | 19.25 cm | 414 | 4130 s | 18.8 cm | 446 | 4450 s | 18.36 cm | 478 | 4770 s | 17.92 cm |
| 383 | 3820 s | 19.23 cm | 415 | 4140 s | 18.79 cm | 447 | 4460 s | 18.35 cm | 479 | 4780 s | 17.91 cm |
| 384 | 3830 s | 19.22 cm | 416 | 4150 s | 18.77 cm | 448 | 4470 s | 18.34 cm | 480 | 4790 s | 17.9 cm |
| 385 | 3840 s | 19.21 cm | 417 | 4160 s | 18.76 cm | 449 | 4480 s | 18.31 cm | 481 | 4800 s | 17.89 cm |
| 386 | 3850 s | 19.19 cm | 418 | 4170 s | 18.75 cm | 450 | 4490 s | 18.3 cm | 482 | 4810 s | 17.87 cm |
| 387 | 3860 s | 19.18 cm | 419 | 4180 s | 18.73 cm | 451 | 4500 s | 18.29 cm | 483 | 4820 s | 17.86 cm |
| 388 | 3870 s | 19.17 cm | 420 | 4190 s | 18.72 cm | 452 | 4510 s | 18.28 cm | 484 | 4830 s | 17.85 cm |

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## RPBCWD

## Lotus Lake WIP - Kerber - Kerber Pond

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### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 485 | 4840 s | 17.83 cm | 517 | 5160 s | 17.4 cm | 549 | 5480 s | 16.96 cm | 581 | 5800 s | 16.52 cm |
| 486 | 4850 s | 17.82 cm | 518 | 5170 s | 17.39 cm | 550 | 5490 s | 16.95 cm | 582 | 5810 s | 16.51 cm |
| 487 | 4860 s | 17.8 cm | 519 | 5180 s | 17.37 cm | 551 | 5500 s | 16.94 cm | 583 | 5820 s | 16.49 cm |
| 488 | 4870 s | 17.79 cm | 520 | 5190 s | 17.36 cm | 552 | 5510 s | 16.92 cm | 584 | 5830 s | 16.48 cm |
| 489 | 4880 s | 17.77 cm | 521 | 5200 s | 17.35 cm | 553 | 5520 s | 16.91 cm | 585 | 5840 s | 16.46 cm |
| 490 | 4890 s | 17.76 cm | 522 | 5210 s | 17.33 cm | 554 | 5530 s | 16.9 cm | 586 | 5850 s | 16.45 cm |
| 491 | 4900 s | 17.75 cm | 523 | 5220 s | 17.31 cm | 555 | 5540 s | 16.88 cm | 587 | 5860 s | 16.44 cm |
| 492 | 4910 s | 17.74 cm | 524 | 5230 s | 17.3 cm | 556 | 5550 s | 16.87 cm | 588 | 5870 s | 16.43 cm |
| 493 | 4920 s | 17.72 cm | 525 | 5240 s | 17.29 cm | 557 | 5560 s | 16.86 cm | 589 | 5880 s | 16.41 cm |
| 494 | 4930 s | 17.71 cm | 526 | 5250 s | 17.28 cm | 558 | 5570 s | 16.84 cm | 590 | 5890 s | 16.4 cm |
| 495 | 4940 s | 17.7 cm | 527 | 5260 s | 17.26 cm | 559 | 5580 s | 16.82 cm | 591 | 5900 s | 16.39 cm |
| 496 | 4950 s | 17.68 cm | 528 | 5270 s | 17.25 cm | 560 | 5590 s | 16.81 cm | 592 | 5910 s | 16.38 cm |
| 497 | 4960 s | 17.66 cm | 529 | 5280 s | 17.24 cm | 561 | 5600 s | 16.8 cm | 593 | 5920 s | 16.35 cm |
| 498 | 4970 s | 17.65 cm | 530 | 5290 s | 17.23 cm | 562 | 5610 s | 16.78 cm | 594 | 5930 s | 16.34 cm |
| 499 | 4980 s | 17.64 cm | 531 | 5300 s | 17.21 cm | 563 | 5620 s | 16.77 cm | 595 | 5940 s | 16.33 cm |
| 500 | 4990 s | 17.63 cm | 532 | 5310 s | 17.2 cm | 564 | 5630 s | 16.76 cm | 596 | 5950 s | 16.31 cm |
| 501 | 5000 s | 17.61 cm | 533 | 5320 s | 17.19 cm | 565 | 5640 s | 16.75 cm | 597 | 5960 s | 16.3 cm |
| 502 | 5010 s | 17.6 cm | 534 | 5330 s | 17.17 cm | 566 | 5650 s | 16.73 cm | 598 | 5970 s | 16.29 cm |
| 503 | 5020 s | 17.59 cm | 535 | 5340 s | 17.15 cm | 567 | 5660 s | 16.72 cm | 599 | 5980 s | 16.28 cm |
| 504 | 5030 s | 17.57 cm | 536 | 5350 s | 17.14 cm | 568 | 5670 s | 16.71 cm | 600 | 5990 s | 16.26 cm |
| 505 | 5040 s | 17.56 cm | 537 | 5360 s | 17.13 cm | 569 | 5680 s | 16.68 cm | 601 | 6000 s | 16.25 cm |
| 506 | 5050 s | 17.55 cm | 538 | 5370 s | 17.12 cm | 570 | 5690 s | 16.67 cm | 602 | 6010 s | 16.24 cm |
| 507 | 5060 s | 17.54 cm | 539 | 5380 s | 17.1 cm | 571 | 5700 s | 16.66 cm | 603 | 6020 s | 16.23 cm |
| 508 | 5070 s | 17.53 cm | 540 | 5390 s | 17.09 cm | 572 | 5710 s | 16.64 cm | 604 | 6030 s | 16.21 cm |
| 509 | 5080 s | 17.5 cm | 541 | 5400 s | 17.08 cm | 573 | 5720 s | 16.63 cm | 605 | 6040 s | 16.19 cm |
| 510 | 5090 s | 17.49 cm | 542 | 5410 s | 17.06 cm | 574 | 5730 s | 16.62 cm | 606 | 6050 s | 16.18 cm |
| 511 | 5100 s | 17.48 cm | 543 | 5420 s | 17.05 cm | 575 | 5740 s | 16.61 cm | 607 | 6060 s | 16.16 cm |
| 512 | 5110 s | 17.46 cm | 544 | 5430 s | 17.04 cm | 576 | 5750 s | 16.59 cm | 608 | 6070 s | 16.15 cm |
| 513 | 5120 s | 17.45 cm | 545 | 5440 s | 17.01 cm | 577 | 5760 s | 16.58 cm | 609 | 6080 s | 16.14 cm |
| 514 | 5130 s | 17.44 cm | 546 | 5450 s | 17.0 cm | 578 | 5770 s | 16.57 cm | 610 | 6090 s | 16.13 cm |
| 515 | 5140 s | 17.42 cm | 547 | 5460 s | 16.99 cm | 579 | 5780 s | 16.55 cm | 611 | 6100 s | 16.11 cm |
| 516 | 5150 s | 17.41 cm | 548 | 5470 s | 16.98 cm | 580 | 5790 s | 16.54 cm | 612 | 6110 s | 16.1 cm |

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## Lotus Lake WIP - Kerber - Kerber Pond

### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 613 | 6120 s | 16.09 cm | 645 | 6440 s | 15.65 cm | 677 | 6760 s | 15.24 cm | 709 | 7080 s | 14.81 cm |
| 614 | 6130 s | 16.07 cm | 646 | 6450 s | 15.64 cm | 678 | 6770 s | 15.22 cm | 710 | 7090 s | 14.79 cm |
| 615 | 6140 s | 16.06 cm | 647 | 6460 s | 15.63 cm | 679 | 6780 s | 15.2 cm | 711 | 7100 s | 14.78 cm |
| 616 | 6150 s | 16.05 cm | 648 | 6470 s | 15.62 cm | 680 | 6790 s | 15.19 cm | 712 | 7110 s | 14.77 cm |
| 617 | 6160 s | 16.04 cm | 649 | 6480 s | 15.6 cm | 681 | 6800 s | 15.17 cm | 713 | 7120 s | 14.76 cm |
| 618 | 6170 s | 16.01 cm | 650 | 6490 s | 15.59 cm | 682 | 6810 s | 15.16 cm | 714 | 7130 s | 14.74 cm |
| 619 | 6180 s | 16.0 cm | 651 | 6500 s | 15.58 cm | 683 | 6820 s | 15.15 cm | 715 | 7140 s | 14.73 cm |
| 620 | 6190 s | 15.99 cm | 652 | 6510 s | 15.57 cm | 684 | 6830 s | 15.14 cm | 716 | 7150 s | 14.71 cm |
| 621 | 6200 s | 15.98 cm | 653 | 6520 s | 15.55 cm | 685 | 6840 s | 15.12 cm | 717 | 7160 s | 14.7 cm |
| 622 | 6210 s | 15.96 cm | 654 | 6530 s | 15.53 cm | 686 | 6850 s | 15.11 cm | 718 | 7170 s | 14.69 cm |
| 623 | 6220 s | 15.95 cm | 655 | 6540 s | 15.52 cm | 687 | 6860 s | 15.1 cm | 719 | 7180 s | 14.67 cm |
| 624 | 6230 s | 15.94 cm | 656 | 6550 s | 15.51 cm | 688 | 6870 s | 15.09 cm | 720 | 7190 s | 14.66 cm |
| 625 | 6240 s | 15.92 cm | 657 | 6560 s | 15.5 cm | 689 | 6880 s | 15.08 cm | 721 | 7200 s | 14.65 cm |
| 626 | 6250 s | 15.91 cm | 658 | 6570 s | 15.48 cm | 690 | 6890 s | 15.06 cm | 722 | 7210 s | 14.63 cm |
| 627 | 6260 s | 15.9 cm | 659 | 6580 s | 15.47 cm | 691 | 6900 s | 15.04 cm | 723 | 7220 s | 14.62 cm |
| 628 | 6270 s | 15.89 cm | 660 | 6590 s | 15.46 cm | 692 | 6910 s | 15.03 cm | 724 | 7230 s | 14.61 cm |
| 629 | 6280 s | 15.88 cm | 661 | 6600 s | 15.45 cm | 693 | 6920 s | 15.02 cm | 725 | 7240 s | 14.6 cm |
| 630 | 6290 s | 15.85 cm | 662 | 6610 s | 15.43 cm | 694 | 6930 s | 15.0 cm | 726 | 7250 s | 14.58 cm |
| 631 | 6300 s | 15.84 cm | 663 | 6620 s | 15.42 cm | 695 | 6940 s | 14.99 cm | 727 | 7260 s | 14.57 cm |
| 632 | 6310 s | 15.83 cm | 664 | 6630 s | 15.41 cm | 696 | 6950 s | 14.98 cm | 728 | 7270 s | 14.55 cm |
| 633 | 6320 s | 15.81 cm | 665 | 6640 s | 15.4 cm | 697 | 6960 s | 14.97 cm | 729 | 7280 s | 14.53 cm |
| 634 | 6330 s | 15.8 cm | 666 | 6650 s | 15.37 cm | 698 | 6970 s | 14.95 cm | 730 | 7290 s | 14.52 cm |
| 635 | 6340 s | 15.79 cm | 667 | 6660 s | 15.36 cm | 699 | 6980 s | 14.94 cm | 731 | 7300 s | 14.51 cm |
| 636 | 6350 s | 15.78 cm | 668 | 6670 s | 15.35 cm | 700 | 6990 s | 14.93 cm | 732 | 7310 s | 14.5 cm |
| 637 | 6360 s | 15.76 cm | 669 | 6680 s | 15.34 cm | 701 | 7000 s | 14.92 cm | 733 | 7320 s | 14.48 cm |
| 638 | 6370 s | 15.75 cm | 670 | 6690 s | 15.32 cm | 702 | 7010 s | 14.9 cm | 734 | 7330 s | 14.47 cm |
| 639 | 6380 s | 15.74 cm | 671 | 6700 s | 15.31 cm | 703 | 7020 s | 14.88 cm | 735 | 7340 s | 14.46 cm |
| 640 | 6390 s | 15.73 cm | 672 | 6710 s | 15.3 cm | 704 | 7030 s | 14.87 cm | 736 | 7350 s | 14.44 cm |
| 641 | 6400 s | 15.7 cm | 673 | 6720 s | 15.29 cm | 705 | 7040 s | 14.85 cm | 737 | 7360 s | 14.43 cm |
| 642 | 6410 s | 15.69 cm | 674 | 6730 s | 15.27 cm | 706 | 7050 s | 14.84 cm | 738 | 7370 s | 14.42 cm |
| 643 | 6420 s | 15.68 cm | 675 | 6740 s | 15.26 cm | 707 | 7060 s | 14.83 cm | 739 | 7380 s | 14.39 cm |
| 644 | 6430 s | 15.67 cm | 676 | 6750 s | 15.25 cm | 708 | 7070 s | 14.82 cm | 740 | 7390 s | 14.38 cm |

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### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 741 | 7400 s | 14.37 cm | 773 | 7720 s | 13.92 cm | 805 | 8040 s | 13.48 cm | 837 | 8360 s | 13.04 cm |
| 742 | 7410 s | 14.35 cm | 774 | 7730 s | 13.91 cm | 806 | 8050 s | 13.47 cm | 838 | 8370 s | 13.03 cm |
| 743 | 7420 s | 14.34 cm | 775 | 7740 s | 13.89 cm | 807 | 8060 s | 13.46 cm | 839 | 8380 s | 13.01 cm |
| 744 | 7430 s | 14.33 cm | 776 | 7750 s | 13.88 cm | 808 | 8070 s | 13.44 cm | 840 | 8390 s | 13.0 cm |
| 745 | 7440 s | 14.31 cm | 777 | 7760 s | 13.86 cm | 809 | 8080 s | 13.43 cm | 841 | 8400 s | 12.99 cm |
| 746 | 7450 s | 14.3 cm | 778 | 7770 s | 13.85 cm | 810 | 8090 s | 13.42 cm | 842 | 8410 s | 12.97 cm |
| 747 | 7460 s | 14.29 cm | 779 | 7780 s | 13.84 cm | 811 | 8100 s | 13.39 cm | 843 | 8420 s | 12.96 cm |
| 748 | 7470 s | 14.28 cm | 780 | 7790 s | 13.82 cm | 812 | 8110 s | 13.38 cm | 844 | 8430 s | 12.95 cm |
| 749 | 7480 s | 14.26 cm | 781 | 7800 s | 13.81 cm | 813 | 8120 s | 13.37 cm | 845 | 8440 s | 12.94 cm |
| 750 | 7490 s | 14.25 cm | 782 | 7810 s | 13.8 cm | 814 | 8130 s | 13.35 cm | 846 | 8450 s | 12.91 cm |
| 751 | 7500 s | 14.24 cm | 783 | 7820 s | 13.79 cm | 815 | 8140 s | 13.34 cm | 847 | 8460 s | 12.9 cm |
| 752 | 7510 s | 14.21 cm | 784 | 7830 s | 13.77 cm | 816 | 8150 s | 13.33 cm | 848 | 8470 s | 12.89 cm |
| 753 | 7520 s | 14.2 cm | 785 | 7840 s | 13.76 cm | 817 | 8160 s | 13.32 cm | 849 | 8480 s | 12.87 cm |
| 754 | 7530 s | 14.18 cm | 786 | 7850 s | 13.75 cm | 818 | 8170 s | 13.3 cm | 850 | 8490 s | 12.86 cm |
| 755 | 7540 s | 14.17 cm | 787 | 7860 s | 13.72 cm | 819 | 8180 s | 13.29 cm | 851 | 8500 s | 12.85 cm |
| 756 | 7550 s | 14.16 cm | 788 | 7870 s | 13.71 cm | 820 | 8190 s | 13.28 cm | 852 | 8510 s | 12.84 cm |
| 757 | 7560 s | 14.15 cm | 789 | 7880 s | 13.7 cm | 821 | 8200 s | 13.26 cm | 853 | 8520 s | 12.82 cm |
| 758 | 7570 s | 14.13 cm | 790 | 7890 s | 13.68 cm | 822 | 8210 s | 13.24 cm | 854 | 8530 s | 12.81 cm |
| 759 | 7580 s | 14.12 cm | 791 | 7900 s | 13.67 cm | 823 | 8220 s | 13.23 cm | 855 | 8540 s | 12.8 cm |
| 760 | 7590 s | 14.11 cm | 792 | 7910 s | 13.66 cm | 824 | 8230 s | 13.22 cm | 856 | 8550 s | 12.78 cm |
| 761 | 7600 s | 14.09 cm | 793 | 7920 s | 13.65 cm | 825 | 8240 s | 13.2 cm | 857 | 8560 s | 12.77 cm |
| 762 | 7610 s | 14.08 cm | 794 | 7930 s | 13.63 cm | 826 | 8250 s | 13.19 cm | 858 | 8570 s | 12.75 cm |
| 763 | 7620 s | 14.06 cm | 795 | 7940 s | 13.62 cm | 827 | 8260 s | 13.18 cm | 859 | 8580 s | 12.74 cm |
| 764 | 7630 s | 14.05 cm | 796 | 7950 s | 13.61 cm | 828 | 8270 s | 13.17 cm | 860 | 8590 s | 12.72 cm |
| 765 | 7640 s | 14.03 cm | 797 | 7960 s | 13.59 cm | 829 | 8280 s | 13.15 cm | 861 | 8600 s | 12.71 cm |
| 766 | 7650 s | 14.02 cm | 798 | 7970 s | 13.57 cm | 830 | 8290 s | 13.14 cm | 862 | 8610 s | 12.7 cm |
| 767 | 7660 s | 14.01 cm | 799 | 7980 s | 13.56 cm | 831 | 8300 s | 13.13 cm | 863 | 8620 s | 12.69 cm |
| 768 | 7670 s | 13.99 cm | 800 | 7990 s | 13.54 cm | 832 | 8310 s | 13.11 cm | 864 | 8630 s | 12.67 cm |
| 769 | 7680 s | 13.98 cm | 801 | 8000 s | 13.53 cm | 833 | 8320 s | 13.1 cm | 865 | 8640 s | 12.66 cm |
| 770 | 7690 s | 13.97 cm | 802 | 8010 s | 13.52 cm | 834 | 8330 s | 13.09 cm | 866 | 8650 s | 12.65 cm |
| 771 | 7700 s | 13.95 cm | 803 | 8020 s | 13.51 cm | 835 | 8340 s | 13.06 cm | 867 | 8660 s | 12.64 cm |
| 772 | 7710 s | 13.94 cm | 804 | 8030 s | 13.49 cm | 836 | 8350 s | 13.05 cm | 868 | 8670 s | 12.62 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP - Kerber - Kerber Pond

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### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 869 | 8680 s | 12.61 cm | 901 | 9000 s | 12.18 cm | 933 | 9320 s | 11.75 cm | 965 | 9640 s | 11.34 cm |
| 870 | 8690 s | 12.6 cm | 902 | 9010 s | 12.17 cm | 934 | 9330 s | 11.74 cm | 966 | 9650 s | 11.33 cm |
| 871 | 8700 s | 12.58 cm | 903 | 9020 s | 12.15 cm | 935 | 9340 s | 11.73 cm | 967 | 9660 s | 11.32 cm |
| 872 | 8710 s | 12.56 cm | 904 | 9030 s | 12.14 cm | 936 | 9350 s | 11.72 cm | 968 | 9670 s | 11.3 cm |
| 873 | 8720 s | 12.55 cm | 905 | 9040 s | 12.13 cm | 937 | 9360 s | 11.7 cm | 969 | 9680 s | 11.29 cm |
| 874 | 8730 s | 12.54 cm | 906 | 9050 s | 12.12 cm | 938 | 9370 s | 11.69 cm | 970 | 9690 s | 11.27 cm |
| 875 | 8740 s | 12.52 cm | 907 | 9060 s | 12.11 cm | 939 | 9380 s | 11.68 cm | 971 | 9700 s | 11.26 cm |
| 876 | 8750 s | 12.51 cm | 908 | 9070 s | 12.08 cm | 940 | 9390 s | 11.67 cm | 972 | 9710 s | 11.24 cm |
| 877 | 8760 s | 12.5 cm | 909 | 9080 s | 12.07 cm | 941 | 9400 s | 11.65 cm | 973 | 9720 s | 11.23 cm |
| 878 | 8770 s | 12.49 cm | 910 | 9090 s | 12.06 cm | 942 | 9410 s | 11.64 cm | 974 | 9730 s | 11.22 cm |
| 879 | 8780 s | 12.47 cm | 911 | 9100 s | 12.05 cm | 943 | 9420 s | 11.63 cm | 975 | 9740 s | 11.21 cm |
| 880 | 8790 s | 12.46 cm | 912 | 9110 s | 12.04 cm | 944 | 9430 s | 11.62 cm | 976 | 9750 s | 11.19 cm |
| 881 | 8800 s | 12.45 cm | 913 | 9120 s | 12.02 cm | 945 | 9440 s | 11.6 cm | 977 | 9760 s | 11.18 cm |
| 882 | 8810 s | 12.44 cm | 914 | 9130 s | 12.01 cm | 946 | 9450 s | 11.58 cm | 978 | 9770 s | 11.17 cm |
| 883 | 8820 s | 12.41 cm | 915 | 9140 s | 12.0 cm | 947 | 9460 s | 11.57 cm | 979 | 9780 s | 11.16 cm |
| 884 | 8830 s | 12.4 cm | 916 | 9150 s | 11.98 cm | 948 | 9470 s | 11.56 cm | 980 | 9790 s | 11.15 cm |
| 885 | 8840 s | 12.39 cm | 917 | 9160 s | 11.97 cm | 949 | 9480 s | 11.55 cm | 981 | 9800 s | 11.13 cm |
| 886 | 8850 s | 12.38 cm | 918 | 9170 s | 11.96 cm | 950 | 9490 s | 11.53 cm | 982 | 9810 s | 11.11 cm |
| 887 | 8860 s | 12.36 cm | 919 | 9180 s | 11.95 cm | 951 | 9500 s | 11.52 cm | 983 | 9820 s | 11.1 cm |
| 888 | 8870 s | 12.35 cm | 920 | 9190 s | 11.92 cm | 952 | 9510 s | 11.51 cm | 984 | 9830 s | 11.09 cm |
| 889 | 8880 s | 12.34 cm | 921 | 9200 s | 11.91 cm | 953 | 9520 s | 11.5 cm | 985 | 9840 s | 11.07 cm |
| 890 | 8890 s | 12.33 cm | 922 | 9210 s | 11.9 cm | 954 | 9530 s | 11.49 cm | 986 | 9850 s | 11.06 cm |
| 891 | 8900 s | 12.31 cm | 923 | 9220 s | 11.89 cm | 955 | 9540 s | 11.47 cm | 987 | 9860 s | 11.05 cm |
| 892 | 8910 s | 12.3 cm | 924 | 9230 s | 11.88 cm | 956 | 9550 s | 11.46 cm | 988 | 9870 s | 11.04 cm |
| 893 | 8920 s | 12.29 cm | 925 | 9240 s | 11.86 cm | 957 | 9560 s | 11.44 cm | 989 | 9880 s | 11.02 cm |
| 894 | 8930 s | 12.28 cm | 926 | 9250 s | 11.85 cm | 958 | 9570 s | 11.43 cm | 990 | 9890 s | 11.01 cm |
| 895 | 8940 s | 12.25 cm | 927 | 9260 s | 11.84 cm | 959 | 9580 s | 11.41 cm | 991 | 9900 s | 11.0 cm |
| 896 | 8950 s | 12.24 cm | 928 | 9270 s | 11.83 cm | 960 | 9590 s | 11.4 cm | 992 | 9910 s | 10.99 cm |
| 897 | 8960 s | 12.23 cm | 929 | 9280 s | 11.81 cm | 961 | 9600 s | 11.39 cm | 993 | 9920 s | 10.98 cm |
| 898 | 8970 s | 12.22 cm | 930 | 9290 s | 11.8 cm | 962 | 9610 s | 11.38 cm | 994 | 9930 s | 10.96 cm |
| 899 | 8980 s | 12.2 cm | 931 | 9300 s | 11.79 cm | 963 | 9620 s | 11.36 cm | 995 | 9940 s | 10.94 cm |
| 900 | 8990 s | 12.19 cm | 932 | 9310 s | 11.78 cm | 964 | 9630 s | 11.35 cm | 996 | 9950 s | 10.93 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP - Kerber - Kerber Pond

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### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 997 | 9960 s | 10.92 cm | 1029 | 10280 s | 10.5 cm | 1061 | 10600 s | 10.07 cm | 1093 | 10920 s | 9.65 cm |
| 998 | 9970 s | 10.9 cm | 1030 | 10290 s | 10.49 cm | 1062 | 10610 s | 10.06 cm | 1094 | 10930 s | 9.63 cm |
| 999 | 9980 s | 10.89 cm | 1031 | 10300 s | 10.47 cm | 1063 | 10620 s | 10.04 cm | 1095 | 10940 s | 9.61 cm |
| 1000 | 9990 s | 10.88 cm | 1032 | 10310 s | 10.45 cm | 1064 | 10630 s | 10.03 cm | 1096 | 10950 s | 9.6 cm |
| 1001 | 10000 s | 10.87 cm | 1033 | 10320 s | 10.44 cm | 1065 | 10640 s | 10.02 cm | 1097 | 10960 s | 9.59 cm |
| 1002 | 10010 s | 10.85 cm | 1034 | 10330 s | 10.42 cm | 1066 | 10650 s | 10.01 cm | 1098 | 10970 s | 9.58 cm |
| 1003 | 10020 s | 10.84 cm | 1035 | 10340 s | 10.41 cm | 1067 | 10660 s | 9.99 cm | 1099 | 10980 s | 9.57 cm |
| 1004 | 10030 s | 10.83 cm | 1036 | 10350 s | 10.4 cm | 1068 | 10670 s | 9.98 cm | 1100 | 10990 s | 9.55 cm |
| 1005 | 10040 s | 10.82 cm | 1037 | 10360 s | 10.39 cm | 1069 | 10680 s | 9.96 cm | 1101 | 11000 s | 9.54 cm |
| 1006 | 10050 s | 10.8 cm | 1038 | 10370 s | 10.37 cm | 1070 | 10690 s | 9.95 cm | 1102 | 11010 s | 9.53 cm |
| 1007 | 10060 s | 10.78 cm | 1039 | 10380 s | 10.36 cm | 1071 | 10700 s | 9.93 cm | 1103 | 11020 s | 9.52 cm |
| 1008 | 10070 s | 10.77 cm | 1040 | 10390 s | 10.35 cm | 1072 | 10710 s | 9.92 cm | 1104 | 11030 s | 9.5 cm |
| 1009 | 10080 s | 10.76 cm | 1041 | 10400 s | 10.34 cm | 1073 | 10720 s | 9.91 cm | 1105 | 11040 s | 9.49 cm |
| 1010 | 10090 s | 10.74 cm | 1042 | 10410 s | 10.32 cm | 1074 | 10730 s | 9.9 cm | 1106 | 11050 s | 9.47 cm |
| 1011 | 10100 s | 10.73 cm | 1043 | 10420 s | 10.31 cm | 1075 | 10740 s | 9.89 cm | 1107 | 11060 s | 9.46 cm |
| 1012 | 10110 s | 10.72 cm | 1044 | 10430 s | 10.29 cm | 1076 | 10750 s | 9.87 cm | 1108 | 11070 s | 9.44 cm |
| 1013 | 10120 s | 10.71 cm | 1045 | 10440 s | 10.28 cm | 1077 | 10760 s | 9.86 cm | 1109 | 11080 s | 9.43 cm |
| 1014 | 10130 s | 10.69 cm | 1046 | 10450 s | 10.26 cm | 1078 | 10770 s | 9.85 cm | 1110 | 11090 s | 9.42 cm |
| 1015 | 10140 s | 10.68 cm | 1047 | 10460 s | 10.25 cm | 1079 | 10780 s | 9.84 cm | 1111 | 11100 s | 9.41 cm |
| 1016 | 10150 s | 10.67 cm | 1048 | 10470 s | 10.24 cm | 1080 | 10790 s | 9.82 cm | 1112 | 11110 s | 9.39 cm |
| 1017 | 10160 s | 10.66 cm | 1049 | 10480 s | 10.23 cm | 1081 | 10800 s | 9.8 cm | 1113 | 11120 s | 9.38 cm |
| 1018 | 10170 s | 10.64 cm | 1050 | 10490 s | 10.22 cm | 1082 | 10810 s | 9.79 cm | 1114 | 11130 s | 9.37 cm |
| 1019 | 10180 s | 10.62 cm | 1051 | 10500 s | 10.2 cm | 1083 | 10820 s | 9.78 cm | 1115 | 11140 s | 9.36 cm |
| 1020 | 10190 s | 10.61 cm | 1052 | 10510 s | 10.19 cm | 1084 | 10830 s | 9.76 cm | 1116 | 11150 s | 9.34 cm |
| 1021 | 10200 s | 10.6 cm | 1053 | 10520 s | 10.18 cm | 1085 | 10840 s | 9.75 cm | 1117 | 11160 s | 9.33 cm |
| 1022 | 10210 s | 10.58 cm | 1054 | 10530 s | 10.17 cm | 1086 | 10850 s | 9.74 cm | 1118 | 11170 s | 9.31 cm |
| 1023 | 10220 s | 10.57 cm | 1055 | 10540 s | 10.15 cm | 1087 | 10860 s | 9.73 cm | 1119 | 11180 s | 9.3 cm |
| 1024 | 10230 s | 10.56 cm | 1056 | 10550 s | 10.13 cm | 1088 | 10870 s | 9.71 cm | 1120 | 11190 s | 9.28 cm |
| 1025 | 10240 s | 10.55 cm | 1057 | 10560 s | 10.12 cm | 1089 | 10880 s | 9.7 cm | 1121 | 11200 s | 9.27 cm |
| 1026 | 10250 s | 10.53 cm | 1058 | 10570 s | 10.11 cm | 1090 | 10890 s | 9.69 cm | 1122 | 11210 s | 9.26 cm |
| 1027 | 10260 s | 10.52 cm | 1059 | 10580 s | 10.1 cm | 1091 | 10900 s | 9.68 cm | 1123 | 11220 s | 9.25 cm |
| 1028 | 10270 s | 10.51 cm | 1060 | 10590 s | 10.08 cm | 1092 | 10910 s | 9.66 cm | 1124 | 11230 s | 9.23 cm |

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## RPBCWD

## Lotus Lake WIP - Kerber - Kerber Pond

### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1125 | 11240 s | 9.22 cm | 1157 | 11560 s | 8.79 cm | 1189 | 11880 s | 8.38 cm | 1221 | 12200 s | 7.96 cm |
| 1126 | 11250 s | 9.21 cm | 1158 | 11570 s | 8.78 cm | 1190 | 11890 s | 8.37 cm | 1222 | 12210 s | 7.94 cm |
| 1127 | 11260 s | 9.2 cm | 1159 | 11580 s | 8.77 cm | 1191 | 11900 s | 8.36 cm | 1223 | 12220 s | 7.93 cm |
| 1128 | 11270 s | 9.19 cm | 1160 | 11590 s | 8.76 cm | 1192 | 11910 s | 8.34 cm | 1224 | 12230 s | 7.92 cm |
| 1129 | 11280 s | 9.17 cm | 1161 | 11600 s | 8.74 cm | 1193 | 11920 s | 8.32 cm | 1225 | 12240 s | 7.91 cm |
| 1130 | 11290 s | 9.16 cm | 1162 | 11610 s | 8.73 cm | 1194 | 11930 s | 8.31 cm | 1226 | 12250 s | 7.89 cm |
| 1131 | 11300 s | 9.14 cm | 1163 | 11620 s | 8.72 cm | 1195 | 11940 s | 8.3 cm | 1227 | 12260 s | 7.88 cm |
| 1132 | 11310 s | 9.13 cm | 1164 | 11630 s | 8.71 cm | 1196 | 11950 s | 8.28 cm | 1228 | 12270 s | 7.87 cm |
| 1133 | 11320 s | 9.11 cm | 1165 | 11640 s | 8.69 cm | 1197 | 11960 s | 8.27 cm | 1229 | 12280 s | 7.86 cm |
| 1134 | 11330 s | 9.1 cm | 1166 | 11650 s | 8.68 cm | 1198 | 11970 s | 8.26 cm | 1230 | 12290 s | 7.85 cm |
| 1135 | 11340 s | 9.09 cm | 1167 | 11660 s | 8.67 cm | 1199 | 11980 s | 8.25 cm | 1231 | 12300 s | 7.82 cm |
| 1136 | 11350 s | 9.07 cm | 1168 | 11670 s | 8.65 cm | 1200 | 11990 s | 8.23 cm | 1232 | 12310 s | 7.81 cm |
| 1137 | 11360 s | 9.06 cm | 1169 | 11680 s | 8.64 cm | 1201 | 12000 s | 8.22 cm | 1233 | 12320 s | 7.8 cm |
| 1138 | 11370 s | 9.05 cm | 1170 | 11690 s | 8.62 cm | 1202 | 12010 s | 8.21 cm | 1234 | 12330 s | 7.79 cm |
| 1139 | 11380 s | 9.04 cm | 1171 | 11700 s | 8.61 cm | 1203 | 12020 s | 8.2 cm | 1235 | 12340 s | 7.77 cm |
| 1140 | 11390 s | 9.03 cm | 1172 | 11710 s | 8.6 cm | 1204 | 12030 s | 8.18 cm | 1236 | 12350 s | 7.76 cm |
| 1141 | 11400 s | 9.01 cm | 1173 | 11720 s | 8.59 cm | 1205 | 12040 s | 8.16 cm | 1237 | 12360 s | 7.75 cm |
| 1142 | 11410 s | 9.0 cm | 1174 | 11730 s | 8.57 cm | 1206 | 12050 s | 8.15 cm | 1238 | 12370 s | 7.74 cm |
| 1143 | 11420 s | 8.98 cm | 1175 | 11740 s | 8.56 cm | 1207 | 12060 s | 8.14 cm | 1239 | 12380 s | 7.73 cm |
| 1144 | 11430 s | 8.97 cm | 1176 | 11750 s | 8.55 cm | 1208 | 12070 s | 8.13 cm | 1240 | 12390 s | 7.71 cm |
| 1145 | 11440 s | 8.95 cm | 1177 | 11760 s | 8.54 cm | 1209 | 12080 s | 8.11 cm | 1241 | 12400 s | 7.7 cm |
| 1146 | 11450 s | 8.94 cm | 1178 | 11770 s | 8.53 cm | 1210 | 12090 s | 8.1 cm | 1242 | 12410 s | 7.69 cm |
| 1147 | 11460 s | 8.93 cm | 1179 | 11780 s | 8.51 cm | 1211 | 12100 s | 8.09 cm | 1243 | 12420 s | 7.67 cm |
| 1148 | 11470 s | 8.92 cm | 1180 | 11790 s | 8.49 cm | 1212 | 12110 s | 8.08 cm | 1244 | 12430 s | 7.65 cm |
| 1149 | 11480 s | 8.9 cm | 1181 | 11800 s | 8.48 cm | 1213 | 12120 s | 8.06 cm | 1245 | 12440 s | 7.64 cm |
| 1150 | 11490 s | 8.89 cm | 1182 | 11810 s | 8.47 cm | 1214 | 12130 s | 8.05 cm | 1246 | 12450 s | 7.63 cm |
| 1151 | 11500 s | 8.88 cm | 1183 | 11820 s | 8.45 cm | 1215 | 12140 s | 8.04 cm | 1247 | 12460 s | 7.62 cm |
| 1152 | 11510 s | 8.87 cm | 1184 | 11830 s | 8.44 cm | 1216 | 12150 s | 8.03 cm | 1248 | 12470 s | 7.6 cm |
| 1153 | 11520 s | 8.85 cm | 1185 | 11840 s | 8.43 cm | 1217 | 12160 s | 8.02 cm | 1249 | 12480 s | 7.59 cm |
| 1154 | 11530 s | 8.84 cm | 1186 | 11850 s | 8.42 cm | 1218 | 12170 s | 7.99 cm | 1250 | 12490 s | 7.58 cm |
| 1155 | 11540 s | 8.83 cm | 1187 | 11860 s | 8.41 cm | 1219 | 12180 s | 7.98 cm | 1251 | 12500 s | 7.57 cm |
| 1156 | 11550 s | 8.81 cm | 1188 | 11870 s | 8.39 cm | 1220 | 12190 s | 7.97 cm | 1252 | 12510 s | 7.55 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP - Kerber - Kerber Pond

