

**TASK ORDER No. 47: Ann, Lucy, and Susan Watershed and Lake
Diagnostic Study and Management Plan
Pursuant to Agreement for Engineering Services
Riley Purgatory Bluff Creek Watershed District and Barr Engineering Co.
August 27, 2024**

This Task Order is issued pursuant to Section 1 of the above-cited engineering services agreement between the Riley Purgatory Bluff Creek Watershed District (District) and BARR Engineering Company (Engineer) and incorporated as a part thereof.

1. Background

Introduction

Through the adaptive management approach outline in the current 10-year plan, the District outlined the need for new lake and watershed studies and identified funding for 2022-2026. The District's focus on implementation of capital construction projects identified in the plan and pursuit of a more holistic ecological approach resulted in shifting the timeline and focus for the refreshed analysis of the lake and watershed studies. As the District moves into the development of the next generation plan, the expansion to a holistic ecological approach to resource management requires a fresh, detailed look beyond the impacted water resource. A distinct connection exists between the human-caused disruption of the hydrologic, biologic, and nutrient cycles within the District's natural waterbodies and the watershed in which they reside. Changes within the upland ecosystem, such as urban development, soil compaction, biodiversity loss, urban heat island effect, and climate change, greatly impact natural water bodies by effecting the quality, volume, and rate of stormwater that reaches them. The ecosystem approach is a preventative approach to watershed management. Every square foot of the District is addressed through management planning along with, where necessary, treating stormwater at the end of the pipe.

Much of the data collection efforts associated with the current 10-year plan and RPBCWD staff's analysis of those data represent the initial steps in the adaptive management approach and provide the basis for the work proposed in this task order. In addition, RPBCWD's recent budgets identified the need to begin the process of updated the lake and watershed assessments by allocating \$60,000 in 2024 and another \$250,000 in 2025 under the line item "UAA Updates".

Based on input from the RPBCWD Board and staff, three work plans were developed to leverage District staff, previous work completed by the District, and to provide District-wide assessments where possible. This approach includes leveraging the shoreline assessments conducted by District staff, aggregating fish and aquatic plant management efforts using benchmarks developed from reference lakes, and developing the District's role is fisheries management partnering with the Minnesota DNR. To provide this holistic approach to lake and watershed management, this work plan is designed to work in concert with two other work plans including:

1. District-wide Shoreline and Aquatic Vegetation Assessment and Restoration Plan
2. District-wide Fisheries Assessment and Management Plan

These two plans are designed to provide District-wide guidance and partnerships to manage aquatic vegetation, shorelines, and fisheries for District lakes. It should be noted that several tasks in this work

plan are reliant on the results of those studies and cost estimates assume all three plans are being developed concurrently.

Lake Selection

To support the development of the RPBCWD next generation plan and the District's desire to develop more holistic lake management plans, each of the lakes were reviewed to prioritize the lakes based on recent development, water quality, downstream water bodies, and other factors. The primary questions used to select the lakes include:

- Is the lake a headwater lake?
- Does the lake discharge to downstream lakes meeting water quality standards with recent and significant restoration efforts?
- How recent is the last UAA study? Are there recent developments or changes in the watershed?
- Is there updated pond information from City inspections?
- Is chloride becoming a potential issue?
- Which lakes need more information for project identification?

Based on this review with RPBCWD staff, four lakes were identified as high priority candidates for watershed diagnostic studies and lake management plans including:

2. Lake Susan
3. Mitchell Lake
4. Lake Lucy
5. Red Rock Lake

Because Lake Lucy, Lake Ann, and Lake Susan represent the headwaters of Riely Creek and are a chain of lakes, this work plan includes all three lakes. Mitchell Lake and Red Rock Lake will be provided as a separate task order.

Lake Lucy, Lake Ann, and Lake Susan Background

Use Attainability Analysis (UAA) studies were developed in 2013 for all three lakes to develop an overall approach for restoring or protecting water quality in all three lakes. The previous UAAs focused on phosphorus management to improve water quality in the lakes. Many of the projects identified in these studies were further assessed or implemented suggesting a new study is needed to further improvements in the watershed and lakes. It should be noted that there have been significant advancements in BMPs in the past decade including pond assessment and sediment phosphorus inactivation, iron enhanced sand filters, wetland assessment and restoration, and other practices. These advancements may provide additional opportunities for nutrient management in the lakes and their watersheds.

While phosphorus will remain an important focus, this iteration of the assessment will include an assessment of shorelines, aquatic vegetation, and fisheries to develop a more holistic approach to lake management. Further, these plans will evaluate the role of nitrogen in lake algal and aquatic plant production and the potential effects of chloride. The primary goal of these plans is to develop an

understanding of the primary stressors affecting the ecological health of the lake and develop management strategies to reduce or eliminate the effects of these stressors.

2. Description of Services:

To address the concerns regarding the ecological health of these lakes and their watersheds, we will develop a lake and watershed management plan to provide a management framework. We will build on District efforts to provide a holistic approach for managing protecting and restoring Lake Lucy, Lake Ann and Lake Susan and their watersheds. Other District efforts that will build on in this plan include:

- 2013 Lake Lucy and Lake Ann UAA and the 2013 Lake Susan UAA
- Ecological health action plan (EHAP)
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- Wetland functional assessment
- District shoreline assessments and District-wide Shoreline and Aquatic Vegetation Management Plan

Using these prior studies, we will work with the District to list the primary stressors affecting these subwatersheds and lakes, develop strategies to mitigate these stressors, and provide a vision for the lakes and subwatersheds at their highest attainable ecological health.

3. Scope of Services:

Engineer's services under this task order shall include:

Task 1. Goal Setting, Visioning, and Plan Objectives

The first step is to work with District staff and local stakeholders to develop a list of issues or concerns for the subwatershed and lake. Issues can range from water quality (phosphorus, nitrogen, chloride or other emerging contaminants), aquatic invasive species, shoreline conditions, hydrology, fisheries, outlet revisions, or other issues. Issues can also include the watershed and may include wetland health, upland soils, or other issues. From there, we will work with the District and stakeholders to develop objectives for the lakes and its watershed. During this process, we will develop measurable, science-based targets for these communities to provide a framework for measuring progress toward a goal. Shoreline and aquatic plant targets will be developed as a part of the District-wide Shoreline and Aquatic Plant Management plan. For the watershed, we will rely on the Ecological Health Assessment Program, the Wetland Functional Assessment, other District programs, and information from partners (cities, counties, etc.) to develop targets linked to lake health and ecosystem function.

Deliverables: A list of issues and concerns with measurable targets and objectives.

Task 2. Current Conditions and Management Summary

A timeline of changes and past management actions will be developed for the subwatershed and lake. Here we will characterize the lake and its watershed including current conditions such as plants, hydrology, shorelines, and other physical or biological conditions. Summaries will be developed for:

- Lake physical conditions (dissolved oxygen, temperature, bathymetry)
- Water quality (phosphorus, nitrogen, chlorophyll-a, Secchi, chloride)
- Sediment chemistry
- Shoreline conditions (provided by the District shoreline assessment)
- Aquatic plants

- Fisheries
- Phytoplankton, zooplankton, and cyanobacteria

The summaries will provide a current understanding of the lake ecological conditions, water quality conditions, and the primary stressors that are likely impacting lake health.

Deliverables: A characterization of water quality and ecological conditions in Lake Lucy, Lake Ann, and Lake Susan.

