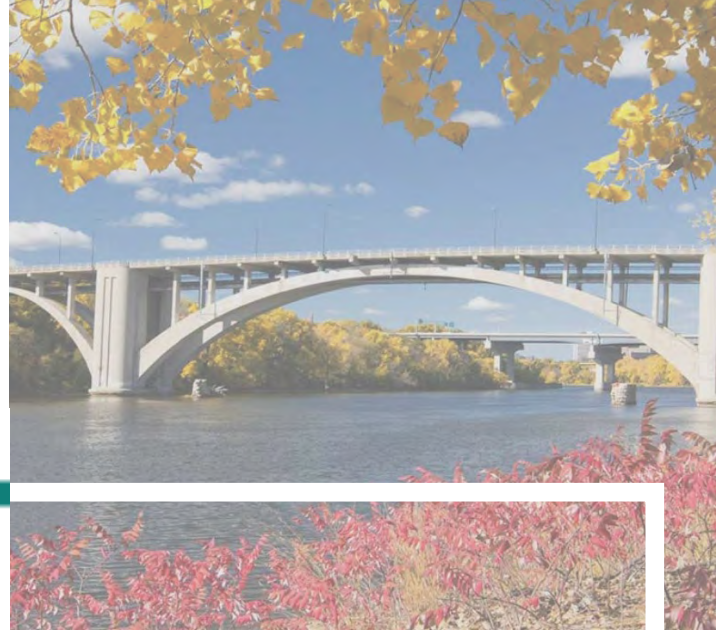


PREPARED BY:



PROPOSAL

Request for Proposals for the Mississippi River Direct Drainage Project Prioritization Study

January 26th, 2024



PREPARED FOR:



January 26, 2024

Lower Mississippi River Water Management Organization (LMRWMO)
Joe Barten, Administrator via Dakota County Soil & Water Conservation District (SWCD)
Dakota County Soil & Water Conservation District
4100 220th St. West, Suite 102
Farmington, Minnesota 55024
(651) 480-7784 | joe.barten@co.dakota.mn.us

Subject: Request for Proposals for the Mississippi River Direct Drainage Project Prioritization Study

Dear Mr. Barten,

Geosyntec Consultants, Inc. (Geosyntec) acknowledges the receipt of the LMRWMO's Request for Proposal (RFP), the RFP Questions and Answers (Addendum 1), and the RFP agenda for the "Mississippi River Direct Drainage Project Prioritization Study." Geosyntec has partnered with Rani Engineering (Rani) for this proposal as the Geosyntec Team (the "Team").

We understand that the LMRWMO has identified sources of pollution from direct drainage tributaries (approx. 17 sq mi) to the Mississippi River (the River) that could cause significant impacts to the water quality of the River, which is already impaired for excess nutrients and total suspended solids (TSS). Upstream areas contribute large volumes of urban stormwater contaminated with trash, nutrients, and sediment to the River. In addition, there are tributary erosion areas that could further impact the water quality of the River. The LMRWMO seeks a thorough investigation and analysis of the direct drainage areas to the River to identify, classify, and rank retrofit stormwater Best Management Practices (BMPs) and erosion stabilization BMPs for the study area.

The Team has assembled an experienced squad of water resources practitioners to help LMRWMO achieve its goals on time and budget. The Geosyntec Team offers you the following benefits:

- Geosyntec provides a local project manager who is experienced in hydrology/watershed analysis and will closely guide our Team and leverage our national staff of over 2,000 employees.
- Our Rani partners will enable us to provide local experience and knowledge about Minnesota stormwater design and the project area.
- Our Team has performed many similar retrofit studies to locate the best sites and least cost BMPs to reduce pollutants and manage sediment from other watersheds.
- Our Team has performed many projects that have used geomorphic (Rosgen), engineering, or geotechnical methods to restore streams that are either incised or showing signs of streambank erosion.
- Our Team will provide a solution-based approach that will yield concrete results and provide solid information for seeking future construction funding, thus enabling the LMRWMO to meet the project goals and the overall goals of the LMRWMO.

This proposal will remain valid for no less than 90 days. Paul Brookner is a Senior Principal based in Minneapolis authorized to bind the offering firm to terms of this proposal. We look forward to the opportunity to partner with the LMRWMO. For any questions, **your primary point of contact will be Nigel**, whose contact information is listed below, and address is within the header of this transmittal letter.