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### kerber b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1253 | 12520 s | 7.54 cm | 1285 | 12840 s | 7.13 cm | 1317 | 13160 s | 6.73 cm | 1349 | 13480 s | 6.31 cm |
| 1254 | 12530 s | 7.53 cm | 1286 | 12850 s | 7.12 cm | 1318 | 13170 s | 6.72 cm | 1350 | 13490 s | 6.3 cm |
| 1255 | 12540 s | 7.52 cm | 1287 | 12860 s | 7.11 cm | 1319 | 13180 s | 6.7 cm | 1351 | 13500 s | 6.29 cm |
| 1256 | 12550 s | 7.5 cm | 1288 | 12870 s | 7.09 cm | 1320 | 13190 s | 6.68 cm | 1352 | 13510 s | 6.28 cm |
| 1257 | 12560 s | 7.49 cm | 1289 | 12880 s | 7.08 cm | 1321 | 13200 s | 6.67 cm | 1353 | 13520 s | 6.26 cm |
| 1258 | 12570 s | 7.47 cm | 1290 | 12890 s | 7.07 cm | 1322 | 13210 s | 6.66 cm | 1354 | 13530 s | 6.25 cm |
| 1259 | 12580 s | 7.46 cm | 1291 | 12900 s | 7.06 cm | 1323 | 13220 s | 6.64 cm | 1355 | 13540 s | 6.24 cm |
| 1260 | 12590 s | 7.45 cm | 1292 | 12910 s | 7.05 cm | 1324 | 13230 s | 6.63 cm | 1356 | 13550 s | 6.23 cm |
| 1261 | 12600 s | 7.44 cm | 1293 | 12920 s | 7.03 cm | 1325 | 13240 s | 6.62 cm | 1357 | 13560 s | 6.22 cm |
| 1262 | 12610 s | 7.43 cm | 1294 | 12930 s | 7.01 cm | 1326 | 13250 s | 6.61 cm | 1358 | 13570 s | 6.21 cm |
| 1263 | 12620 s | 7.41 cm | 1295 | 12940 s | 7.0 cm | 1327 | 13260 s | 6.6 cm | 1359 | 13580 s | 6.18 cm |
| 1264 | 12630 s | 7.4 cm | 1296 | 12950 s | 6.99 cm | 1328 | 13270 s | 6.58 cm | 1360 | 13590 s | 6.17 cm |
| 1265 | 12640 s | 7.39 cm | 1297 | 12960 s | 6.98 cm | 1329 | 13280 s | 6.57 cm | 1361 | 13600 s | 6.16 cm |
| 1266 | 12650 s | 7.38 cm | 1298 | 12970 s | 6.96 cm | 1330 | 13290 s | 6.56 cm | 1362 | 13610 s | 6.15 cm |
| 1267 | 12660 s | 7.37 cm | 1299 | 12980 s | 6.95 cm | 1331 | 13300 s | 6.55 cm | 1363 | 13620 s | 6.13 cm |
| 1268 | 12670 s | 7.34 cm | 1300 | 12990 s | 6.94 cm | 1332 | 13310 s | 6.54 cm | 1364 | 13630 s | 6.12 cm |
| 1269 | 12680 s | 7.33 cm | 1301 | 13000 s | 6.93 cm | 1333 | 13320 s | 6.51 cm | 1365 | 13640 s | 6.11 cm |
| 1270 | 12690 s | 7.32 cm | 1302 | 13010 s | 6.92 cm | 1334 | 13330 s | 6.5 cm | 1366 | 13650 s | 6.1 cm |
| 1271 | 12700 s | 7.31 cm | 1303 | 13020 s | 6.91 cm | 1335 | 13340 s | 6.49 cm | 1367 | 13660 s | 6.09 cm |
| 1272 | 12710 s | 7.29 cm | 1304 | 13030 s | 6.89 cm | 1336 | 13350 s | 6.48 cm | 1368 | 13670 s | 6.08 cm |
| 1273 | 12720 s | 7.28 cm | 1305 | 13040 s | 6.88 cm | 1337 | 13360 s | 6.47 cm | 1369 | 13680 s | 6.06 cm |
| 1274 | 12730 s | 7.27 cm | 1306 | 13050 s | 6.87 cm | 1338 | 13370 s | 6.45 cm | 1370 | 13690 s | 6.05 cm |
| 1275 | 12740 s | 7.26 cm | 1307 | 13060 s | 6.85 cm | 1339 | 13380 s | 6.44 cm | 1371 | 13700 s | 6.03 cm |
| 1276 | 12750 s | 7.25 cm | 1308 | 13070 s | 6.84 cm | 1340 | 13390 s | 6.43 cm | 1372 | 13710 s | 6.02 cm |
| 1277 | 12760 s | 7.24 cm | 1309 | 13080 s | 6.82 cm | 1341 | 13400 s | 6.42 cm | 1373 | 13720 s | 6.01 cm |
| 1278 | 12770 s | 7.22 cm | 1310 | 13090 s | 6.81 cm | 1342 | 13410 s | 6.41 cm | 1374 | 13730 s | 5.99 cm |
| 1279 | 12780 s | 7.21 cm | 1311 | 13100 s | 6.8 cm | 1343 | 13420 s | 6.39 cm | 1375 | 13740 s | 5.98 cm |
| 1280 | 12790 s | 7.2 cm | 1312 | 13110 s | 6.79 cm | 1344 | 13430 s | 6.38 cm | 1376 | 13750 s | 5.97 cm |
| 1281 | 12800 s | 7.18 cm | 1313 | 13120 s | 6.77 cm | 1345 | 13440 s | 6.36 cm | 1377 | 13760 s | 5.96 cm |
| 1282 | 12810 s | 7.17 cm | 1314 | 13130 s | 6.76 cm | 1346 | 13450 s | 6.35 cm | 1378 | 13770 s | 5.95 cm |
| 1283 | 12820 s | 7.15 cm | 1315 | 13140 s | 6.75 cm | 1347 | 13460 s | 6.34 cm | 1379 | 13780 s | 5.93 cm |
| 1284 | 12830 s | 7.14 cm | 1316 | 13150 s | 6.74 cm | 1348 | 13470 s | 6.33 cm | 1380 | 13790 s | 5.92 cm |

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### kerber b Readings continued

| # | Time | Head |
|---|---|---|
| 1381 | 13800 s | 5.91 cm |
| 1382 | 13810 s | 5.9 cm |
| 1383 | 13820 s | 5.89 cm |
| 1384 | 13830 s | 5.86 cm |
| 1385 | 13840 s | 5.85 cm |
| 1386 | 13850 s | 5.84 cm |
| 1387 | 13860 s | 5.83 cm |
| 1388 | 13870 s | 5.82 cm |
| 1389 | 13880 s | 5.81 cm |
| 1390 | 13890 s | 5.79 cm |
| 1391 | 13900 s | 5.78 cm |
| 1392 | 13910 s | 5.77 cm |
| 1393 | 13920 s | 5.76 cm |
| 1394 | 13930 s | 5.75 cm |
| 1395 | 13940 s | 5.74 cm |
| 1396 | 13950 s | 5.73 cm |
| 1397 | 13960 s | 5.72 cm |
| 1398 | 13970 s | 5.69 cm |
| 1399 | 13980 s | 5.68 cm |
| 1400 | 13990 s | 5.67 cm |
| 1401 | 14000 s | 5.66 cm |
| 1402 | 14010 s | 5.65 cm |
| 1403 | 14020 s | 5.64 cm |
| 1404 | 14030 s | 5.63 cm |
| 1405 | 14040 s | 5.61 cm |
| 1406 | 14050 s | 5.6 cm |
| 1407 | 14060 s | 5.59 cm |
| 1408 | 14070 s | 5.58 cm |
| 1409 | 14080 s | 5.57 cm |
| 1410 | 14090 s | 5.56 cm |
| 1411 | 14100 s | 5.54 cm |
| 1412 | 14110 s | 5.53 cm |
| 1413 | 14120 s | 5.51 cm |
| 1414 | 14130 s | 5.5 cm |
| 1415 | 14140 s | 5.49 cm |
| 1416 | 14150 s | 5.48 cm |
| 1417 | 14160 s | 5.47 cm |
| 1418 | 14170 s | 5.46 cm |
| 1419 | 14180 s | 5.45 cm |
| 1420 | 14190 s | 5.43 cm |
| 1421 | 14200 s | 5.42 cm |
| 1422 | 14210 s | 5.41 cm |
| 1423 | 14220 s | 5.4 cm |
| 1424 | 14230 s | 5.39 cm |
| 1425 | 14240 s | 5.37 cm |
| 1426 | 14250 s | 5.35 cm |
| 1427 | 14260 s | 5.34 cm |
| 1428 | 14270 s | 5.33 cm |
| 1429 | 14280 s | 5.32 cm |
| 1430 | 14290 s | 5.31 cm |
| 1431 | 14300 s | 5.3 cm |
| 1432 | 14310 s | 5.29 cm |
| 1433 | 14320 s | 5.27 cm |
| 1434 | 14330 s | 5.26 cm |
| 1435 | 14340 s | 5.25 cm |
| 1436 | 14350 s | 5.24 cm |
| 1437 | 14360 s | 5.23 cm |
| 1438 | 14370 s | 5.21 cm |
| 1439 | 14380 s | 5.2 cm |
| 1440 | 14390 s | 5.18 cm |
| 1441 | 14400 s | 5.17 cm |
| 1442 | 14410 s | 5.16 cm |
| 1443 | 14420 s | 5.15 cm |
| 1444 | 14430 s | 5.14 cm |
| 1445 | 14440 s | 5.13 cm |
| 1446 | 14450 s | 5.12 cm |
| 1447 | 14460 s | 5.1 cm |
| 1448 | 14470 s | 5.09 cm |
| 1449 | 14480 s | 5.08 cm |
| 1450 | 14490 s | 5.07 cm |
| 1451 | 14500 s | 5.05 cm |
| 1452 | 14510 s | 5.04 cm |
| 1453 | 14520 s | 5.02 cm |
| 1454 | 14530 s | 5.01 cm |
| 1455 | 14540 s | 5.0 cm |
| 1456 | 14550 s | 4.99 cm |
| 1457 | 14560 s | 4.98 cm |
| 1458 | 14570 s | 4.97 cm |
| 1459 | 14580 s | 4.95 cm |
| 1460 | 14590 s | 4.94 cm |
| 1461 | 14600 s | 4.93 cm |
| 1462 | 14610 s | 4.92 cm |

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# Infiltration Report

## RPBCWD

## Lotus Lake WIP - Kerber - Kerber Pond

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### kerber c

| | |
|---|---|
| Date | 6/14/2023 |
| Time | 2:03 PM |
| Latitude | 44.873013 |
| Longitude | -93.533853 |
| Initial Volumetric Moisture | 80.00 % |
| Final Volumetric Moisture | 81.00 % |
| Cylinder Size | 3 Liter |

### kerber c Results

| | |
|---|---|
| Map Pin # | 3 |
| Test Number | 24756 |
| Ksat - mm/hr | 73 |
| Ksat - in/hr | 2.88 |
| Capillary Pressure C mm | -68.6 |
| RMS Error of Regression | 67 |
| Normalized RMS | 1.8% |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 s | 30.59 cm | 26 | 247 s | 27.51 cm | 51 | 497 s | 24.97 cm | 76 | 747 s | 22.84 cm |
| 2 | 7 s | 30.43 cm | 27 | 257 s | 27.4 cm | 52 | 507 s | 24.87 cm | 77 | 757 s | 22.77 cm |
| 3 | 17 s | 30.28 cm | 28 | 267 s | 27.28 cm | 53 | 517 s | 24.79 cm | 78 | 767 s | 22.68 cm |
| 4 | 27 s | 30.15 cm | 29 | 277 s | 27.17 cm | 54 | 527 s | 24.69 cm | 79 | 777 s | 22.61 cm |
| 5 | 37 s | 30.01 cm | 30 | 287 s | 27.07 cm | 55 | 537 s | 24.61 cm | 80 | 787 s | 22.53 cm |
| 6 | 47 s | 29.87 cm | 31 | 297 s | 26.96 cm | 56 | 547 s | 24.51 cm | 81 | 797 s | 22.46 cm |
| 7 | 57 s | 29.74 cm | 32 | 307 s | 26.86 cm | 57 | 557 s | 24.43 cm | 82 | 807 s | 22.38 cm |
| 8 | 67 s | 29.61 cm | 33 | 317 s | 26.75 cm | 58 | 567 s | 24.33 cm | 83 | 817 s | 22.3 cm |
| 9 | 77 s | 29.5 cm | 34 | 327 s | 26.65 cm | 59 | 577 s | 24.25 cm | 84 | 827 s | 22.22 cm |
| 10 | 87 s | 29.37 cm | 35 | 337 s | 26.55 cm | 60 | 587 s | 24.16 cm | 85 | 837 s | 22.15 cm |
| 11 | 97 s | 29.25 cm | 36 | 347 s | 26.44 cm | 61 | 597 s | 24.07 cm | 86 | 847 s | 22.07 cm |
| 12 | 107 s | 29.12 cm | 37 | 357 s | 26.34 cm | 62 | 607 s | 23.98 cm | 87 | 857 s | 22.0 cm |
| 13 | 117 s | 29.01 cm | 38 | 367 s | 26.24 cm | 63 | 617 s | 23.89 cm | 88 | 867 s | 21.92 cm |
| 14 | 127 s | 28.88 cm | 39 | 377 s | 26.14 cm | 64 | 627 s | 23.81 cm | 89 | 877 s | 21.86 cm |
| 15 | 137 s | 28.76 cm | 40 | 387 s | 26.04 cm | 65 | 637 s | 23.72 cm | 90 | 887 s | 21.79 cm |
| 16 | 147 s | 28.64 cm | 41 | 397 s | 25.93 cm | 66 | 647 s | 23.64 cm | 91 | 897 s | 21.71 cm |
| 17 | 157 s | 28.53 cm | 42 | 407 s | 25.83 cm | 67 | 657 s | 23.55 cm | 92 | 907 s | 21.64 cm |
| 18 | 167 s | 28.41 cm | 43 | 417 s | 25.74 cm | 68 | 667 s | 23.47 cm | 93 | 917 s | 21.56 cm |
| 19 | 177 s | 28.29 cm | 44 | 427 s | 25.64 cm | 69 | 677 s | 23.38 cm | 94 | 927 s | 21.5 cm |
| 20 | 187 s | 28.18 cm | 45 | 437 s | 25.55 cm | 70 | 687 s | 23.3 cm | 95 | 937 s | 21.42 cm |
| 21 | 197 s | 28.07 cm | 46 | 447 s | 25.45 cm | 71 | 697 s | 23.22 cm | 96 | 947 s | 21.35 cm |
| 22 | 207 s | 27.95 cm | 47 | 457 s | 25.35 cm | 72 | 707 s | 23.15 cm | 97 | 957 s | 21.27 cm |
| 23 | 217 s | 27.84 cm | 48 | 467 s | 25.26 cm | 73 | 717 s | 23.06 cm | 98 | 967 s | 21.21 cm |
| 24 | 227 s | 27.73 cm | 49 | 477 s | 25.16 cm | 74 | 727 s | 22.99 cm | 99 | 977 s | 21.14 cm |
| 25 | 237 s | 27.61 cm | 50 | 487 s | 25.07 cm | 75 | 737 s | 22.91 cm | 100 | 987 s | 21.07 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP - Kerber - Kerber Pond

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### kerber c Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | 997 s | 21.0 cm | 133 | 1317 s | 18.86 cm | 165 | 1637 s | 16.91 cm | 197 | 1957 s | 15.1 cm |
| 102 | 1007 s | 20.92 cm | 134 | 1327 s | 18.79 cm | 166 | 1647 s | 16.86 cm | 198 | 1967 s | 15.03 cm |
| 103 | 1017 s | 20.86 cm | 135 | 1337 s | 18.73 cm | 167 | 1657 s | 16.79 cm | 199 | 1977 s | 14.98 cm |
| 104 | 1027 s | 20.78 cm | 136 | 1347 s | 18.67 cm | 168 | 1667 s | 16.73 cm | 200 | 1987 s | 14.93 cm |
| 105 | 1037 s | 20.72 cm | 137 | 1357 s | 18.6 cm | 169 | 1677 s | 16.67 cm | 201 | 1997 s | 14.87 cm |
| 106 | 1047 s | 20.65 cm | 138 | 1367 s | 18.54 cm | 170 | 1687 s | 16.62 cm | 202 | 2007 s | 14.82 cm |
| 107 | 1057 s | 20.58 cm | 139 | 1377 s | 18.47 cm | 171 | 1697 s | 16.56 cm | 203 | 2017 s | 14.77 cm |
| 108 | 1067 s | 20.51 cm | 140 | 1387 s | 18.41 cm | 172 | 1707 s | 16.5 cm | 204 | 2027 s | 14.71 cm |
| 109 | 1077 s | 20.44 cm | 141 | 1397 s | 18.35 cm | 173 | 1717 s | 16.44 cm | 205 | 2037 s | 14.66 cm |
| 110 | 1087 s | 20.37 cm | 142 | 1407 s | 18.28 cm | 174 | 1727 s | 16.39 cm | 206 | 2047 s | 14.61 cm |
| 111 | 1097 s | 20.31 cm | 143 | 1417 s | 18.23 cm | 175 | 1737 s | 16.32 cm | 207 | 2057 s | 14.55 cm |
| 112 | 1107 s | 20.23 cm | 144 | 1427 s | 18.17 cm | 176 | 1747 s | 16.27 cm | 208 | 2067 s | 14.5 cm |
| 113 | 1117 s | 20.17 cm | 145 | 1437 s | 18.1 cm | 177 | 1757 s | 16.22 cm | 209 | 2077 s | 14.45 cm |
| 114 | 1127 s | 20.1 cm | 146 | 1447 s | 18.04 cm | 178 | 1767 s | 16.15 cm | 210 | 2087 s | 14.39 cm |
| 115 | 1137 s | 20.04 cm | 147 | 1457 s | 17.97 cm | 179 | 1777 s | 16.1 cm | 211 | 2097 s | 14.34 cm |
| 116 | 1147 s | 19.96 cm | 148 | 1467 s | 17.91 cm | 180 | 1787 s | 16.05 cm | 212 | 2107 s | 14.29 cm |
| 117 | 1157 s | 19.9 cm | 149 | 1477 s | 17.86 cm | 181 | 1797 s | 15.98 cm | 213 | 2117 s | 14.24 cm |
| 118 | 1167 s | 19.83 cm | 150 | 1487 s | 17.79 cm | 182 | 1807 s | 15.93 cm | 214 | 2127 s | 14.17 cm |
| 119 | 1177 s | 19.76 cm | 151 | 1497 s | 17.73 cm | 183 | 1817 s | 15.88 cm | 215 | 2137 s | 14.12 cm |
| 120 | 1187 s | 19.7 cm | 152 | 1507 s | 17.66 cm | 184 | 1827 s | 15.81 cm | 216 | 2147 s | 14.08 cm |
| 121 | 1197 s | 19.63 cm | 153 | 1517 s | 17.61 cm | 185 | 1837 s | 15.76 cm | 217 | 2157 s | 14.01 cm |
| 122 | 1207 s | 19.57 cm | 154 | 1527 s | 17.55 cm | 186 | 1847 s | 15.7 cm | 218 | 2167 s | 13.97 cm |
| 123 | 1217 s | 19.51 cm | 155 | 1537 s | 17.48 cm | 187 | 1857 s | 15.65 cm | 219 | 2177 s | 13.92 cm |
| 124 | 1227 s | 19.43 cm | 156 | 1547 s | 17.43 cm | 188 | 1867 s | 15.59 cm | 220 | 2187 s | 13.86 cm |
| 125 | 1237 s | 19.37 cm | 157 | 1557 s | 17.37 cm | 189 | 1877 s | 15.53 cm | 221 | 2197 s | 13.81 cm |
| 126 | 1247 s | 19.3 cm | 158 | 1567 s | 17.31 cm | 190 | 1887 s | 15.48 cm | 222 | 2207 s | 13.76 cm |
| 127 | 1257 s | 19.24 cm | 159 | 1577 s | 17.25 cm | 191 | 1897 s | 15.43 cm | 223 | 2217 s | 13.7 cm |
| 128 | 1267 s | 19.18 cm | 160 | 1587 s | 17.19 cm | 192 | 1907 s | 15.36 cm | 224 | 2227 s | 13.65 cm |
| 129 | 1277 s | 19.11 cm | 161 | 1597 s | 17.13 cm | 193 | 1917 s | 15.31 cm | 225 | 2237 s | 13.6 cm |
| 130 | 1287 s | 19.05 cm | 162 | 1607 s | 17.07 cm | 194 | 1927 s | 15.26 cm | 226 | 2247 s | 13.54 cm |
| 131 | 1297 s | 18.99 cm | 163 | 1617 s | 17.01 cm | 195 | 1937 s | 15.2 cm | 227 | 2257 s | 13.49 cm |
| 132 | 1307 s | 18.92 cm | 164 | 1627 s | 16.95 cm | 196 | 1947 s | 15.15 cm | 228 | 2267 s | 13.44 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP - Kerber - Kerber Pond

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### kerber c Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 229 | 2277 s | 13.38 cm | 261 | 2597 s | 11.79 cm | 293 | 2917 s | 10.27 cm | 325 | 3237 s | 8.81 cm |
| 230 | 2287 s | 13.34 cm | 262 | 2607 s | 11.74 cm | 294 | 2927 s | 10.22 cm | 326 | 3247 s | 8.77 cm |
| 231 | 2297 s | 13.29 cm | 263 | 2617 s | 11.69 cm | 295 | 2937 s | 10.18 cm | 327 | 3257 s | 8.73 cm |
| 232 | 2307 s | 13.23 cm | 264 | 2627 s | 11.64 cm | 296 | 2947 s | 10.13 cm | 328 | 3267 s | 8.68 cm |
| 233 | 2317 s | 13.18 cm | 265 | 2637 s | 11.59 cm | 297 | 2957 s | 10.08 cm | 329 | 3277 s | 8.63 cm |
| 234 | 2327 s | 13.13 cm | 266 | 2647 s | 11.55 cm | 298 | 2967 s | 10.04 cm | 330 | 3287 s | 8.59 cm |
| 235 | 2337 s | 13.09 cm | 267 | 2657 s | 11.5 cm | 299 | 2977 s | 10.0 cm | 331 | 3297 s | 8.55 cm |
| 236 | 2347 s | 13.03 cm | 268 | 2667 s | 11.46 cm | 300 | 2987 s | 9.94 cm | 332 | 3307 s | 8.51 cm |
| 237 | 2357 s | 12.98 cm | 269 | 2677 s | 11.4 cm | 301 | 2997 s | 9.9 cm | 333 | 3317 s | 8.46 cm |
| 238 | 2367 s | 12.93 cm | 270 | 2687 s | 11.35 cm | 302 | 3007 s | 9.86 cm | 334 | 3327 s | 8.42 cm |
| 239 | 2377 s | 12.88 cm | 271 | 2697 s | 11.31 cm | 303 | 3017 s | 9.82 cm | 335 | 3337 s | 8.38 cm |
| 240 | 2387 s | 12.83 cm | 272 | 2707 s | 11.26 cm | 304 | 3027 s | 9.76 cm | 336 | 3347 s | 8.34 cm |
| 241 | 2397 s | 12.78 cm | 273 | 2717 s | 11.21 cm | 305 | 3037 s | 9.72 cm | 337 | 3357 s | 8.29 cm |
| 242 | 2407 s | 12.72 cm | 274 | 2727 s | 11.17 cm | 306 | 3047 s | 9.68 cm | 338 | 3367 s | 8.25 cm |
| 243 | 2417 s | 12.68 cm | 275 | 2737 s | 11.11 cm | 307 | 3057 s | 9.62 cm | 339 | 3377 s | 8.2 cm |
| 244 | 2427 s | 12.63 cm | 276 | 2747 s | 11.07 cm | 308 | 3067 s | 9.58 cm | 340 | 3387 s | 8.15 cm |
| 245 | 2437 s | 12.57 cm | 277 | 2757 s | 11.02 cm | 309 | 3077 s | 9.54 cm | 341 | 3397 s | 8.11 cm |
| 246 | 2447 s | 12.53 cm | 278 | 2767 s | 10.98 cm | 310 | 3087 s | 9.5 cm | 342 | 3407 s | 8.07 cm |
| 247 | 2457 s | 12.48 cm | 279 | 2777 s | 10.92 cm | 311 | 3097 s | 9.44 cm | 343 | 3417 s | 8.03 cm |
| 248 | 2467 s | 12.42 cm | 280 | 2787 s | 10.88 cm | 312 | 3107 s | 9.4 cm | 344 | 3427 s | 7.98 cm |
| 249 | 2477 s | 12.38 cm | 281 | 2797 s | 10.84 cm | 313 | 3117 s | 9.36 cm | 345 | 3437 s | 7.94 cm |
| 250 | 2487 s | 12.33 cm | 282 | 2807 s | 10.78 cm | 314 | 3127 s | 9.31 cm | 346 | 3447 s | 7.9 cm |
| 251 | 2497 s | 12.28 cm | 283 | 2817 s | 10.74 cm | 315 | 3137 s | 9.28 cm | 347 | 3457 s | 7.86 cm |
| 252 | 2507 s | 12.22 cm | 284 | 2827 s | 10.69 cm | 316 | 3147 s | 9.23 cm | 348 | 3467 s | 7.81 cm |
| 253 | 2517 s | 12.17 cm | 285 | 2837 s | 10.65 cm | 317 | 3157 s | 9.17 cm | 349 | 3477 s | 7.77 cm |
| 254 | 2527 s | 12.13 cm | 286 | 2847 s | 10.59 cm | 318 | 3167 s | 9.12 cm | 350 | 3487 s | 7.73 cm |
| 255 | 2537 s | 12.07 cm | 287 | 2857 s | 10.55 cm | 319 | 3177 s | 9.08 cm | 351 | 3497 s | 7.69 cm |
| 256 | 2547 s | 12.03 cm | 288 | 2867 s | 10.51 cm | 320 | 3187 s | 9.04 cm | 352 | 3507 s | 7.64 cm |
| 257 | 2557 s | 11.98 cm | 289 | 2877 s | 10.45 cm | 321 | 3197 s | 8.98 cm | 353 | 3517 s | 7.6 cm |
| 258 | 2567 s | 11.93 cm | 290 | 2887 s | 10.41 cm | 322 | 3207 s | 8.94 cm | 354 | 3527 s | 7.56 cm |
| 259 | 2577 s | 11.88 cm | 291 | 2897 s | 10.36 cm | 323 | 3217 s | 8.9 cm | 355 | 3537 s | 7.52 cm |
| 260 | 2587 s | 11.84 cm | 292 | 2907 s | 10.32 cm | 324 | 3227 s | 8.86 cm | 356 | 3547 s | 7.47 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP - Kerber - Kerber Pond

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### kerber c Readings continued

| # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|
| 357 | 3557 s | 7.43 cm | 389 | 3877 s | 6.1 cm |
| 358 | 3567 s | 7.39 cm | 390 | 3887 s | 6.06 cm |
| 359 | 3577 s | 7.34 cm | 391 | 3897 s | 6.01 cm |
| 360 | 3587 s | 7.31 cm | 392 | 3907 s | 5.97 cm |
| 361 | 3597 s | 7.26 cm | 393 | 3917 s | 5.93 cm |
| 362 | 3607 s | 7.23 cm | 394 | 3927 s | 5.89 cm |
| 363 | 3617 s | 7.18 cm | 395 | 3937 s | 5.84 cm |
| 364 | 3627 s | 7.14 cm | 396 | 3947 s | 5.79 cm |
| 365 | 3637 s | 7.1 cm | 397 | 3957 s | 5.75 cm |
| 366 | 3647 s | 7.06 cm | 398 | 3967 s | 5.7 cm |
| 367 | 3657 s | 7.01 cm | 399 | 3977 s | 5.66 cm |
| 368 | 3667 s | 6.97 cm | 400 | 3987 s | 5.61 cm |
| 369 | 3677 s | 6.93 cm | 401 | 3997 s | 5.57 cm |
| 370 | 3687 s | 6.89 cm | 402 | 4007 s | 5.51 cm |
| 371 | 3697 s | 6.84 cm | 403 | 4017 s | 5.47 cm |
| 372 | 3707 s | 6.8 cm | 404 | 4027 s | 5.42 cm |
| 373 | 3717 s | 6.76 cm | 405 | 4037 s | 5.36 cm |
| 374 | 3727 s | 6.73 cm | 406 | 4047 s | 5.31 cm |
| 375 | 3737 s | 6.68 cm | 407 | 4057 s | 5.27 cm |
| 376 | 3747 s | 6.64 cm | 408 | 4067 s | 5.21 cm |
| 377 | 3757 s | 6.6 cm | 409 | 4077 s | 5.16 cm |
| 378 | 3767 s | 6.56 cm | 410 | 4087 s | 5.11 cm |
| 379 | 3777 s | 6.51 cm | 411 | 4097 s | 5.04 cm |
| 380 | 3787 s | 6.47 cm | 412 | 4107 s | 4.99 cm |
| 381 | 3797 s | 6.44 cm | | | |
| 382 | 3807 s | 6.4 cm | | | |
| 383 | 3817 s | 6.35 cm | | | |
| 384 | 3827 s | 6.31 cm | | | |
| 385 | 3837 s | 6.27 cm | | | |
| 386 | 3847 s | 6.23 cm | | | |
| 387 | 3857 s | 6.18 cm | | | |
| 388 | 3867 s | 6.14 cm | | | |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

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### $K_{sat}$ best-fit site average: 42 mm/hr or 1.65 in/hr

*GPS Infiltration Test Site Map*


| Map Pin # | Test # | Test Name | Ksat (mm/hr) | Ksat (in/hr) | C (mm) | RMS Error of Regression (s) | Normalized RMS |
|---|---|---|---|---|---|---|---|
| 1 | 24521 | LL 7 a | 42 | 1.65 | -35.6 | 115 | 1.8% |
| 2 | 24522 | LL 7 b | NULL | NULL | NULL | NULL | NULL |
| 3 | 24523 | LL 7 c | NULL | NULL | NULL | NULL | NULL |

** NULL tests were removed from the site average calculation

*** Site Average could not be calculated from only 1 viable test

# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

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This report summarizes the results of a set of Modified Philip Dunne (MPD) Infiltrometer tests performed at the above referenced site. RPBCWD personnel performed the field tests. The software used to compute saturated hydraulic conductivity ($K_{sat}$) and generate this report assumes that the field personnel used infiltrometers manufactured by Upstream Technologies Inc. and followed the procedures outlined in "Manual – Modified Philip - Dunne Infiltrometer" by Ahmed, Gulliver, and Nieber.

The following paragraphs describe the individual tests, input values used in the analysis, and methods used to compute the $K_{sat}$ value.

After individual $K_{sat}$ values were calculated, the method used to determine the overall site $K_{sat}$value ($K_{best\text{-}fit}$) is described in "Effective Saturated Hydraulic Conductivity of an Infiltration-Based Stormwater Control Measure" by Weiss and Gulliver 2015, "A relationship to more consistently and accurately predict the best-fit value of saturated hydraulic conductivity used a weighted sum of 0.32 times the arithmetic mean and 0.68 times the geometric mean."

### METHOD USED TO COMPUTE $K_{sat}$

The MPD Infiltrometer software uses the following procedure described in "The Comparison of Infiltration Devices and Modification of the Philip-Dunne Permeameter for the Assessment of Rain Gardens" by Rebecca Nestigen, University of Minnesota, November 2007.