Task 3. Watershed Water Quality (TSS, TP, TN, and chloride) Modeling and Assessment

Watershed Nutrient (TP, and TN) Assessment

P8 water quality models were developed for the lake subwatersheds in 2013 as a part of the UAA studies. Some development/redevelopment has occurred since the creation of the models and the City of Chanhassen may have completed pond inspections on some of the ponds. We will update the P8 models to represent the most current conditions and to determine watershed nutrient loading. The model steps include:

- Compiling new development information from District permits
- Compiling pond inspection information from the City of Chanhassen and District staff
- Updating the P8 models including new watershed areas and pond information
- Validating the P8 model using SWMM output if available
- Validating the P8 model with any pond water quality data
- Developing watershed total nitrogen and total phosphorus loading

The P8 model will then be used to develop watershed loading estimates for total suspended solids, total phosphorus, and total nitrogen.

Sediment Phosphorus Loading in Stormwater Ponds and Wetlands

Our understanding of stormwater pond P cycling is evolving rapidly and has bypassed the basic settling processes in P8. We will review if any pond monitoring data are available for the watershed and if any ponds are showing signs of internal phosphorus loading. We will also review pond hydraulics to provide a cursory review if pond hydraulics are limiting P retention. If internal loading is suspected, sediment cores may need to be collected from the pond to measure sediment P release. Sediment cores are not included in this budget. Wetlands in the watershed will also be reviewed for P release potential. However, no new data will be collected as a part of this work plan. Rather, priority ponds and wetlands will be identified, and Barr will work with District staff to determine if new data is required and how those data will be collected.

Chloride Loading

Another potential stressor to these lakes is chloride loading from the use of road salt in winter months. We will quantify watershed chloride loading based on application records from the City and County. Barr staff will contact the City of Chanhassen to develop an understanding of how road salt is applied, typical amounts and where applications occur. Using this information and a GIS approach (road miles by type, location, and drainage patterns), a chloride loading characterization will be developed for study lakes.

Deliverables:

- *An updated P8 model with recently collected data including nitrogen and phosphorus.*
- *A summary of chloride loading to the study lakes.*
- *A review of water quality data for the stormwater ponds draining to the study lakes.*
- *A cursory assessment of internal P loading potential in the ponds.*

Task 4. Lake Water Quality Modeling and Assessment

Following the update of the watershed P8 model, we will develop a lake response models for the study lakes to assess lake response to changes in nutrient loading. The Barr Lake Model will be applied to the two shallow lakes (Lake Lucy and Lake Susan) and the Barr Phosphorus Mass Balance Model will be used for Lake Ann, a deep lake. The Barr Lake model is a daily time step model developed by Barr staff that predicts nutrients, algal production, and cyanobacteria production. This model will be used to develop an understanding of the importance of nitrogen in driving algal blooms and determine if nitrogen management is beneficial to lake water quality. Since Ann Lake is a deep lake with good water quality, this model is not required but a daily time step model is needed for downstream water bodies. So, the mass balance model will be used. Internal phosphorus loading from sediments will also be assessed during this task using data collected in previous studies. The water quality response models will help identify the impacts of changes in nutrient loading or water levels on water quality. The model will also provide insight into management actions such as aquatic plant management impacts on water quality.

Deliverables:

- *A lake response model for nitrogen and phosphorus in Lake Lucy and Lake Susan.*
- *A mass balance model for Lake Ann*
- *A chloride mass balance for the three study lakes and their watersheds.*

Task 5. Watershed and In-lake Nutrient and Chloride Management Approach

Using the lake response models and the watershed models, we will develop a list of potential nutrient and chloride management projects in the watershed and in-lake. Projects will build on previous work in the UAAs as well as new areas identified during the model update. Concept level designs and cost estimates will be developed for priority projects representing approximately <10% design. Identified projects will require further vetting at a feasibility level but provide planning level estimates for inclusion in the plan. In-lake options will also be provided and may include sediment phosphorus inactivation, plant management, fish management or other lake management practices. All projects will be vetted by District staff prior to inclusion in the plan.

Deliverable: A list of potential nutrient and chloride reduction projects including estimated reductions and costs.

Task 6. Aquatic Plant and Shoreline Management

The purpose of the District-wide Shoreline and Aquatic plant Management Plan is to develop overall strategies for aquatic plant management, AIS management, and recreational management of aquatic plants in District Lakes. This plan will essentially establish a series of District polices and approaches for managing aquatic plants and shorelines in District lakes. These approaches can then be adopted into individual lake management plans to establish expected outcomes, develop quantifiable goals, and to develop strategies to meet these goals. One of the goals of this approach is to develop a unified

understanding of what a healthy shoreline and aquatic plant community looks like and a management framework to achieve these goals.

Using the results of the District-wide Shoreline and Aquatic plant Management Plan as a basis, this task includes:

1. A summary of current aquatic plant and shoreline conditions in the study lakes
2. A summary of current aquatic plant management activities
3. Goals and vision for a healthy shoreline and aquatic plant community (from completed District-wide Shoreline and Aquatic plant Management Plan)
4. Specific strategies for shoreline and aquatic plant management based on the District-wide Shoreline and Aquatic plant Management Plan

Deliverable: A list of strategies and goals for shoreline and aquatic plant management

Task 7. Fisheries Management

The Minnesota DNR leads fishery management in most of the District lakes. The Minnesota DNR is currently developing stressor identification studies using indices of biotic integrity (IBI) for fisheries in lakes statewide to develop management strategies for these lakes. The District conducts some fishery management activities including carp (invasive) control and fish stocking for carp management. Further, aquatic plant and shoreline management can indirectly affect fish habitat and overall fisheries and can be identified as a stressor in the DNR lake IBI studies. The District-wide Fisheries Management Plan is designed to align District management activities with Minnesota DNR management goals and strategies so the two agencies can work together to maintain the ecological health of the lakes.

For the study lakes, this plan will:

1. Summarize current fishery conditions and fishery type (from the District-wide Fisheries Management Plan)
2. Summarize current management goals and management actions
3. Develop a list of fishery management strategies to support DNR management goals

Management strategies may align with aquatic vegetation and shoreline strategies to improve habitat for the fisheries. More information for the District-wide Fisheries Management Plan approach can be found in proposed work plan for the District-wide Fisheries Management Plan.

Deliverables:

- *A description of the current fishery in the study lakes.*
- *Management strategies based on the defined fishery type and Minnesota DNR management goals.*

Task 8. Capital Improvement and Monitoring Plan

After management strategies are developed for nutrients, aquatic vegetation, shorelines, and fisheries, management actions and capital projects need to be summarized including cost estimates. Building off other completed studies such as previous UAAs, lake/watershed feasibility studies, and our analyses here, a project list for managing the study lakes and their subwatershed will be developed in close coordination with District staff. The projects will be at the concept level to develop a list of appropriate

practices aimed at eliminating or reducing the stressors. The project list will be developed to be easily adopted into District planning efforts.

Deliverable: A capital improvement summary table listing projects, recommended management actions, and monitoring with costs at the concept level.

Task 9. Public input process

An important part of the development of the subwatershed and lake management plan is a stakeholder process to ensure all of the issues are summarized and addressed and to develop support among the shoreline owners, city, District, and other entities. We assume the District will lead the public input process with our support. We also envision supporting the District in developing partnerships with stakeholders including Lake Associations and City of Chanhassen to provide a plan for communication and collaboration. To support the public input process, we assume the following meetings.

- A kick-off stakeholder meeting to discuss current conditions, issues and concerns
- A stakeholder meeting to discuss shallow lake ecology and management
- A stakeholder meeting to discuss assessment results and management options

Deliverables: Preparation for and attendance at 3 stakeholder meetings. We assume a Barr led presentation at each meeting and the District leading the overall public input process.

Task 12. Reporting

We will develop a combined draft and final management plan for the three study subwatersheds and lakes including results from the previous tasks. The plan will include watershed projects, monitoring, in-lake management, and opportunities to collaborate among stakeholders. An electronic version of the draft report, will be provided for RPBCWD Administrator and Managers to review. Revisions will be made to the report based on the feedback and comments received.