Sincerely,



Nigel Pickering, PhD, PE
Senior Engineer
npickering@geosyntec.com
(612) 253-8214



Paul Brookner, PG
Senior Principal
pbrookner@geosyntec.com
(612) 253-8203

January 26, 2024

TABLE OF CONTENTS

PROJECT UNDERSTANDING	1
APPROACH & METHODOLOGY	1
Task 1. Project Coordination.....	1
Task 2. Data Review	2
Task 3. Desktop Analysis to Identify Potential BMP Locations.....	3
Task 4. Site Reconnaissance to Prioritize Potential Locations	4
Task 5. Estimated Site Performance.....	4
Task 6. Develop Conceptual Designs	5
Task 7. Reporting.....	6
References.....	6
QUALIFICATIONS & EXPERIENCE	7
Geosyntec Staff	7
Rani Staff.....	9
Organizational Chart	10
Geosyntec Project Experience	11
Rani Project Experience	13
BUDGET & SCHEDULE	14
Budget	14
Rates and Hours	14
Timeline	14
SUBCONTRACTING	15
CONFLICT OF INTEREST	15
RESOURCES, ASSUMPTIONS, AND RESTRICTIONS.....	15

APPENDICES

Appendix A: Resumes

January 26, 2024

PROJECT UNDERSTANDING

Our Team's understanding of the project is the LMRWMO is concerned about nutrient and sediment pollution of the River via the project's direct drainage areas. LMRWMO is looking for ways to mitigate the pollutants from the direct drainage areas identifying potential sites for stormwater and stream stabilization best management practices (BMPs) to reduce land-based sources of pollution to the River.

We understand that finding feasible and cost-effective sites for stormwater and stream restoration BMPs is a complex overlay of many factors. These factors include regulatory hurdles like setbacks and contaminated sites; availability of public open space to avoid land costs; location of sites relative to upstream drivers of high flow (e.g., impervious area); and accumulated flow, slope, and erodibility of soils for river sites. We will use a GIS-based desktop analysis backed by site verification to develop a prioritized candidate list of potential sites, for which cost-effective conceptual designs and costs will be developed.

Our Team firmly believes that the final report will serve as a valuable tool for decision-making and future prioritization of projects, promoting improved water quality and erosion control within the targeted watersheds. Besides providing a prioritized list, the report will include details such as project locations and footprints, feasibility, constructability, estimated construction and maintenance costs, and pollutant reduction benefits.

There is a desire for modeling mentioned in the RFP, but at this stage of our understanding, we do not see value to include modeling in our scope based on the following reasons: 1) past modeling has used models that vary greatly in location and model type and will take time to combine; 2) the study area drains directly to the River via small unconnected watersheds so the advantage of an inter-connected model would not be realized; and 3) the budget seems better suited to solving the pollution and erosion issues with analysis, field observation, and design.

APPROACH & METHODOLOGY

Our Team's approach will identify potential retrofit sites for stormwater and stabilization BMPs where significant flow and pollutant reductions are feasible. These sites could be constructed or retrofitted to minimize direct runoff conveying trash, sediment, and nutrients to the River. The approach will use a GIS-based desktop analysis with criteria that are ranked and scored through a transparent process to evaluate site suitability and develop a draft candidate list of potential sites. Site assessments will be performed to assess and refine the candidate site list and to create a final list of priority candidate sites. Conceptual designs and costs will be developed for the final list candidate sites.

We will provide a comprehensive and clear approach, produce work products that establish a strong foundation for the next steps, and facilitate a good working relationship with LMRWMO that is flexible yet sensible and accessible. The following tasks provide details for our overall approach.

Task 1. Project Coordination

Approach: We will coordinate with LMRWMO regarding project roles, details, and progress. The Geosyntec team will host a one-hour remote or in-person meeting with the LMRWMO at the end of significant tasks. These meetings will be at the completion of Tasks 2, 4 and 7. The final project meeting will be a presentation to LMRWMO that summarizes the report. Minutes will be documented during project meetings.

January 26, 2024

Internally, the team will meet bi-weekly to coordinate progress on the project. Our Team project manager will relay progress to LMRWMO project manager via emails or brief project check-ins, as needed.

Deliverables:

- Meeting minutes
- Monthly invoices

Task 2. Data Review

Approach: We will work with the LMRWMO and their member cities to collate the data necessary for this project in both digital and hard-copy formats. Data will include Geographic Information System (GIS) layers, maps, reports, and Computer Aided Design (CAD) files. The data that will likely be used for this analysis include, at a minimum, the data listed in Table 1. All data will be reviewed in detail to identify potential data gaps.