The steps are as follows:

1. For each measurement of head, use the following equation to find the corresponding distance to the sharp wetting front.

$$[H_0 - H(t)]r_1^2 = \frac{\theta_1 - \theta_2}{3}[2[R(t)]^3 + 3[R(t)]^2 L_{max} - L_{max}^3 - 4r_0^3]$$

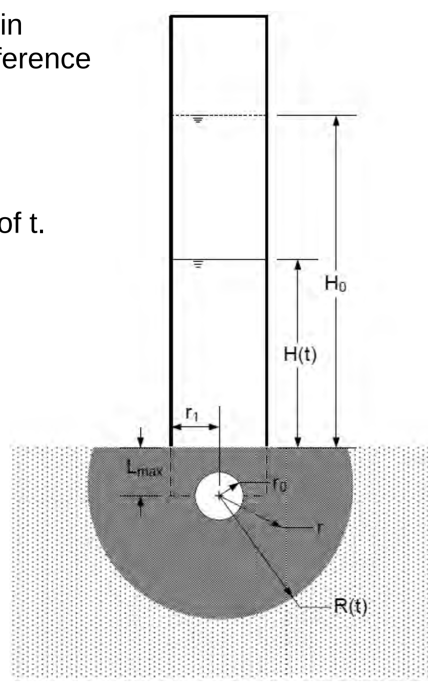
2. Estimate the change in head with respect to time and the change in wetting front distance with respect to time by using the backward difference for all values of R(t) equal to or greater than the distance $\sqrt{r_1^2 + L_{max}^2}$

3. Make initial guesses for K and C.
4. Solve the following equations for ΔP(t) at each incremental value of t.

$$\Delta P(t) = \frac{\pi^2}{8}\left\{\theta_1 - \theta_0 \frac{[R(t)^2] + [R(t)]L_{max}}{K}\frac{dr}{dt} - 2r_0^2\right\}\frac{ln[\frac{R(t)[r_0 + L_{max}]}{r_0[R(t)+L_{max}]}]}{L_{max}}$$

$$\Delta P(t) = C - H(t) - L_{max} + \frac{L_{max}}{K}\frac{dh}{dt}$$

5. Minimize the absolute difference between the two solutions found in Step 4 by adjusting the values of K and C.




*Parameters for Equations*

$\Theta_0$ = volumetric water content of soil before MPD test
$\Theta_1$ = volumetric water content of soil after MPD test

# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

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### LL 7 a

| | |
|---|---|
| Date | 5/31/2023 |
| Time | 1:44 PM |
| Latitude | 44.876595 |
| Longitude | -93.538182 |
| Initial Volumetric Moisture | 0.00 % |
| Final Volumetric Moisture | 5.00 % |
| Cylinder Size | 3 Liter |

### LL 7 a Results

| | |
|---|---|
| Map Pin # | 1 |
| Test Number | 24521 |
| Ksat - mm/hr | 42 |
| Ksat - in/hr | 1.65 |
| Capillary Pressure C mm | -35.6 |
| RMS Error of Regression | 115 |
| Normalized RMS | 1.8% |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 s | 29.55 cm | 26 | 249 s | 27.59 cm | 51 | 499 s | 26.15 cm | 76 | 749 s | 24.82 cm |
| 2 | 9 s | 29.36 cm | 27 | 259 s | 27.53 cm | 52 | 509 s | 26.1 cm | 77 | 759 s | 24.77 cm |
| 3 | 19 s | 29.23 cm | 28 | 269 s | 27.47 cm | 53 | 519 s | 26.05 cm | 78 | 769 s | 24.73 cm |
| 4 | 29 s | 29.12 cm | 29 | 279 s | 27.41 cm | 54 | 529 s | 25.99 cm | 79 | 779 s | 24.67 cm |
| 5 | 39 s | 29.04 cm | 30 | 289 s | 27.35 cm | 55 | 539 s | 25.94 cm | 80 | 789 s | 24.62 cm |
| 6 | 49 s | 28.95 cm | 31 | 299 s | 27.28 cm | 56 | 549 s | 25.88 cm | 81 | 799 s | 24.57 cm |
| 7 | 59 s | 28.87 cm | 32 | 309 s | 27.23 cm | 57 | 559 s | 25.83 cm | 82 | 809 s | 24.52 cm |
| 8 | 69 s | 28.78 cm | 33 | 319 s | 27.16 cm | 58 | 569 s | 25.77 cm | 83 | 819 s | 24.47 cm |
| 9 | 79 s | 28.71 cm | 34 | 329 s | 27.11 cm | 59 | 579 s | 25.72 cm | 84 | 829 s | 24.42 cm |
| 10 | 89 s | 28.63 cm | 35 | 339 s | 27.05 cm | 60 | 589 s | 25.66 cm | 85 | 839 s | 24.37 cm |
| 11 | 99 s | 28.56 cm | 36 | 349 s | 26.99 cm | 61 | 599 s | 25.61 cm | 86 | 849 s | 24.32 cm |
| 12 | 109 s | 28.48 cm | 37 | 359 s | 26.94 cm | 62 | 609 s | 25.56 cm | 87 | 859 s | 24.27 cm |
| 13 | 119 s | 28.42 cm | 38 | 369 s | 26.88 cm | 63 | 619 s | 25.5 cm | 88 | 869 s | 24.21 cm |
| 14 | 129 s | 28.35 cm | 39 | 379 s | 26.82 cm | 64 | 629 s | 25.45 cm | 89 | 879 s | 24.17 cm |
| 15 | 139 s | 28.28 cm | 40 | 389 s | 26.77 cm | 65 | 639 s | 25.41 cm | 90 | 889 s | 24.12 cm |
| 16 | 149 s | 28.22 cm | 41 | 399 s | 26.72 cm | 66 | 649 s | 25.35 cm | 91 | 899 s | 24.07 cm |
| 17 | 159 s | 28.15 cm | 42 | 409 s | 26.65 cm | 67 | 659 s | 25.3 cm | 92 | 909 s | 24.02 cm |
| 18 | 169 s | 28.08 cm | 43 | 419 s | 26.6 cm | 68 | 669 s | 25.25 cm | 93 | 919 s | 23.97 cm |
| 19 | 179 s | 28.03 cm | 44 | 429 s | 26.55 cm | 69 | 679 s | 25.19 cm | 94 | 929 s | 23.92 cm |
| 20 | 189 s | 27.96 cm | 45 | 439 s | 26.49 cm | 70 | 689 s | 25.14 cm | 95 | 939 s | 23.87 cm |
| 21 | 199 s | 27.9 cm | 46 | 449 s | 26.43 cm | 71 | 699 s | 25.09 cm | 96 | 949 s | 23.82 cm |
| 22 | 209 s | 27.84 cm | 47 | 459 s | 26.38 cm | 72 | 709 s | 25.03 cm | 97 | 959 s | 23.78 cm |
| 23 | 219 s | 27.77 cm | 48 | 469 s | 26.32 cm | 73 | 719 s | 24.98 cm | 98 | 969 s | 23.72 cm |
| 24 | 229 s | 27.71 cm | 49 | 479 s | 26.27 cm | 74 | 729 s | 24.93 cm | 99 | 979 s | 23.68 cm |
| 25 | 239 s | 27.64 cm | 50 | 489 s | 26.22 cm | 75 | 739 s | 24.87 cm | 100 | 989 s | 23.63 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

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Upstream Technologies 651.237.5123

### LL 7 a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | 999 s | 23.58 cm | 133 | 1319 s | 22.12 cm | 165 | 1639 s | 20.76 cm | 197 | 1959 s | 19.57 cm |
| 102 | 1009 s | 23.53 cm | 134 | 1329 s | 22.06 cm | 166 | 1649 s | 20.72 cm | 198 | 1969 s | 19.53 cm |
| 103 | 1019 s | 23.48 cm | 135 | 1339 s | 22.02 cm | 167 | 1659 s | 20.69 cm | 199 | 1979 s | 19.5 cm |
| 104 | 1029 s | 23.44 cm | 136 | 1349 s | 21.98 cm | 168 | 1669 s | 20.65 cm | 200 | 1989 s | 19.46 cm |
| 105 | 1039 s | 23.38 cm | 137 | 1359 s | 21.94 cm | 169 | 1679 s | 20.6 cm | 201 | 1999 s | 19.42 cm |
| 106 | 1049 s | 23.34 cm | 138 | 1369 s | 21.89 cm | 170 | 1689 s | 20.57 cm | 202 | 2009 s | 19.39 cm |
| 107 | 1059 s | 23.29 cm | 139 | 1379 s | 21.85 cm | 171 | 1699 s | 20.53 cm | 203 | 2019 s | 19.36 cm |
| 108 | 1069 s | 23.25 cm | 140 | 1389 s | 21.81 cm | 172 | 1709 s | 20.49 cm | 204 | 2029 s | 19.32 cm |
| 109 | 1079 s | 23.2 cm | 141 | 1399 s | 21.75 cm | 173 | 1719 s | 20.45 cm | 205 | 2039 s | 19.28 cm |
| 110 | 1089 s | 23.15 cm | 142 | 1409 s | 21.71 cm | 174 | 1729 s | 20.41 cm | 206 | 2049 s | 19.25 cm |
| 111 | 1099 s | 23.11 cm | 143 | 1419 s | 21.67 cm | 175 | 1739 s | 20.38 cm | 207 | 2059 s | 19.21 cm |
| 112 | 1109 s | 23.06 cm | 144 | 1429 s | 21.63 cm | 176 | 1749 s | 20.34 cm | 208 | 2069 s | 19.18 cm |
| 113 | 1119 s | 23.01 cm | 145 | 1439 s | 21.58 cm | 177 | 1759 s | 20.3 cm | 209 | 2079 s | 19.14 cm |
| 114 | 1129 s | 22.97 cm | 146 | 1449 s | 21.54 cm | 178 | 1769 s | 20.26 cm | 210 | 2089 s | 19.1 cm |
| 115 | 1139 s | 22.91 cm | 147 | 1459 s | 21.5 cm | 179 | 1779 s | 20.22 cm | 211 | 2099 s | 19.07 cm |
| 116 | 1149 s | 22.87 cm | 148 | 1469 s | 21.46 cm | 180 | 1789 s | 20.19 cm | 212 | 2109 s | 19.04 cm |
| 117 | 1159 s | 22.83 cm | 149 | 1479 s | 21.41 cm | 181 | 1799 s | 20.15 cm | 213 | 2119 s | 19.0 cm |
| 118 | 1169 s | 22.78 cm | 150 | 1489 s | 21.37 cm | 182 | 1809 s | 20.11 cm | 214 | 2129 s | 18.96 cm |
| 119 | 1179 s | 22.73 cm | 151 | 1499 s | 21.33 cm | 183 | 1819 s | 20.07 cm | 215 | 2139 s | 18.93 cm |
| 120 | 1189 s | 22.69 cm | 152 | 1509 s | 21.29 cm | 184 | 1829 s | 20.04 cm | 216 | 2149 s | 18.89 cm |
| 121 | 1199 s | 22.65 cm | 153 | 1519 s | 21.24 cm | 185 | 1839 s | 20.0 cm | 217 | 2159 s | 18.86 cm |
| 122 | 1209 s | 22.6 cm | 154 | 1529 s | 21.2 cm | 186 | 1849 s | 19.96 cm | 218 | 2169 s | 18.81 cm |
| 123 | 1219 s | 22.55 cm | 155 | 1539 s | 21.16 cm | 187 | 1859 s | 19.92 cm | 219 | 2179 s | 18.78 cm |
| 124 | 1229 s | 22.51 cm | 156 | 1549 s | 21.13 cm | 188 | 1869 s | 19.89 cm | 220 | 2189 s | 18.74 cm |
| 125 | 1239 s | 22.47 cm | 157 | 1559 s | 21.08 cm | 189 | 1879 s | 19.86 cm | 221 | 2199 s | 18.71 cm |
| 126 | 1249 s | 22.43 cm | 158 | 1569 s | 21.04 cm | 190 | 1889 s | 19.82 cm | 222 | 2209 s | 18.68 cm |
| 127 | 1259 s | 22.38 cm | 159 | 1579 s | 21.0 cm | 191 | 1899 s | 19.79 cm | 223 | 2219 s | 18.63 cm |
| 128 | 1269 s | 22.33 cm | 160 | 1589 s | 20.96 cm | 192 | 1909 s | 19.75 cm | 224 | 2229 s | 18.6 cm |
| 129 | 1279 s | 22.29 cm | 161 | 1599 s | 20.91 cm | 193 | 1919 s | 19.72 cm | 225 | 2239 s | 18.57 cm |
| 130 | 1289 s | 22.24 cm | 162 | 1609 s | 20.88 cm | 194 | 1929 s | 19.68 cm | 226 | 2249 s | 18.54 cm |
| 131 | 1299 s | 22.2 cm | 163 | 1619 s | 20.84 cm | 195 | 1939 s | 19.65 cm | 227 | 2259 s | 18.51 cm |
| 132 | 1309 s | 22.16 cm | 164 | 1629 s | 20.81 cm | 196 | 1949 s | 19.6 cm | 228 | 2269 s | 18.46 cm |

# Infiltration Report

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## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

### LL 7 a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 229 | 2279 s | 18.43 cm | 261 | 2599 s | 17.38 cm | 293 | 2919 s | 16.38 cm | 325 | 3239 s | 15.46 cm |
| 230 | 2289 s | 18.4 cm | 262 | 2609 s | 17.35 cm | 294 | 2929 s | 16.34 cm | 326 | 3249 s | 15.43 cm |
| 231 | 2299 s | 18.37 cm | 263 | 2619 s | 17.31 cm | 295 | 2939 s | 16.31 cm | 327 | 3259 s | 15.41 cm |
| 232 | 2309 s | 18.34 cm | 264 | 2629 s | 17.28 cm | 296 | 2949 s | 16.28 cm | 328 | 3269 s | 15.37 cm |
| 233 | 2319 s | 18.29 cm | 265 | 2639 s | 17.24 cm | 297 | 2959 s | 16.26 cm | 329 | 3279 s | 15.35 cm |
| 234 | 2329 s | 18.26 cm | 266 | 2649 s | 17.21 cm | 298 | 2969 s | 16.23 cm | 330 | 3289 s | 15.32 cm |
| 235 | 2339 s | 18.23 cm | 267 | 2659 s | 17.17 cm | 299 | 2979 s | 16.19 cm | 331 | 3299 s | 15.29 cm |
| 236 | 2349 s | 18.2 cm | 268 | 2669 s | 17.14 cm | 300 | 2989 s | 16.16 cm | 332 | 3309 s | 15.27 cm |
| 237 | 2359 s | 18.17 cm | 269 | 2679 s | 17.11 cm | 301 | 2999 s | 16.14 cm | 333 | 3319 s | 15.25 cm |
| 238 | 2369 s | 18.13 cm | 270 | 2689 s | 17.08 cm | 302 | 3009 s | 16.11 cm | 334 | 3329 s | 15.22 cm |
| 239 | 2379 s | 18.1 cm | 271 | 2699 s | 17.06 cm | 303 | 3019 s | 16.08 cm | 335 | 3339 s | 15.19 cm |
| 240 | 2389 s | 18.07 cm | 272 | 2709 s | 17.03 cm | 304 | 3029 s | 16.06 cm | 336 | 3349 s | 15.16 cm |
| 241 | 2399 s | 18.04 cm | 273 | 2719 s | 16.99 cm | 305 | 3039 s | 16.02 cm | 337 | 3359 s | 15.13 cm |
| 242 | 2409 s | 18.01 cm | 274 | 2729 s | 16.96 cm | 306 | 3049 s | 15.99 cm | 338 | 3369 s | 15.11 cm |
| 243 | 2419 s | 17.96 cm | 275 | 2739 s | 16.93 cm | 307 | 3059 s | 15.97 cm | 339 | 3379 s | 15.08 cm |
| 244 | 2429 s | 17.94 cm | 276 | 2749 s | 16.9 cm | 308 | 3069 s | 15.94 cm | 340 | 3389 s | 15.06 cm |
| 245 | 2439 s | 17.91 cm | 277 | 2759 s | 16.87 cm | 309 | 3079 s | 15.92 cm | 341 | 3399 s | 15.02 cm |
| 246 | 2449 s | 17.88 cm | 278 | 2769 s | 16.83 cm | 310 | 3089 s | 15.89 cm | 342 | 3409 s | 15.0 cm |
| 247 | 2459 s | 17.85 cm | 279 | 2779 s | 16.8 cm | 311 | 3099 s | 15.85 cm | 343 | 3419 s | 14.97 cm |
| 248 | 2469 s | 17.8 cm | 280 | 2789 s | 16.77 cm | 312 | 3109 s | 15.83 cm | 344 | 3429 s | 14.94 cm |
| 249 | 2479 s | 17.77 cm | 281 | 2799 s | 16.73 cm | 313 | 3119 s | 15.8 cm | 345 | 3439 s | 14.92 cm |
| 250 | 2489 s | 17.74 cm | 282 | 2809 s | 16.71 cm | 314 | 3129 s | 15.77 cm | 346 | 3449 s | 14.88 cm |
| 251 | 2499 s | 17.71 cm | 283 | 2819 s | 16.67 cm | 315 | 3139 s | 15.75 cm | 347 | 3459 s | 14.86 cm |
| 252 | 2509 s | 17.68 cm | 284 | 2829 s | 16.64 cm | 316 | 3149 s | 15.72 cm | 348 | 3469 s | 14.83 cm |
| 253 | 2519 s | 17.64 cm | 285 | 2839 s | 16.61 cm | 317 | 3159 s | 15.68 cm | 349 | 3479 s | 14.81 cm |
| 254 | 2529 s | 17.61 cm | 286 | 2849 s | 16.58 cm | 318 | 3169 s | 15.65 cm | 350 | 3489 s | 14.78 cm |
| 255 | 2539 s | 17.58 cm | 287 | 2859 s | 16.55 cm | 319 | 3179 s | 15.63 cm | 351 | 3499 s | 14.76 cm |
| 256 | 2549 s | 17.54 cm | 288 | 2869 s | 16.52 cm | 320 | 3189 s | 15.6 cm | 352 | 3509 s | 14.74 cm |
| 257 | 2559 s | 17.5 cm | 289 | 2879 s | 16.49 cm | 321 | 3199 s | 15.58 cm | 353 | 3519 s | 14.7 cm |
| 258 | 2569 s | 17.47 cm | 290 | 2889 s | 16.46 cm | 322 | 3209 s | 15.55 cm | 354 | 3529 s | 14.68 cm |
| 259 | 2579 s | 17.44 cm | 291 | 2899 s | 16.43 cm | 323 | 3219 s | 15.51 cm | 355 | 3539 s | 14.65 cm |
| 260 | 2589 s | 17.41 cm | 292 | 2909 s | 16.41 cm | 324 | 3229 s | 15.49 cm | 356 | 3549 s | 14.63 cm |

# Infiltration Report
## RPBCWD
## Lotus Lake WIP_LL7 - LL7 - LL7

### LL 7 a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 357 | 3559 s | 14.6 cm | 389 | 3879 s | 13.71 cm | 421 | 4199 s | 12.9 cm | 453 | 4519 s | 12.15 cm |
| 358 | 3569 s | 14.57 cm | 390 | 3889 s | 13.69 cm | 422 | 4209 s | 12.88 cm | 454 | 4529 s | 12.13 cm |
| 359 | 3579 s | 14.54 cm | 391 | 3899 s | 13.66 cm | 423 | 4219 s | 12.85 cm | 455 | 4539 s | 12.11 cm |
| 360 | 3589 s | 14.51 cm | 392 | 3909 s | 13.64 cm | 424 | 4229 s | 12.83 cm | 456 | 4549 s | 12.08 cm |
| 361 | 3599 s | 14.49 cm | 393 | 3919 s | 13.62 cm | 425 | 4239 s | 12.81 cm | 457 | 4559 s | 12.06 cm |
| 362 | 3609 s | 14.46 cm | 394 | 3929 s | 13.59 cm | 426 | 4249 s | 12.79 cm | 458 | 4569 s | 12.04 cm |
| 363 | 3619 s | 14.43 cm | 395 | 3939 s | 13.56 cm | 427 | 4259 s | 12.77 cm | 459 | 4579 s | 12.01 cm |
| 364 | 3629 s | 14.39 cm | 396 | 3949 s | 13.54 cm | 428 | 4269 s | 12.73 cm | 460 | 4589 s | 11.99 cm |
| 365 | 3639 s | 14.37 cm | 397 | 3959 s | 13.51 cm | 429 | 4279 s | 12.71 cm | 461 | 4599 s | 11.97 cm |
| 366 | 3649 s | 14.34 cm | 398 | 3969 s | 13.49 cm | 430 | 4289 s | 12.69 cm | 462 | 4609 s | 11.95 cm |
| 367 | 3659 s | 14.31 cm | 399 | 3979 s | 13.46 cm | 431 | 4299 s | 12.67 cm | 463 | 4619 s | 11.92 cm |
| 368 | 3669 s | 14.29 cm | 400 | 3989 s | 13.44 cm | 432 | 4309 s | 12.65 cm | 464 | 4629 s | 11.9 cm |
| 369 | 3679 s | 14.26 cm | 401 | 3999 s | 13.42 cm | 433 | 4319 s | 12.63 cm | 465 | 4639 s | 11.87 cm |
| 370 | 3689 s | 14.22 cm | 402 | 4009 s | 13.38 cm | 434 | 4329 s | 12.6 cm | 466 | 4649 s | 11.85 cm |
| 371 | 3699 s | 14.2 cm | 403 | 4019 s | 13.36 cm | 435 | 4339 s | 12.57 cm | 467 | 4659 s | 11.83 cm |
| 372 | 3709 s | 14.17 cm | 404 | 4029 s | 13.34 cm | 436 | 4349 s | 12.55 cm | 468 | 4669 s | 11.81 cm |
| 373 | 3719 s | 14.15 cm | 405 | 4039 s | 13.31 cm | 437 | 4359 s | 12.53 cm | 469 | 4679 s | 11.78 cm |
| 374 | 3729 s | 14.12 cm | 406 | 4049 s | 13.29 cm | 438 | 4369 s | 12.51 cm | 470 | 4689 s | 11.75 cm |
| 375 | 3739 s | 14.09 cm | 407 | 4059 s | 13.26 cm | 439 | 4379 s | 12.48 cm | 471 | 4699 s | 11.73 cm |
| 376 | 3749 s | 14.06 cm | 408 | 4069 s | 13.23 cm | 440 | 4389 s | 12.46 cm | 472 | 4709 s | 11.71 cm |
| 377 | 3759 s | 14.04 cm | 409 | 4079 s | 13.21 cm | 441 | 4399 s | 12.44 cm | 473 | 4719 s | 11.69 cm |
| 378 | 3769 s | 14.01 cm | 410 | 4089 s | 13.18 cm | 442 | 4409 s | 12.41 cm | 474 | 4729 s | 11.66 cm |
| 379 | 3779 s | 13.99 cm | 411 | 4099 s | 13.16 cm | 443 | 4419 s | 12.38 cm | 475 | 4739 s | 11.64 cm |
| 380 | 3789 s | 13.96 cm | 412 | 4109 s | 13.13 cm | 444 | 4429 s | 12.36 cm | 476 | 4749 s | 11.62 cm |
| 381 | 3799 s | 13.94 cm | 413 | 4119 s | 13.11 cm | 445 | 4439 s | 12.34 cm | 477 | 4759 s | 11.59 cm |
| 382 | 3809 s | 13.91 cm | 414 | 4129 s | 13.07 cm | 446 | 4449 s | 12.32 cm | 478 | 4769 s | 11.56 cm |
| 383 | 3819 s | 13.88 cm | 415 | 4139 s | 13.05 cm | 447 | 4459 s | 12.3 cm | 479 | 4779 s | 11.54 cm |
| 384 | 3829 s | 13.85 cm | 416 | 4149 s | 13.03 cm | 448 | 4469 s | 12.26 cm | 480 | 4789 s | 11.52 cm |
| 385 | 3839 s | 13.83 cm | 417 | 4159 s | 13.0 cm | 449 | 4479 s | 12.24 cm | 481 | 4799 s | 11.5 cm |
| 386 | 3849 s | 13.8 cm | 418 | 4169 s | 12.98 cm | 450 | 4489 s | 12.22 cm | 482 | 4809 s | 11.48 cm |
| 387 | 3859 s | 13.77 cm | 419 | 4179 s | 12.95 cm | 451 | 4499 s | 12.2 cm | 483 | 4819 s | 11.44 cm |
| 388 | 3869 s | 13.75 cm | 420 | 4189 s | 12.93 cm | 452 | 4509 s | 12.18 cm | 484 | 4829 s | 11.42 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

651.237.5123

### LL 7 a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 485 | 4839 s | 11.4 cm | 517 | 5159 s | 10.62 cm | 549 | 5479 s | 9.87 cm | 581 | 5799 s | 9.16 cm |
| 486 | 4849 s | 11.38 cm | 518 | 5169 s | 10.6 cm | 550 | 5489 s | 9.85 cm | 582 | 5809 s | 9.13 cm |
| 487 | 4859 s | 11.35 cm | 519 | 5179 s | 10.58 cm | 551 | 5499 s | 9.83 cm | 583 | 5819 s | 9.1 cm |
| 488 | 4869 s | 11.33 cm | 520 | 5189 s | 10.55 cm | 552 | 5509 s | 9.79 cm | 584 | 5829 s | 9.08 cm |
| 489 | 4879 s | 11.31 cm | 521 | 5199 s | 10.53 cm | 553 | 5519 s | 9.77 cm | 585 | 5839 s | 9.06 cm |
| 490 | 4889 s | 11.29 cm | 522 | 5209 s | 10.51 cm | 554 | 5529 s | 9.75 cm | 586 | 5849 s | 9.04 cm |
| 491 | 4899 s | 11.26 cm | 523 | 5219 s | 10.49 cm | 555 | 5539 s | 9.73 cm | 587 | 5859 s | 9.02 cm |
| 492 | 4909 s | 11.23 cm | 524 | 5229 s | 10.45 cm | 556 | 5549 s | 9.71 cm | 588 | 5869 s | 9.0 cm |
| 493 | 4919 s | 11.21 cm | 525 | 5239 s | 10.43 cm | 557 | 5559 s | 9.68 cm | 589 | 5879 s | 8.97 cm |
| 494 | 4929 s | 11.19 cm | 526 | 5249 s | 10.41 cm | 558 | 5569 s | 9.66 cm | 590 | 5889 s | 8.95 cm |
| 495 | 4939 s | 11.16 cm | 527 | 5259 s | 10.39 cm | 559 | 5579 s | 9.63 cm | 591 | 5899 s | 8.93 cm |
| 496 | 4949 s | 11.14 cm | 528 | 5269 s | 10.37 cm | 560 | 5589 s | 9.61 cm | 592 | 5909 s | 8.91 cm |
| 497 | 4959 s | 11.11 cm | 529 | 5279 s | 10.34 cm | 561 | 5599 s | 9.59 cm | 593 | 5919 s | 8.89 cm |
| 498 | 4969 s | 11.09 cm | 530 | 5289 s | 10.32 cm | 562 | 5609 s | 9.57 cm | 594 | 5929 s | 8.87 cm |
| 499 | 4979 s | 11.06 cm | 531 | 5299 s | 10.29 cm | 563 | 5619 s | 9.55 cm | 595 | 5939 s | 8.85 cm |
| 500 | 4989 s | 11.04 cm | 532 | 5309 s | 10.27 cm | 564 | 5629 s | 9.53 cm | 596 | 5949 s | 8.83 cm |
| 501 | 4999 s | 11.02 cm | 533 | 5319 s | 10.25 cm | 565 | 5639 s | 9.51 cm | 597 | 5959 s | 8.8 cm |
| 502 | 5009 s | 11.0 cm | 534 | 5329 s | 10.23 cm | 566 | 5649 s | 9.49 cm | 598 | 5969 s | 8.78 cm |
| 503 | 5019 s | 10.98 cm | 535 | 5339 s | 10.2 cm | 567 | 5659 s | 9.45 cm | 599 | 5979 s | 8.76 cm |
| 504 | 5029 s | 10.94 cm | 536 | 5349 s | 10.18 cm | 568 | 5669 s | 9.43 cm | 600 | 5989 s | 8.73 cm |
| 505 | 5039 s | 10.92 cm | 537 | 5359 s | 10.16 cm | 569 | 5679 s | 9.41 cm | 601 | 5999 s | 8.71 cm |
| 506 | 5049 s | 10.9 cm | 538 | 5369 s | 10.13 cm | 570 | 5689 s | 9.39 cm | 602 | 6009 s | 8.69 cm |
| 507 | 5059 s | 10.87 cm | 539 | 5379 s | 10.11 cm | 571 | 5699 s | 9.37 cm | 603 | 6019 s | 8.67 cm |
| 508 | 5069 s | 10.85 cm | 540 | 5389 s | 10.09 cm | 572 | 5709 s | 9.35 cm | 604 | 6029 s | 8.64 cm |
| 509 | 5079 s | 10.83 cm | 541 | 5399 s | 10.06 cm | 573 | 5719 s | 9.33 cm | 605 | 6039 s | 8.62 cm |
| 510 | 5089 s | 10.8 cm | 542 | 5409 s | 10.04 cm | 574 | 5729 s | 9.3 cm | 606 | 6049 s | 8.6 cm |
| 511 | 5099 s | 10.77 cm | 543 | 5419 s | 10.02 cm | 575 | 5739 s | 9.28 cm | 607 | 6059 s | 8.57 cm |
| 512 | 5109 s | 10.75 cm | 544 | 5429 s | 9.99 cm | 576 | 5749 s | 9.26 cm | 608 | 6069 s | 8.55 cm |
| 513 | 5119 s | 10.73 cm | 545 | 5439 s | 9.96 cm | 577 | 5759 s | 9.24 cm | 609 | 6079 s | 8.53 cm |
| 514 | 5129 s | 10.7 cm | 546 | 5449 s | 9.94 cm | 578 | 5769 s | 9.22 cm | 610 | 6089 s | 8.51 cm |
| 515 | 5139 s | 10.68 cm | 547 | 5459 s | 9.91 cm | 579 | 5779 s | 9.2 cm | 611 | 6099 s | 8.47 cm |
| 516 | 5149 s | 10.66 cm | 548 | 5469 s | 9.89 cm | 580 | 5789 s | 9.18 cm | 612 | 6109 s | 8.45 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

### LL 7 a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 613 | 6119 s | 8.43 cm | 645 | 6439 s | 7.63 cm | 677 | 6759 s | 6.82 cm | 709 | 7079 s | 6.07 cm |
| 614 | 6129 s | 8.41 cm | 646 | 6449 s | 7.61 cm | 678 | 6769 s | 6.8 cm | 710 | 7089 s | 6.05 cm |
| 615 | 6139 s | 8.39 cm | 647 | 6459 s | 7.58 cm | 679 | 6779 s | 6.77 cm | 711 | 7099 s | 6.01 cm |
| 616 | 6149 s | 8.36 cm | 648 | 6469 s | 7.56 cm | 680 | 6789 s | 6.75 cm | 712 | 7109 s | 5.99 cm |
| 617 | 6159 s | 8.34 cm | 649 | 6479 s | 7.54 cm | 681 | 6799 s | 6.72 cm | 713 | 7119 s | 5.97 cm |
| 618 | 6169 s | 8.31 cm | 650 | 6489 s | 7.5 cm | 682 | 6809 s | 6.7 cm | 714 | 7129 s | 5.95 cm |
| 619 | 6179 s | 8.29 cm | 651 | 6499 s | 7.48 cm | 683 | 6819 s | 6.67 cm | | | |
| 620 | 6189 s | 8.26 cm | 652 | 6509 s | 7.46 cm | 684 | 6829 s | 6.64 cm | | | |
| 621 | 6199 s | 8.24 cm | 653 | 6519 s | 7.43 cm | 685 | 6839 s | 6.62 cm | | | |
| 622 | 6209 s | 8.22 cm | 654 | 6529 s | 7.41 cm | 686 | 6849 s | 6.62 cm | | | |
| 623 | 6219 s | 8.19 cm | 655 | 6539 s | 7.39 cm | 687 | 6859 s | 6.59 cm | | | |
| 624 | 6229 s | 8.16 cm | 656 | 6549 s | 7.36 cm | 688 | 6869 s | 6.57 cm | | | |
| 625 | 6239 s | 8.13 cm | 657 | 6559 s | 7.33 cm | 689 | 6879 s | 6.55 cm | | | |
| 626 | 6249 s | 8.11 cm | 658 | 6569 s | 7.3 cm | 690 | 6889 s | 6.52 cm | | | |
| 627 | 6259 s | 8.09 cm | 659 | 6579 s | 7.28 cm | 691 | 6899 s | 6.49 cm | | | |
| 628 | 6269 s | 8.06 cm | 660 | 6589 s | 7.25 cm | 692 | 6909 s | 6.47 cm | | | |
| 629 | 6279 s | 8.04 cm | 661 | 6599 s | 7.23 cm | 693 | 6919 s | 6.44 cm | | | |
| 630 | 6289 s | 8.02 cm | 662 | 6609 s | 7.21 cm | 694 | 6929 s | 6.42 cm | | | |
| 631 | 6299 s | 7.98 cm | 663 | 6619 s | 7.17 cm | 695 | 6939 s | 6.4 cm | | | |
| 632 | 6309 s | 7.96 cm | 664 | 6629 s | 7.15 cm | 696 | 6949 s | 6.36 cm | | | |
| 633 | 6319 s | 7.94 cm | 665 | 6639 s | 7.13 cm | 697 | 6959 s | 6.34 cm | | | |
| 634 | 6329 s | 7.91 cm | 666 | 6649 s | 7.1 cm | 698 | 6969 s | 6.32 cm | | | |
| 635 | 6339 s | 7.89 cm | 667 | 6659 s | 7.08 cm | 699 | 6979 s | 6.29 cm | | | |
| 636 | 6349 s | 7.87 cm | 668 | 6669 s | 7.06 cm | 700 | 6989 s | 6.27 cm | | | |
| 637 | 6359 s | 7.83 cm | 669 | 6679 s | 7.03 cm | 701 | 6999 s | 6.25 cm | | | |
| 638 | 6369 s | 7.81 cm | 670 | 6689 s | 7.0 cm | 702 | 7009 s | 6.23 cm | | | |
| 639 | 6379 s | 7.79 cm | 671 | 6699 s | 6.97 cm | 703 | 7019 s | 6.21 cm | | | |
| 640 | 6389 s | 7.76 cm | 672 | 6709 s | 6.95 cm | 704 | 7029 s | 6.17 cm | | | |
| 641 | 6399 s | 7.74 cm | 673 | 6719 s | 6.93 cm | 705 | 7039 s | 6.15 cm | | | |
| 642 | 6409 s | 7.71 cm | 674 | 6729 s | 6.9 cm | 706 | 7049 s | 6.13 cm | | | |
| 643 | 6419 s | 7.69 cm | 675 | 6739 s | 6.88 cm | 707 | 7059 s | 6.11 cm | | | |
| 644 | 6429 s | 7.65 cm | 676 | 6749 s | 6.84 cm | 708 | 7069 s | 6.09 cm | | | |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

### LL 7 b

| | |
|---|---|
| Date | 5/31/2023 |
| Time | 1:48 PM |
| Latitude | 44.876701 |
| Longitude | -93.537991 |
| Initial Volumetric Moisture | 5.00 % |
| Final Volumetric Moisture | 8.00 % |
| Cylinder Size | 3 Liter |