Deliverables: A draft and final subwatershed and lake management plan for Lake Lucy, Lake Ann, and Lake Susan.

Task 13. Project Management, Meetings, and Presentations

Project Management is a key component to help meet project milestones and will help to ensure the work meets the expectations of District staff and other stakeholders, and that it is completed in a satisfactory manner, within the project timeline and within the agreed-upon budget. Barr will provide updates to the project team that document project progress and coordinate tasks. We will provide monthly progress reports and budget status updates as part of the monthly invoicing process. We will solicit feedback from the Administrator on an ongoing basis to ensure clear and timely communication.

We assume the following meetings.

- Up to four staff meetings to discuss results, review management approaches, and provide input
- Up to two Board presentations to discuss results of the outlet analysis and management planning

Deliverables: Meetings to update and collaborate with District staff and the Board. Monthly summaries of activities completed.

Assumptions

We have made several assumptions in preparing the scope of work for each work item in this agreement. Assumptions relating to individual work tasks are listed along with the detailed description. The proposed scope, schedule and budget may need to be adjusted at a future time as emerging details about the available data help to clarify the most appropriate modeling tool(s) to fit the available data. However, additional assumptions that do not correspond with a single work task are listed below:

- Shorelines, aquatic plants, and fisheries section cost estimates assume approval of the District-wide Fisheries Management Plan and District-wide Aquatic Plant and Shoreline Management Plan work plans.
- The District will be responsible for providing shoreline conditions for the study lakes. Barr will not be conducting any field work.
- District staff will provide all available aquatic vegetation data.
- District staff will provide all monitoring cost estimates and level of effort.
- All meetings will be held virtually or at RPBCWD’s office and last no more than 2 hours.
- Meeting scheduling and coordination will be performed by District staff.
- The District will provide all available and applicable GIS and CAD files to Barr in electronic format.
- Barr has allotted time for a single round of review comment on the draft report by the District.
- Unless previously subject to more detailed design, watershed restoration measures proposed for this study will be conceptual in order to evaluate the relative benefit and develop planning level costs.
- Supplemental studies and field investigation (wetland/waterbody delineation, Phase I archeology, Phase I environmental, etc) will not be completed with this Task Order.
- Technical advisory committee representatives and other stakeholders will provide all pertinent monitoring and infrastructure data (such as as-built drawings, surveys, models, etc.) that they have collected.
- The proposed budget includes costs for mileage reimbursement for meetings and site visits.
- The District and project stakeholders will provide all available and applicable GIS and CAD files to Barr in an electronic format.
- Only minor revisions will be needed to finalize the report.

4. Budget:

Services under this Task Order will be compensated for in accordance with the engineering services agreement and will not exceed \$XX,XXX without written authorization by the Administrator. The following table provides a breakdown of the anticipated cost for major tasks associated with scope of services describe above. The scope and level of effort associated with the various tasks may need to be adjusted as additional information become available to maintain the overall objectives within the allotted budget.

Task	Task Description	Anticipated Budget	Tentative Completion Date
1	Goal Setting and Plan Objectives	\$4,230	January 2025

2	Current Conditions and Management Summary	\$12,845	December 2024
3	Watershed and Water Quality Modeling and Assessment	\$24,480	June 2025
4	Lake Water Quality Response Modeling	\$31,090	August 2025
5	Watershed and In-lake Nutrient and Chloride Management BMPs	\$18,890	September 2025
6	Aquatic Plant and Shoreline Management	\$7,440	August 2025
7	Fisheries Management	\$3,610	August 2025
8	Capital Improvement Plan	\$8,805	October 2025
9	Public Input Process	\$5,215	January through November 2025
10	Reporting	\$20,140	November 2025
11	Meetings, Presentations & Management	\$13,480	Throughout
Task Order 47 Total		\$150,225	

5. Schedule and Assumptions Upon Which Schedule is Based

The proposed schedule (above) assumes project initiation will occur in September 2024. The schedule may be modified depending on actual initiation of project work, when information is provided by the Cities, or if project outcomes warrant an extension to the timeline.

IN WITNESS WHEREOF, intending to be legally bound, the parties hereto execute and deliver of this Agreement.

CONSULTANT

**RILEY PURGATORY BLUFF CREEK
WATERSHED DISTRICT**

By _____

By _____

Its Vice President

Its _____

Date:

Date:

APPROVED AS TO FORM & EXECUTION

**TASK ORDER No. 48: District-Wide Shoreline and Aquatic Vegetation Management Plan
Pursuant to Agreement for Engineering Services
Riley Purgatory Bluff Creek Watershed District and Barr Engineering Co.
August 27, 2024**

This Task Order is issued pursuant to Section 1 of the above-cited engineering services agreement between the Riley Purgatory Bluff Creek Watershed District (District) and BARR Engineering Company (Engineer) and incorporated as a part thereof.

1. Background

As the Riley Purgatory Bluff Creek Watershed District (District) begins the process of developing the next generation watershed management plan and holistic subwatershed/lake management plans, one of the primary management activities identified was shoreline and aquatic plant management. We understand the District would like to continue to pursue improved ecological health and function in District lakes and develop a management approach that supports this goal. The District recently completed shoreline assessments for watershed lakes using the Minnesota DNR's Score the Shore methods and routinely monitors and manages submerged aquatic vegetation in District lakes. Traditionally, aquatic vegetation management plans were developed lake by lake with very specific management actions. However, there were limited data demonstrating end points for management. Management goals for these plans was often abstract and difficult to communicate. Common questions around these plans included:

1. What should healthy shorelines look like?
2. What should a healthy aquatic plant community look like?
3. How can we measure progress toward healthier lakes?

As the District develops subwatershed/lake ecological management plans, there is a need for an overall shoreline aquatic plant management strategy that provides clear endpoints and strategies to improve ecosystem functions and overall ecological health. Further, better communication tools are needed to illustrate positive outcomes to stakeholders. The purpose of this work plan is to develop quantifiable end points and illustrations for healthy aquatic plant communities and shorelines.

2. Description of Services:

The goal of this work order is to leverage the work of District staff in developing an overarching plan for shoreline and aquatic plant management that supports the lake management plans. Since the District manages many lakes with limited resources, the purpose of this plan is to develop endpoints and opportunities to support data driven management decisions. To support this effort, we plan to:

- Develop quantifiable goals for managing aquatic plant communities using DNR developed reference points
- Develop quantifiable goals and clear design concepts for shorelines,
- Develop management strategies for shorelines and aquatic plant communities,
- Develop a data management scheme to track progress toward these ecological goals,
- Link the metrics to ecosystem functions where possible, and
- Graphically illustrate healthy shorelines and aquatic vegetation communities.

To complete this scope of work, we envision working closely with District staff to leverage their current efforts and skills. Under each task, we describe District staff contributions.

3. Scope of Services:

Engineer's services under this task order shall include:

Task 1. Aquatic Plant Management Framework

The primary focus for the development of a District-wide aquatic plant management framework is to develop strategies that result in improved ecological function, improved water quality, and increased lake resilience. To move toward this end, a District-wide framework for aquatic plant management can support District efforts and allocation of funds to best achieve improvements in ecological function. We propose the following tasks to develop the aquatic plant management framework.

- Develop metrics and reference lakes for assessing aquatic plant communities
- Summarize current aquatic plant community conditions using selected metrics
- Develop aquatic plant management strategies and priorities to improve ecological function
- Develop a vision for a healthy, balanced aquatic plant community

Task 1.1 Developing reference conditions and ecological metrics

The first step in the development of a District-wide aquatic plant management framework is to develop the appropriate metrics and benchmarks to measure aquatic plant health in District lakes. To accomplish this task, we will use the Minnesota DNR's database to develop reference lakes for each lake type in the District. While this database is readily available, the actual plant surveys for these lakes are more difficult to obtain. The University of Minnesota recently developed a database of these plant surveys. We will use this database to pull lakes similar in type (Schupps lake class) and develop reference conditions. Using the reference lakes we plan to develop metrics for measuring ecosystem function (biodiversity, habitat, etc.). These data will then be used to develop management endpoints for the aquatic plant communities in these lakes. These metrics can also be linked to Minnesota DNR stressor identification studies if available.

The next step is to summarize the current vegetation conditions and trends in the lakes using metrics such as species richness, floristic quality, and indicator species. Trends in diversity and floristic quality will be evaluated as well as the extent and biovolume of the community. The goal of this task is to evaluate recent management actions effectiveness in making progress toward established vegetation goals.

Deliverables: A list of reference lakes and aquatic plant metrics to measure ecological health of the aquatic plant communities.

District Contributions: Compiled aquatic plant survey data for District lakes.

Task 1.2 Develop a Vision and Graphics for a Healthy Lake Plant Community

The next step is to use these reference lakes and metrics to develop a vision for healthy aquatic plant communities. We envision working closely with District staff to develop graphics that clearly reflect what healthy plants community should look like in District lakes, and how this may interact with other lake

uses. We envision using cross sections of the lakes and developing a current condition and healthy condition using species identified in the reference lakes. These can then be used for outreach to better communicate the goals of aquatic plant management to stakeholders as well as paint a clear vision for aquatic plant management outcome.

Deliverables: Up to 3 graphical displays of a healthy lake aquatic plant community. A list of issues and concerns with measurable targets and objectives.

District Contributions: The District will develop all graphics working with Barr staff. Barr will support the development of these graphics by providing GIS information and technical information to include.

Task 1.3 Summarize Current Aquatic Plant Management Activities and Goals

The next step is to summarize District aquatic plant management activities and goals for District lakes. This will begin by summarizing activities conducted for all lakes over the past 5 years including herbicide applications. These data will provide an understanding of the current tools the District uses to manage aquatic plants and where some additional tools might be useful.

Deliverables: Summary of current District management efforts

District Contributions: Provide a summary of District management efforts and costs

Task 1.4 Develop District-wide Aquatic Plant Management Strategies

Significant advances in our understanding of healthy aquatic vegetation communities were developed in recent years. Statewide reference databases are now available from the MNDNR as well as recent studies highlighting reasonable expectations for healthy, diverse aquatic plant communities. Barr staff will use these databases to develop reference lakes to develop a better understanding of potential outcomes for lake management. Barr will also use recent studies to develop an understanding of the lakes' provision of ecosystem services. This task also includes some "visioning" for the aquatic plant community to visualize the goals and help residents understand the goals of the plan.

Using this information and the current health of the lakes, we will develop strategies and costs for aquatic plant management in the District. We envision developing strategies for AIS prevention and control, homeowner strategies, native aquatic plant restoration and protection and other strategies such as alum treatments to support improved ecological function. These strategies can then be adopted in a plan including estimated costs for budgeting purposes.

Included in the recent advances in our understanding of aquatic plant communities is a more developed understanding of the factors controlling plant diversity and health. Barr staff will highlight the factors that may be limiting aquatic plant diversity in these lakes to help guide management actions. While not all of these factors are well understood, they provide reasonable guidance for managing the aquatic vegetation community.

Deliverables: Summary of recommended District aquatic plant management strategies

District Contributions: Input on strategies and goals

Task 2. Shoreline Management Framework

District staff recently completed a shoreline health survey for all of the lakes in the District. Shorelines in general were degraded and require restoration to improve ecological function including habitat, water quality protection, and other ecological functions. The purpose of the Shoreline Management Framework is to provide critical components of a successful shoreline restoration and outreach information to help landowners envision outcomes.

Task 2.1 Summarize Shoreline Conditions in the District

The first step is to develop a District-wide summary of shoreline conditions identifying the most common shortfalls for degraded shoreline such as a lack of a buffer, limited woody debris, or other important metrics. Using this summary and the Score the Shore framework, we will develop a list of critical components for a shoreline restoration and develop conceptual design components. Since shorelines flow into the aquatic plant community, we will include aquatic plants where possible.

Deliverables: A summary of shoreline conditions in the District including most commonly lost features and metrics.

District Contributions: A summary of shoreline conditions and shoreline condition database.

Task 2.2 Develop Shoreline Restoration Vision Cut Sheets

The next step is to develop a vision for health shorelines and critical components of a successful restoration. These sheets can be used to help homeowners design shoreline restorations that include critical aspects that improve ecological function. Further, these metrics can be used to track progress District-wide on shoreline improvements. This information will also be used to develop high level shoreline restoration costs to inform District planning efforts.

Deliverables: A list of critical shoreline design features that should be pursued in lake shoreline restorations.

District Contributions: The District will develop all graphics working with Barr staff. Barr will support the development of these graphics by providing GIS information and technical information to include.

Task 3. Reporting

We will develop a draft and final management framework for aquatic plants and shorelines District-wide. The plan will be developed in collaboration with District staff and will include opportunities to collaborate among stakeholders. An electronic version of the draft report will be provided for RPBCWD Administrator and Managers to review. Revisions will be made to the report based on the feedback and comments received.

Deliverables: A draft and final lake District-wide Aquatic Vegetation and Shoreline Management Plan.

Task 4. Project Management, Meetings, and Presentations

Project Management is a key component to help meet project milestones and will help to ensure the work meets the expectations of District staff and other stakeholders, and that it is completed in a satisfactory manner, within the project timeline and within the agreed-upon budget. Barr will provide updates to the project team that document project progress and coordinate tasks. We will provide

monthly progress reports and budget status updates as part of the monthly invoicing process. We will solicit feedback from the Administrator on an ongoing basis to ensure clear and timely communication.

We assume the following meetings.

- Up to four staff meetings to discuss results, review management approaches, and provide input
- Up to one Board presentations to discuss results of the analysis and management planning

Deliverables: Meetings to update and collaborate with District staff and the Board. Monthly summaries of activities completed.

Assumptions

We have made several assumptions in preparing the scope of work for each work item in this agreement. Assumptions relating to individual work tasks are listed along with the detailed description. The proposed scope, schedule and budget may need to be adjusted at a future time as emerging details about the available data help to clarify the most appropriate modeling tool(s) to fit the available data. However, additional assumptions that do not correspond with a single work task are listed below:

- The District will be responsible for providing shoreline conditions and aquatic plant survey data. Barr will not be conducting any field work.
- District staff will be responsible for all graphics with technical input from Barr staff
- All meetings will be held virtually or at RPBCWD's office and last no more than 2 hours.
- Meeting scheduling and coordination will be performed by District staff
- Barr will provide supporting data to RPBCWD; however, it will not be comprehensively included in the report.
- The proposed budget includes costs for mileage reimbursement for site visits and site observation.
- The District will provide all available and applicable GIS and CAD files to Barr in electronic format.
- Barr has allotted time for a single round of review comment on the draft report by the District
- Unless previously subject to more detailed design, watershed restoration measures proposed for this study will be conceptual in order to evaluate the relative benefit and develop planning level costs
- Supplemental studies and field investigation (wetland/waterbody delineation, Phase I archeology, Phase I environmental, etc.) will not be completed with this Task Order.
- Technical advisory committee representatives and other stakeholders will provide all pertinent monitoring and infrastructure data (such as as-built drawings, surveys, models, etc.) that they have collected.
- Only minor revisions will be needed to finalize the report.