### LL 7 b Results

| | |
|---|---|
| Map Pin # | 2 |
| Test Number | 24522 |
| Ksat - mm/hr | NULL |
| Ksat - in/hr | NULL |
| Capillary Pressure C mm | NULL |
| RMS Error of Regression | NULL |
| Normalized RMS | NULL |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 s | 30.55 cm | 26 | 250 s | 30.39 cm | 51 | 500 s | 30.43 cm | 76 | 750 s | 30.46 cm |
| 2 | 10 s | 30.49 cm | 27 | 260 s | 30.4 cm | 52 | 510 s | 30.43 cm | 77 | 760 s | 30.46 cm |
| 3 | 20 s | 30.46 cm | 28 | 270 s | 30.39 cm | 53 | 520 s | 30.43 cm | 78 | 770 s | 30.46 cm |
| 4 | 30 s | 30.43 cm | 29 | 280 s | 30.39 cm | 54 | 530 s | 30.43 cm | 79 | 780 s | 30.46 cm |
| 5 | 40 s | 30.42 cm | 30 | 290 s | 30.39 cm | 55 | 540 s | 30.43 cm | 80 | 790 s | 30.47 cm |
| 6 | 50 s | 30.41 cm | 31 | 300 s | 30.4 cm | 56 | 550 s | 30.43 cm | 81 | 800 s | 30.47 cm |
| 7 | 60 s | 30.42 cm | 32 | 310 s | 30.4 cm | 57 | 560 s | 30.43 cm | 82 | 810 s | 30.47 cm |
| 8 | 70 s | 30.41 cm | 33 | 320 s | 30.4 cm | 58 | 570 s | 30.43 cm | 83 | 820 s | 30.47 cm |
| 9 | 80 s | 30.41 cm | 34 | 330 s | 30.4 cm | 59 | 580 s | 30.43 cm | 84 | 830 s | 30.47 cm |
| 10 | 90 s | 30.41 cm | 35 | 340 s | 30.4 cm | 60 | 590 s | 30.44 cm | 85 | 840 s | 30.47 cm |
| 11 | 100 s | 30.41 cm | 36 | 350 s | 30.4 cm | 61 | 600 s | 30.44 cm | 86 | 850 s | 30.47 cm |
| 12 | 110 s | 30.4 cm | 37 | 360 s | 30.4 cm | 62 | 610 s | 30.44 cm | 87 | 860 s | 30.47 cm |
| 13 | 120 s | 30.4 cm | 38 | 370 s | 30.41 cm | 63 | 620 s | 30.44 cm | 88 | 870 s | 30.47 cm |
| 14 | 130 s | 30.4 cm | 39 | 380 s | 30.41 cm | 64 | 630 s | 30.44 cm | 89 | 880 s | 30.47 cm |
| 15 | 140 s | 30.4 cm | 40 | 390 s | 30.41 cm | 65 | 640 s | 30.44 cm | 90 | 890 s | 30.48 cm |
| 16 | 150 s | 30.4 cm | 41 | 400 s | 30.41 cm | 66 | 650 s | 30.44 cm | 91 | 900 s | 30.48 cm |
| 17 | 160 s | 30.39 cm | 42 | 410 s | 30.41 cm | 67 | 660 s | 30.44 cm | 92 | 910 s | 30.48 cm |
| 18 | 170 s | 30.39 cm | 43 | 420 s | 30.41 cm | 68 | 670 s | 30.44 cm | 93 | 920 s | 30.48 cm |
| 19 | 180 s | 30.39 cm | 44 | 430 s | 30.41 cm | 69 | 680 s | 30.44 cm | 94 | 930 s | 30.48 cm |
| 20 | 190 s | 30.39 cm | 45 | 440 s | 30.42 cm | 70 | 690 s | 30.46 cm | 95 | 940 s | 30.48 cm |
| 21 | 200 s | 30.39 cm | 46 | 450 s | 30.42 cm | 71 | 700 s | 30.46 cm | 96 | 950 s | 30.48 cm |
| 22 | 210 s | 30.39 cm | 47 | 460 s | 30.42 cm | 72 | 710 s | 30.46 cm | 97 | 960 s | 30.48 cm |
| 23 | 220 s | 30.39 cm | 48 | 470 s | 30.42 cm | 73 | 720 s | 30.46 cm | 98 | 970 s | 30.48 cm |
| 24 | 230 s | 30.39 cm | 49 | 480 s | 30.42 cm | 74 | 730 s | 30.46 cm | 99 | 980 s | 30.48 cm |
| 25 | 240 s | 30.39 cm | 50 | 490 s | 30.42 cm | 75 | 740 s | 30.46 cm | 100 | 990 s | 30.48 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

### LL 7 b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | 1000 s | 30.48 cm | 133 | 1320 s | 30.51 cm | 165 | 1640 s | 30.53 cm | 197 | 1960 s | 30.54 cm |
| 102 | 1010 s | 30.49 cm | 134 | 1330 s | 30.51 cm | 166 | 1650 s | 30.53 cm | 198 | 1970 s | 30.54 cm |
| 103 | 1020 s | 30.49 cm | 135 | 1340 s | 30.51 cm | 167 | 1660 s | 30.53 cm | 199 | 1980 s | 30.54 cm |
| 104 | 1030 s | 30.49 cm | 136 | 1350 s | 30.51 cm | 168 | 1670 s | 30.53 cm | 200 | 1990 s | 30.54 cm |
| 105 | 1040 s | 30.49 cm | 137 | 1360 s | 30.51 cm | 169 | 1680 s | 30.53 cm | 201 | 2000 s | 30.54 cm |
| 106 | 1050 s | 30.49 cm | 138 | 1370 s | 30.51 cm | 170 | 1690 s | 30.53 cm | 202 | 2010 s | 30.54 cm |
| 107 | 1060 s | 30.49 cm | 139 | 1380 s | 30.51 cm | 171 | 1700 s | 30.53 cm | 203 | 2020 s | 30.54 cm |
| 108 | 1070 s | 30.49 cm | 140 | 1390 s | 30.51 cm | 172 | 1710 s | 30.53 cm | 204 | 2030 s | 30.54 cm |
| 109 | 1080 s | 30.49 cm | 141 | 1400 s | 30.51 cm | 173 | 1720 s | 30.53 cm | 205 | 2040 s | 30.54 cm |
| 110 | 1090 s | 30.49 cm | 142 | 1410 s | 30.51 cm | 174 | 1730 s | 30.53 cm | 206 | 2050 s | 30.54 cm |
| 111 | 1100 s | 30.49 cm | 143 | 1420 s | 30.51 cm | 175 | 1740 s | 30.53 cm | 207 | 2060 s | 30.54 cm |
| 112 | 1110 s | 30.49 cm | 144 | 1430 s | 30.51 cm | 176 | 1750 s | 30.53 cm | 208 | 2070 s | 30.54 cm |
| 113 | 1120 s | 30.49 cm | 145 | 1440 s | 30.51 cm | 177 | 1760 s | 30.53 cm | 209 | 2080 s | 30.54 cm |
| 114 | 1130 s | 30.49 cm | 146 | 1450 s | 30.51 cm | 178 | 1770 s | 30.53 cm | 210 | 2090 s | 30.54 cm |
| 115 | 1140 s | 30.5 cm | 147 | 1460 s | 30.51 cm | 179 | 1780 s | 30.53 cm | 211 | 2100 s | 30.54 cm |
| 116 | 1150 s | 30.49 cm | 148 | 1470 s | 30.51 cm | 180 | 1790 s | 30.53 cm | 212 | 2110 s | 30.54 cm |
| 117 | 1160 s | 30.5 cm | 149 | 1480 s | 30.51 cm | 181 | 1800 s | 30.53 cm | 213 | 2120 s | 30.54 cm |
| 118 | 1170 s | 30.5 cm | 150 | 1490 s | 30.52 cm | 182 | 1810 s | 30.53 cm | 214 | 2130 s | 30.54 cm |
| 119 | 1180 s | 30.5 cm | 151 | 1500 s | 30.51 cm | 183 | 1820 s | 30.53 cm | 215 | 2140 s | 30.54 cm |
| 120 | 1190 s | 30.5 cm | 152 | 1510 s | 30.51 cm | 184 | 1830 s | 30.53 cm | 216 | 2150 s | 30.54 cm |
| 121 | 1200 s | 30.5 cm | 153 | 1520 s | 30.51 cm | 185 | 1840 s | 30.53 cm | 217 | 2160 s | 30.54 cm |
| 122 | 1210 s | 30.5 cm | 154 | 1530 s | 30.52 cm | 186 | 1850 s | 30.53 cm | 218 | 2170 s | 30.54 cm |
| 123 | 1220 s | 30.51 cm | 155 | 1540 s | 30.52 cm | 187 | 1860 s | 30.53 cm | 219 | 2180 s | 30.54 cm |
| 124 | 1230 s | 30.51 cm | 156 | 1550 s | 30.52 cm | 188 | 1870 s | 30.53 cm | 220 | 2190 s | 30.54 cm |
| 125 | 1240 s | 30.51 cm | 157 | 1560 s | 30.52 cm | 189 | 1880 s | 30.53 cm | 221 | 2200 s | 30.54 cm |
| 126 | 1250 s | 30.51 cm | 158 | 1570 s | 30.52 cm | 190 | 1890 s | 30.53 cm | 222 | 2210 s | 30.54 cm |
| 127 | 1260 s | 30.5 cm | 159 | 1580 s | 30.52 cm | 191 | 1900 s | 30.53 cm | 223 | 2220 s | 30.54 cm |
| 128 | 1270 s | 30.51 cm | 160 | 1590 s | 30.52 cm | 192 | 1910 s | 30.53 cm | 224 | 2230 s | 30.54 cm |
| 129 | 1280 s | 30.51 cm | 161 | 1600 s | 30.52 cm | 193 | 1920 s | 30.53 cm | 225 | 2240 s | 30.54 cm |
| 130 | 1290 s | 30.51 cm | 162 | 1610 s | 30.52 cm | 194 | 1930 s | 30.53 cm | 226 | 2250 s | 30.54 cm |
| 131 | 1300 s | 30.51 cm | 163 | 1620 s | 30.52 cm | 195 | 1940 s | 30.53 cm | 227 | 2260 s | 30.54 cm |
| 132 | 1310 s | 30.51 cm | 164 | 1630 s | 30.53 cm | 196 | 1950 s | 30.53 cm | 228 | 2270 s | 30.54 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

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### LL 7 b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 229 | 2280 s | 30.54 cm | 261 | 2600 s | 30.55 cm | 293 | 2920 s | 30.55 cm | 325 | 3240 s | 30.56 cm |
| 230 | 2290 s | 30.54 cm | 262 | 2610 s | 30.55 cm | 294 | 2930 s | 30.55 cm | 326 | 3250 s | 30.56 cm |
| 231 | 2300 s | 30.54 cm | 263 | 2620 s | 30.55 cm | 295 | 2940 s | 30.56 cm | 327 | 3260 s | 30.56 cm |
| 232 | 2310 s | 30.54 cm | 264 | 2630 s | 30.55 cm | 296 | 2950 s | 30.56 cm | 328 | 3270 s | 30.56 cm |
| 233 | 2320 s | 30.54 cm | 265 | 2640 s | 30.55 cm | 297 | 2960 s | 30.56 cm | 329 | 3280 s | 30.56 cm |
| 234 | 2330 s | 30.54 cm | 266 | 2650 s | 30.56 cm | 298 | 2970 s | 30.55 cm | 330 | 3290 s | 30.56 cm |
| 235 | 2340 s | 30.54 cm | 267 | 2660 s | 30.56 cm | 299 | 2980 s | 30.56 cm | 331 | 3300 s | 30.56 cm |
| 236 | 2350 s | 30.54 cm | 268 | 2670 s | 30.55 cm | 300 | 2990 s | 30.56 cm | 332 | 3310 s | 30.56 cm |
| 237 | 2360 s | 30.54 cm | 269 | 2680 s | 30.55 cm | 301 | 3000 s | 30.56 cm | 333 | 3320 s | 30.56 cm |
| 238 | 2370 s | 30.54 cm | 270 | 2690 s | 30.55 cm | 302 | 3010 s | 30.56 cm | 334 | 3330 s | 30.56 cm |
| 239 | 2380 s | 30.54 cm | 271 | 2700 s | 30.55 cm | 303 | 3020 s | 30.56 cm | 335 | 3340 s | 30.56 cm |
| 240 | 2390 s | 30.54 cm | 272 | 2710 s | 30.55 cm | 304 | 3030 s | 30.56 cm | 336 | 3350 s | 30.56 cm |
| 241 | 2400 s | 30.54 cm | 273 | 2720 s | 30.55 cm | 305 | 3040 s | 30.56 cm | 337 | 3360 s | 30.56 cm |
| 242 | 2410 s | 30.54 cm | 274 | 2730 s | 30.55 cm | 306 | 3050 s | 30.56 cm | 338 | 3370 s | 30.56 cm |
| 243 | 2420 s | 30.55 cm | 275 | 2740 s | 30.55 cm | 307 | 3060 s | 30.56 cm | 339 | 3380 s | 30.56 cm |
| 244 | 2430 s | 30.55 cm | 276 | 2750 s | 30.55 cm | 308 | 3070 s | 30.56 cm | 340 | 3390 s | 30.56 cm |
| 245 | 2440 s | 30.55 cm | 277 | 2760 s | 30.55 cm | 309 | 3080 s | 30.56 cm | 341 | 3400 s | 30.56 cm |
| 246 | 2450 s | 30.55 cm | 278 | 2770 s | 30.55 cm | 310 | 3090 s | 30.56 cm | 342 | 3410 s | 30.56 cm |
| 247 | 2460 s | 30.55 cm | 279 | 2780 s | 30.55 cm | 311 | 3100 s | 30.56 cm | 343 | 3420 s | 30.56 cm |
| 248 | 2470 s | 30.55 cm | 280 | 2790 s | 30.55 cm | 312 | 3110 s | 30.56 cm | 344 | 3430 s | 30.56 cm |
| 249 | 2480 s | 30.55 cm | 281 | 2800 s | 30.55 cm | 313 | 3120 s | 30.56 cm | 345 | 3440 s | 30.56 cm |
| 250 | 2490 s | 30.55 cm | 282 | 2810 s | 30.55 cm | 314 | 3130 s | 30.56 cm | 346 | 3450 s | 30.56 cm |
| 251 | 2500 s | 30.55 cm | 283 | 2820 s | 30.55 cm | 315 | 3140 s | 30.56 cm | 347 | 3460 s | 30.56 cm |
| 252 | 2510 s | 30.55 cm | 284 | 2830 s | 30.55 cm | 316 | 3150 s | 30.56 cm | 348 | 3470 s | 30.56 cm |
| 253 | 2520 s | 30.55 cm | 285 | 2840 s | 30.55 cm | 317 | 3160 s | 30.56 cm | 349 | 3480 s | 30.56 cm |
| 254 | 2530 s | 30.55 cm | 286 | 2850 s | 30.55 cm | 318 | 3170 s | 30.56 cm | 350 | 3490 s | 30.56 cm |
| 255 | 2540 s | 30.55 cm | 287 | 2860 s | 30.55 cm | 319 | 3180 s | 30.56 cm | 351 | 3500 s | 30.56 cm |
| 256 | 2550 s | 30.54 cm | 288 | 2870 s | 30.55 cm | 320 | 3190 s | 30.56 cm | 352 | 3510 s | 30.56 cm |
| 257 | 2560 s | 30.55 cm | 289 | 2880 s | 30.55 cm | 321 | 3200 s | 30.56 cm | 353 | 3520 s | 30.56 cm |
| 258 | 2570 s | 30.55 cm | 290 | 2890 s | 30.55 cm | 322 | 3210 s | 30.56 cm | 354 | 3530 s | 30.56 cm |
| 259 | 2580 s | 30.55 cm | 291 | 2900 s | 30.55 cm | 323 | 3220 s | 30.56 cm | 355 | 3540 s | 30.56 cm |
| 260 | 2590 s | 30.55 cm | 292 | 2910 s | 30.55 cm | 324 | 3230 s | 30.56 cm | 356 | 3550 s | 30.56 cm |

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# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

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### LL 7 b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 357 | 3560 s | 30.56 cm | 389 | 3880 s | 30.56 cm | 421 | 4200 s | 30.56 cm | 453 | 4520 s | 30.56 cm |
| 358 | 3570 s | 30.56 cm | 390 | 3890 s | 30.56 cm | 422 | 4210 s | 30.56 cm | 454 | 4530 s | 30.56 cm |
| 359 | 3580 s | 30.56 cm | 391 | 3900 s | 30.56 cm | 423 | 4220 s | 30.56 cm | 455 | 4540 s | 30.56 cm |
| 360 | 3590 s | 30.56 cm | 392 | 3910 s | 30.56 cm | 424 | 4230 s | 30.56 cm | 456 | 4550 s | 30.56 cm |
| 361 | 3600 s | 30.56 cm | 393 | 3920 s | 30.56 cm | 425 | 4240 s | 30.56 cm | 457 | 4560 s | 30.56 cm |
| 362 | 3610 s | 30.56 cm | 394 | 3930 s | 30.56 cm | 426 | 4250 s | 30.56 cm | 458 | 4570 s | 30.56 cm |
| 363 | 3620 s | 30.56 cm | 395 | 3940 s | 30.56 cm | 427 | 4260 s | 30.56 cm | 459 | 4580 s | 30.56 cm |
| 364 | 3630 s | 30.56 cm | 396 | 3950 s | 30.56 cm | 428 | 4270 s | 30.56 cm | 460 | 4590 s | 30.56 cm |
| 365 | 3640 s | 30.56 cm | 397 | 3960 s | 30.56 cm | 429 | 4280 s | 30.56 cm | 461 | 4600 s | 30.56 cm |
| 366 | 3650 s | 30.56 cm | 398 | 3970 s | 30.56 cm | 430 | 4290 s | 30.56 cm | 462 | 4610 s | 30.56 cm |
| 367 | 3660 s | 30.56 cm | 399 | 3980 s | 30.56 cm | 431 | 4300 s | 30.57 cm | 463 | 4620 s | 30.56 cm |
| 368 | 3670 s | 30.56 cm | 400 | 3990 s | 30.56 cm | 432 | 4310 s | 30.56 cm | 464 | 4630 s | 30.56 cm |
| 369 | 3680 s | 30.56 cm | 401 | 4000 s | 30.56 cm | 433 | 4320 s | 30.56 cm | 465 | 4640 s | 30.57 cm |
| 370 | 3690 s | 30.56 cm | 402 | 4010 s | 30.56 cm | 434 | 4330 s | 30.56 cm | 466 | 4650 s | 30.57 cm |
| 371 | 3700 s | 30.56 cm | 403 | 4020 s | 30.56 cm | 435 | 4340 s | 30.56 cm | 467 | 4660 s | 30.56 cm |
| 372 | 3710 s | 30.57 cm | 404 | 4030 s | 30.56 cm | 436 | 4350 s | 30.56 cm | 468 | 4670 s | 30.56 cm |
| 373 | 3720 s | 30.56 cm | 405 | 4040 s | 30.56 cm | 437 | 4360 s | 30.56 cm | 469 | 4680 s | 30.57 cm |
| 374 | 3730 s | 30.56 cm | 406 | 4050 s | 30.56 cm | 438 | 4370 s | 30.57 cm | 470 | 4690 s | 30.57 cm |
| 375 | 3740 s | 30.56 cm | 407 | 4060 s | 30.56 cm | 439 | 4380 s | 30.57 cm | 471 | 4700 s | 30.56 cm |
| 376 | 3750 s | 30.56 cm | 408 | 4070 s | 30.56 cm | 440 | 4390 s | 30.57 cm | 472 | 4710 s | 30.57 cm |
| 377 | 3760 s | 30.56 cm | 409 | 4080 s | 30.56 cm | 441 | 4400 s | 30.56 cm | 473 | 4720 s | 30.57 cm |
| 378 | 3770 s | 30.56 cm | 410 | 4090 s | 30.56 cm | 442 | 4410 s | 30.56 cm | 474 | 4730 s | 30.56 cm |
| 379 | 3780 s | 30.56 cm | 411 | 4100 s | 30.56 cm | 443 | 4420 s | 30.56 cm | 475 | 4740 s | 30.57 cm |
| 380 | 3790 s | 30.56 cm | 412 | 4110 s | 30.56 cm | 444 | 4430 s | 30.56 cm | 476 | 4750 s | 30.57 cm |
| 381 | 3800 s | 30.56 cm | 413 | 4120 s | 30.56 cm | 445 | 4440 s | 30.56 cm | 477 | 4760 s | 30.56 cm |
| 382 | 3810 s | 30.56 cm | 414 | 4130 s | 30.56 cm | 446 | 4450 s | 30.56 cm | 478 | 4770 s | 30.56 cm |
| 383 | 3820 s | 30.56 cm | 415 | 4140 s | 30.56 cm | 447 | 4460 s | 30.56 cm | 479 | 4780 s | 30.56 cm |
| 384 | 3830 s | 30.56 cm | 416 | 4150 s | 30.56 cm | 448 | 4470 s | 30.56 cm | 480 | 4790 s | 30.56 cm |
| 385 | 3840 s | 30.56 cm | 417 | 4160 s | 30.56 cm | 449 | 4480 s | 30.56 cm | 481 | 4800 s | 30.56 cm |
| 386 | 3850 s | 30.56 cm | 418 | 4170 s | 30.56 cm | 450 | 4490 s | 30.56 cm | 482 | 4810 s | 30.56 cm |
| 387 | 3860 s | 30.56 cm | 419 | 4180 s | 30.56 cm | 451 | 4500 s | 30.56 cm | 483 | 4820 s | 30.56 cm |
| 388 | 3870 s | 30.56 cm | 420 | 4190 s | 30.56 cm | 452 | 4510 s | 30.56 cm | 484 | 4830 s | 30.56 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

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### LL 7 b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 485 | 4840 s | 30.56 cm | 517 | 5160 s | 30.55 cm | 549 | 5480 s | 30.55 cm | 581 | 5800 s | 30.55 cm |
| 486 | 4850 s | 30.56 cm | 518 | 5170 s | 30.55 cm | 550 | 5490 s | 30.55 cm | 582 | 5810 s | 30.55 cm |
| 487 | 4860 s | 30.56 cm | 519 | 5180 s | 30.55 cm | 551 | 5500 s | 30.55 cm | 583 | 5820 s | 30.55 cm |
| 488 | 4870 s | 30.56 cm | 520 | 5190 s | 30.55 cm | 552 | 5510 s | 30.55 cm | 584 | 5830 s | 30.55 cm |
| 489 | 4880 s | 30.56 cm | 521 | 5200 s | 30.55 cm | 553 | 5520 s | 30.55 cm | 585 | 5840 s | 30.55 cm |
| 490 | 4890 s | 30.56 cm | 522 | 5210 s | 30.55 cm | 554 | 5530 s | 30.55 cm | 586 | 5850 s | 30.55 cm |
| 491 | 4900 s | 30.56 cm | 523 | 5220 s | 30.55 cm | 555 | 5540 s | 30.55 cm | 587 | 5860 s | 30.55 cm |
| 492 | 4910 s | 30.56 cm | 524 | 5230 s | 30.55 cm | 556 | 5550 s | 30.55 cm | 588 | 5870 s | 30.55 cm |
| 493 | 4920 s | 30.55 cm | 525 | 5240 s | 30.55 cm | 557 | 5560 s | 30.55 cm | 589 | 5880 s | 30.55 cm |
| 494 | 4930 s | 30.55 cm | 526 | 5250 s | 30.55 cm | 558 | 5570 s | 30.55 cm | 590 | 5890 s | 30.55 cm |
| 495 | 4940 s | 30.55 cm | 527 | 5260 s | 30.55 cm | 559 | 5580 s | 30.55 cm | 591 | 5900 s | 30.55 cm |
| 496 | 4950 s | 30.56 cm | 528 | 5270 s | 30.55 cm | 560 | 5590 s | 30.55 cm | 592 | 5910 s | 30.55 cm |
| 497 | 4960 s | 30.55 cm | 529 | 5280 s | 30.55 cm | 561 | 5600 s | 30.55 cm | 593 | 5920 s | 30.55 cm |
| 498 | 4970 s | 30.55 cm | 530 | 5290 s | 30.55 cm | 562 | 5610 s | 30.55 cm | 594 | 5930 s | 30.55 cm |
| 499 | 4980 s | 30.55 cm | 531 | 5300 s | 30.55 cm | 563 | 5620 s | 30.55 cm | 595 | 5940 s | 30.55 cm |
| 500 | 4990 s | 30.55 cm | 532 | 5310 s | 30.55 cm | 564 | 5630 s | 30.55 cm | 596 | 5950 s | 30.55 cm |
| 501 | 5000 s | 30.55 cm | 533 | 5320 s | 30.55 cm | 565 | 5640 s | 30.55 cm | 597 | 5960 s | 30.55 cm |
| 502 | 5010 s | 30.55 cm | 534 | 5330 s | 30.55 cm | 566 | 5650 s | 30.55 cm | 598 | 5970 s | 30.55 cm |
| 503 | 5020 s | 30.55 cm | 535 | 5340 s | 30.55 cm | 567 | 5660 s | 30.55 cm | 599 | 5980 s | 30.55 cm |
| 504 | 5030 s | 30.55 cm | 536 | 5350 s | 30.55 cm | 568 | 5670 s | 30.56 cm | 600 | 5990 s | 30.55 cm |
| 505 | 5040 s | 30.55 cm | 537 | 5360 s | 30.55 cm | 569 | 5680 s | 30.55 cm | 601 | 6000 s | 30.55 cm |
| 506 | 5050 s | 30.55 cm | 538 | 5370 s | 30.55 cm | 570 | 5690 s | 30.56 cm | 602 | 6010 s | 30.55 cm |
| 507 | 5060 s | 30.55 cm | 539 | 5380 s | 30.55 cm | 571 | 5700 s | 30.56 cm | 603 | 6020 s | 30.55 cm |
| 508 | 5070 s | 30.55 cm | 540 | 5390 s | 30.55 cm | 572 | 5710 s | 30.56 cm | 604 | 6030 s | 30.54 cm |
| 509 | 5080 s | 30.55 cm | 541 | 5400 s | 30.55 cm | 573 | 5720 s | 30.56 cm | 605 | 6040 s | 30.54 cm |
| 510 | 5090 s | 30.55 cm | 542 | 5410 s | 30.55 cm | 574 | 5730 s | 30.56 cm | 606 | 6050 s | 30.55 cm |
| 511 | 5100 s | 30.55 cm | 543 | 5420 s | 30.55 cm | 575 | 5740 s | 30.55 cm | 607 | 6060 s | 30.55 cm |
| 512 | 5110 s | 30.55 cm | 544 | 5430 s | 30.55 cm | 576 | 5750 s | 30.55 cm | 608 | 6070 s | 30.55 cm |
| 513 | 5120 s | 30.55 cm | 545 | 5440 s | 30.55 cm | 577 | 5760 s | 30.55 cm | 609 | 6080 s | 30.55 cm |
| 514 | 5130 s | 30.55 cm | 546 | 5450 s | 30.55 cm | 578 | 5770 s | 30.55 cm | 610 | 6090 s | 30.55 cm |
| 515 | 5140 s | 30.55 cm | 547 | 5460 s | 30.55 cm | 579 | 5780 s | 30.55 cm | 611 | 6100 s | 30.55 cm |
| 516 | 5150 s | 30.55 cm | 548 | 5470 s | 30.55 cm | 580 | 5790 s | 30.55 cm | 612 | 6110 s | 30.54 cm |

# Infiltration Report

**RPBCWD**

**Lotus Lake WIP_LL7 - LL7 - LL7**

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651.237.5123

### LL 7 b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|
| 613 | 6120 s | 30.55 cm | 645 | 6440 s | 30.54 cm | 677 | 6760 s | 30.54 cm |
| 614 | 6130 s | 30.54 cm | 646 | 6450 s | 30.54 cm | 678 | 6770 s | 30.54 cm |
| 615 | 6140 s | 30.55 cm | 647 | 6460 s | 30.54 cm | 679 | 6780 s | 30.54 cm |
| 616 | 6150 s | 30.54 cm | 648 | 6470 s | 30.54 cm | 680 | 6790 s | 30.54 cm |
| 617 | 6160 s | 30.54 cm | 649 | 6480 s | 30.54 cm | 681 | 6800 s | 30.54 cm |
| 618 | 6170 s | 30.54 cm | 650 | 6490 s | 30.54 cm | 682 | 6810 s | 30.54 cm |
| 619 | 6180 s | 30.54 cm | 651 | 6500 s | 30.54 cm | 683 | 6820 s | 30.54 cm |
| 620 | 6190 s | 30.54 cm | 652 | 6510 s | 30.54 cm | 684 | 6830 s | 30.54 cm |
| 621 | 6200 s | 30.54 cm | 653 | 6520 s | 30.54 cm | 685 | 6840 s | 30.54 cm |
| 622 | 6210 s | 30.55 cm | 654 | 6530 s | 30.55 cm | 686 | 6850 s | 30.54 cm |
| 623 | 6220 s | 30.54 cm | 655 | 6540 s | 30.55 cm | 687 | 6860 s | 30.54 cm |
| 624 | 6230 s | 30.55 cm | 656 | 6550 s | 30.55 cm | 688 | 6870 s | 30.54 cm |
| 625 | 6240 s | 30.54 cm | 657 | 6560 s | 30.55 cm | 689 | 6880 s | 30.54 cm |
| 626 | 6250 s | 30.54 cm | 658 | 6570 s | 30.55 cm | 690 | 6890 s | 30.54 cm |
| 627 | 6260 s | 30.54 cm | 659 | 6580 s | 30.55 cm | 691 | 6900 s | 30.54 cm |
| 628 | 6270 s | 30.54 cm | 660 | 6590 s | 30.55 cm | 692 | 6910 s | 30.54 cm |
| 629 | 6280 s | 30.54 cm | 661 | 6600 s | 30.55 cm | | | |
| 630 | 6290 s | 30.54 cm | 662 | 6610 s | 30.54 cm | | | |
| 631 | 6300 s | 30.54 cm | 663 | 6620 s | 30.54 cm | | | |
| 632 | 6310 s | 30.54 cm | 664 | 6630 s | 30.54 cm | | | |
| 633 | 6320 s | 30.54 cm | 665 | 6640 s | 30.54 cm | | | |
| 634 | 6330 s | 30.54 cm | 666 | 6650 s | 30.54 cm | | | |
| 635 | 6340 s | 30.54 cm | 667 | 6660 s | 30.54 cm | | | |
| 636 | 6350 s | 30.54 cm | 668 | 6670 s | 30.54 cm | | | |
| 637 | 6360 s | 30.54 cm | 669 | 6680 s | 30.54 cm | | | |
| 638 | 6370 s | 30.54 cm | 670 | 6690 s | 30.54 cm | | | |
| 639 | 6380 s | 30.54 cm | 671 | 6700 s | 30.54 cm | | | |
| 640 | 6390 s | 30.54 cm | 672 | 6710 s | 30.54 cm | | | |
| 641 | 6400 s | 30.55 cm | 673 | 6720 s | 30.54 cm | | | |
| 642 | 6410 s | 30.54 cm | 674 | 6730 s | 30.54 cm | | | |
| 643 | 6420 s | 30.54 cm | 675 | 6740 s | 30.54 cm | | | |
| 644 | 6430 s | 30.54 cm | 676 | 6750 s | 30.54 cm | | | |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

651.237.5123

### LL 7 c

| | |
|---|---|
| Date | 5/31/2023 |
| Time | 1:50 PM |
| Latitude | 44.876861 |
| Longitude | -93.537596 |
| Initial Volumetric Moisture | 5.00 % |
| Final Volumetric Moisture | 6.00 % |
| Cylinder Size | 3 Liter |

### LL 7 c Results

| | |
|---|---|
| Map Pin # | 3 |
| Test Number | 24523 |
| Ksat - mm/hr | NULL |
| Ksat - in/hr | NULL |
| Capillary Pressure C mm | NULL |
| RMS Error of Regression | NULL |
| Normalized RMS | NULL |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 3 s | 31.34 cm | 26 | 247 s | 31.31 cm | 51 | 497 s | 31.3 cm | 76 | 747 s | 31.26 cm |
| 2 | 7 s | 31.34 cm | 27 | 257 s | 31.31 cm | 52 | 507 s | 31.29 cm | 77 | 757 s | 31.26 cm |
| 3 | 17 s | 31.34 cm | 28 | 267 s | 31.31 cm | 53 | 517 s | 31.29 cm | 78 | 767 s | 31.26 cm |
| 4 | 27 s | 31.34 cm | 29 | 277 s | 31.31 cm | 54 | 527 s | 31.29 cm | 79 | 777 s | 31.26 cm |
| 5 | 37 s | 31.34 cm | 30 | 287 s | 31.31 cm | 55 | 537 s | 31.29 cm | 80 | 787 s | 31.26 cm |
| 6 | 47 s | 31.34 cm | 31 | 297 s | 31.31 cm | 56 | 547 s | 31.29 cm | 81 | 797 s | 31.26 cm |
| 7 | 57 s | 31.33 cm | 32 | 307 s | 31.31 cm | 57 | 557 s | 31.29 cm | 82 | 807 s | 31.25 cm |
| 8 | 67 s | 31.33 cm | 33 | 317 s | 31.31 cm | 58 | 567 s | 31.29 cm | 83 | 817 s | 31.25 cm |
| 9 | 77 s | 31.33 cm | 34 | 327 s | 31.31 cm | 59 | 577 s | 31.29 cm | 84 | 827 s | 31.25 cm |
| 10 | 87 s | 31.33 cm | 35 | 337 s | 31.31 cm | 60 | 587 s | 31.29 cm | 85 | 837 s | 31.25 cm |
| 11 | 97 s | 31.33 cm | 36 | 347 s | 31.3 cm | 61 | 597 s | 31.29 cm | 86 | 847 s | 31.25 cm |
| 12 | 107 s | 31.32 cm | 37 | 357 s | 31.3 cm | 62 | 607 s | 31.29 cm | 87 | 857 s | 31.25 cm |
| 13 | 117 s | 31.32 cm | 38 | 367 s | 31.31 cm | 63 | 617 s | 31.29 cm | 88 | 867 s | 31.25 cm |
| 14 | 127 s | 31.32 cm | 39 | 377 s | 31.3 cm | 64 | 627 s | 31.29 cm | 89 | 877 s | 31.25 cm |
| 15 | 137 s | 31.32 cm | 40 | 387 s | 31.3 cm | 65 | 637 s | 31.28 cm | 90 | 887 s | 31.24 cm |
| 16 | 147 s | 31.32 cm | 41 | 397 s | 31.3 cm | 66 | 647 s | 31.28 cm | 91 | 897 s | 31.24 cm |
| 17 | 157 s | 31.32 cm | 42 | 407 s | 31.3 cm | 67 | 657 s | 31.28 cm | 92 | 907 s | 31.24 cm |
| 18 | 167 s | 31.32 cm | 43 | 417 s | 31.3 cm | 68 | 667 s | 31.28 cm | 93 | 917 s | 31.24 cm |
| 19 | 177 s | 31.31 cm | 44 | 427 s | 31.3 cm | 69 | 677 s | 31.28 cm | 94 | 927 s | 31.24 cm |
| 20 | 187 s | 31.31 cm | 45 | 437 s | 31.3 cm | 70 | 687 s | 31.28 cm | 95 | 937 s | 31.24 cm |
| 21 | 197 s | 31.31 cm | 46 | 447 s | 31.3 cm | 71 | 697 s | 31.28 cm | 96 | 947 s | 31.24 cm |
| 22 | 207 s | 31.31 cm | 47 | 457 s | 31.3 cm | 72 | 707 s | 31.28 cm | 97 | 957 s | 31.24 cm |
| 23 | 217 s | 31.31 cm | 48 | 467 s | 31.3 cm | 73 | 717 s | 31.28 cm | 98 | 967 s | 31.24 cm |
| 24 | 227 s | 31.31 cm | 49 | 477 s | 31.3 cm | 74 | 727 s | 31.28 cm | 99 | 977 s | 31.24 cm |
| 25 | 237 s | 31.31 cm | 50 | 487 s | 31.3 cm | 75 | 737 s | 31.26 cm | 100 | 987 s | 31.24 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