4. Budget:

Services under this Task Order will be compensated for in accordance with the engineering services agreement and will not exceed \$XX,XXX without written authorization by the Administrator. We will coordinate closely with RPBCWD staff to leverage their expertise and availability with the intent of maximizing staff's role in the development of the district-wide shoreline and aquatic vegetation management plans while reducing the level of effort needed from Barr. The following table provides

a breakdown of the anticipated cost for major tasks associated with scope of services describe above. The scope and level of effort associated with the various tasks may need to be adjusted as additional information become available to maintain the overall objectives within the allotted budget.

Task	Task Description	Anticipated Budget	Tentative Completion Date
1	Aquatic Plant Management Plan		June 2025
1.1	Develop reference conditions and ecological metrics	\$9,070	January 2025
1.2	Develop a vision and graphics for a healthy aquatic plant community	\$6,300	March 2025
1.3	Summarize current aquatic plant management activities	\$4,095	February 2025
1.4	Develop District-wide aquatic plant management activities	\$4,275	May 2025
2	Shoreline Management Plan		June 2025
2.1	Summarize District shoreline conditions	\$3,255	February 2025
2.2	Develop shoreline restoration cut sheets	\$6,250	March 2025
3	Report	\$8,775	June 2025
4	Meetings and project management	\$6,125	Ongoing
Task Order 48 Total		\$48,145	

5. Schedule and Assumptions Upon Which Schedule is Based

The proposed schedule (above) assumes project initiation will occur in September 2024. The schedule may be modified depending on actual initiation of project work, when information is provided by the Cities, or if project outcomes warrant an extension to the timeline.

IN WITNESS WHEREOF, intending to be legally bound, the parties hereto execute and deliver of this Agreement.

CONSULTANT

**RILEY PURGATORY BLUFF CREEK
WATERSHED DISTRICT**

By _____

By _____

Its Vice President

Its _____

Date:

Date:

APPROVED AS TO FORM & EXECUTION

TASK ORDER No. 49: District-Wide Fisheries Management Plan
Pursuant to Agreement for Engineering Services
Riley Purgatory Bluff Creek Watershed District and Barr Engineering Co.
August 27, 2024

This Task Order is issued pursuant to Section 1 of the above-cited engineering services agreement between the Riley Purgatory Bluff Creek Watershed District (District) and BARR Engineering Company (Engineer) and incorporated as a part thereof.

1. Background

As the Riley Purgatory Bluff Creek Watershed District (District) begins the process of developing the next generation watershed management plan and holistic lake management plans, fisheries management is a necessary focus area for the next plan. We understand the District would like to continue to pursue improved ecological health and function in District lakes to support water quality and develop a management approach that supports this goal. To promote ecological health in District lakes, fisheries are a management area that could help improve ecological conditions in area lakes, making lakes more resilient to increasing stressors such as chloride, nutrient enrichment, and climate change. While the Minnesota DNR leads fisheries management in most lakes in the District, much of their focus is recreational fisheries rather than ecological integrity. Fisheries management is an important management focus for water quality improvements for the District. The District manages carp populations in District lakes to maintain good water quality and promote healthy native plant populations. Part of this management strategy often includes stocking bluegill after hard winters where fish kills may occur in some shallow lakes. Consequently, developing a fisheries management strategy that supports the Minnesota DNR management efforts will help improve ecological conditions in District lakes. Further, as the District develops lake management plans, there is a need for an overall fisheries management strategy that provides clear endpoints and strategies to improve ecosystem functions and overall ecological health while protecting improved water quality achieved through District management efforts.

Recently, the Minnesota DNR is focusing on ecological health of lake fish communities by developing Indices of Biotic Integrity (IBI) for lakes in Minnesota to better understand current fish community health and the stressors that may be affecting these communities. Stressors may include poor habitat, invasive species, poor water quality, specifically dissolved oxygen and temperature, and other factors that contribute to poor water quality. While the DNR leads fisheries management, many of these stressors are managed by the District and can contribute to improved fish communities. This work plan intends to build on this information to develop a cohesive partnership with the DNR to improve the overall ecological conditions in the lake.

Note that this management plan will focus on the ecological health of the fishery and not the recreational value. However, it may provide areas where the District can support DNR efforts to manage recreational fisheries.

2. Description of Services:

The goal of this task order is to develop an overarching fisheries management plan for District lakes that supports the holistic management approach. Since the District manages many lakes with limited resources, the purpose of this plan is to develop endpoints and opportunities to support data driven management decisions and to develop a partnership with the Minnesota DNR to support fisheries management. To support this effort, we plan to:

- Summarize DNR fisheries management plans and District management activities for District lakes
- Describe expected fisheries types and lake types
- Summarize stressor identification studies completed for lakes in the District
- Develop fisheries management strategies for District lakes

To complete this scope of work, we envision working closely with District staff to leverage their current efforts and skills. Under each task, we describe District staff contributions.

3. Scope of Services:

Engineer's services under this task order shall include:

Task 1. Summarize Current Fisheries Conditions and Current Management

The first step in developing the fisheries management plan is to summarize current management plans and activities currently being conducted by Minnesota DNR and the District. We envision District staff leading this effort by visiting with the DNR, reviewing their files for each District lake, and summarizing management plans and activities including fish stocking, fish removal, aeration, and other management techniques. The District will also summarize their current activities including carp surveys and fish stocking.

Barr will develop a summary of the fish communities in the lakes using data collected by the Minnesota DNR to develop an understanding of current conditions. Barr will also summarize lake fishery types (Schupps class), expected fishery (panfish, bass, wallyeye, etc.), and other important information. Barr will also summarize any information available from the IBI studies currently under way by the Minnesota DNR.

Deliverables: A summary of the Minnesota DNR's management plans and current fishery conditions for District Lakes.

District Contributions: District staff will compile information from the Minnesota DNR and summarize District management activities.

Task 2 Summarize stressors potentially affecting fish communities in District lakes

The next step is to compile a list of stressors that may be affecting District lake fisheries. Barr will use the Minnesota DNR's IBI studies and input from district staff to identify critical habitat features and physical conditions for each lake type and critical species to develop management strategies to improve lake conditions.

Deliverables: Stressor summary for District lakes to determine management strategies.

Task 3. Develop management strategies for fisheries management

The final step is to develop a list of management strategies that the District can implement to support the overall health of the fish community. Strategies will be developed to work in unison with Minnesota DNR management efforts. The plan will also summarize the District's carp management strategy.

Deliverables: A list of strategies to support fishery management in District lakes to improve ecological health of the lakes.

District Contributions: Input in management strategies.

Task 4. Reporting

We will develop a draft and final management framework for fisheries District-wide. The plan will be developed in collaboration with District staff and will include opportunities to collaborate among stakeholders. An electronic version of the draft report will be provided for RPBCWD Administrator and Managers to review. Revisions will be made to the report based on the feedback and comments received.

Deliverables: A draft and final lake District-wide Fisheries Management Plan.

Task 4. Project Management, Meetings, and Presentations

Project Management is a key component to help meet project milestones and will help to ensure the work meets the expectations of District staff and other stakeholders, and that it is completed in a satisfactory manner, within the project timeline and within the agreed-upon budget. Barr will provide updates to the project team that document project progress and coordinate tasks. We will provide monthly progress reports and budget status updates as part of the monthly invoicing process. We will solicit feedback from the Administrator on an ongoing basis to ensure clear and timely communication.

We assume the following meetings.

- Up to four staff meetings to discuss results, review management approaches, and provide input
- One Board presentations to discuss results of the analysis and management planning

Deliverables: Meetings to update and collaborate with District staff and the Board. Monthly summaries of activities completed.

Assumptions

We have made several assumptions in preparing the scope of work for each work item in this agreement. Assumptions relating to individual work tasks are listed along with the detailed description. The proposed scope, schedule and budget may need to be adjusted at a future time as emerging details about the available data help to clarify the most appropriate modeling tool(s) to fit the available data. However, additional assumptions that do not correspond with a single work task are listed below:

- The District will be responsible for providing fisheries data and acquiring data from the Minnesota DNR. Barr will not be conducting any field work.
- All meetings will be held virtually or at RPBCWD's office and last no more than 2 hours.
- Meeting scheduling and coordination will be performed by District staff
- Barr will provide supporting data to RPBCWD; however, it will not be comprehensively included in the report.
- The proposed budget includes costs for mileage reimbursement for site visits and site observation.
- The District will provide all available and applicable GIS and CAD files to Barr in electronic format.
- Barr has allotted time for a single round of review comment on the draft report by the District

- Supplemental studies and field investigation (wetland/waterbody delineation, Phase I archeology, Phase I environmental, etc.) will not be completed with this Task Order.
- Technical advisory committee representatives and other stakeholders will provide all pertinent monitoring and infrastructure data (such as as-built drawings, surveys, models, etc.) that they have collected.
- Only minor revisions will be needed to finalize the report.

4. Budget:

Services under this Task Order will be compensated for in accordance with the engineering services agreement and will not exceed \$XX,XXX without written authorization by the Administrator. The following table provides a breakdown of the anticipated cost for major tasks associated with scope of services describe above. The scope and level of effort associated with the various tasks may need to be adjusted as additional information become available to maintain the overall objectives within the allotted budget.

Task	Task Description	Anticipated Budget	Tentative Completion Date
1	Summarize current fishery and management activities	\$4,230	January 2025
2	Summarize stressors to fish community	\$3,825	February 2025
3	Develop fishery management strategies	\$2,985	March 2025
4	Report	\$7,035	April 2025
5	Meetings and project management	\$3,195	Ongoing
Task Order 49 Total		\$21,270	

5. Schedule and Assumptions Upon Which Schedule is Based

The proposed schedule (above) assumes project initiation will occur in August 2023. The schedule may be modified depending on actual initiation of project work, when information is provided by the Cities, or if project outcomes warrant an extension to the timeline.

IN WITNESS WHEREOF, intending to be legally bound, the parties hereto execute and deliver of this Agreement.

CONSULTANT

**RILEY PURGATORY BLUFF CREEK
WATERSHED DISTRICT**

By _____

By _____

Its Vice President _____

Its _____

Date:

Date:

APPROVED AS TO FORM & EXECUTION

**TASK ORDER No. 50: Mitchell and Red Rock Lake Watershed and Lake
Diagnostic Study and Management Plan
Pursuant to Agreement for Engineering Services
Riley Purgatory Bluff Creek Watershed District and Barr Engineering Co.
August 27, 2024**

This Task Order is issued pursuant to Section 1 of the above-cited engineering services agreement between the Riley Purgatory Bluff Creek Watershed District (District) and BARR Engineering Company (Engineer) and incorporated as a part thereof.

1. Background

Introduction

Through the adaptive management approach outline in the current 10-year plan, the District outlined the need for new lake and watershed studies and identified funding for 2022-2026. The District's focus on implementation of capital construction projects identified in the plan and pursuit of a more holistic ecological approach resulted in shifting the timeline and focus for the refreshed analysis of the lake and watershed studies. As the District moves into the development of the next generation plan, the expansion to a holistic ecological approach to resource management requires a fresh, detailed look beyond the impacted water resource. A distinct connection exists between the human-caused disruption of the hydrologic, biologic, and nutrient cycles within the District's natural waterbodies and the watershed in which they reside. Changes within the upland ecosystem, such as urban development, soil compaction, biodiversity loss, urban heat island effect, and climate change, greatly impact natural water bodies by effecting the quality, volume, and rate of stormwater that reaches them. The ecosystem approach is a preventative approach to watershed management. Every square foot of the District is addressed through management planning along with, where necessary, treating stormwater at the end of the pipe.

Much of the data collection efforts associated with the current 10-year plan and RPBCWD staff's analysis of those data represent the initial steps in the adaptive management approach and provide the basis for the work proposed in this task order. In addition, RPBCWD's recent budgets identified the need to begin the process of updated the lake and watershed assessments by allocating \$60,000 in 2024 and another \$250,000 in 2025 under the line item "UAA Updates".

Based on input from the RPBCWD Board and staff, three work plans were developed to leverage District staff, previous work completed by the District, and to provide District-wide assessments where possible. This approach includes leveraging the shoreline assessments conducted by District staff, aggregating fish and aquatic plant management efforts using benchmarks developed from reference lakes and developing the District's role in fisheries management partnering with the Minnesota DNR. To provide this holistic approach to lake and watershed management, this work plan is designed to work in concert with two other work plans including:

1. District-wide Shoreline and Aquatic Vegetation Assessment and Restoration Plan
2. District-wide Fisheries Assessment and Management Plan

These two plans are designed to provide District-wide guidance and partnerships to manage aquatic vegetation, shorelines, and fisheries for District lakes. It should be noted that several tasks in this work

plan are reliant on the results of those studies and cost estimates assume all three plans are being developed concurrently.

Lake Selection

To support the development of the RPBCWD next generation plan and the District's desire to develop more holistic lake management plans, each of the lakes were reviewed to prioritize the lakes based on recent development, water quality, downstream water bodes, and other factors. The primary questions used to select the lakes include:

- Is the lake a headwater lake?
- Does the lake discharge to downstream lakes meeting water quality standards with recent and significant restoration efforts?
- How recent is the last UAA study? Are there recent developments or changes in the watershed?
- Is there updated pond information from City inspections?
- Is chloride becoming a potential issue?
- Which lakes need more information for project identification?

Based on this review with RPBCWD staff, four lakes were identified as high priority candidates for watershed diagnostic studies and lake management plans including:

2. Lake Susan
3. Mitchell Lake
4. Lake Lucy
5. Red Rock Lake

Mitchell and Red Rock Lake are headwater lakes in the Purgatory Creek watershed and has recent updated information on ponds in the watershed.

Mitchell Lake and Red Rock Background

A Use Attainability Analysis (UAA) study was completed for Mitchell Lake in 2005 and Red Rock Lake in 2006. Both of these studies were updated in 2016 as a port of a UAA update for all of Purgatory Creek. Since the last update was completed, the City of Eden Prairie completed pond inspections in both watersheds, field measuring pond volumes and other critical features. In 2021, a subwatershed assessment was completed in the Mitchell Lake watershed focusing on internal phosphorus loading in stormwater ponds. Both lakes undergo annual aquatic plant management for invasive species control and harvesting to support recreational activities. Water quality in both lakes demonstrate cyclical patterns near the shallow lake water quality standards, meeting standards in some years and not others. Both lakes are highly sensitive to changes in biological conditions that can affect water quality. For example, Red Rock Lake exhibited high water quality for six years following a hard fish kill, with more recent years exceeding the standard as the fish community recovers. Both lakes will benefit from a holistic management plan aimed at permanently removing these waters from the impaired waters list.

Previous UAAs and watershed studies focused on phosphorus management to improve water quality in the lakes. Many of the projects identified in these studies were further assessed or implemented suggesting a new study is needed to further improvements in the watershed and lakes. Further,

additional data are available since these previous studies were completed. It should be noted that there have been significant advancements in BMPs in the past decade including pond assessment and sediment phosphorus inactivation, iron enhanced sand filters, wetland assessment and restoration, and other practices. These advancements may provide additional opportunities for nutrient management in the lakes and their watersheds.