MPD INFILTROMETER www.upstreamtechnologies.us

Upstream Technologies 651.237.5123

### LL 7 c Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | 997 s | 31.23 cm | 133 | 1317 s | 31.2 cm | 165 | 1637 s | 31.17 cm | 197 | 1957 s | 31.15 cm |
| 102 | 1007 s | 31.23 cm | 134 | 1327 s | 31.2 cm | 166 | 1647 s | 31.18 cm | 198 | 1967 s | 31.15 cm |
| 103 | 1017 s | 31.23 cm | 135 | 1337 s | 31.2 cm | 167 | 1657 s | 31.17 cm | 199 | 1977 s | 31.14 cm |
| 104 | 1027 s | 31.23 cm | 136 | 1347 s | 31.2 cm | 168 | 1667 s | 31.17 cm | 200 | 1987 s | 31.14 cm |
| 105 | 1037 s | 31.23 cm | 137 | 1357 s | 31.2 cm | 169 | 1677 s | 31.17 cm | 201 | 1997 s | 31.14 cm |
| 106 | 1047 s | 31.23 cm | 138 | 1367 s | 31.19 cm | 170 | 1687 s | 31.17 cm | 202 | 2007 s | 31.14 cm |
| 107 | 1057 s | 31.23 cm | 139 | 1377 s | 31.19 cm | 171 | 1697 s | 31.17 cm | 203 | 2017 s | 31.14 cm |
| 108 | 1067 s | 31.23 cm | 140 | 1387 s | 31.19 cm | 172 | 1707 s | 31.17 cm | 204 | 2027 s | 31.14 cm |
| 109 | 1077 s | 31.23 cm | 141 | 1397 s | 31.19 cm | 173 | 1717 s | 31.17 cm | 205 | 2037 s | 31.14 cm |
| 110 | 1087 s | 31.23 cm | 142 | 1407 s | 31.19 cm | 174 | 1727 s | 31.16 cm | 206 | 2047 s | 31.14 cm |
| 111 | 1097 s | 31.22 cm | 143 | 1417 s | 31.19 cm | 175 | 1737 s | 31.16 cm | 207 | 2057 s | 31.14 cm |
| 112 | 1107 s | 31.22 cm | 144 | 1427 s | 31.19 cm | 176 | 1747 s | 31.16 cm | 208 | 2067 s | 31.14 cm |
| 113 | 1117 s | 31.22 cm | 145 | 1437 s | 31.19 cm | 177 | 1757 s | 31.16 cm | 209 | 2077 s | 31.14 cm |
| 114 | 1127 s | 31.22 cm | 146 | 1447 s | 31.19 cm | 178 | 1767 s | 31.16 cm | 210 | 2087 s | 31.13 cm |
| 115 | 1137 s | 31.22 cm | 147 | 1457 s | 31.19 cm | 179 | 1777 s | 31.16 cm | 211 | 2097 s | 31.13 cm |
| 116 | 1147 s | 31.22 cm | 148 | 1467 s | 31.19 cm | 180 | 1787 s | 31.16 cm | 212 | 2107 s | 31.13 cm |
| 117 | 1157 s | 31.21 cm | 149 | 1477 s | 31.19 cm | 181 | 1797 s | 31.16 cm | 213 | 2117 s | 31.13 cm |
| 118 | 1167 s | 31.21 cm | 150 | 1487 s | 31.19 cm | 182 | 1807 s | 31.16 cm | 214 | 2127 s | 31.13 cm |
| 119 | 1177 s | 31.21 cm | 151 | 1497 s | 31.19 cm | 183 | 1817 s | 31.16 cm | 215 | 2137 s | 31.13 cm |
| 120 | 1187 s | 31.21 cm | 152 | 1507 s | 31.19 cm | 184 | 1827 s | 31.16 cm | 216 | 2147 s | 31.13 cm |
| 121 | 1197 s | 31.21 cm | 153 | 1517 s | 31.19 cm | 185 | 1837 s | 31.15 cm | 217 | 2157 s | 31.13 cm |
| 122 | 1207 s | 31.21 cm | 154 | 1527 s | 31.19 cm | 186 | 1847 s | 31.16 cm | 218 | 2167 s | 31.13 cm |
| 123 | 1217 s | 31.21 cm | 155 | 1537 s | 31.19 cm | 187 | 1857 s | 31.16 cm | 219 | 2177 s | 31.13 cm |
| 124 | 1227 s | 31.21 cm | 156 | 1547 s | 31.18 cm | 188 | 1867 s | 31.15 cm | 220 | 2187 s | 31.13 cm |
| 125 | 1237 s | 31.21 cm | 157 | 1557 s | 31.18 cm | 189 | 1877 s | 31.15 cm | 221 | 2197 s | 31.12 cm |
| 126 | 1247 s | 31.2 cm | 158 | 1567 s | 31.18 cm | 190 | 1887 s | 31.15 cm | 222 | 2207 s | 31.12 cm |
| 127 | 1257 s | 31.2 cm | 159 | 1577 s | 31.18 cm | 191 | 1897 s | 31.15 cm | 223 | 2217 s | 31.12 cm |
| 128 | 1267 s | 31.2 cm | 160 | 1587 s | 31.18 cm | 192 | 1907 s | 31.15 cm | 224 | 2227 s | 31.12 cm |
| 129 | 1277 s | 31.2 cm | 161 | 1597 s | 31.18 cm | 193 | 1917 s | 31.15 cm | 225 | 2237 s | 31.12 cm |
| 130 | 1287 s | 31.2 cm | 162 | 1607 s | 31.18 cm | 194 | 1927 s | 31.15 cm | 226 | 2247 s | 31.12 cm |
| 131 | 1297 s | 31.2 cm | 163 | 1617 s | 31.17 cm | 195 | 1937 s | 31.15 cm | 227 | 2257 s | 31.12 cm |
| 132 | 1307 s | 31.2 cm | 164 | 1627 s | 31.17 cm | 196 | 1947 s | 31.15 cm | 228 | 2267 s | 31.12 cm |

### LL 7 c Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 229 | 2277 s | 31.12 cm | 261 | 2597 s | 31.09 cm | 293 | 2917 s | 31.06 cm | 325 | 3237 s | 31.03 cm |
| 230 | 2287 s | 31.12 cm | 262 | 2607 s | 31.08 cm | 294 | 2927 s | 31.06 cm | 326 | 3247 s | 31.03 cm |
| 231 | 2297 s | 31.12 cm | 263 | 2617 s | 31.08 cm | 295 | 2937 s | 31.06 cm | 327 | 3257 s | 31.03 cm |
| 232 | 2307 s | 31.12 cm | 264 | 2627 s | 31.08 cm | 296 | 2947 s | 31.06 cm | 328 | 3267 s | 31.03 cm |
| 233 | 2317 s | 31.1 cm | 265 | 2637 s | 31.08 cm | 297 | 2957 s | 31.06 cm | 329 | 3277 s | 31.03 cm |
| 234 | 2327 s | 31.1 cm | 266 | 2647 s | 31.08 cm | 298 | 2967 s | 31.05 cm | 330 | 3287 s | 31.03 cm |
| 235 | 2337 s | 31.1 cm | 267 | 2657 s | 31.08 cm | 299 | 2977 s | 31.05 cm | 331 | 3297 s | 31.03 cm |
| 236 | 2347 s | 31.1 cm | 268 | 2667 s | 31.08 cm | 300 | 2987 s | 31.05 cm | 332 | 3307 s | 31.03 cm |
| 237 | 2357 s | 31.1 cm | 269 | 2677 s | 31.08 cm | 301 | 2997 s | 31.05 cm | 333 | 3317 s | 31.03 cm |
| 238 | 2367 s | 31.1 cm | 270 | 2687 s | 31.08 cm | 302 | 3007 s | 31.05 cm | 334 | 3327 s | 31.03 cm |
| 239 | 2377 s | 31.1 cm | 271 | 2697 s | 31.08 cm | 303 | 3017 s | 31.05 cm | 335 | 3337 s | 31.02 cm |
| 240 | 2387 s | 31.1 cm | 272 | 2707 s | 31.08 cm | 304 | 3027 s | 31.05 cm | 336 | 3347 s | 31.02 cm |
| 241 | 2397 s | 31.1 cm | 273 | 2717 s | 31.08 cm | 305 | 3037 s | 31.05 cm | 337 | 3357 s | 31.02 cm |
| 242 | 2407 s | 31.1 cm | 274 | 2727 s | 31.08 cm | 306 | 3047 s | 31.05 cm | 338 | 3367 s | 31.02 cm |
| 243 | 2417 s | 31.1 cm | 275 | 2737 s | 31.08 cm | 307 | 3057 s | 31.05 cm | 339 | 3377 s | 31.02 cm |
| 244 | 2427 s | 31.1 cm | 276 | 2747 s | 31.07 cm | 308 | 3067 s | 31.05 cm | 340 | 3387 s | 31.02 cm |
| 245 | 2437 s | 31.1 cm | 277 | 2757 s | 31.07 cm | 309 | 3077 s | 31.05 cm | 341 | 3397 s | 31.02 cm |
| 246 | 2447 s | 31.1 cm | 278 | 2767 s | 31.07 cm | 310 | 3087 s | 31.05 cm | 342 | 3407 s | 31.02 cm |
| 247 | 2457 s | 31.1 cm | 279 | 2777 s | 31.07 cm | 311 | 3097 s | 31.05 cm | 343 | 3417 s | 31.02 cm |
| 248 | 2467 s | 31.1 cm | 280 | 2787 s | 31.07 cm | 312 | 3107 s | 31.05 cm | 344 | 3427 s | 31.02 cm |
| 249 | 2477 s | 31.1 cm | 281 | 2797 s | 31.06 cm | 313 | 3117 s | 31.04 cm | 345 | 3437 s | 31.02 cm |
| 250 | 2487 s | 31.09 cm | 282 | 2807 s | 31.06 cm | 314 | 3127 s | 31.04 cm | 346 | 3447 s | 31.02 cm |
| 251 | 2497 s | 31.1 cm | 283 | 2817 s | 31.07 cm | 315 | 3137 s | 31.04 cm | 347 | 3457 s | 31.02 cm |
| 252 | 2507 s | 31.09 cm | 284 | 2827 s | 31.06 cm | 316 | 3147 s | 31.04 cm | 348 | 3467 s | 31.02 cm |
| 253 | 2517 s | 31.09 cm | 285 | 2837 s | 31.06 cm | 317 | 3157 s | 31.04 cm | 349 | 3477 s | 31.02 cm |
| 254 | 2527 s | 31.09 cm | 286 | 2847 s | 31.06 cm | 318 | 3167 s | 31.04 cm | 350 | 3487 s | 31.02 cm |
| 255 | 2537 s | 31.09 cm | 287 | 2857 s | 31.06 cm | 319 | 3177 s | 31.04 cm | 351 | 3497 s | 31.01 cm |
| 256 | 2547 s | 31.09 cm | 288 | 2867 s | 31.06 cm | 320 | 3187 s | 31.04 cm | 352 | 3507 s | 31.01 cm |
| 257 | 2557 s | 31.09 cm | 289 | 2877 s | 31.06 cm | 321 | 3197 s | 31.04 cm | 353 | 3517 s | 31.01 cm |
| 258 | 2567 s | 31.09 cm | 290 | 2887 s | 31.06 cm | 322 | 3207 s | 31.04 cm | 354 | 3527 s | 31.01 cm |
| 259 | 2577 s | 31.09 cm | 291 | 2897 s | 31.06 cm | 323 | 3217 s | 31.04 cm | 355 | 3537 s | 31.01 cm |
| 260 | 2587 s | 31.09 cm | 292 | 2907 s | 31.06 cm | 324 | 3227 s | 31.03 cm | 356 | 3547 s | 31.01 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

### LL 7 c Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 357 | 3557 s | 31.01 cm | 389 | 3877 s | 30.98 cm | 421 | 4197 s | 30.95 cm | 453 | 4517 s | 30.9 cm |
| 358 | 3567 s | 31.01 cm | 390 | 3887 s | 30.98 cm | 422 | 4207 s | 30.95 cm | 454 | 4527 s | 30.9 cm |
| 359 | 3577 s | 31.01 cm | 391 | 3897 s | 30.98 cm | 423 | 4217 s | 30.93 cm | 455 | 4537 s | 30.9 cm |
| 360 | 3587 s | 31.01 cm | 392 | 3907 s | 30.98 cm | 424 | 4227 s | 30.93 cm | 456 | 4547 s | 30.9 cm |
| 361 | 3597 s | 31.01 cm | 393 | 3917 s | 30.97 cm | 425 | 4237 s | 30.93 cm | 457 | 4557 s | 30.9 cm |
| 362 | 3607 s | 31.01 cm | 394 | 3927 s | 30.97 cm | 426 | 4247 s | 30.93 cm | 458 | 4567 s | 30.9 cm |
| 363 | 3617 s | 31.01 cm | 395 | 3937 s | 30.97 cm | 427 | 4257 s | 30.93 cm | 459 | 4577 s | 30.9 cm |
| 364 | 3627 s | 31.01 cm | 396 | 3947 s | 30.97 cm | 428 | 4267 s | 30.93 cm | 460 | 4587 s | 30.9 cm |
| 365 | 3637 s | 31.0 cm | 397 | 3957 s | 30.97 cm | 429 | 4277 s | 30.93 cm | 461 | 4597 s | 30.9 cm |
| 366 | 3647 s | 31.0 cm | 398 | 3967 s | 30.97 cm | 430 | 4287 s | 30.93 cm | 462 | 4607 s | 30.9 cm |
| 367 | 3657 s | 31.0 cm | 399 | 3977 s | 30.97 cm | 431 | 4297 s | 30.93 cm | 463 | 4617 s | 30.89 cm |
| 368 | 3667 s | 31.0 cm | 400 | 3987 s | 30.97 cm | 432 | 4307 s | 30.92 cm | 464 | 4627 s | 30.9 cm |
| 369 | 3677 s | 31.0 cm | 401 | 3997 s | 30.97 cm | 433 | 4317 s | 30.92 cm | 465 | 4637 s | 30.9 cm |
| 370 | 3687 s | 31.0 cm | 402 | 4007 s | 30.97 cm | 434 | 4327 s | 30.92 cm | 466 | 4647 s | 30.9 cm |
| 371 | 3697 s | 31.0 cm | 403 | 4017 s | 30.97 cm | 435 | 4337 s | 30.92 cm | 467 | 4657 s | 30.89 cm |
| 372 | 3707 s | 31.0 cm | 404 | 4027 s | 30.97 cm | 436 | 4347 s | 30.92 cm | 468 | 4667 s | 30.89 cm |
| 373 | 3717 s | 31.0 cm | 405 | 4037 s | 30.97 cm | 437 | 4357 s | 30.92 cm | 469 | 4677 s | 30.89 cm |
| 374 | 3727 s | 31.0 cm | 406 | 4047 s | 30.96 cm | 438 | 4367 s | 30.92 cm | 470 | 4687 s | 30.89 cm |
| 375 | 3737 s | 31.0 cm | 407 | 4057 s | 30.96 cm | 439 | 4377 s | 30.92 cm | 471 | 4697 s | 30.89 cm |
| 376 | 3747 s | 31.0 cm | 408 | 4067 s | 30.96 cm | 440 | 4387 s | 30.92 cm | 472 | 4707 s | 30.89 cm |
| 377 | 3757 s | 30.99 cm | 409 | 4077 s | 30.96 cm | 441 | 4397 s | 30.92 cm | 473 | 4717 s | 30.89 cm |
| 378 | 3767 s | 30.99 cm | 410 | 4087 s | 30.96 cm | 442 | 4407 s | 30.91 cm | 474 | 4727 s | 30.89 cm |
| 379 | 3777 s | 30.99 cm | 411 | 4097 s | 30.96 cm | 443 | 4417 s | 30.91 cm | 475 | 4737 s | 30.89 cm |
| 380 | 3787 s | 30.99 cm | 412 | 4107 s | 30.96 cm | 444 | 4427 s | 30.91 cm | 476 | 4747 s | 30.89 cm |
| 381 | 3797 s | 30.99 cm | 413 | 4117 s | 30.95 cm | 445 | 4437 s | 30.91 cm | 477 | 4757 s | 30.89 cm |
| 382 | 3807 s | 30.99 cm | 414 | 4127 s | 30.95 cm | 446 | 4447 s | 30.91 cm | 478 | 4767 s | 30.88 cm |
| 383 | 3817 s | 30.98 cm | 415 | 4137 s | 30.95 cm | 447 | 4457 s | 30.91 cm | 479 | 4777 s | 30.88 cm |
| 384 | 3827 s | 30.98 cm | 416 | 4147 s | 30.95 cm | 448 | 4467 s | 30.91 cm | 480 | 4787 s | 30.88 cm |
| 385 | 3837 s | 30.98 cm | 417 | 4157 s | 30.95 cm | 449 | 4477 s | 30.91 cm | 481 | 4797 s | 30.88 cm |
| 386 | 3847 s | 30.98 cm | 418 | 4167 s | 30.95 cm | 450 | 4487 s | 30.91 cm | 482 | 4807 s | 30.88 cm |
| 387 | 3857 s | 30.98 cm | 419 | 4177 s | 30.95 cm | 451 | 4497 s | 30.91 cm | 483 | 4817 s | 30.88 cm |
| 388 | 3867 s | 30.98 cm | 420 | 4187 s | 30.95 cm | 452 | 4507 s | 30.9 cm | 484 | 4827 s | 30.88 cm |

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# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

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### LL 7 c Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 485 | 4837 s | 30.87 cm | 517 | 5157 s | 30.84 cm | 549 | 5477 s | 30.82 cm | 581 | 5797 s | 30.77 cm |
| 486 | 4847 s | 30.88 cm | 518 | 5167 s | 30.84 cm | 550 | 5487 s | 30.82 cm | 582 | 5807 s | 30.77 cm |
| 487 | 4857 s | 30.87 cm | 519 | 5177 s | 30.84 cm | 551 | 5497 s | 30.81 cm | 583 | 5817 s | 30.77 cm |
| 488 | 4867 s | 30.87 cm | 520 | 5187 s | 30.84 cm | 552 | 5507 s | 30.81 cm | 584 | 5827 s | 30.77 cm |
| 489 | 4877 s | 30.87 cm | 521 | 5197 s | 30.84 cm | 553 | 5517 s | 30.81 cm | 585 | 5837 s | 30.77 cm |
| 490 | 4887 s | 30.87 cm | 522 | 5207 s | 30.84 cm | 554 | 5527 s | 30.81 cm | 586 | 5847 s | 30.77 cm |
| 491 | 4897 s | 30.87 cm | 523 | 5217 s | 30.84 cm | 555 | 5537 s | 30.81 cm | 587 | 5857 s | 30.77 cm |
| 492 | 4907 s | 30.87 cm | 524 | 5227 s | 30.84 cm | 556 | 5547 s | 30.81 cm | 588 | 5867 s | 30.76 cm |
| 493 | 4917 s | 30.87 cm | 525 | 5237 s | 30.83 cm | 557 | 5557 s | 30.81 cm | 589 | 5877 s | 30.76 cm |
| 494 | 4927 s | 30.87 cm | 526 | 5247 s | 30.83 cm | 558 | 5567 s | 30.81 cm | 590 | 5887 s | 30.76 cm |
| 495 | 4937 s | 30.86 cm | 527 | 5257 s | 30.83 cm | 559 | 5577 s | 30.81 cm | 591 | 5897 s | 30.76 cm |
| 496 | 4947 s | 30.86 cm | 528 | 5267 s | 30.83 cm | 560 | 5587 s | 30.81 cm | 592 | 5907 s | 30.76 cm |
| 497 | 4957 s | 30.86 cm | 529 | 5277 s | 30.83 cm | 561 | 5597 s | 30.81 cm | 593 | 5917 s | 30.76 cm |
| 498 | 4967 s | 30.86 cm | 530 | 5287 s | 30.83 cm | 562 | 5607 s | 30.8 cm | 594 | 5927 s | 30.76 cm |
| 499 | 4977 s | 30.86 cm | 531 | 5297 s | 30.83 cm | 563 | 5617 s | 30.8 cm | 595 | 5937 s | 30.76 cm |
| 500 | 4987 s | 30.86 cm | 532 | 5307 s | 30.83 cm | 564 | 5627 s | 30.8 cm | 596 | 5947 s | 30.76 cm |
| 501 | 4997 s | 30.86 cm | 533 | 5317 s | 30.83 cm | 565 | 5637 s | 30.8 cm | 597 | 5957 s | 30.75 cm |
| 502 | 5007 s | 30.86 cm | 534 | 5327 s | 30.83 cm | 566 | 5647 s | 30.8 cm | 598 | 5967 s | 30.75 cm |
| 503 | 5017 s | 30.86 cm | 535 | 5337 s | 30.83 cm | 567 | 5657 s | 30.8 cm | 599 | 5977 s | 30.75 cm |
| 504 | 5027 s | 30.86 cm | 536 | 5347 s | 30.83 cm | 568 | 5667 s | 30.8 cm | 600 | 5987 s | 30.75 cm |
| 505 | 5037 s | 30.85 cm | 537 | 5357 s | 30.83 cm | 569 | 5677 s | 30.8 cm | 601 | 5997 s | 30.75 cm |
| 506 | 5047 s | 30.85 cm | 538 | 5367 s | 30.82 cm | 570 | 5687 s | 30.8 cm | 602 | 6007 s | 30.75 cm |
| 507 | 5057 s | 30.85 cm | 539 | 5377 s | 30.83 cm | 571 | 5697 s | 30.79 cm | 603 | 6017 s | 30.75 cm |
| 508 | 5067 s | 30.85 cm | 540 | 5387 s | 30.83 cm | 572 | 5707 s | 30.79 cm | 604 | 6027 s | 30.75 cm |
| 509 | 5077 s | 30.85 cm | 541 | 5397 s | 30.83 cm | 573 | 5717 s | 30.79 cm | 605 | 6037 s | 30.74 cm |
| 510 | 5087 s | 30.85 cm | 542 | 5407 s | 30.82 cm | 574 | 5727 s | 30.79 cm | 606 | 6047 s | 30.74 cm |
| 511 | 5097 s | 30.84 cm | 543 | 5417 s | 30.82 cm | 575 | 5737 s | 30.79 cm | 607 | 6057 s | 30.74 cm |
| 512 | 5107 s | 30.84 cm | 544 | 5427 s | 30.82 cm | 576 | 5747 s | 30.79 cm | 608 | 6067 s | 30.74 cm |
| 513 | 5117 s | 30.84 cm | 545 | 5437 s | 30.82 cm | 577 | 5757 s | 30.79 cm | 609 | 6077 s | 30.74 cm |
| 514 | 5127 s | 30.84 cm | 546 | 5447 s | 30.82 cm | 578 | 5767 s | 30.79 cm | 610 | 6087 s | 30.74 cm |
| 515 | 5137 s | 30.84 cm | 547 | 5457 s | 30.82 cm | 579 | 5777 s | 30.79 cm | 611 | 6097 s | 30.74 cm |
| 516 | 5147 s | 30.84 cm | 548 | 5467 s | 30.82 cm | 580 | 5787 s | 30.77 cm | 612 | 6107 s | 30.74 cm |

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# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

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### LL 7 c Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|
| 613 | 6117 s | 30.74 cm | 645 | 6437 s | 30.71 cm | 677 | 6757 s | 30.68 cm |
| 614 | 6127 s | 30.74 cm | 646 | 6447 s | 30.71 cm | 678 | 6767 s | 30.68 cm |
| 615 | 6137 s | 30.74 cm | 647 | 6457 s | 30.71 cm | 679 | 6777 s | 30.68 cm |
| 616 | 6147 s | 30.73 cm | 648 | 6467 s | 30.71 cm | 680 | 6787 s | 30.68 cm |
| 617 | 6157 s | 30.73 cm | 649 | 6477 s | 30.71 cm | 681 | 6797 s | 30.68 cm |
| 618 | 6167 s | 30.73 cm | 650 | 6487 s | 30.71 cm | 682 | 6807 s | 30.67 cm |
| 619 | 6177 s | 30.73 cm | 651 | 6497 s | 30.71 cm | 683 | 6817 s | 30.67 cm |
| 620 | 6187 s | 30.73 cm | 652 | 6507 s | 30.7 cm | 684 | 6827 s | 30.67 cm |
| 621 | 6197 s | 30.73 cm | 653 | 6517 s | 30.7 cm | 685 | 6837 s | 30.67 cm |
| 622 | 6207 s | 30.73 cm | 654 | 6527 s | 30.7 cm | 686 | 6847 s | 30.67 cm |
| 623 | 6217 s | 30.73 cm | 655 | 6537 s | 30.7 cm | 687 | 6857 s | 30.67 cm |
| 624 | 6227 s | 30.73 cm | 656 | 6547 s | 30.7 cm | | | |
| 625 | 6237 s | 30.73 cm | 657 | 6557 s | 30.7 cm | | | |
| 626 | 6247 s | 30.73 cm | 658 | 6567 s | 30.69 cm | | | |
| 627 | 6257 s | 30.73 cm | 659 | 6577 s | 30.69 cm | | | |
| 628 | 6267 s | 30.73 cm | 660 | 6587 s | 30.69 cm | | | |
| 629 | 6277 s | 30.73 cm | 661 | 6597 s | 30.69 cm | | | |
| 630 | 6287 s | 30.73 cm | 662 | 6607 s | 30.69 cm | | | |
| 631 | 6297 s | 30.72 cm | 663 | 6617 s | 30.69 cm | | | |
| 632 | 6307 s | 30.72 cm | 664 | 6627 s | 30.69 cm | | | |
| 633 | 6317 s | 30.72 cm | 665 | 6637 s | 30.69 cm | | | |
| 634 | 6327 s | 30.72 cm | 666 | 6647 s | 30.69 cm | | | |
| 635 | 6337 s | 30.72 cm | 667 | 6657 s | 30.69 cm | | | |
| 636 | 6347 s | 30.72 cm | 668 | 6667 s | 30.69 cm | | | |
| 637 | 6357 s | 30.72 cm | 669 | 6677 s | 30.69 cm | | | |
| 638 | 6367 s | 30.72 cm | 670 | 6687 s | 30.69 cm | | | |
| 639 | 6377 s | 30.72 cm | 671 | 6697 s | 30.68 cm | | | |
| 640 | 6387 s | 30.71 cm | 672 | 6707 s | 30.68 cm | | | |
| 641 | 6397 s | 30.71 cm | 673 | 6717 s | 30.68 cm | | | |
| 642 | 6407 s | 30.71 cm | 674 | 6727 s | 30.68 cm | | | |
| 643 | 6417 s | 30.71 cm | 675 | 6737 s | 30.68 cm | | | |
| 644 | 6427 s | 30.71 cm | 676 | 6747 s | 30.68 cm | | | |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

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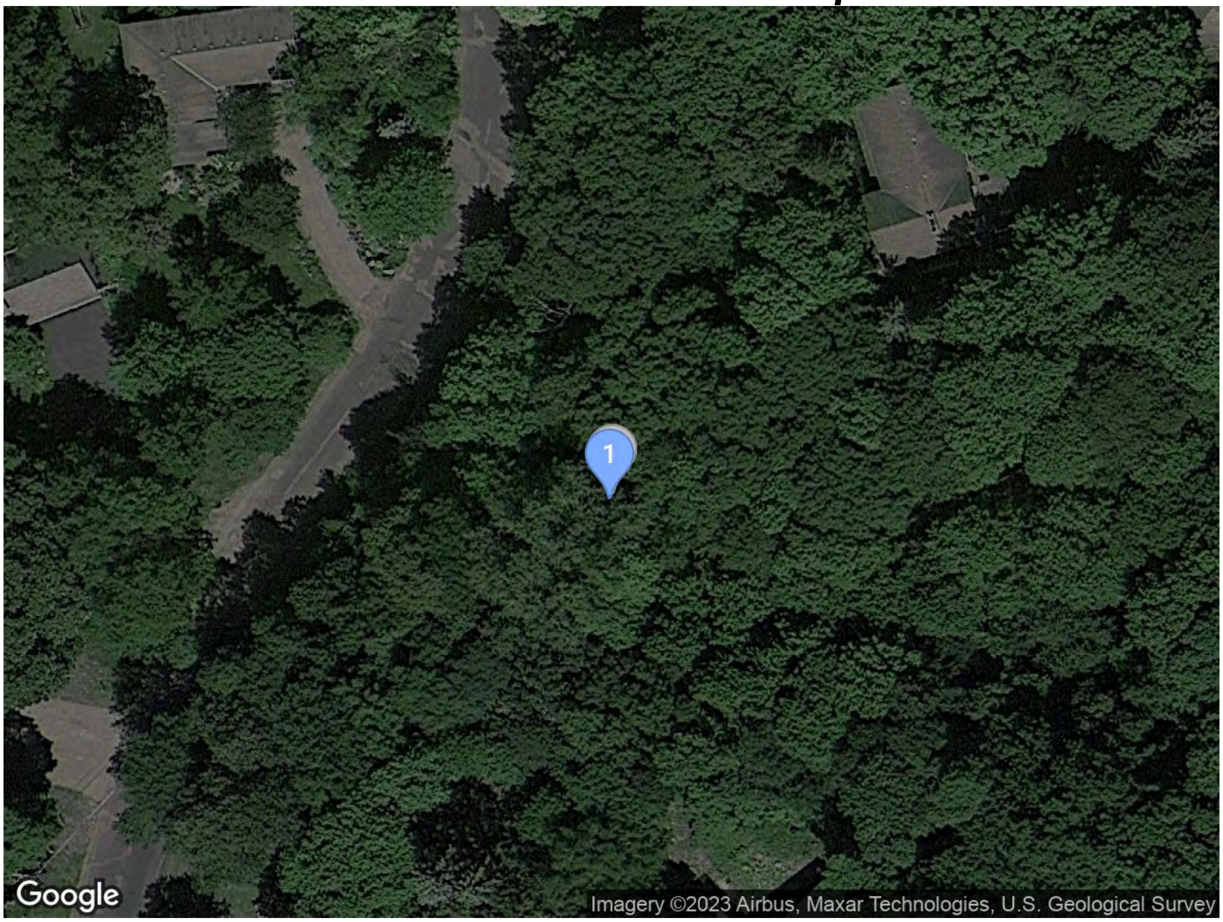
## $K_{sat}$ best-fit site average: 816 mm/hr or 32.1 in/hr

### *GPS Infiltration Test Site Map*




| Map Pin # | Test # | Test Name | Ksat (mm/hr) | Ksat (in/hr) | C (mm) | RMS Error of Regression (s) | Normalized RMS |
|---|---|---|---|---|---|---|---|
| 1 | 24518 | LL 8 a | 754 | 29.7 | -105.6 | 0.4 | 0.1% |
| 2 | 24519 | LL 8 b | 882 | 34.7 | -173.5 | 0.07 | 0.04% |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

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This report summarizes the results of a set of Modified Philip Dunne (MPD) Infiltrometer tests performed at the above referenced site. RPBCWD personnel performed the field tests. The software used to compute saturated hydraulic conductivity ($K_{sat}$) and generate this report assumes that the field personnel used infiltrometers manufactured by Upstream Technologies Inc. and followed the procedures outlined in “Manual – Modified Philip - Dunne Infiltrometer” by Ahmed, Gulliver, and Nieber.

The following paragraphs describe the individual tests, input values used in the analysis, and methods used to compute the $K_{sat}$ value.

After individual $K_{sat}$ values were calculated, the method used to determine the overall site $K_{sat}$value ($K_{best\text{-}fit}$) is described in "Effective Saturated Hydraulic Conductivity of an Infiltration-Based Stormwater Control Measure" by Weiss and Gulliver 2015, "A relationship to more consistently and accurately predict the best-fit value of saturated hydraulic conductivity used a weighted sum of 0.32 times the arithmetic mean and 0.68 times the geometric mean."

### METHOD USED TO COMPUTE $K_{sat}$

The MPD Infiltrometer software uses the following procedure described in "The Comparison of Infiltration Devices and Modification of the Philip-Dunne Permeameter for the Assessment of Rain Gardens" by Rebecca Nestigen, University of Minnesota, November 2007.