While phosphorus will remain an important focus of this study, this iteration of the assessment will include an assessment of shorelines, aquatic vegetation, and fisheries to develop a more holistic approach to lake management. Further, these plans will evaluate the role of nitrogen in lake algal and aquatic plant production and the potential effects of chloride. The primary goal of these plans is to develop an understanding of the primary stressors affecting the ecological health of the lake and develop management strategies to reduce or eliminate the effects of these stressors.

2. Description of Services:

To address the concerns regarding the ecological health of these lakes and their watersheds, we will develop a lake and watershed management plan to provide a management framework. We will build on District efforts to provide a holistic approach for managing protecting and restoring Mitchell Lake and Red Rock Lake and their watersheds. Other District efforts that will build on in this plan include:

- 2005 Mitchell Lake UAA, 2006 Red Rock Lake UAA, and the 2016 Purgatory Creek UAA update
- 2021 Mitchell Lake, Rice Marsh Lake, and Lake Riely Subwatershed Assessment
- 2014 Red Rock and Duck Lake Pond Inspection Report completed by Eden Prairie
- 2016 Mitchell Lake Pond Inspection Report completed by Eden Prairie
- Ecological health action plan (EHAP)
- Wetland functional assessment
- District shoreline assessments and District-wide Shoreline and Aquatic Vegetation Management Plan

Using these prior studies, we will work with the District to list the primary stressors affecting these subwatersheds and lakes, develop strategies to mitigate these stressors, and provide a vision for the lakes and subwatersheds at their highest attainable ecological health.

3. Scope of Services:

Engineer's services under this task order shall include:

Task 1. Goal Setting, Visioning, and Plan Objectives

The first step is to work with District staff and local stakeholders to develop a list of issues or concerns for the subwatershed and lake. Issues can range from water quality (phosphorus, nitrogen, chloride or other emerging contaminants), aquatic invasive species, shoreline conditions, hydrology, fisheries, outlet revisions, or other issues. Issues can also include the watershed and may include wetland health, upland soils, or other issues. From there, we will work with the District and stakeholders to develop objectives for the lakes and its watershed. During this process, we will develop measurable, science-based targets for these communities to provide a framework for measuring progress toward a goal. Shoreline and aquatic plant targets will be developed as a part of the District-wide Shoreline and Aquatic Plant Management plan. For the watershed, we will rely on the Ecological Health Assessment Program,

the Wetland Functional Assessment, other District programs, and information from partners (cities, counties, etc.) to develop targets linked to lake health and ecosystem function.

Deliverables: A list of issues and concerns with measurable targets and objectives.

Task 2. Current Conditions and Management Summary

A timeline of changes and past management actions will be developed for the subwatershed and lake. Here we will characterize the lake and its watershed including current conditions such as plants, hydrology, shorelines, and other physical or biological conditions. Summaries will be developed for:

- Lake physical conditions (dissolved oxygen, temperature, bathymetry)
- Water quality (phosphorus, nitrogen, chlorophyll-a, Secchi, chloride)
- Sediment chemistry
- Shoreline conditions (provided by the District shoreline assessment)
- Aquatic plants
- Fisheries
- Phytoplankton, zooplankton, and cyanobacteria

The summaries will provide a current understanding of the lake ecological conditions, water quality conditions, and the primary stressors that are likely impacting lake health.

Deliverables: A characterization of water quality and ecological conditions in Mitchell Lake and Red Rock Lake.

Task 3. Watershed Water Quality (TSS, TP, TN, and chloride) Modeling and Assessment

Watershed Nutrient (TP, and TN) Assessment

P8 water quality models were developed for the lake subwatersheds in 2016 as a part of the Purgatory Creek UAA study. The City of Eden Prairie completed pond inspections in the watersheds in 2014 and 2016 and some development/redevelopment has occurred since the creation of the models. We will update the P8 models to represent the most current conditions and to determine watershed nutrient loading. The model steps include:

- Compiling new development information from District permits
- Compiling pond inspection information from the City of Eden Prairie and District staff
- Updating the P8 models including new watershed areas and pond information
- Validating the P8 model using SWMM output if available
- Validating the P8 model with any pond water quality data
- Developing watershed total nitrogen and total phosphorus loading

The P8 model will then be used to develop watershed loading estimates for total suspended solids, total phosphorus, and total nitrogen.

Sediment Phosphorus Loading in Stormwater Ponds and Wetlands

Our understanding of stormwater pond P cycling is evolving rapidly and has bypassed the basic settling processes in P8. We will review if any pond monitoring data are available for the watershed and if any ponds are showing signs of internal phosphorus loading. We will also review pond hydraulics to provide a cursory review if pond hydraulics are limiting P retention. If internal loading is suspected, sediment

cores may need to be collected from the pond to measure sediment P release. Sediment cores are not included in this budget. Wetlands in the watershed will also be reviewed for P release potential. However, no new data will be collected as a part of this work plan. Rather, priority ponds and wetlands will be identified, and Barr will work with District staff to determine if new data is required and how those data will be collected.

Chloride Loading

Another potential stressor to these lakes is chloride loading from the use of road salt in winter months. We will quantify watershed chloride loading based on application records from the City and County. Barr staff will contact the City of Eden Prairie to develop an understanding of how road salt is applied, typical amounts and where applications occur. Using this information and a GIS approach (road miles by type, location, and drainage patterns), a chloride loading characterization will be developed for the study lakes.

Deliverables:

- *An updated P8 model with recently collected data including nitrogen and phosphorus.*
- *A summary of chloride loading to the study lakes.*
- *A review of water quality data for the stormwater ponds draining to the study lakes.*
- *A cursory assessment of internal P loading potential in the ponds.*

Task 4. Lake Water Quality Modeling and Assessment

Following the update of the watershed P8 model, we will develop lake response models for the study lakes to assess lake response to changes in nutrient loading. The Barr Lake Model will be applied to Mitchell Lake and Red Rock Lake. The Barr Lake model is a daily time step model developed by Barr staff that predicts nutrients, algal production, and cyanobacteria production. This model will be used to develop an understanding of the importance of nitrogen in driving algal blooms and determine if nitrogen management is beneficial to lake water quality. Internal phosphorus loading from sediments will also be assessed during this task using data collected in previous studies. The water quality response models will help identify the impacts of changes in nutrient loading or water levels on water quality. The model will also provide insight into management actions such as aquatic plant management impacts on water quality.

Deliverables:

- *A lake response model for nitrogen and phosphorus in Mitchell Lake and Red Rock Lake.*
- *A chloride mass balance for the two study lakes and their watersheds.*

Task 5. Watershed and In-lake Nutrient and Chloride Management Approach

Using the lake response models and the watershed models, we will develop a list of potential nutrient and chloride management projects in the watershed and in-lake. Projects will build on previous work in the UAAs as well as new areas identified during the model update. Concept level designs and cost estimates will be developed for priority projects representing approximately <10% design. Identified projects will require further vetting at a feasibility level but provide planning level estimates for inclusion in the plan. In-lake options will also be provided and may include sediment phosphorus inactivation, plant management, fish management or other lake management practices. All projects will be vetted by District staff prior to inclusion in the plan.

Deliverable: A list of potential nutrient and chloride reduction projects including estimated reductions and costs.

Task 6. Aquatic Plant and Shoreline Management

The purpose of the District-wide Shoreline and Aquatic plant Management Plan is to develop overall strategies for aquatic plant management, AIS management, and recreational management of aquatic plants in District Lakes. This plan will essentially establish a series of District polices and approaches for managing aquatic plants and shorelines in District lakes. These approaches can then be adopted into individual lake management plans to establish expected outcomes, develop quantifiable goals, and to develop strategies to meet these goals. One of the goals of this approach is to develop a unified understanding of what a healthy shoreline and aquatic plant community looks like and a management framework to achieve these goals.