The steps are as follows:

1. For each measurement of head, use the following equation to find the corresponding distance to the sharp wetting front.

$$[H_0 - H(t)]r_1^2 = \frac{\theta_1 - \theta_2}{3}[2[R(t)]^3 + 3[R(t)]^2 L_{max} - L_{max}^3 - 4r_0^3]$$

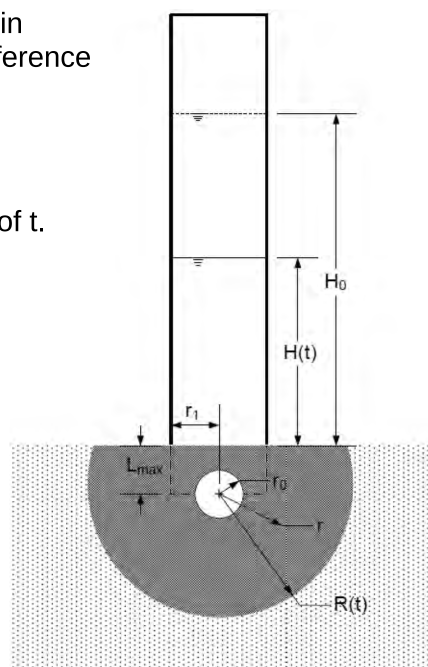
2. Estimate the change in head with respect to time and the change in wetting front distance with respect to time by using the backward difference for all values of R(t) equal to or greater than the distance $\sqrt{r_1^2 + L_{max}^2}$

3. Make initial guesses for K and C.
4. Solve the following equations for ΔP(t) at each incremental value of t.

$$\Delta P(t) = \frac{\pi^2}{8}\left\{\theta_1 - \theta_0 \frac{[R(t)^2] + [R(t)]L_{max}}{K}\frac{dr}{dt} - 2r_0^2\right\}\frac{ln[\frac{R(t)[r_0 + L_{max}]}{r_0[R(t)+L_{max}]}]}{L_{max}}$$

$$\Delta P(t) = C - H(t) - L_{max} + \frac{L_{max}}{K}\frac{dh}{dt}$$

5. Minimize the absolute difference between the two solutions found in Step 4 by adjusting the values of K and C.




*Parameters for Equations*

$\Theta_0$ = volumetric water content of soil before MPD test
$\Theta_1$ = volumetric water content of soil after MPD test

# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

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### LL 8 a

| | |
|---|---|
| Date | 5/31/2023 |
| Time | 10:54 AM |
| Latitude | 44.867581 |
| Longitude | -93.528400 |
| Initial Volumetric Moisture | 5.00 % |
| Final Volumetric Moisture | 12.00 % |
| Cylinder Size | 3 Liter |

### LL 8 a Results

| | |
|---|---|
| Map Pin # | 1 |
| Test Number | 24518 |
| Ksat - mm/hr | 754 |
| Ksat - in/hr | 29.7 |
| Capillary Pressure C mm | -105.6 |
| RMS Error of Regression | 0.4 |
| Normalized RMS | 0.1% |

### Readings

| # | Time | Head |
|---|---|---|
| 1 | 0 s | 28.89 cm |
| 2 | 9 s | 27.88 cm |
| 3 | 19 s | 26.75 cm |
| 4 | 29 s | 25.65 cm |
| 5 | 39 s | 24.59 cm |
| 6 | 49 s | 23.54 cm |
| 7 | 59 s | 22.54 cm |
| 8 | 69 s | 21.57 cm |
| 9 | 79 s | 20.64 cm |
| 10 | 89 s | 19.72 cm |
| 11 | 99 s | 18.83 cm |
| 12 | 109 s | 17.96 cm |
| 13 | 119 s | 17.12 cm |
| 14 | 129 s | 16.3 cm |
| 15 | 139 s | 15.5 cm |
| 16 | 149 s | 14.75 cm |
| 17 | 159 s | 14.05 cm |
| 18 | 169 s | 13.4 cm |
| 19 | 179 s | 12.69 cm |
| 20 | 189 s | 12.0 cm |
| 21 | 199 s | 11.49 cm |
| 22 | 209 s | 10.83 cm |
| 23 | 219 s | 10.19 cm |
| 24 | 229 s | 9.56 cm |
| 25 | 239 s | 9.02 cm |

| # | Time | Head |
|---|---|---|
| 26 | 249 s | 8.42 cm |
| 27 | 259 s | 7.83 cm |
| 28 | 269 s | 7.26 cm |
| 29 | 279 s | 6.7 cm |
| 30 | 289 s | 6.12 cm |
| 31 | 299 s | 5.5 cm |

# Infiltration Report

## RPBCWD

## Lotus Lake WIP_LL7 - LL7 - LL7

### LL 8 b

| | |
|---|---|
| Date | 5/31/2023 |
| Time | 10:55 AM |
| Latitude | 44.867586 |
| Longitude | -93.528397 |
| Initial Volumetric Moisture | 3.00 % |
| Final Volumetric Moisture | 15.00 % |
| Cylinder Size | 3 Liter |

### LL 8 b Results

| | |
|---|---|
| Map Pin # | 2 |
| Test Number | 24519 |
| Ksat - mm/hr | 882 |
| Ksat - in/hr | 34.7 |
| Capillary Pressure C mm | -173.5 |
| RMS Error of Regression | 0.07 |
| Normalized RMS | 0.04% |

### Readings

| # | Time | Head |
|---|---|---|
| 1 | 0 s | 28.36 cm |
| 2 | 10 s | 26.79 cm |
| 3 | 20 s | 25.23 cm |
| 4 | 30 s | 23.72 cm |
| 5 | 40 s | 22.28 cm |
| 6 | 50 s | 20.9 cm |
| 7 | 60 s | 19.57 cm |
| 8 | 70 s | 18.29 cm |
| 9 | 80 s | 17.06 cm |
| 10 | 90 s | 15.88 cm |
| 11 | 100 s | 14.74 cm |
| 12 | 110 s | 13.64 cm |
| 13 | 120 s | 12.57 cm |
| 14 | 130 s | 11.55 cm |
| 15 | 140 s | 10.57 cm |
| 16 | 150 s | 9.61 cm |
| 17 | 160 s | 8.69 cm |
| 18 | 170 s | 7.79 cm |
| 19 | 180 s | 6.94 cm |
| 20 | 190 s | 6.11 cm |

# Infiltration Report

## RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

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## $K_{sat}$ best-fit site average: 145 mm/hr or 5.71 in/hr

*GPS Infiltration Test Site Map*


| Map Pin # | Test # | Test Name | Ksat (mm/hr) | Ksat (in/hr) | C (mm) | RMS Error of Regression (s) | Normalized RMS |
|---|---|---|---|---|---|---|---|
| 1 | 24068 | nllp ne a | 120 | 4.73 | -97.4 | 13.3 | 0.8% |
| 2 | 24069 | nllp ne b | 140 | 5.52 | -89.8 | 18.2 | 1.0% |
| 3 | 24070 | nllp ne c | 291 | 11.5 | -64.2 | 10.2 | 1.1% |
| 4 | 24071 | nllp nw a | 102 | 4.00 | -33.7 | 65 | 2.1% |
| 5 | 24072 | nllp nw b | 35 | 1.39 | -326.4 | 42 | 1.1% |
| 6 | 24073 | nllp nw c | 89 | 3.52 | -55.7 | 65 | 2.0% |
| 7 | 24074 | nllp se a | 169 | 6.64 | -102.1 | 7.0 | 0.6% |
| 8 | 24075 | nllp se b | 158 | 6.21 | -89.8 | 3.7 | 0.3% |
| 9 | 24076 | nllp se c | 376 | 14.8 | -63.9 | 2.7 | 0.4% |

# Infiltration Report

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## RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

This report summarizes the results of a set of Modified Philip Dunne (MPD) Infiltrometer tests performed at the above referenced site. RPBCWD personnel performed the field tests. The software used to compute saturated hydraulic conductivity ($K_{sat}$) and generate this report assumes that the field personnel used infiltrometers manufactured by Upstream Technologies Inc. and followed the procedures outlined in “Manual – Modified Philip - Dunne Infiltrometer” by Ahmed, Gulliver, and Nieber.

The following paragraphs describe the individual tests, input values used in the analysis, and methods used to compute the $K_{sat}$ value.

After individual $K_{sat}$ values were calculated, the method used to determine the overall site $K_{sat}$value ($K_{best\text{-}fit}$) is described in "Effective Saturated Hydraulic Conductivity of an Infiltration-Based Stormwater Control Measure" by Weiss and Gulliver 2015, "A relationship to more consistently and accurately predict the best-fit value of saturated hydraulic conductivity used a weighted sum of 0.32 times the arithmetic mean and 0.68 times the geometric mean."

**METHOD USED TO COMPUTE $K_{sat}$**

The MPD Infiltrometer software uses the following procedure described in "The Comparison of Infiltration Devices and Modification of the Philip-Dunne Permeameter for the Assessment of Rain Gardens" by Rebecca Nestigen, University of Minnesota, November 2007.

The steps are as follows:

1. For each measurement of head, use the following equation to find the corresponding distance to the sharp wetting front.

$$[H_0 - H(t)]r_1^2 = \frac{\theta_1 - \theta_2}{3}[2[R(t)]^3 + 3[R(t)]^2 L_{max} - L_{max}^3 - 4r_0^3]$$

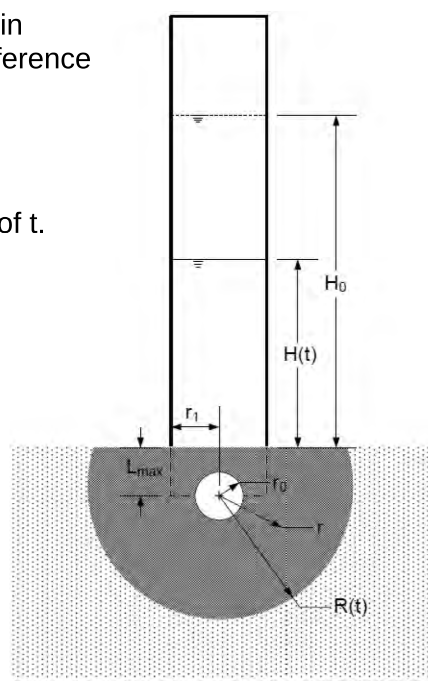
2. Estimate the change in head with respect to time and the change in wetting front distance with respect to time by using the backward difference for all values of R(t) equal to or greater than the distance $\sqrt{r_1^2 + L_{max}^2}$

3. Make initial guesses for K and C.
4. Solve the following equations for ΔP(t) at each incremental value of t.

$$\Delta P(t) = \frac{\pi^2}{8}\left\{\theta_1 - \theta_0 \frac{[R(t)^2] + [R(t)]L_{max}}{K}\frac{dr}{dt} - 2r_0^2\right\}\frac{ln[\frac{R(t)[r_0 + L_{max}]}{r_0[R(t)+L_{max}]}]}{L_{max}}$$

$$\Delta P(t) = C - H(t) - L_{max} + \frac{L_{max}}{K}\frac{dh}{dt}$$

5. Minimize the absolute difference between the two solutions found in Step 4 by adjusting the values of K and C.




*Parameters for Equations*

$\Theta_0$ = volumetric water content of soil before MPD test

$\Theta_1$ = volumetric water content of soil after MPD test

# Infiltration Report

## RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

MPD INFILTROMETER
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### nllp ne a

| | |
|---|---|
| Date | 5/9/2023 |
| Time | 10:35 AM |
| Latitude | 44.884636 |
| Longitude | -93.526196 |
| Initial Volumetric Moisture | 12.00 % |
| Final Volumetric Moisture | 30.00 % |
| Cylinder Size | 3 Liter |

### nllp ne a Results

| | |
|---|---|
| Map Pin # | 1 |
| Test Number | 24068 |
| Ksat - mm/hr | 120 |
| Ksat - in/hr | 4.73 |
| Capillary Pressure C mm | -97.4 |
| RMS Error of Regression | 13.3 |
| Normalized RMS | 0.8% |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 238 s | 25.65 cm | 26 | 488 s | 21.4 cm | 51 | 58 s | 29.48 cm | 76 | 748 s | 17.76 cm |
| 2 | 248 s | 25.46 cm | 27 | 498 s | 21.25 cm | 52 | 48 s | 29.73 cm | 77 | 758 s | 17.63 cm |
| 3 | 258 s | 25.28 cm | 28 | 508 s | 21.09 cm | 53 | 38 s | 29.98 cm | 78 | 768 s | 17.5 cm |
| 4 | 268 s | 25.09 cm | 29 | 518 s | 20.94 cm | 54 | 28 s | 30.23 cm | 79 | 778 s | 17.37 cm |
| 5 | 278 s | 24.91 cm | 30 | 528 s | 20.8 cm | 55 | 18 s | 30.5 cm | 80 | 788 s | 17.24 cm |
| 6 | 288 s | 24.73 cm | 31 | 538 s | 20.65 cm | 56 | 8 s | 30.76 cm | 81 | 798 s | 17.11 cm |
| 7 | 298 s | 24.54 cm | 32 | 548 s | 20.5 cm | 57 | 0 s | 30.98 cm | 82 | 808 s | 16.98 cm |
| 8 | 308 s | 24.36 cm | 33 | 558 s | 20.35 cm | 58 | 568 s | 20.21 cm | 83 | 818 s | 16.86 cm |
| 9 | 318 s | 24.19 cm | 34 | 228 s | 25.84 cm | 59 | 578 s | 20.06 cm | 84 | 828 s | 16.73 cm |
| 10 | 328 s | 24.01 cm | 35 | 218 s | 26.05 cm | 60 | 588 s | 19.92 cm | 85 | 838 s | 16.6 cm |
| 11 | 338 s | 23.84 cm | 36 | 208 s | 26.25 cm | 61 | 598 s | 19.78 cm | 86 | 848 s | 16.47 cm |
| 12 | 348 s | 23.67 cm | 37 | 198 s | 26.44 cm | 62 | 608 s | 19.65 cm | 87 | 858 s | 16.35 cm |
| 13 | 358 s | 23.5 cm | 38 | 188 s | 26.64 cm | 63 | 618 s | 19.5 cm | 88 | 868 s | 16.23 cm |
| 14 | 368 s | 23.33 cm | 39 | 178 s | 26.84 cm | 64 | 628 s | 19.36 cm | 89 | 878 s | 16.1 cm |
| 15 | 378 s | 23.17 cm | 40 | 168 s | 27.05 cm | 65 | 638 s | 19.22 cm | 90 | 888 s | 15.97 cm |
| 16 | 388 s | 23.0 cm | 41 | 158 s | 27.25 cm | 66 | 648 s | 19.08 cm | 91 | 898 s | 15.85 cm |
| 17 | 398 s | 22.83 cm | 42 | 148 s | 27.45 cm | 67 | 658 s | 18.94 cm | 92 | 908 s | 15.73 cm |
| 18 | 408 s | 22.67 cm | 43 | 138 s | 27.66 cm | 68 | 668 s | 18.81 cm | 93 | 918 s | 15.61 cm |
| 19 | 418 s | 22.51 cm | 44 | 128 s | 27.87 cm | 69 | 678 s | 18.68 cm | 94 | 928 s | 15.48 cm |
| 20 | 428 s | 22.35 cm | 45 | 118 s | 28.09 cm | 70 | 688 s | 18.54 cm | 95 | 938 s | 15.36 cm |
| 21 | 438 s | 22.19 cm | 46 | 108 s | 28.31 cm | 71 | 698 s | 18.4 cm | 96 | 948 s | 15.25 cm |
| 22 | 448 s | 22.03 cm | 47 | 98 s | 28.54 cm | 72 | 708 s | 18.27 cm | 97 | 958 s | 15.13 cm |
| 23 | 458 s | 21.87 cm | 48 | 88 s | 28.77 cm | 73 | 718 s | 18.13 cm | 98 | 968 s | 15.0 cm |
| 24 | 468 s | 21.71 cm | 49 | 78 s | 29.01 cm | 74 | 728 s | 18.03 cm | 99 | 978 s | 14.98 cm |
| 25 | 478 s | 21.55 cm | 50 | 68 s | 29.24 cm | 75 | 738 s | 17.9 cm | 100 | 988 s | 14.86 cm |

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# Infiltration Report

## RPBCWD

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## North Lotus Lake Park - LL-23-01 - Chanhassen

### nllp ne a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | 998 s | 14.75 cm | 133 | 1318 s | 11.34 cm | 165 | 1638 s | 8.27 cm | 197 | 1958 s | 5.12 cm |
| 102 | 1008 s | 14.64 cm | 134 | 1328 s | 11.24 cm | 166 | 1648 s | 8.18 cm | | | |
| 103 | 1018 s | 14.52 cm | 135 | 1338 s | 11.15 cm | 167 | 1658 s | 8.09 cm | | | |
| 104 | 1028 s | 14.41 cm | 136 | 1348 s | 11.04 cm | 168 | 1668 s | 7.99 cm | | | |
| 105 | 1038 s | 14.3 cm | 137 | 1358 s | 10.94 cm | 169 | 1678 s | 7.91 cm | | | |
| 106 | 1048 s | 14.18 cm | 138 | 1368 s | 10.85 cm | 170 | 1688 s | 7.81 cm | | | |
| 107 | 1058 s | 14.08 cm | 139 | 1378 s | 10.75 cm | 171 | 1698 s | 7.73 cm | | | |
| 108 | 1068 s | 13.96 cm | 140 | 1388 s | 10.65 cm | 172 | 1708 s | 7.63 cm | | | |
| 109 | 1078 s | 13.85 cm | 141 | 1398 s | 10.55 cm | 173 | 1718 s | 7.54 cm | | | |
| 110 | 1088 s | 13.73 cm | 142 | 1408 s | 10.45 cm | 174 | 1728 s | 7.44 cm | | | |
| 111 | 1098 s | 13.63 cm | 143 | 1418 s | 10.36 cm | 175 | 1738 s | 7.36 cm | | | |
| 112 | 1108 s | 13.52 cm | 144 | 1428 s | 10.26 cm | 176 | 1748 s | 7.26 cm | | | |
| 113 | 1118 s | 13.42 cm | 145 | 1438 s | 10.17 cm | 177 | 1758 s | 7.16 cm | | | |
| 114 | 1128 s | 13.32 cm | 146 | 1448 s | 10.07 cm | 178 | 1768 s | 7.09 cm | | | |
| 115 | 1138 s | 13.2 cm | 147 | 1458 s | 9.96 cm | 179 | 1778 s | 6.99 cm | | | |
| 116 | 1148 s | 13.1 cm | 148 | 1468 s | 9.87 cm | 180 | 1788 s | 6.89 cm | | | |
| 117 | 1158 s | 13.0 cm | 149 | 1478 s | 9.77 cm | 181 | 1798 s | 6.79 cm | | | |
| 118 | 1168 s | 12.89 cm | 150 | 1488 s | 9.68 cm | 182 | 1808 s | 6.7 cm | | | |
| 119 | 1178 s | 12.79 cm | 151 | 1498 s | 9.58 cm | 183 | 1818 s | 6.59 cm | | | |
| 120 | 1188 s | 12.68 cm | 152 | 1508 s | 9.49 cm | 184 | 1828 s | 6.49 cm | | | |
| 121 | 1198 s | 12.57 cm | 153 | 1518 s | 9.39 cm | 185 | 1838 s | 6.39 cm | | | |
| 122 | 1208 s | 12.47 cm | 154 | 1528 s | 9.29 cm | 186 | 1848 s | 6.28 cm | | | |
| 123 | 1218 s | 12.36 cm | 155 | 1538 s | 9.2 cm | 187 | 1858 s | 6.17 cm | | | |
| 124 | 1228 s | 12.26 cm | 156 | 1548 s | 9.11 cm | 188 | 1868 s | 6.07 cm | | | |
| 125 | 1238 s | 12.16 cm | 157 | 1558 s | 9.03 cm | 189 | 1878 s | 5.96 cm | | | |
| 126 | 1248 s | 12.05 cm | 158 | 1568 s | 8.93 cm | 190 | 1888 s | 5.85 cm | | | |
| 127 | 1258 s | 11.95 cm | 159 | 1578 s | 8.84 cm | 191 | 1898 s | 5.78 cm | | | |
| 128 | 1268 s | 11.85 cm | 160 | 1588 s | 8.74 cm | 192 | 1908 s | 5.67 cm | | | |
| 129 | 1278 s | 11.74 cm | 161 | 1598 s | 8.64 cm | 193 | 1918 s | 5.57 cm | | | |
| 130 | 1288 s | 11.65 cm | 162 | 1608 s | 8.55 cm | 194 | 1928 s | 5.46 cm | | | |
| 131 | 1298 s | 11.55 cm | 163 | 1618 s | 8.45 cm | 195 | 1938 s | 5.36 cm | | | |
| 132 | 1308 s | 11.44 cm | 164 | 1628 s | 8.37 cm | 196 | 1948 s | 5.25 cm | | | |

# Infiltration Report

## RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

MPD INFILTROMETER www.upstreamtechnologies.us

Upstream Technologies 651.237.5123

### nllp ne b

| | |
|---|---|
| Date | 5/9/2023 |
| Time | 10:40 AM |
| Latitude | 44.884632 |
| Longitude | -93.526214 |
| Initial Volumetric Moisture | 30.00 % |
| Final Volumetric Moisture | 31.00 % |
| Cylinder Size | 3 Liter |

### nllp ne b Results

| | |
|---|---|
| Map Pin # | 2 |
| Test Number | 24069 |
| Ksat - mm/hr | 140 |
| Ksat - in/hr | 5.52 |
| Capillary Pressure C mm | -89.8 |
| RMS Error of Regression | 18.2 |
| Normalized RMS | 1.0% |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 s | 29.49 cm | 26 | 250 s | 24.44 cm | 51 | 500 s | 20.43 cm | 76 | 750 s | 16.99 cm |
| 2 | 10 s | 29.28 cm | 27 | 260 s | 24.26 cm | 52 | 510 s | 20.28 cm | 77 | 760 s | 16.87 cm |
| 3 | 20 s | 29.03 cm | 28 | 270 s | 24.09 cm | 53 | 520 s | 20.14 cm | 78 | 770 s | 16.75 cm |
| 4 | 30 s | 28.79 cm | 29 | 280 s | 23.92 cm | 54 | 530 s | 20.0 cm | 79 | 780 s | 16.62 cm |
| 5 | 40 s | 28.56 cm | 30 | 290 s | 23.75 cm | 55 | 540 s | 19.85 cm | 80 | 790 s | 16.5 cm |
| 6 | 50 s | 28.34 cm | 31 | 300 s | 23.58 cm | 56 | 550 s | 19.7 cm | 81 | 800 s | 16.38 cm |
| 7 | 60 s | 28.11 cm | 32 | 310 s | 23.42 cm | 57 | 560 s | 19.56 cm | 82 | 810 s | 16.26 cm |
| 8 | 70 s | 27.89 cm | 33 | 320 s | 23.25 cm | 58 | 570 s | 19.42 cm | 83 | 820 s | 16.14 cm |
| 9 | 80 s | 27.68 cm | 34 | 330 s | 23.09 cm | 59 | 580 s | 19.27 cm | 84 | 830 s | 16.02 cm |
| 10 | 90 s | 27.46 cm | 35 | 340 s | 22.91 cm | 60 | 590 s | 19.13 cm | 85 | 840 s | 15.91 cm |
| 11 | 100 s | 27.26 cm | 36 | 350 s | 22.76 cm | 61 | 600 s | 19.0 cm | 86 | 850 s | 15.78 cm |
| 12 | 110 s | 27.06 cm | 37 | 360 s | 22.6 cm | 62 | 610 s | 18.86 cm | 87 | 860 s | 15.66 cm |
| 13 | 120 s | 26.86 cm | 38 | 370 s | 22.43 cm | 63 | 620 s | 18.72 cm | 88 | 870 s | 15.55 cm |
| 14 | 130 s | 26.65 cm | 39 | 380 s | 22.27 cm | 64 | 630 s | 18.58 cm | 89 | 880 s | 15.43 cm |
| 15 | 140 s | 26.46 cm | 40 | 390 s | 22.11 cm | 65 | 640 s | 18.44 cm | 90 | 890 s | 15.31 cm |
| 16 | 150 s | 26.27 cm | 41 | 400 s | 21.95 cm | 66 | 650 s | 18.3 cm | 91 | 900 s | 15.19 cm |
| 17 | 160 s | 26.08 cm | 42 | 410 s | 21.79 cm | 67 | 660 s | 18.17 cm | 92 | 910 s | 15.08 cm |
| 18 | 170 s | 25.89 cm | 43 | 420 s | 21.63 cm | 68 | 670 s | 18.04 cm | 93 | 920 s | 14.97 cm |
| 19 | 180 s | 25.69 cm | 44 | 430 s | 21.48 cm | 69 | 680 s | 17.9 cm | 94 | 930 s | 14.85 cm |
| 20 | 190 s | 25.5 cm | 45 | 440 s | 21.33 cm | 70 | 690 s | 17.77 cm | 95 | 940 s | 14.74 cm |
| 21 | 200 s | 25.32 cm | 46 | 450 s | 21.17 cm | 71 | 700 s | 17.64 cm | 96 | 950 s | 14.62 cm |
| 22 | 210 s | 25.14 cm | 47 | 460 s | 21.02 cm | 72 | 710 s | 17.5 cm | 97 | 960 s | 14.51 cm |
| 23 | 220 s | 24.97 cm | 48 | 470 s | 20.87 cm | 73 | 720 s | 17.38 cm | 98 | 970 s | 14.39 cm |
| 24 | 230 s | 24.79 cm | 49 | 480 s | 20.72 cm | 74 | 730 s | 17.25 cm | 99 | 980 s | 14.28 cm |
| 25 | 240 s | 24.61 cm | 50 | 490 s | 20.57 cm | 75 | 740 s | 17.12 cm | 100 | 990 s | 14.17 cm |

# Infiltration Report

## RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

MPD INFILTROMETER www.upstreamtechnologies.us

Upstream Technologies 651.237.5123

### nllp ne b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|
| 101 | 1000 s | 14.05 cm | 133 | 1320 s | 10.64 cm | 165 | 1640 s | 7.56 cm |
| 102 | 1010 s | 13.95 cm | 134 | 1330 s | 10.53 cm | 166 | 1650 s | 7.46 cm |
| 103 | 1020 s | 13.84 cm | 135 | 1340 s | 10.43 cm | 167 | 1660 s | 7.38 cm |
| 104 | 1030 s | 13.72 cm | 136 | 1350 s | 10.33 cm | 168 | 1670 s | 7.28 cm |
| 105 | 1040 s | 13.62 cm | 137 | 1360 s | 10.23 cm | 169 | 1680 s | 7.2 cm |
| 106 | 1050 s | 13.5 cm | 138 | 1370 s | 10.12 cm | 170 | 1690 s | 7.1 cm |
| 107 | 1060 s | 13.39 cm | 139 | 1380 s | 10.03 cm | 171 | 1700 s | 7.01 cm |
| 108 | 1070 s | 13.29 cm | 140 | 1390 s | 9.93 cm | 172 | 1710 s | 6.92 cm |
| 109 | 1080 s | 13.17 cm | 141 | 1400 s | 9.83 cm | 173 | 1720 s | 6.83 cm |
| 110 | 1090 s | 13.06 cm | 142 | 1410 s | 9.73 cm | 174 | 1730 s | 6.75 cm |
| 111 | 1100 s | 12.96 cm | 143 | 1420 s | 9.63 cm | 175 | 1740 s | 6.65 cm |
| 112 | 1110 s | 12.84 cm | 144 | 1430 s | 9.53 cm | 176 | 1750 s | 6.57 cm |
| 113 | 1120 s | 12.73 cm | 145 | 1440 s | 9.43 cm | 177 | 1760 s | 6.48 cm |
| 114 | 1130 s | 12.63 cm | 146 | 1450 s | 9.34 cm | 178 | 1770 s | 6.39 cm |
| 115 | 1140 s | 12.52 cm | 147 | 1460 s | 9.23 cm | 179 | 1780 s | 6.3 cm |
| 116 | 1150 s | 12.41 cm | 148 | 1470 s | 9.14 cm | 180 | 1790 s | 6.22 cm |
| 117 | 1160 s | 12.31 cm | 149 | 1480 s | 9.04 cm | 181 | 1800 s | 6.13 cm |
| 118 | 1170 s | 12.2 cm | 150 | 1490 s | 8.94 cm | 182 | 1810 s | 6.03 cm |
| 119 | 1180 s | 12.09 cm | 151 | 1500 s | 8.86 cm | 183 | 1820 s | 5.95 cm |
| 120 | 1190 s | 11.99 cm | 152 | 1510 s | 8.76 cm | 184 | 1830 s | 5.86 cm |
| 121 | 1200 s | 11.88 cm | 153 | 1520 s | 8.67 cm | 185 | 1840 s | 5.78 cm |
| 122 | 1210 s | 11.78 cm | 154 | 1530 s | 8.57 cm | 186 | 1850 s | 5.69 cm |
| 123 | 1220 s | 11.67 cm | 155 | 1540 s | 8.47 cm | 187 | 1860 s | 5.61 cm |
| 124 | 1230 s | 11.57 cm | 156 | 1550 s | 8.38 cm | 188 | 1870 s | 5.52 cm |
| 125 | 1240 s | 11.47 cm | 157 | 1560 s | 8.28 cm | 189 | 1880 s | 5.44 cm |
| 126 | 1250 s | 11.36 cm | 158 | 1570 s | 8.2 cm | 190 | 1890 s | 5.36 cm |
| 127 | 1260 s | 11.25 cm | 159 | 1580 s | 8.1 cm | 191 | 1900 s | 5.28 cm |
| 128 | 1270 s | 11.15 cm | 160 | 1590 s | 8.02 cm | 192 | 1910 s | 5.2 cm |
| 129 | 1280 s | 11.05 cm | 161 | 1600 s | 7.92 cm | 193 | 1920 s | 5.12 cm |
| 130 | 1290 s | 10.94 cm | 162 | 1610 s | 7.82 cm | 194 | 1930 s | 5.03 cm |
| 131 | 1300 s | 10.84 cm | 163 | 1620 s | 7.74 cm | | | |
| 132 | 1310 s | 10.74 cm | 164 | 1630 s | 7.64 cm | | | |

# Infiltration Report

www.upstreamtechnologies.us

651.237.5123

## RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

### nllp ne c

| | |
|---|---|
| Date | 5/9/2023 |
| Time | 10:46 AM |
| Latitude | 44.884620 |
| Longitude | -93.526170 |
| Initial Volumetric Moisture | 30.00 % |
| Final Volumetric Moisture | 31.00 % |
| Cylinder Size | 3 Liter |

### nllp ne c Results

| | |
|---|---|
| Map Pin # | 3 |
| Test Number | 24070 |
| Ksat - mm/hr | 291 |
| Ksat - in/hr | 11.5 |
| Capillary Pressure C mm | -64.2 |
| RMS Error of Regression | 10.2 |
| Normalized RMS | 1.1% |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 s | 29.62 cm | 26 | 250 s | 20.73 cm | 51 | 500 s | 14.62 cm | 76 | 750 s | 9.73 cm |
| 2 | 10 s | 29.17 cm | 27 | 260 s | 20.45 cm | 52 | 510 s | 14.41 cm | 77 | 760 s | 9.56 cm |
| 3 | 20 s | 28.68 cm | 28 | 270 s | 20.17 cm | 53 | 520 s | 14.18 cm | 78 | 770 s | 9.38 cm |
| 4 | 30 s | 28.23 cm | 29 | 280 s | 19.89 cm | 54 | 530 s | 13.97 cm | 79 | 780 s | 9.21 cm |
| 5 | 39 s | 27.78 cm | 30 | 290 s | 19.61 cm | 55 | 540 s | 13.76 cm | 80 | 790 s | 9.04 cm |
| 6 | 49 s | 27.37 cm | 31 | 300 s | 19.35 cm | 56 | 550 s | 13.55 cm | 81 | 800 s | 8.86 cm |
| 7 | 59 s | 26.97 cm | 32 | 310 s | 19.08 cm | 57 | 560 s | 13.34 cm | 82 | 810 s | 8.69 cm |
| 8 | 70 s | 26.58 cm | 33 | 320 s | 18.81 cm | 58 | 570 s | 13.14 cm | 83 | 820 s | 8.52 cm |
| 9 | 80 s | 26.2 cm | 34 | 330 s | 18.56 cm | 59 | 580 s | 12.94 cm | 84 | 830 s | 8.36 cm |
| 10 | 90 s | 25.82 cm | 35 | 340 s | 18.29 cm | 60 | 590 s | 12.73 cm | 85 | 840 s | 8.19 cm |
| 11 | 100 s | 25.46 cm | 36 | 350 s | 18.04 cm | 61 | 600 s | 12.54 cm | 86 | 849 s | 8.02 cm |
| 12 | 110 s | 25.11 cm | 37 | 360 s | 17.79 cm | 62 | 609 s | 12.34 cm | 87 | 859 s | 7.85 cm |
| 13 | 120 s | 24.76 cm | 38 | 369 s | 17.54 cm | 63 | 619 s | 12.14 cm | 88 | 869 s | 7.69 cm |
| 14 | 130 s | 24.43 cm | 39 | 379 s | 17.29 cm | 64 | 629 s | 11.96 cm | 89 | 879 s | 7.52 cm |
| 15 | 140 s | 24.09 cm | 40 | 389 s | 17.06 cm | 65 | 639 s | 11.76 cm | 90 | 889 s | 7.36 cm |
| 16 | 150 s | 23.77 cm | 41 | 399 s | 16.81 cm | 66 | 649 s | 11.57 cm | 91 | 899 s | 7.2 cm |
| 17 | 160 s | 23.45 cm | 42 | 409 s | 16.58 cm | 67 | 659 s | 11.38 cm | 92 | 909 s | 7.03 cm |
| 18 | 169 s | 23.13 cm | 43 | 419 s | 16.34 cm | 68 | 669 s | 11.2 cm | 93 | 919 s | 6.87 cm |
| 19 | 179 s | 22.82 cm | 44 | 430 s | 16.11 cm | 69 | 680 s | 11.01 cm | 94 | 929 s | 6.71 cm |
| 20 | 189 s | 22.51 cm | 45 | 440 s | 15.88 cm | 70 | 690 s | 10.83 cm | 95 | 940 s | 6.55 cm |
| 21 | 199 s | 22.2 cm | 46 | 450 s | 15.64 cm | 71 | 700 s | 10.64 cm | 96 | 950 s | 6.38 cm |
| 22 | 209 s | 21.9 cm | 47 | 460 s | 15.42 cm | 72 | 710 s | 10.45 cm | 97 | 960 s | 6.22 cm |
| 23 | 220 s | 21.61 cm | 48 | 470 s | 15.18 cm | 73 | 720 s | 10.27 cm | 98 | 970 s | 6.05 cm |
| 24 | 230 s | 21.31 cm | 49 | 480 s | 14.97 cm | 74 | 730 s | 10.09 cm | 99 | 980 s | 5.86 cm |
| 25 | 240 s | 21.02 cm | 50 | 490 s | 14.75 cm | 75 | 740 s | 9.91 cm | 100 | 990 s | 5.68 cm |

### nllp ne c Readings continued

| # | Time | Head |
|---|---|---|
| 101 | 1000 s | 5.5 cm |
| 102 | 1010 s | 5.31 cm |

# Infiltration Report

## RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

MPD INFILTROMETER
www.upstreamtechnologies.us
Upstream Technologies
651.237.5123

### nllp nw a

| | |
|---|---|
| Date | 5/9/2023 |
| Time | 11:45 AM |
| Latitude | 44.884481 |
| Longitude | -93.526571 |
| Initial Volumetric Moisture | 5.00 % |
| Final Volumetric Moisture | 6.00 % |
| Cylinder Size | 3 Liter |

### nllp nw a Results

| | |
|---|---|
| Map Pin # | 4 |
| Test Number | 24071 |
| Ksat - mm/hr | 102 |
| Ksat - in/hr | 4.00 |
| Capillary Pressure C mm | -33.7 |
| RMS Error of Regression | 65 |
| Normalized RMS | 2.1% |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 s | 29.08 cm | 26 | 248 s | 25.22 cm | 51 | 498 s | 22.54 cm | 76 | 748 s | 20.08 cm |
| 2 | 8 s | 28.94 cm | 27 | 258 s | 25.1 cm | 52 | 508 s | 22.44 cm | 77 | 758 s | 19.98 cm |
| 3 | 18 s | 28.76 cm | 28 | 268 s | 24.99 cm | 53 | 518 s | 22.34 cm | 78 | 768 s | 19.88 cm |
| 4 | 28 s | 28.6 cm | 29 | 278 s | 24.87 cm | 54 | 528 s | 22.24 cm | 79 | 778 s | 19.79 cm |
| 5 | 38 s | 28.44 cm | 30 | 288 s | 24.77 cm | 55 | 538 s | 22.15 cm | 80 | 788 s | 19.69 cm |
| 6 | 48 s | 28.24 cm | 31 | 298 s | 24.65 cm | 56 | 548 s | 22.05 cm | 81 | 798 s | 19.59 cm |
| 7 | 58 s | 28.05 cm | 32 | 308 s | 24.53 cm | 57 | 558 s | 21.96 cm | 82 | 808 s | 19.51 cm |
| 8 | 68 s | 27.85 cm | 33 | 318 s | 24.43 cm | 58 | 568 s | 21.86 cm | 83 | 818 s | 19.42 cm |
| 9 | 78 s | 27.66 cm | 34 | 328 s | 24.32 cm | 59 | 578 s | 21.76 cm | 84 | 828 s | 19.34 cm |
| 10 | 88 s | 27.49 cm | 35 | 338 s | 24.2 cm | 60 | 588 s | 21.69 cm | 85 | 838 s | 19.25 cm |
| 11 | 98 s | 27.31 cm | 36 | 348 s | 24.1 cm | 61 | 598 s | 21.61 cm | 86 | 848 s | 19.19 cm |
| 12 | 108 s | 27.14 cm | 37 | 358 s | 23.99 cm | 62 | 608 s | 21.53 cm | 87 | 858 s | 19.1 cm |
| 13 | 118 s | 26.97 cm | 38 | 368 s | 23.89 cm | 63 | 618 s | 21.47 cm | 88 | 868 s | 19.04 cm |
| 14 | 128 s | 26.81 cm | 39 | 378 s | 23.78 cm | 64 | 628 s | 21.37 cm | 89 | 878 s | 18.96 cm |
| 15 | 138 s | 26.65 cm | 40 | 388 s | 23.67 cm | 65 | 638 s | 21.26 cm | 90 | 888 s | 18.88 cm |
| 16 | 148 s | 26.5 cm | 41 | 398 s | 23.58 cm | 66 | 648 s | 21.17 cm | 91 | 898 s | 18.79 cm |
| 17 | 158 s | 26.35 cm | 42 | 408 s | 23.47 cm | 67 | 658 s | 21.03 cm | 92 | 908 s | 18.72 cm |
| 18 | 168 s | 26.22 cm | 43 | 418 s | 23.37 cm | 68 | 668 s | 20.91 cm | 93 | 918 s | 18.63 cm |
| 19 | 178 s | 26.07 cm | 44 | 428 s | 23.27 cm | 69 | 678 s | 20.8 cm | 94 | 928 s | 18.55 cm |
| 20 | 188 s | 25.94 cm | 45 | 438 s | 23.16 cm | 70 | 688 s | 20.68 cm | 95 | 938 s | 18.47 cm |
| 21 | 198 s | 25.8 cm | 46 | 448 s | 23.06 cm | 71 | 698 s | 20.57 cm | 96 | 948 s | 18.4 cm |
| 22 | 208 s | 25.67 cm | 47 | 458 s | 22.96 cm | 72 | 708 s | 20.47 cm | 97 | 958 s | 18.34 cm |
| 23 | 218 s | 25.56 cm | 48 | 468 s | 22.85 cm | 73 | 718 s | 20.36 cm | 98 | 968 s | 18.26 cm |
| 24 | 228 s | 25.44 cm | 49 | 478 s | 22.74 cm | 74 | 728 s | 20.27 cm | 99 | 978 s | 18.19 cm |
| 25 | 238 s | 25.32 cm | 50 | 488 s | 22.64 cm | 75 | 738 s | 20.18 cm | 100 | 988 s | 18.11 cm |

# Infiltration Report

## RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

MPD INFILTROMETER
www.upstreamtechnologies.us

Upstream Technologies
651.237.5123

### nllp nw a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | 998 s | 18.04 cm | 133 | 1318 s | 15.82 cm | 165 | 1638 s | 13.92 cm | 197 | 1958 s | 11.99 cm |
| 102 | 1008 s | 17.96 cm | 134 | 1328 s | 15.77 cm | 166 | 1648 s | 13.84 cm | 198 | 1968 s | 11.95 cm |
| 103 | 1018 s | 17.88 cm | 135 | 1338 s | 15.7 cm | 167 | 1658 s | 13.78 cm | 199 | 1978 s | 11.89 cm |
| 104 | 1028 s | 17.8 cm | 136 | 1348 s | 15.64 cm | 168 | 1668 s | 13.7 cm | 200 | 1988 s | 11.84 cm |
| 105 | 1038 s | 17.73 cm | 137 | 1358 s | 15.58 cm | 169 | 1678 s | 13.64 cm | 201 | 1998 s | 11.79 cm |
| 106 | 1048 s | 17.65 cm | 138 | 1368 s | 15.51 cm | 170 | 1688 s | 13.57 cm | 202 | 2008 s | 11.73 cm |
| 107 | 1058 s | 17.58 cm | 139 | 1378 s | 15.46 cm | 171 | 1698 s | 13.5 cm | 203 | 2018 s | 11.68 cm |
| 108 | 1068 s | 17.5 cm | 140 | 1388 s | 15.41 cm | 172 | 1708 s | 13.44 cm | 204 | 2028 s | 11.64 cm |
| 109 | 1078 s | 17.43 cm | 141 | 1398 s | 15.35 cm | 173 | 1718 s | 13.37 cm | 205 | 2038 s | 11.58 cm |
| 110 | 1088 s | 17.36 cm | 142 | 1408 s | 15.31 cm | 174 | 1728 s | 13.31 cm | 206 | 2048 s | 11.53 cm |
| 111 | 1098 s | 17.28 cm | 143 | 1418 s | 15.26 cm | 175 | 1738 s | 13.23 cm | 207 | 2058 s | 11.48 cm |
| 112 | 1108 s | 17.21 cm | 144 | 1428 s | 15.2 cm | 176 | 1748 s | 13.18 cm | 208 | 2068 s | 11.42 cm |
| 113 | 1118 s | 17.14 cm | 145 | 1438 s | 15.14 cm | 177 | 1758 s | 13.12 cm | 209 | 2078 s | 11.38 cm |
| 114 | 1128 s | 17.07 cm | 146 | 1448 s | 15.09 cm | 178 | 1768 s | 13.05 cm | 210 | 2088 s | 11.33 cm |
| 115 | 1138 s | 17.0 cm | 147 | 1458 s | 15.02 cm | 179 | 1778 s | 13.0 cm | 211 | 2098 s | 11.27 cm |
| 116 | 1148 s | 16.93 cm | 148 | 1468 s | 14.97 cm | 180 | 1788 s | 12.93 cm | 212 | 2108 s | 11.23 cm |
| 117 | 1158 s | 16.86 cm | 149 | 1478 s | 14.92 cm | 181 | 1798 s | 12.86 cm | 213 | 2118 s | 11.18 cm |
| 118 | 1168 s | 16.78 cm | 150 | 1488 s | 14.86 cm | 182 | 1808 s | 12.79 cm | 214 | 2128 s | 11.14 cm |
| 119 | 1178 s | 16.71 cm | 151 | 1498 s | 14.81 cm | 183 | 1818 s | 12.73 cm | 215 | 2138 s | 11.08 cm |
| 120 | 1188 s | 16.64 cm | 152 | 1508 s | 14.76 cm | 184 | 1828 s | 12.68 cm | 216 | 2148 s | 11.03 cm |
| 121 | 1198 s | 16.57 cm | 153 | 1518 s | 14.7 cm | 185 | 1838 s | 12.62 cm | 217 | 2158 s | 10.99 cm |
| 122 | 1208 s | 16.5 cm | 154 | 1528 s | 14.64 cm | 186 | 1848 s | 12.56 cm | 218 | 2168 s | 10.94 cm |
| 123 | 1218 s | 16.45 cm | 155 | 1538 s | 14.59 cm | 187 | 1858 s | 12.51 cm | 219 | 2178 s | 10.9 cm |
| 124 | 1228 s | 16.39 cm | 156 | 1548 s | 14.52 cm | 188 | 1868 s | 12.46 cm | 220 | 2188 s | 10.85 cm |
| 125 | 1238 s | 16.32 cm | 157 | 1558 s | 14.47 cm | 189 | 1878 s | 12.4 cm | 221 | 2198 s | 10.81 cm |
| 126 | 1248 s | 16.26 cm | 158 | 1568 s | 14.41 cm | 190 | 1888 s | 12.34 cm | 222 | 2208 s | 10.76 cm |
| 127 | 1258 s | 16.19 cm | 159 | 1578 s | 14.34 cm | 191 | 1898 s | 12.3 cm | 223 | 2218 s | 10.71 cm |
| 128 | 1268 s | 16.14 cm | 160 | 1588 s | 14.27 cm | 192 | 1908 s | 12.24 cm | 224 | 2228 s | 10.67 cm |
| 129 | 1278 s | 16.08 cm | 161 | 1598 s | 14.19 cm | 193 | 1918 s | 12.19 cm | 225 | 2238 s | 10.62 cm |
| 130 | 1288 s | 16.01 cm | 162 | 1608 s | 14.12 cm | 194 | 1928 s | 12.15 cm | 226 | 2248 s | 10.58 cm |
| 131 | 1298 s | 15.95 cm | 163 | 1618 s | 14.04 cm | 195 | 1938 s | 12.09 cm | 227 | 2258 s | 10.54 cm |
| 132 | 1308 s | 15.89 cm | 164 | 1628 s | 13.98 cm | 196 | 1948 s | 12.04 cm | 228 | 2268 s | 10.5 cm |

# Infiltration Report

## RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

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Upstream Technologies 651.237.5123

### nllp nw a Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 229 | 2278 s | 10.44 cm | 261 | 2598 s | 8.84 cm | 293 | 2918 s | 7.14 cm | 325 | 3238 s | 5.76 cm |
| 230 | 2288 s | 10.41 cm | 262 | 2608 s | 8.78 cm | 294 | 2928 s | 7.1 cm | 326 | 3248 s | 5.7 cm |
| 231 | 2298 s | 10.36 cm | 263 | 2618 s | 8.74 cm | 295 | 2938 s | 7.07 cm | 327 | 3258 s | 5.66 cm |
| 232 | 2308 s | 10.32 cm | 264 | 2628 s | 8.69 cm | 296 | 2948 s | 7.03 cm | 328 | 3268 s | 5.62 cm |
| 233 | 2318 s | 10.27 cm | 265 | 2638 s | 8.63 cm | 297 | 2958 s | 6.97 cm | 329 | 3278 s | 5.58 cm |
| 234 | 2328 s | 10.23 cm | 266 | 2648 s | 8.57 cm | 298 | 2968 s | 6.94 cm | 330 | 3288 s | 5.53 cm |
| 235 | 2338 s | 10.19 cm | 267 | 2658 s | 8.52 cm | 299 | 2978 s | 6.9 cm | 331 | 3298 s | 5.49 cm |
| 236 | 2348 s | 10.15 cm | 268 | 2668 s | 8.45 cm | 300 | 2988 s | 6.87 cm | 332 | 3308 s | 5.45 cm |
| 237 | 2358 s | 10.1 cm | 269 | 2678 s | 8.4 cm | 301 | 2998 s | 6.82 cm | 333 | 3318 s | 5.41 cm |
| 238 | 2368 s | 10.06 cm | 270 | 2688 s | 8.35 cm | 302 | 3008 s | 6.78 cm | 334 | 3328 s | 5.36 cm |
| 239 | 2378 s | 10.02 cm | 271 | 2698 s | 8.29 cm | 303 | 3018 s | 6.74 cm | 335 | 3338 s | 5.32 cm |
| 240 | 2388 s | 9.96 cm | 272 | 2708 s | 8.23 cm | 304 | 3028 s | 6.7 cm | 336 | 3348 s | 5.28 cm |
| 241 | 2398 s | 9.92 cm | 273 | 2718 s | 8.18 cm | 305 | 3038 s | 6.64 cm | 337 | 3358 s | 5.24 cm |
| 242 | 2408 s | 9.87 cm | 274 | 2728 s | 8.12 cm | 306 | 3048 s | 6.6 cm | 338 | 3368 s | 5.19 cm |
| 243 | 2418 s | 9.83 cm | 275 | 2738 s | 8.07 cm | 307 | 3058 s | 6.56 cm | 339 | 3378 s | 5.15 cm |
| 244 | 2428 s | 9.77 cm | 276 | 2748 s | 8.0 cm | 308 | 3068 s | 6.51 cm | 340 | 3388 s | 5.11 cm |
| 245 | 2438 s | 9.72 cm | 277 | 2758 s | 7.95 cm | 309 | 3078 s | 6.46 cm | 341 | 3398 s | 5.07 cm |
| 246 | 2448 s | 9.67 cm | 278 | 2768 s | 7.9 cm | 310 | 3088 s | 6.43 cm | 342 | 3408 s | 5.02 cm |
| 247 | 2458 s | 9.62 cm | 279 | 2778 s | 7.85 cm | 311 | 3098 s | 6.39 cm | 343 | 3418 s | 4.98 cm |
| 248 | 2468 s | 9.57 cm | 280 | 2788 s | 7.8 cm | 312 | 3108 s | 6.33 cm | | | |
| 249 | 2478 s | 9.52 cm | 281 | 2798 s | 7.75 cm | 313 | 3118 s | 6.29 cm | | | |
| 250 | 2488 s | 9.46 cm | 282 | 2808 s | 7.7 cm | 314 | 3128 s | 6.25 cm | | | |
| 251 | 2498 s | 9.4 cm | 283 | 2818 s | 7.64 cm | 315 | 3138 s | 6.21 cm | | | |
| 252 | 2508 s | 9.34 cm | 284 | 2828 s | 7.59 cm | 316 | 3148 s | 6.15 cm | | | |
| 253 | 2518 s | 9.27 cm | 285 | 2838 s | 7.54 cm | 317 | 3158 s | 6.11 cm | | | |
| 254 | 2528 s | 9.23 cm | 286 | 2848 s | 7.48 cm | 318 | 3168 s | 6.07 cm | | | |
| 255 | 2538 s | 9.18 cm | 287 | 2858 s | 7.43 cm | 319 | 3178 s | 6.02 cm | | | |
| 256 | 2548 s | 9.11 cm | 288 | 2868 s | 7.39 cm | 320 | 3188 s | 5.98 cm | | | |
| 257 | 2558 s | 9.05 cm | 289 | 2878 s | 7.33 cm | 321 | 3198 s | 5.93 cm | | | |
| 258 | 2568 s | 9.0 cm | 290 | 2888 s | 7.28 cm | 322 | 3208 s | 5.89 cm | | | |
| 259 | 2578 s | 8.94 cm | 291 | 2898 s | 7.24 cm | 323 | 3218 s | 5.84 cm | | | |
| 260 | 2588 s | 8.89 cm | 292 | 2908 s | 7.2 cm | 324 | 3228 s | 5.8 cm | | | |

# Infiltration Report

## RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

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### nllp nw b

| | |
|---|---|
| Date | 5/9/2023 |
| Time | 11:47 AM |
| Latitude | 44.884480 |
| Longitude | -93.526572 |
| Initial Volumetric Moisture | 10.00 % |
| Final Volumetric Moisture | 11.00 % |
| Cylinder Size | 3 Liter |

### nllp nw b Results

| | |
|---|---|
| Map Pin # | 5 |
| Test Number | 24072 |
| Ksat - mm/hr | 35 |
| Ksat - in/hr | 1.39 |
| Capillary Pressure C mm | -326.4 |
| RMS Error of Regression | 42 |
| Normalized RMS | 1.1% |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 s | 30.65 cm | 26 | 248 s | 27.08 cm | 51 | 498 s | 26.51 cm | 76 | 1195 s | 21.33 cm |
| 2 | 8 s | 30.49 cm | 27 | 258 s | 26.96 cm | 52 | 508 s | 26.4 cm | 77 | 1205 s | 21.24 cm |
| 3 | 18 s | 30.3 cm | 28 | 268 s | 26.86 cm | 53 | 965 s | 23.29 cm | 78 | 1215 s | 21.17 cm |
| 4 | 28 s | 30.11 cm | 29 | 278 s | 26.74 cm | 54 | 975 s | 23.19 cm | 79 | 1225 s | 21.08 cm |
| 5 | 38 s | 29.94 cm | 30 | 288 s | 26.62 cm | 55 | 985 s | 23.1 cm | 80 | 1235 s | 21.01 cm |
| 6 | 48 s | 29.77 cm | 31 | 298 s | 26.51 cm | 56 | 995 s | 23.01 cm | 81 | 1245 s | 20.92 cm |
| 7 | 58 s | 29.61 cm | 32 | 308 s | 26.4 cm | 57 | 1005 s | 22.93 cm | 82 | 1255 s | 20.85 cm |
| 8 | 68 s | 29.46 cm | 33 | 318 s | 26.29 cm | 58 | 1015 s | 22.84 cm | 83 | 1265 s | 20.76 cm |
| 9 | 78 s | 29.3 cm | 34 | 328 s | 26.17 cm | 59 | 1025 s | 22.74 cm | 84 | 1275 s | 20.69 cm |
| 10 | 88 s | 29.16 cm | 35 | 338 s | 26.07 cm | 60 | 1035 s | 22.66 cm | 85 | 1285 s | 20.6 cm |
| 11 | 98 s | 29.02 cm | 36 | 348 s | 25.95 cm | 61 | 1045 s | 22.57 cm | 86 | 1295 s | 20.53 cm |
| 12 | 108 s | 28.87 cm | 37 | 358 s | 25.84 cm | 62 | 1055 s | 22.49 cm | 87 | 1305 s | 20.45 cm |
| 13 | 118 s | 28.73 cm | 38 | 368 s | 25.74 cm | 63 | 1065 s | 22.4 cm | 88 | 1315 s | 20.37 cm |
| 14 | 128 s | 28.59 cm | 39 | 378 s | 25.62 cm | 64 | 1075 s | 22.32 cm | 89 | 1325 s | 20.3 cm |
| 15 | 138 s | 28.46 cm | 40 | 388 s | 25.51 cm | 65 | 1085 s | 22.23 cm | 90 | 1335 s | 20.22 cm |
| 16 | 148 s | 28.33 cm | 41 | 398 s | 25.42 cm | 66 | 1095 s | 22.15 cm | 91 | 1345 s | 20.15 cm |
| 17 | 158 s | 28.2 cm | 42 | 408 s | 25.31 cm | 67 | 1105 s | 22.06 cm | 92 | 1355 s | 20.07 cm |
| 18 | 168 s | 28.07 cm | 43 | 418 s | 27.44 cm | 68 | 1115 s | 21.98 cm | 93 | 1365 s | 19.99 cm |
| 19 | 178 s | 27.94 cm | 44 | 428 s | 27.32 cm | 69 | 1125 s | 21.89 cm | 94 | 1375 s | 19.9 cm |
| 20 | 188 s | 27.81 cm | 45 | 438 s | 27.21 cm | 70 | 1135 s | 21.81 cm | 95 | 1385 s | 19.82 cm |
| 21 | 198 s | 27.69 cm | 46 | 448 s | 27.08 cm | 71 | 1145 s | 21.73 cm | 96 | 1395 s | 19.73 cm |
| 22 | 208 s | 27.56 cm | 47 | 458 s | 26.96 cm | 72 | 1155 s | 21.65 cm | 97 | 1405 s | 19.65 cm |
| 23 | 218 s | 27.44 cm | 48 | 468 s | 26.86 cm | 73 | 1165 s | 21.56 cm | 98 | 1415 s | 19.56 cm |
| 24 | 228 s | 27.32 cm | 49 | 478 s | 26.74 cm | 74 | 1175 s | 21.49 cm | 99 | 1425 s | 19.49 cm |
| 25 | 238 s | 27.21 cm | 50 | 488 s | 26.62 cm | 75 | 1185 s | 21.4 cm | 100 | 1435 s | 19.4 cm |

# Infiltration Report

RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

### nllp nw b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | 1445 s | 19.32 cm | 133 | 1765 s | 16.92 cm | 165 | 2085 s | 14.84 cm | 197 | 2405 s | 12.91 cm |
| 102 | 1455 s | 19.24 cm | 134 | 1775 s | 16.86 cm | 166 | 2095 s | 14.78 cm | 198 | 2415 s | 12.86 cm |
| 103 | 1465 s | 19.16 cm | 135 | 1785 s | 16.78 cm | 167 | 2105 s | 14.71 cm | 199 | 2425 s | 12.81 cm |
| 104 | 1475 s | 19.07 cm | 136 | 1795 s | 16.72 cm | 168 | 2115 s | 14.66 cm | 200 | 2435 s | 12.74 cm |
| 105 | 1485 s | 19.0 cm | 137 | 1805 s | 16.65 cm | 169 | 2125 s | 14.6 cm | 201 | 2445 s | 12.69 cm |
| 106 | 1495 s | 18.91 cm | 138 | 1815 s | 16.59 cm | 170 | 2135 s | 14.53 cm | 202 | 2455 s | 12.64 cm |
| 107 | 1505 s | 18.84 cm | 139 | 1825 s | 16.52 cm | 171 | 2145 s | 14.47 cm | 203 | 2465 s | 12.57 cm |
| 108 | 1515 s | 18.75 cm | 140 | 1835 s | 16.45 cm | 172 | 2155 s | 14.41 cm | 204 | 2475 s | 12.52 cm |
| 109 | 1525 s | 18.68 cm | 141 | 1845 s | 16.39 cm | 173 | 2165 s | 14.35 cm | 205 | 2485 s | 12.46 cm |
| 110 | 1535 s | 18.59 cm | 142 | 1855 s | 16.32 cm | 174 | 2175 s | 14.29 cm | 206 | 2495 s | 12.4 cm |
| 111 | 1545 s | 18.52 cm | 143 | 1865 s | 16.26 cm | 175 | 2185 s | 14.22 cm | 207 | 2505 s | 12.35 cm |
| 112 | 1555 s | 18.44 cm | 144 | 1875 s | 16.19 cm | 176 | 2195 s | 14.16 cm | 208 | 2515 s | 12.3 cm |
| 113 | 1565 s | 18.37 cm | 145 | 1885 s | 16.13 cm | 177 | 2205 s | 14.11 cm | 209 | 2525 s | 12.23 cm |
| 114 | 1575 s | 18.28 cm | 146 | 1895 s | 16.06 cm | 178 | 2215 s | 14.04 cm | 210 | 2535 s | 12.18 cm |
| 115 | 1585 s | 18.21 cm | 147 | 1905 s | 15.99 cm | 179 | 2225 s | 13.98 cm | 211 | 2545 s | 12.13 cm |
| 116 | 1595 s | 18.13 cm | 148 | 1915 s | 15.93 cm | 180 | 2235 s | 13.93 cm | 212 | 2555 s | 12.07 cm |
| 117 | 1605 s | 18.06 cm | 149 | 1925 s | 15.86 cm | 181 | 2245 s | 13.86 cm | 213 | 2565 s | 12.01 cm |
| 118 | 1615 s | 17.98 cm | 150 | 1935 s | 15.8 cm | 182 | 2255 s | 13.8 cm | 214 | 2575 s | 11.96 cm |
| 119 | 1625 s | 17.91 cm | 151 | 1945 s | 15.73 cm | 183 | 2265 s | 13.75 cm | 215 | 2585 s | 11.9 cm |
| 120 | 1635 s | 17.83 cm | 152 | 1955 s | 15.66 cm | 184 | 2275 s | 13.68 cm | 216 | 2595 s | 11.85 cm |
| 121 | 1645 s | 17.76 cm | 153 | 1965 s | 15.6 cm | 185 | 2285 s | 13.63 cm | 217 | 2605 s | 11.8 cm |
| 122 | 1655 s | 17.69 cm | 154 | 1975 s | 15.53 cm | 186 | 2295 s | 13.56 cm | 218 | 2615 s | 11.74 cm |
| 123 | 1665 s | 17.61 cm | 155 | 1985 s | 15.47 cm | 187 | 2305 s | 13.5 cm | 219 | 2625 s | 11.68 cm |
| 124 | 1675 s | 17.55 cm | 156 | 1995 s | 15.41 cm | 188 | 2315 s | 13.45 cm | 220 | 2635 s | 11.63 cm |
| 125 | 1685 s | 17.47 cm | 157 | 2005 s | 15.34 cm | 189 | 2325 s | 13.38 cm | 221 | 2645 s | 11.57 cm |
| 126 | 1695 s | 17.4 cm | 158 | 2015 s | 15.28 cm | 190 | 2335 s | 13.33 cm | 222 | 2655 s | 11.52 cm |
| 127 | 1705 s | 17.33 cm | 159 | 2025 s | 15.22 cm | 191 | 2345 s | 13.27 cm | 223 | 2665 s | 11.47 cm |
| 128 | 1715 s | 17.26 cm | 160 | 2035 s | 15.15 cm | 192 | 2355 s | 13.21 cm | 224 | 2675 s | 11.41 cm |
| 129 | 1725 s | 17.2 cm | 161 | 2045 s | 15.09 cm | 193 | 2365 s | 13.16 cm | 225 | 2685 s | 11.36 cm |
| 130 | 1735 s | 17.12 cm | 162 | 2055 s | 15.03 cm | 194 | 2375 s | 13.1 cm | 226 | 2695 s | 11.31 cm |
| 131 | 1745 s | 17.06 cm | 163 | 2065 s | 14.97 cm | 195 | 2385 s | 13.03 cm | 227 | 2705 s | 11.25 cm |
| 132 | 1755 s | 16.98 cm | 164 | 2075 s | 14.91 cm | 196 | 2395 s | 12.98 cm | 228 | 2715 s | 11.2 cm |

# Infiltration Report

## RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

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### nllp nw b Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 229 | 2725 s | 11.15 cm | 261 | 3045 s | 9.49 cm | 293 | 3365 s | 7.89 cm | 325 | 3685 s | 6.4 cm |
| 230 | 2735 s | 11.09 cm | 262 | 3055 s | 9.43 cm | 294 | 3375 s | 7.83 cm | 326 | 3695 s | 6.35 cm |
| 231 | 2745 s | 11.04 cm | 263 | 3065 s | 9.39 cm | 295 | 3385 s | 7.79 cm | 327 | 3705 s | 6.3 cm |
| 232 | 2755 s | 10.99 cm | 264 | 3075 s | 9.34 cm | 296 | 3395 s | 7.74 cm | 328 | 3715 s | 6.26 cm |
| 233 | 2765 s | 10.93 cm | 265 | 3085 s | 9.28 cm | 297 | 3405 s | 7.7 cm | 329 | 3725 s | 6.22 cm |
| 234 | 2775 s | 10.88 cm | 266 | 3095 s | 9.23 cm | 298 | 3415 s | 7.64 cm | 330 | 3735 s | 6.17 cm |
| 235 | 2785 s | 10.83 cm | 267 | 3105 s | 9.19 cm | 299 | 3425 s | 7.6 cm | 331 | 3745 s | 6.12 cm |
| 236 | 2795 s | 10.77 cm | 268 | 3115 s | 9.13 cm | 300 | 3435 s | 7.55 cm | 332 | 3755 s | 6.08 cm |
| 237 | 2805 s | 10.73 cm | 269 | 3125 s | 9.08 cm | 301 | 3445 s | 7.5 cm | 333 | 3765 s | 6.03 cm |
| 238 | 2815 s | 10.68 cm | 270 | 3135 s | 9.03 cm | 302 | 3455 s | 7.45 cm | 334 | 3775 s | 5.98 cm |
| 239 | 2825 s | 10.62 cm | 271 | 3145 s | 8.98 cm | 303 | 3465 s | 7.41 cm | 335 | 3785 s | 5.94 cm |
| 240 | 2835 s | 10.57 cm | 272 | 3155 s | 8.93 cm | 304 | 3475 s | 7.37 cm | 336 | 3795 s | 5.9 cm |
| 241 | 2845 s | 10.52 cm | 273 | 3165 s | 8.88 cm | 305 | 3485 s | 7.31 cm | 337 | 3805 s | 5.85 cm |
| 242 | 2855 s | 10.47 cm | 274 | 3175 s | 8.83 cm | 306 | 3495 s | 7.27 cm | 338 | 3815 s | 5.8 cm |
| 243 | 2865 s | 10.41 cm | 275 | 3185 s | 8.78 cm | 307 | 3505 s | 7.23 cm | 339 | 3825 s | 5.76 cm |
| 244 | 2875 s | 10.36 cm | 276 | 3195 s | 8.73 cm | 308 | 3515 s | 7.17 cm | 340 | 3835 s | 5.72 cm |
| 245 | 2885 s | 10.32 cm | 277 | 3205 s | 8.68 cm | 309 | 3525 s | 7.13 cm | 341 | 3845 s | 5.67 cm |
| 246 | 2895 s | 10.26 cm | 278 | 3215 s | 8.62 cm | 310 | 3535 s | 7.09 cm | 342 | 3855 s | 5.62 cm |
| 247 | 2905 s | 10.21 cm | 279 | 3225 s | 8.58 cm | 311 | 3545 s | 7.04 cm | 343 | 3865 s | 5.58 cm |
| 248 | 2915 s | 10.16 cm | 280 | 3235 s | 8.53 cm | 312 | 3555 s | 6.99 cm | 344 | 3875 s | 5.53 cm |
| 249 | 2925 s | 10.1 cm | 281 | 3245 s | 8.47 cm | 313 | 3565 s | 6.94 cm | 345 | 3885 s | 5.49 cm |
| 250 | 2935 s | 10.06 cm | 282 | 3255 s | 8.43 cm | 314 | 3575 s | 6.9 cm | 346 | 3895 s | 5.44 cm |
| 251 | 2945 s | 10.01 cm | 283 | 3265 s | 8.38 cm | 315 | 3585 s | 6.85 cm | 347 | 3905 s | 5.4 cm |
| 252 | 2955 s | 9.95 cm | 284 | 3275 s | 8.32 cm | 316 | 3595 s | 6.8 cm | 348 | 3915 s | 5.35 cm |
| 253 | 2965 s | 9.9 cm | 285 | 3285 s | 8.28 cm | 317 | 3605 s | 6.76 cm | 349 | 3925 s | 5.31 cm |
| 254 | 2975 s | 9.85 cm | 286 | 3295 s | 8.23 cm | 318 | 3615 s | 6.72 cm | 350 | 3935 s | 5.27 cm |
| 255 | 2985 s | 9.79 cm | 287 | 3305 s | 8.18 cm | 319 | 3625 s | 6.67 cm | 351 | 3945 s | 5.23 cm |
| 256 | 2995 s | 9.74 cm | 288 | 3315 s | 8.13 cm | 320 | 3635 s | 6.62 cm | 352 | 3955 s | 5.17 cm |
| 257 | 3005 s | 9.7 cm | 289 | 3325 s | 8.08 cm | 321 | 3645 s | 6.58 cm | 353 | 3965 s | 5.13 cm |
| 258 | 3015 s | 9.65 cm | 290 | 3335 s | 8.04 cm | 322 | 3655 s | 6.54 cm | 354 | 3975 s | 5.09 cm |
| 259 | 3025 s | 9.59 cm | 291 | 3345 s | 7.98 cm | 323 | 3665 s | 6.49 cm | 355 | 3985 s | 5.04 cm |
| 260 | 3035 s | 9.54 cm | 292 | 3355 s | 7.93 cm | 324 | 3675 s | 6.44 cm | 356 | 3995 s | 5.0 cm |

# Infiltration Report

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## North Lotus Lake Park - LL-23-01 - Chanhassen

### nllp nw b Readings continued

| # | Time | Head |
|---|---|---|
| 357 | 4005 s | 4.96 cm |

# Infiltration Report

## RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

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### nllp nw c

| | |
|---|---|
| Date | 5/9/2023 |
| Time | 11:48 AM |
| Latitude | 44.884475 |
| Longitude | -93.526531 |
| Initial Volumetric Moisture | 10.00 % |
| Final Volumetric Moisture | 11.00 % |
| Cylinder Size | 3 Liter |