Using the results of the District-wide Shoreline and Aquatic plant Management Plan as a basis, this task includes:

1. A summary of current aquatic plant and shoreline conditions in the study lakes
2. A summary of current aquatic plant management activities
3. Goals and vision for a healthy shoreline and aquatic plant community (from completed District-wide Shoreline and Aquatic plant Management Plan)
4. Specific strategies for shoreline and aquatic plant management based on the District-wide Shoreline and Aquatic plant Management Plan

Deliverable: A list of strategies and goals for shoreline and aquatic plant management

Task 7. Fisheries Management

The Minnesota DNR leads fishery management in most of the District lakes. The Minnesota DNR is currently developing stressor identification studies using indices of biotic integrity (IBI) for fisheries in lakes statewide to develop management strategies for these lakes. The District conducts some fishery management activities including carp (invasive) control and fish stocking for carp management. Further, aquatic plant and shoreline management can indirectly affect fish habitat and overall fisheries and can be identified as a stressor in the DNR lake IBI studies. The District-wide Fisheries Management Plan is designed to align District management activities with Minnesota DNR management goals and strategies so the two agencies can work together to maintain the ecological health of the lakes.

For the study lakes, this plan will:

1. Summarize current fishery conditions and fishery type (from the District-wide Fisheries Management Plan)
2. Summarize current management goals and management actions
3. Develop a list of fishery management strategies to support DNR management goals

Management strategies may align with aquatic vegetation and shoreline strategies to improve habitat for the fisheries. More information for the District-wide Fisheries Management Plan approach can be found in proposed work plan for the District-wide Fisheries Management Plan.

Deliverables:

- A description of the current fishery in the study lakes.
- Management strategies based on the defined fishery type and Minnesota DNR management goals.

Task 8. Capital Improvement and Monitoring Plan

After management strategies are developed for nutrients, aquatic vegetation, shorelines, and fisheries, management actions and capital projects need to be summarized including cost estimates. Building off other completed studies such as previous UAAs, lake/watershed feasibility studies, and our analyses here, a project list for managing the study lakes and their subwatershed will be developed in close coordination with District staff. The projects will be at the concept level to develop a list of appropriate practices aimed at eliminating or reducing the stressors. The project list will be developed to be easily adopted into District planning efforts.

Deliverable: A capital improvement summary table listing projects, recommended management actions, and monitoring with costs at the concept level.

Task 9. Public input process

An important part of the development of the subwatershed and lake management plan is a stakeholder process to ensure all of the issues are summarized and addressed and to develop support among the shoreline owners, city, District, and other entities. We assume the District will lead the public input process with our support. We also envision supporting the District in developing partnerships with stakeholders including Lake Associations and City of Eden Prairie to provide a plan for communication and collaboration. To support the public input process, we assume the following meetings.

- A kick-off stakeholder meeting to discuss current conditions, issues and concerns
- A stakeholder meeting to discuss shallow lake ecology and management
- A stakeholder meeting to discuss assessment results and management options

Deliverables: Preparation for and attendance at 3 stakeholder meetings. We assume a Barr led presentation at each meeting and the District leading the overall public input process.

Task 12. Reporting

We will develop a combined draft and final management plan for the three study subwatersheds and lakes including results from the previous tasks. The plan will include watershed projects, monitoring, in-lake management, and opportunities to collaborate among stakeholders. An electronic version of the draft report, will be provided for RPBCWD Administrator and Managers to review. Revisions will be made to the report based on the feedback and comments received.

Deliverables: A draft and final subwatershed and lake management plan for Mitchell Lake and Red Rock Lake.

Task 13. Project Management, Meetings, and Presentations

Project Management is a key component to help meet project milestones and will help to ensure the work meets the expectations of District staff and other stakeholders, and that it is completed in a satisfactory manner, within the project timeline and within the agreed-upon budget. Barr will provide updates to the project team that document project progress and coordinate tasks. We will provide

monthly progress reports and budget status updates as part of the monthly invoicing process. We will solicit feedback from the Administrator on an ongoing basis to ensure clear and timely communication.

We assume the following meetings.

- Up to four staff meetings to discuss results, review management approaches, and provide input
- Up to two Board presentations to discuss results of the outlet analysis and management planning

Deliverables: Meetings to update and collaborate with District staff and the Board. Monthly summaries of activities completed.

Assumptions

We have made several assumptions in preparing the scope of work for each work item in this agreement. Assumptions relating to individual work tasks are listed along with the detailed description. The proposed scope, schedule and budget may need to be adjusted at a future time as emerging details about the available data help to clarify the most appropriate modeling tool(s) to fit the available data. However, additional assumptions that do not correspond with a single work task are listed below:

- Shorelines, aquatic plants, and fisheries section cost estimates assume approval of the District-wide Fisheries Management Plan and District-wide Aquatic Plant and Shoreline Management Plan work plans.
- The District will be responsible for providing shoreline conditions for the study lakes. Barr will not be conducting any field work.
- District staff will provide all available aquatic vegetation data.
- District staff will provide all monitoring cost estimates and level of effort.
- All meetings will be held virtually or at RPBCWD's office and last no more than 2 hours.
- Meeting scheduling and coordination will be performed by District staff.
- The District will provide all available and applicable GIS and CAD files to Barr in electronic format.
- Barr has allotted time for a single round of review comment on the draft report by the District.
- Unless previously subject to more detailed design, watershed restoration measures proposed for this study will be conceptual in order to evaluate the relative benefit and develop planning level costs.
- Supplemental studies and field investigation (wetland/waterbody delineation, Phase I archeology, Phase I environmental, etc) will not be completed with this Task Order.
- Technical advisory committee representatives and other stakeholders will provide all pertinent monitoring and infrastructure data (such as as-built drawings, surveys, models, etc.) that they have collected.
- The proposed budget includes costs for mileage reimbursement for meetings and site visits.
- The District and project stakeholders will provide all available and applicable GIS and CAD files to Barr in an electronic format.
- Only minor revisions will be needed to finalize the report.

4. **Budget:**

Services under this Task Order will be compensated for in accordance with the engineering services agreement and will not exceed \$XX,XXX without written authorization by the Administrator. The following table provides a breakdown of the anticipated cost for major tasks associated with scope of services describe above. The scope and level of effort associated with the various tasks may need to be adjusted as additional information become available to maintain the overall objectives within the allotted budget.

Task	Task Description	Anticipated Budget	Tentative Completion Date
1	Goal Setting and Plan Objectives	\$3,820	January 2025
2	Current Conditions and Management Summary	\$9,370	December 2024
3	Watershed and Water Quality Modeling and Assessment	\$25,030	June 2025
4	Lake Water Quality Response Modeling	\$24,570	August 2025
5	Watershed and In-lake Nutrient and Chloride Management BMPs	\$18,890	September 2025
6	Aquatic Plant and Shoreline Management	\$4,820	August 2025
7	Fisheries Management	\$2,750	August 2025
8	Capital Improvement Plan	\$7,760	October 2025
9	Public Input Process	\$5,215	January through November 2025
10	Reporting	\$20,140	November 2025
11	Meetings, Presentations & Management	\$13,480	Throughout
Task Order 50 Total		\$135,845	

5. Schedule and Assumptions Upon Which Schedule is Based

The proposed schedule (above) assumes project initiation will occur in September 2024. The schedule may be modified depending on actual initiation of project work, when information is provided by the Cities, or if project outcomes warrant an extension to the timeline.

IN WITNESS WHEREOF, intending to be legally bound, the parties hereto execute and deliver of this Agreement.

CONSULTANT

**RILEY PURGATORY BLUFF CREEK
WATERSHED DISTRICT**

By _____

By _____

Its Vice President _____

Its _____

Date:

Date:

APPROVED AS TO FORM & EXECUTION

DRAFT