### nllp nw c Results

| | |
|---|---|
| Map Pin # | 6 |
| Test Number | 24073 |
| Ksat - mm/hr | 89 |
| Ksat - in/hr | 3.52 |
| Capillary Pressure C mm | -55.7 |
| RMS Error of Regression | 65 |
| Normalized RMS | 2.0% |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 s | 31.03 cm | 26 | 249 s | 27.2 cm | 51 | 499 s | 24.4 cm | 76 | 749 s | 22.05 cm |
| 2 | 9 s | 30.87 cm | 27 | 259 s | 27.07 cm | 52 | 509 s | 24.29 cm | 77 | 759 s | 21.97 cm |
| 3 | 19 s | 30.68 cm | 28 | 269 s | 26.94 cm | 53 | 519 s | 24.19 cm | 78 | 769 s | 21.88 cm |
| 4 | 29 s | 30.5 cm | 29 | 279 s | 26.86 cm | 54 | 529 s | 24.09 cm | 79 | 779 s | 21.8 cm |
| 5 | 39 s | 30.31 cm | 30 | 289 s | 26.7 cm | 55 | 539 s | 23.99 cm | 80 | 789 s | 21.71 cm |
| 6 | 49 s | 30.13 cm | 31 | 299 s | 26.58 cm | 56 | 549 s | 23.88 cm | 81 | 799 s | 21.63 cm |
| 7 | 59 s | 29.95 cm | 32 | 309 s | 26.46 cm | 57 | 559 s | 23.79 cm | 82 | 809 s | 21.54 cm |
| 8 | 69 s | 29.78 cm | 33 | 319 s | 26.34 cm | 58 | 569 s | 23.69 cm | 83 | 819 s | 21.46 cm |
| 9 | 79 s | 29.61 cm | 34 | 329 s | 26.24 cm | 59 | 579 s | 23.6 cm | 84 | 829 s | 21.37 cm |
| 10 | 89 s | 29.44 cm | 35 | 339 s | 26.12 cm | 60 | 589 s | 23.49 cm | 85 | 839 s | 21.29 cm |
| 11 | 99 s | 29.28 cm | 36 | 349 s | 26.0 cm | 61 | 599 s | 23.4 cm | 86 | 849 s | 21.21 cm |
| 12 | 109 s | 29.13 cm | 37 | 359 s | 25.89 cm | 62 | 609 s | 23.31 cm | 87 | 859 s | 21.13 cm |
| 13 | 119 s | 28.97 cm | 38 | 369 s | 25.78 cm | 63 | 619 s | 23.21 cm | 88 | 869 s | 21.04 cm |
| 14 | 129 s | 28.83 cm | 39 | 379 s | 25.67 cm | 64 | 629 s | 23.12 cm | 89 | 879 s | 20.97 cm |
| 15 | 139 s | 28.68 cm | 40 | 389 s | 25.56 cm | 65 | 639 s | 23.03 cm | 90 | 889 s | 20.88 cm |
| 16 | 149 s | 28.54 cm | 41 | 399 s | 25.45 cm | 66 | 649 s | 22.94 cm | 91 | 899 s | 20.8 cm |
| 17 | 159 s | 28.39 cm | 42 | 409 s | 25.34 cm | 67 | 659 s | 22.85 cm | 92 | 909 s | 20.71 cm |
| 18 | 169 s | 28.25 cm | 43 | 419 s | 25.24 cm | 68 | 669 s | 22.76 cm | 93 | 919 s | 20.64 cm |
| 19 | 179 s | 28.11 cm | 44 | 429 s | 25.13 cm | 69 | 679 s | 22.67 cm | 94 | 929 s | 20.55 cm |
| 20 | 189 s | 27.97 cm | 45 | 439 s | 25.01 cm | 70 | 689 s | 22.57 cm | 95 | 939 s | 20.48 cm |
| 21 | 199 s | 27.84 cm | 46 | 449 s | 24.92 cm | 71 | 699 s | 22.49 cm | 96 | 949 s | 20.4 cm |
| 22 | 209 s | 27.71 cm | 47 | 459 s | 24.81 cm | 72 | 709 s | 22.4 cm | 97 | 959 s | 20.32 cm |
| 23 | 219 s | 27.58 cm | 48 | 469 s | 24.69 cm | 73 | 719 s | 22.31 cm | 98 | 969 s | 20.24 cm |
| 24 | 229 s | 27.45 cm | 49 | 479 s | 24.6 cm | 74 | 729 s | 22.22 cm | 99 | 979 s | 20.16 cm |
| 25 | 239 s | 27.32 cm | 50 | 489 s | 24.49 cm | 75 | 739 s | 22.14 cm | 100 | 989 s | 20.08 cm |

# Infiltration Report

## RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

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### nllp nw c Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 101 | 999 s | 20.01 cm | 133 | 1319 s | 17.62 cm | 165 | 1639 s | 15.48 cm | 197 | 1959 s | 13.51 cm |
| 102 | 1009 s | 19.92 cm | 134 | 1329 s | 17.55 cm | 166 | 1649 s | 15.42 cm | 198 | 1969 s | 13.45 cm |
| 103 | 1019 s | 19.85 cm | 135 | 1339 s | 17.48 cm | 167 | 1659 s | 15.35 cm | 199 | 1979 s | 13.39 cm |
| 104 | 1029 s | 19.77 cm | 136 | 1349 s | 17.41 cm | 168 | 1669 s | 15.29 cm | 200 | 1989 s | 13.34 cm |
| 105 | 1039 s | 19.7 cm | 137 | 1359 s | 17.33 cm | 169 | 1679 s | 15.23 cm | 201 | 1999 s | 13.29 cm |
| 106 | 1049 s | 19.62 cm | 138 | 1369 s | 17.27 cm | 170 | 1689 s | 15.16 cm | 202 | 2009 s | 13.22 cm |
| 107 | 1059 s | 19.54 cm | 139 | 1379 s | 17.2 cm | 171 | 1699 s | 15.1 cm | 203 | 2019 s | 13.17 cm |
| 108 | 1069 s | 19.46 cm | 140 | 1389 s | 17.13 cm | 172 | 1709 s | 15.03 cm | 204 | 2029 s | 13.11 cm |
| 109 | 1079 s | 19.39 cm | 141 | 1399 s | 17.06 cm | 173 | 1719 s | 14.97 cm | 205 | 2039 s | 13.05 cm |
| 110 | 1089 s | 19.32 cm | 142 | 1409 s | 16.99 cm | 174 | 1729 s | 14.91 cm | 206 | 2049 s | 13.0 cm |
| 111 | 1099 s | 19.24 cm | 143 | 1419 s | 16.92 cm | 175 | 1739 s | 14.84 cm | 207 | 2059 s | 12.94 cm |
| 112 | 1109 s | 19.17 cm | 144 | 1429 s | 16.86 cm | 176 | 1749 s | 14.79 cm | 208 | 2069 s | 12.88 cm |
| 113 | 1119 s | 19.09 cm | 145 | 1439 s | 16.79 cm | 177 | 1759 s | 14.73 cm | 209 | 2079 s | 12.83 cm |
| 114 | 1129 s | 19.02 cm | 146 | 1449 s | 16.73 cm | 178 | 1769 s | 14.66 cm | 210 | 2089 s | 12.77 cm |
| 115 | 1139 s | 18.94 cm | 147 | 1459 s | 16.65 cm | 179 | 1779 s | 14.6 cm | 211 | 2099 s | 12.71 cm |
| 116 | 1149 s | 18.86 cm | 148 | 1469 s | 16.59 cm | 180 | 1789 s | 14.54 cm | 212 | 2109 s | 12.66 cm |
| 117 | 1159 s | 18.78 cm | 149 | 1479 s | 16.52 cm | 181 | 1799 s | 14.48 cm | 213 | 2119 s | 12.6 cm |
| 118 | 1169 s | 18.71 cm | 150 | 1489 s | 16.46 cm | 182 | 1809 s | 14.42 cm | 214 | 2129 s | 12.54 cm |
| 119 | 1179 s | 18.63 cm | 151 | 1499 s | 16.4 cm | 183 | 1819 s | 14.35 cm | 215 | 2139 s | 12.49 cm |
| 120 | 1189 s | 18.56 cm | 152 | 1509 s | 16.33 cm | 184 | 1829 s | 14.3 cm | 216 | 2149 s | 12.44 cm |
| 121 | 1199 s | 18.48 cm | 153 | 1519 s | 16.27 cm | 185 | 1839 s | 14.24 cm | 217 | 2159 s | 12.38 cm |
| 122 | 1209 s | 18.41 cm | 154 | 1529 s | 16.19 cm | 186 | 1849 s | 14.17 cm | 218 | 2169 s | 12.33 cm |
| 123 | 1219 s | 18.34 cm | 155 | 1539 s | 16.13 cm | 187 | 1859 s | 14.12 cm | 219 | 2179 s | 12.26 cm |
| 124 | 1229 s | 18.26 cm | 156 | 1549 s | 16.07 cm | 188 | 1869 s | 14.05 cm | 220 | 2189 s | 12.21 cm |
| 125 | 1239 s | 18.19 cm | 157 | 1559 s | 16.0 cm | 189 | 1879 s | 13.99 cm | 221 | 2199 s | 12.16 cm |
| 126 | 1249 s | 18.11 cm | 158 | 1569 s | 15.93 cm | 190 | 1889 s | 13.93 cm | 222 | 2209 s | 12.11 cm |
| 127 | 1259 s | 18.05 cm | 159 | 1579 s | 15.86 cm | 191 | 1899 s | 13.87 cm | 223 | 2219 s | 12.05 cm |
| 128 | 1269 s | 17.97 cm | 160 | 1589 s | 15.8 cm | 192 | 1909 s | 13.81 cm | 224 | 2229 s | 12.0 cm |
| 129 | 1279 s | 17.9 cm | 161 | 1599 s | 15.74 cm | 193 | 1919 s | 13.75 cm | 225 | 2239 s | 11.95 cm |
| 130 | 1289 s | 17.83 cm | 162 | 1609 s | 15.67 cm | 194 | 1929 s | 13.68 cm | 226 | 2249 s | 11.89 cm |
| 131 | 1299 s | 17.76 cm | 163 | 1619 s | 15.61 cm | 195 | 1939 s | 13.64 cm | 227 | 2259 s | 11.83 cm |
| 132 | 1309 s | 17.69 cm | 164 | 1629 s | 15.55 cm | 196 | 1949 s | 13.57 cm | 228 | 2269 s | 11.78 cm |

# Infiltration Report

RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

### nllp nw c Readings continued

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 229 | 2279 s | 11.72 cm | 261 | 2599 s | 10.04 cm | 293 | 2919 s | 8.4 cm | 325 | 3239 s | 6.89 cm |
| 230 | 2289 s | 11.67 cm | 262 | 2609 s | 9.98 cm | 294 | 2929 s | 8.36 cm | 326 | 3249 s | 6.83 cm |
| 231 | 2299 s | 11.62 cm | 263 | 2619 s | 9.92 cm | 295 | 2939 s | 8.3 cm | 327 | 3259 s | 6.79 cm |
| 232 | 2309 s | 11.56 cm | 264 | 2629 s | 9.87 cm | 296 | 2949 s | 8.25 cm | 328 | 3269 s | 6.74 cm |
| 233 | 2319 s | 11.51 cm | 265 | 2639 s | 9.83 cm | 297 | 2959 s | 8.2 cm | 329 | 3279 s | 6.68 cm |
| 234 | 2329 s | 11.47 cm | 266 | 2649 s | 9.77 cm | 298 | 2969 s | 8.15 cm | 330 | 3289 s | 6.64 cm |
| 235 | 2339 s | 11.41 cm | 267 | 2659 s | 9.72 cm | 299 | 2979 s | 8.1 cm | 331 | 3299 s | 6.59 cm |
| 236 | 2349 s | 11.36 cm | 268 | 2669 s | 9.67 cm | 300 | 2989 s | 8.05 cm | 332 | 3309 s | 6.55 cm |
| 237 | 2359 s | 11.31 cm | 269 | 2679 s | 9.61 cm | 301 | 2999 s | 8.0 cm | 333 | 3319 s | 6.49 cm |
| 238 | 2369 s | 11.25 cm | 270 | 2689 s | 9.57 cm | 302 | 3009 s | 7.95 cm | 334 | 3329 s | 6.44 cm |
| 239 | 2379 s | 11.2 cm | 271 | 2699 s | 9.52 cm | 303 | 3019 s | 7.91 cm | 335 | 3339 s | 6.39 cm |
| 240 | 2389 s | 11.15 cm | 272 | 2709 s | 9.46 cm | 304 | 3029 s | 7.86 cm | 336 | 3349 s | 6.35 cm |
| 241 | 2399 s | 11.09 cm | 273 | 2719 s | 9.41 cm | 305 | 3039 s | 7.81 cm | 337 | 3359 s | 6.29 cm |
| 242 | 2409 s | 11.04 cm | 274 | 2729 s | 9.37 cm | 306 | 3049 s | 7.76 cm | 338 | 3369 s | 6.25 cm |
| 243 | 2419 s | 10.99 cm | 275 | 2739 s | 9.31 cm | 307 | 3059 s | 7.72 cm | 339 | 3379 s | 6.19 cm |
| 244 | 2429 s | 10.94 cm | 276 | 2749 s | 9.26 cm | 308 | 3069 s | 7.67 cm | 340 | 3389 s | 6.14 cm |
| 245 | 2439 s | 10.89 cm | 277 | 2759 s | 9.21 cm | 309 | 3079 s | 7.62 cm | 341 | 3399 s | 6.09 cm |
| 246 | 2449 s | 10.84 cm | 278 | 2769 s | 9.16 cm | 310 | 3089 s | 7.58 cm | 342 | 3409 s | 6.03 cm |
| 247 | 2459 s | 10.78 cm | 279 | 2779 s | 9.1 cm | 311 | 3099 s | 7.54 cm | 343 | 3419 s | 5.98 cm |
| 248 | 2469 s | 10.73 cm | 280 | 2789 s | 9.05 cm | 312 | 3109 s | 7.49 cm | 344 | 3429 s | 5.92 cm |
| 249 | 2479 s | 10.68 cm | 281 | 2799 s | 9.01 cm | 313 | 3119 s | 7.44 cm | 345 | 3439 s | 5.86 cm |
| 250 | 2489 s | 10.62 cm | 282 | 2809 s | 8.95 cm | 314 | 3129 s | 7.4 cm | 346 | 3449 s | 5.81 cm |
| 251 | 2499 s | 10.56 cm | 283 | 2819 s | 8.9 cm | 315 | 3139 s | 7.36 cm | 347 | 3459 s | 5.76 cm |
| 252 | 2509 s | 10.51 cm | 284 | 2829 s | 8.85 cm | 316 | 3149 s | 7.3 cm | 348 | 3469 s | 5.69 cm |
| 253 | 2519 s | 10.47 cm | 285 | 2839 s | 8.8 cm | 317 | 3159 s | 7.26 cm | 349 | 3479 s | 5.64 cm |
| 254 | 2529 s | 10.4 cm | 286 | 2849 s | 8.75 cm | 318 | 3169 s | 7.22 cm | 350 | 3489 s | 5.58 cm |
| 255 | 2539 s | 10.35 cm | 287 | 2859 s | 8.7 cm | 319 | 3179 s | 7.17 cm | 351 | 3499 s | 5.52 cm |
| 256 | 2549 s | 10.29 cm | 288 | 2869 s | 8.64 cm | 320 | 3189 s | 7.12 cm | 352 | 3509 s | 5.46 cm |
| 257 | 2559 s | 10.24 cm | 289 | 2879 s | 8.6 cm | 321 | 3199 s | 7.08 cm | 353 | 3519 s | 5.4 cm |
| 258 | 2569 s | 10.19 cm | 290 | 2889 s | 8.55 cm | 322 | 3209 s | 7.03 cm | 354 | 3529 s | 5.33 cm |
| 259 | 2579 s | 10.13 cm | 291 | 2899 s | 8.49 cm | 323 | 3219 s | 6.98 cm | 355 | 3539 s | 5.28 cm |
| 260 | 2589 s | 10.08 cm | 292 | 2909 s | 8.45 cm | 324 | 3229 s | 6.93 cm | 356 | 3549 s | 5.21 cm |

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# Infiltration Report

## RPBCWD

Upstream Technologies
651.237.5123

## North Lotus Lake Park - LL-23-01 - Chanhassen

### nllp nw c Readings continued

| # | Time | Head |
|---|---|---|
| 357 | 3559 s | 5.15 cm |
| 358 | 3569 s | 5.1 cm |
| 359 | 3579 s | 5.05 cm |
| 360 | 3589 s | 5.0 cm |

# Infiltration Report

## RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

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651.237.5123

### nllp se a

| | |
|---|---|
| Date | 5/10/2023 |
| Time | 9:10 AM |
| Latitude | 44.883932 |
| Longitude | -93.526103 |
| Initial Volumetric Moisture | 0.00 % |
| Final Volumetric Moisture | 15.00 % |
| Cylinder Size | 3 Liter |

### nllp se a Results

| | |
|---|---|
| Map Pin # | 7 |
| Test Number | 24074 |
| Ksat - mm/hr | 169 |
| Ksat - in/hr | 6.64 |
| Capillary Pressure C mm | -102.1 |
| RMS Error of Regression | 7.0 |
| Normalized RMS | 0.6% |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 s | 29.09 cm | 26 | 248 s | 22.01 cm | 51 | 498 s | 16.98 cm | 76 | 748 s | 12.83 cm |
| 2 | 8 s | 28.62 cm | 27 | 258 s | 21.79 cm | 52 | 508 s | 16.8 cm | 77 | 758 s | 12.68 cm |
| 3 | 18 s | 28.2 cm | 28 | 268 s | 21.56 cm | 53 | 518 s | 16.62 cm | 78 | 768 s | 12.52 cm |
| 4 | 28 s | 27.82 cm | 29 | 278 s | 21.34 cm | 54 | 528 s | 16.45 cm | 79 | 778 s | 12.37 cm |
| 5 | 38 s | 27.48 cm | 30 | 288 s | 21.12 cm | 55 | 538 s | 16.27 cm | 80 | 788 s | 12.22 cm |
| 6 | 48 s | 27.17 cm | 31 | 298 s | 20.9 cm | 56 | 548 s | 16.1 cm | 81 | 798 s | 12.07 cm |
| 7 | 58 s | 26.87 cm | 32 | 308 s | 20.69 cm | 57 | 558 s | 15.93 cm | 82 | 808 s | 11.92 cm |
| 8 | 68 s | 26.58 cm | 33 | 318 s | 20.47 cm | 58 | 568 s | 15.76 cm | 83 | 818 s | 11.79 cm |
| 9 | 78 s | 26.29 cm | 34 | 328 s | 20.25 cm | 59 | 578 s | 15.58 cm | 84 | 828 s | 11.64 cm |
| 10 | 88 s | 26.01 cm | 35 | 338 s | 20.05 cm | 60 | 588 s | 15.41 cm | 85 | 838 s | 11.49 cm |
| 11 | 98 s | 25.74 cm | 36 | 348 s | 19.85 cm | 61 | 598 s | 15.25 cm | 86 | 848 s | 11.35 cm |
| 12 | 108 s | 25.47 cm | 37 | 358 s | 19.65 cm | 62 | 608 s | 15.08 cm | 87 | 858 s | 11.2 cm |
| 13 | 118 s | 25.2 cm | 38 | 368 s | 19.45 cm | 63 | 618 s | 14.91 cm | 88 | 868 s | 11.06 cm |
| 14 | 128 s | 24.93 cm | 39 | 378 s | 19.25 cm | 64 | 628 s | 14.75 cm | 89 | 878 s | 10.92 cm |
| 15 | 138 s | 24.67 cm | 40 | 388 s | 19.06 cm | 65 | 638 s | 14.58 cm | 90 | 888 s | 10.78 cm |
| 16 | 148 s | 24.41 cm | 41 | 398 s | 18.87 cm | 66 | 648 s | 14.42 cm | 91 | 898 s | 10.65 cm |
| 17 | 158 s | 24.16 cm | 42 | 408 s | 18.68 cm | 67 | 658 s | 14.26 cm | 92 | 908 s | 10.5 cm |
| 18 | 168 s | 23.92 cm | 43 | 418 s | 18.48 cm | 68 | 668 s | 14.09 cm | 93 | 918 s | 10.36 cm |
| 19 | 178 s | 23.66 cm | 44 | 428 s | 18.28 cm | 69 | 678 s | 13.93 cm | 94 | 928 s | 10.22 cm |
| 20 | 188 s | 23.42 cm | 45 | 438 s | 18.09 cm | 70 | 688 s | 13.77 cm | 95 | 938 s | 10.08 cm |
| 21 | 198 s | 23.18 cm | 46 | 448 s | 17.9 cm | 71 | 698 s | 13.61 cm | 96 | 948 s | 9.94 cm |
| 22 | 208 s | 22.94 cm | 47 | 458 s | 17.72 cm | 72 | 708 s | 13.45 cm | 97 | 958 s | 9.82 cm |
| 23 | 218 s | 22.7 cm | 48 | 468 s | 17.53 cm | 73 | 718 s | 13.3 cm | 98 | 968 s | 9.68 cm |
| 24 | 228 s | 22.47 cm | 49 | 478 s | 17.35 cm | 74 | 728 s | 13.14 cm | 99 | 978 s | 9.54 cm |
| 25 | 238 s | 22.23 cm | 50 | 488 s | 17.16 cm | 75 | 738 s | 12.99 cm | 100 | 988 s | 9.41 cm |

# Infiltration Report

## RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

### nllp se a Readings continued

| # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|
| 101 | 998 s | 9.27 cm | 133 | 1318 s | 5.25 cm |
| 102 | 1008 s | 9.13 cm | 134 | 1328 s | 5.13 cm |
| 103 | 1018 s | 9.0 cm | | | |
| 104 | 1028 s | 8.87 cm | | | |
| 105 | 1038 s | 8.73 cm | | | |
| 106 | 1048 s | 8.59 cm | | | |
| 107 | 1058 s | 8.46 cm | | | |
| 108 | 1068 s | 8.34 cm | | | |
| 109 | 1078 s | 8.21 cm | | | |
| 110 | 1088 s | 8.08 cm | | | |
| 111 | 1098 s | 7.95 cm | | | |
| 112 | 1108 s | 7.83 cm | | | |
| 113 | 1118 s | 7.71 cm | | | |
| 114 | 1128 s | 7.59 cm | | | |
| 115 | 1138 s | 7.46 cm | | | |
| 116 | 1148 s | 7.34 cm | | | |
| 117 | 1158 s | 7.22 cm | | | |
| 118 | 1168 s | 7.1 cm | | | |
| 119 | 1178 s | 6.98 cm | | | |
| 120 | 1188 s | 6.84 cm | | | |
| 121 | 1198 s | 6.73 cm | | | |
| 122 | 1208 s | 6.6 cm | | | |
| 123 | 1218 s | 6.47 cm | | | |
| 124 | 1228 s | 6.34 cm | | | |
| 125 | 1238 s | 6.23 cm | | | |
| 126 | 1248 s | 6.1 cm | | | |
| 127 | 1258 s | 5.97 cm | | | |
| 128 | 1268 s | 5.84 cm | | | |
| 129 | 1278 s | 5.73 cm | | | |
| 130 | 1288 s | 5.6 cm | | | |
| 131 | 1298 s | 5.48 cm | | | |
| 132 | 1308 s | 5.36 cm | | | |

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# Infiltration Report

## RPBCWD

Upstream Technologies
651.237.5123

## North Lotus Lake Park - LL-23-01 - Chanhassen

### nllp se b

| | |
|---|---|
| Date | 5/10/2023 |
| Time | 9:11 AM |
| Latitude | 44.883931 |
| Longitude | -93.526115 |
| Initial Volumetric Moisture | 0.00 % |
| Final Volumetric Moisture | 10.00 % |
| Cylinder Size | 3 Liter |

### nllp se b Results

| | |
|---|---|
| Map Pin # | 8 |
| Test Number | 24075 |
| Ksat - mm/hr | 158 |
| Ksat - in/hr | 6.21 |
| Capillary Pressure C mm | -89.8 |
| RMS Error of Regression | 3.7 |
| Normalized RMS | 0.3% |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 s | 29.29 cm | 26 | 249 s | 23.15 cm | 51 | 499 s | 18.52 cm | 76 | 749 s | 14.58 cm |
| 2 | 9 s | 28.82 cm | 27 | 259 s | 22.95 cm | 52 | 509 s | 18.35 cm | 77 | 759 s | 14.44 cm |
| 3 | 19 s | 28.45 cm | 28 | 269 s | 22.74 cm | 53 | 519 s | 18.19 cm | 78 | 769 s | 14.29 cm |
| 4 | 29 s | 28.15 cm | 29 | 279 s | 22.55 cm | 54 | 529 s | 18.02 cm | 79 | 779 s | 14.15 cm |
| 5 | 39 s | 27.88 cm | 30 | 289 s | 22.35 cm | 55 | 539 s | 17.85 cm | 80 | 789 s | 14.0 cm |
| 6 | 49 s | 27.61 cm | 31 | 299 s | 22.15 cm | 56 | 549 s | 17.68 cm | 81 | 799 s | 13.85 cm |
| 7 | 59 s | 27.37 cm | 32 | 309 s | 21.96 cm | 57 | 559 s | 17.52 cm | 82 | 809 s | 13.71 cm |
| 8 | 69 s | 27.12 cm | 33 | 319 s | 21.76 cm | 58 | 569 s | 17.36 cm | 83 | 819 s | 13.56 cm |
| 9 | 79 s | 26.89 cm | 34 | 329 s | 21.57 cm | 59 | 579 s | 17.19 cm | 84 | 829 s | 13.42 cm |
| 10 | 89 s | 26.65 cm | 35 | 339 s | 21.38 cm | 60 | 589 s | 17.03 cm | 85 | 839 s | 13.27 cm |
| 11 | 99 s | 26.43 cm | 36 | 349 s | 21.19 cm | 61 | 599 s | 16.87 cm | 86 | 849 s | 13.13 cm |
| 12 | 109 s | 26.21 cm | 37 | 359 s | 21.01 cm | 62 | 609 s | 16.71 cm | 87 | 859 s | 12.98 cm |
| 13 | 119 s | 25.97 cm | 38 | 369 s | 20.82 cm | 63 | 619 s | 16.55 cm | 88 | 869 s | 12.84 cm |
| 14 | 129 s | 25.74 cm | 39 | 379 s | 20.64 cm | 64 | 629 s | 16.4 cm | 89 | 879 s | 12.69 cm |
| 15 | 139 s | 25.51 cm | 40 | 389 s | 20.45 cm | 65 | 639 s | 16.24 cm | 90 | 889 s | 12.55 cm |
| 16 | 149 s | 25.29 cm | 41 | 399 s | 20.26 cm | 66 | 649 s | 16.09 cm | 91 | 899 s | 12.41 cm |
| 17 | 159 s | 25.07 cm | 42 | 409 s | 20.08 cm | 67 | 659 s | 15.93 cm | 92 | 909 s | 12.28 cm |
| 18 | 169 s | 24.85 cm | 43 | 419 s | 19.91 cm | 68 | 669 s | 15.78 cm | 93 | 919 s | 12.14 cm |
| 19 | 179 s | 24.64 cm | 44 | 429 s | 19.73 cm | 69 | 679 s | 15.63 cm | 94 | 929 s | 11.99 cm |
| 20 | 189 s | 24.42 cm | 45 | 439 s | 19.55 cm | 70 | 689 s | 15.47 cm | 95 | 939 s | 11.85 cm |
| 21 | 199 s | 24.2 cm | 46 | 449 s | 19.38 cm | 71 | 699 s | 15.31 cm | 96 | 949 s | 11.71 cm |
| 22 | 209 s | 23.99 cm | 47 | 459 s | 19.2 cm | 72 | 709 s | 15.16 cm | 97 | 959 s | 11.57 cm |
| 23 | 219 s | 23.78 cm | 48 | 469 s | 19.03 cm | 73 | 719 s | 15.01 cm | 98 | 969 s | 11.42 cm |
| 24 | 229 s | 23.58 cm | 49 | 479 s | 18.86 cm | 74 | 729 s | 14.87 cm | 99 | 979 s | 11.29 cm |
| 25 | 239 s | 23.36 cm | 50 | 489 s | 18.68 cm | 75 | 739 s | 14.73 cm | 100 | 989 s | 11.15 cm |

# Infiltration Report

## RPBCWD

## North Lotus Lake Park - LL-23-01 - Chanhassen

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### nllp se b Readings continued

| # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|
| 101 | 999 s | 11.02 cm | 133 | 1319 s | 7.46 cm |
| 102 | 1009 s | 10.89 cm | 134 | 1329 s | 7.36 cm |
| 103 | 1019 s | 10.75 cm | 135 | 1339 s | 7.25 cm |
| 104 | 1029 s | 10.62 cm | 136 | 1349 s | 7.14 cm |
| 105 | 1039 s | 10.49 cm | 137 | 1359 s | 7.04 cm |
| 106 | 1049 s | 10.36 cm | 138 | 1369 s | 6.93 cm |
| 107 | 1059 s | 10.22 cm | 139 | 1379 s | 6.82 cm |
| 108 | 1069 s | 10.09 cm | 140 | 1389 s | 6.72 cm |
| 109 | 1079 s | 9.96 cm | 141 | 1399 s | 6.61 cm |
| 110 | 1089 s | 9.85 cm | 142 | 1409 s | 6.5 cm |
| 111 | 1099 s | 9.72 cm | 143 | 1419 s | 6.4 cm |
| 112 | 1109 s | 9.59 cm | 144 | 1429 s | 6.29 cm |
| 113 | 1119 s | 9.82 cm | 145 | 1439 s | 6.18 cm |
| 114 | 1129 s | 9.69 cm | 146 | 1449 s | 6.09 cm |
| 115 | 1139 s | 9.57 cm | 147 | 1459 s | 5.98 cm |
| 116 | 1149 s | 9.44 cm | 148 | 1469 s | 5.87 cm |
| 117 | 1159 s | 9.31 cm | 149 | 1479 s | 5.78 cm |
| 118 | 1169 s | 9.2 cm | 150 | 1489 s | 5.67 cm |
| 119 | 1179 s | 9.08 cm | 151 | 1499 s | 5.58 cm |
| 120 | 1189 s | 8.95 cm | 152 | 1509 s | 5.47 cm |
| 121 | 1199 s | 8.84 cm | 153 | 1519 s | 5.37 cm |
| 122 | 1209 s | 8.72 cm | 154 | 1529 s | 5.27 cm |
| 123 | 1219 s | 8.6 cm | 155 | 1539 s | 5.16 cm |
| 124 | 1229 s | 8.48 cm | 156 | 1549 s | 5.07 cm |
| 125 | 1239 s | 8.37 cm | | | |
| 126 | 1249 s | 8.25 cm | | | |
| 127 | 1259 s | 8.14 cm | | | |
| 128 | 1269 s | 8.03 cm | | | |
| 129 | 1279 s | 7.91 cm | | | |
| 130 | 1289 s | 7.79 cm | | | |
| 131 | 1299 s | 7.69 cm | | | |
| 132 | 1309 s | 7.58 cm | | | |

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# Infiltration Report

## RPBCWD

Upstream Technologies
651.237.5123

## North Lotus Lake Park - LL-23-01 - Chanhassen

### nllp se c

| | |
|---|---|
| Date | 5/10/2023 |
| Time | 9:14 AM |
| Latitude | 44.883930 |
| Longitude | -93.526109 |
| Initial Volumetric Moisture | 5.00 % |
| Final Volumetric Moisture | 6.00 % |
| Cylinder Size | 3 Liter |

### nllp se c Results

| | |
|---|---|
| Map Pin # | 9 |
| Test Number | 24076 |
| Ksat - mm/hr | 376 |
| Ksat - in/hr | 14.8 |
| Capillary Pressure C mm | -63.9 |
| RMS Error of Regression | 2.7 |
| Normalized RMS | 0.4% |

### Readings

| # | Time | Head | # | Time | Head | # | Time | Head | # | Time | Head |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0 s | 29.56 cm | 26 | 239 s | 19.38 cm | 51 | 489 s | 11.89 cm | 76 | 739 s | 6.4 cm |
| 2 | 2 s | 29.42 cm | 27 | 249 s | 19.04 cm | 52 | 499 s | 11.64 cm | 77 | 749 s | 6.21 cm |
| 3 | 9 s | 29.04 cm | 28 | 259 s | 18.7 cm | 53 | 509 s | 11.38 cm | 78 | 759 s | 6.01 cm |
| 4 | 19 s | 28.53 cm | 29 | 269 s | 18.36 cm | 54 | 519 s | 11.13 cm | 79 | 769 s | 5.82 cm |
| 5 | 29 s | 28.03 cm | 30 | 279 s | 18.02 cm | 55 | 529 s | 10.88 cm | 80 | 779 s | 5.62 cm |
| 6 | 39 s | 27.56 cm | 31 | 289 s | 17.69 cm | 56 | 539 s | 10.64 cm | 81 | 789 s | 5.42 cm |
| 7 | 49 s | 27.09 cm | 32 | 299 s | 17.37 cm | 57 | 549 s | 10.4 cm | 82 | 799 s | 5.21 cm |
| 8 | 59 s | 26.62 cm | 33 | 309 s | 17.05 cm | 58 | 559 s | 10.17 cm | | | |
| 9 | 69 s | 26.17 cm | 34 | 319 s | 16.73 cm | 59 | 569 s | 9.93 cm | | | |
| 10 | 79 s | 25.72 cm | 35 | 329 s | 16.42 cm | 60 | 579 s | 9.71 cm | | | |
| 11 | 89 s | 25.27 cm | 36 | 339 s | 16.11 cm | 61 | 589 s | 9.47 cm | | | |
| 12 | 99 s | 24.83 cm | 37 | 349 s | 15.8 cm | 62 | 599 s | 9.26 cm | | | |
| 13 | 109 s | 24.4 cm | 38 | 359 s | 15.49 cm | 63 | 609 s | 9.04 cm | | | |
| 14 | 119 s | 23.97 cm | 39 | 369 s | 15.19 cm | 64 | 619 s | 8.83 cm | | | |
| 15 | 129 s | 23.55 cm | 40 | 379 s | 14.91 cm | 65 | 629 s | 8.6 cm | | | |
| 16 | 139 s | 23.14 cm | 41 | 389 s | 14.62 cm | 66 | 639 s | 8.39 cm | | | |
| 17 | 149 s | 22.74 cm | 42 | 399 s | 14.32 cm | 67 | 649 s | 8.18 cm | | | |
| 18 | 159 s | 22.35 cm | 43 | 409 s | 14.03 cm | 68 | 659 s | 7.97 cm | | | |
| 19 | 169 s | 21.96 cm | 44 | 419 s | 13.76 cm | 69 | 669 s | 7.77 cm | | | |
| 20 | 179 s | 21.57 cm | 45 | 429 s | 13.48 cm | 70 | 679 s | 7.57 cm | | | |
| 21 | 189 s | 21.19 cm | 46 | 439 s | 13.2 cm | 71 | 689 s | 7.37 cm | | | |
| 22 | 199 s | 20.82 cm | 47 | 449 s | 12.94 cm | 72 | 699 s | 7.17 cm | | | |
| 23 | 209 s | 20.44 cm | 48 | 459 s | 12.67 cm | 73 | 709 s | 6.97 cm | | | |
| 24 | 219 s | 20.08 cm | 49 | 469 s | 12.4 cm | 74 | 719 s | 6.78 cm | | | |
| 25 | 229 s | 19.73 cm | 50 | 479 s | 12.15 cm | 75 | 729 s | 6.59 cm | | | |