Table 1. List of Data Sources Useful for the Desktop Analysis

DATA NAME	DATA SOURCE	DATA TYPE
Parcels	City	GIS Vector
Parcels – city-owned	City	GIS Vector
Stormwater Manholes	City	GIS Vector
Stormwater Catch Basins	City	GIS Vector
Stormwater Pipes	City	GIS Vector
Stormwater BMPs (existing)	City	GIS Vector / Report
Impervious area (IA) - if available	City/County	GIS Vector / Raster
Recreational spaces	State	GIS Vector
Land Use	State	GIS Vector
Karst geology	State	GIS Vector
Regulatory Areas (e.g. setbacks)	State	GIS Vector / Statutes
Contaminated sites	State	GIS Vector
Resource Areas	State	GIS Vector / Statutes
Public Wells and County Well Index	State	GIS Vector
Drinking Water Supply Management Areas	State	GIS Vector
National Wetlands Inventory	USFWS	GIS Vector
Soils	NRCS SSURGO	GIS Raster
Soil Erodibility	Derived from SSURGO	GIS Raster
Ground Elevation	USGS LiDAR	GIS Raster
Landscape Slope	Derived from LiDAR	GIS Raster
Upstream Drainage Area	Derived from LiDAR	GIS Raster
Upstream Impervious Area	Derived from LiDAR & IA	GIS Raster
Past BMP Designs & CAD Files	City/State	CAD / Reports
Past Modeling Studies & Maps	City/State	Reports
Past Watershed Studies & Maps	City/State	Reports

January 26, 2024

Deliverables:

- Data summary and data gaps.
- Meeting with LMRWMO

Task 3. Desktop Analysis to Identify Potential BMP Locations

Approach: We will work closely with the LMRWMO to ensure that the proposed watershed analysis and proposed site rating system meets their objectives for the project.

The proposed approach will use a GIS-based desktop analysis with pre-determined criteria to identify sites that are ranked highly for stormwater treatment or erosion stabilization BMPs. The criteria for stormwater BMPs and stabilization sites will differ slightly, and we will likely emphasize upstream stormwater BMPs to treat the cause (high flow) rather than the symptoms (streambank erosion).

Stormwater BMP suitability criteria would determine the upland areas that would be most suitable for stormwater BMPs. Criteria could include available space, property ownership (e.g., public versus private), upgradient impervious area, soil type and infiltration capacity, and nearby environmental constraints (e.g., wetlands and waterbodies). Soils with low to moderately low runoff potential and no high groundwater issues could ensure recharge of groundwater. Sites in certain priority sub-basins might be preferred. Public well, environmental resource, and contaminated site data could be used to exclude high vulnerability drinking water supply management areas and proximity to local wells, wetlands, some riparian areas, Karst areas, and regulated areas.

Stabilization BMP suitability criteria would determine the areas that would be ranked most suitable for stabilizing eroded areas. Criteria could include available riverine space, site slope, soil erodibility, incised riverbed conditions, and nearby environmental constraints (e.g., wetlands and waterbodies). Riverbanks with steep channel and bank slopes with an incised bed could indicate high channel erodibility. Public well, environmental resource, and contaminated site data could be used to avoid wetlands, riparian areas, and regulated areas. Furthermore, vegetative characteristics, existing riparian buffers, storm sewer outfalls, and ephemeral tributary outfalls could be assessed to identify priority sites for stabilization and restoration.

The proposed approach will also include criteria to identify sites that are most constructible. These criteria could include potential land costs related to parcel ownership, presence of an existing BMP, accessibility, and available space. Ownership of parcels can be used to determine the ease of a municipality implementing a BMP on the site and long-term operation and maintenance considerations. Ownership can be grouped into three categories: city-owned, other public, and private. Existing BMPs can be included as a criterion to identify those sites that can potentially be retrofitted. A higher percentage of onsite (not upland) impervious area indicates less available space, which may result in a more costly BMP.

The individual geographic criteria can be overlaid in GIS and ranked to identify excellent, constructible BMP sites that will have high potential for pollutant removal. Ranking will use a simple and transparent scoring analysis to screen for potential sites. Each criterion can be scored on a 1-5 range and weighted, if necessary. Total scores will be presented graphically to show favorable regions. The top ranked 100 sites will be presented in a summary table. This table will form the basis of the proposed field work.

Deliverables: Maps and table showing top-ranked sites from desktop analysis.

January 26, 2024

Task 4. Site Reconnaissance to Prioritize Potential Locations

Approach: The priority stormwater and riverine sites from the GIS analysis will be reviewed using Google Earth to ensure that sites are viable for site assessments and BMP implementation. Specifically, the potential for stormwater runoff to be directed to stormwater BMPs and adequate space onsite will be reviewed visually. Priority streambank stabilization and restoration sites will be assessed in the field to verify desktop findings including constructability, site measurements of channel geometry, bank angle, and other relevant factors. The remaining candidate sites will be selected for assessing the potential for BMPs for both stormwater treatment and reducing streambank erosion.

Site assessments will be conducted using up to three teams, depending on time available, weather conditions, and number of proposed sites. The teams will use ArcGIS Collector/Survey123 or field sheets to facilitate the collection of site data and take geo-referenced photos at each of the field sites. We expect about 50-70 sites will be evaluated in the field, based on the desktop GIS assessment. Priority ravines might have to be walked along the entire length.

For the candidate sites, we will confirm and evaluate the following:

- Location OK or modify (if applicable)
- Land use at the candidate site
- Land use in the drainage area
- Existing outfalls and BMPs (stormwater sites)
- Evidence of erosion, seepage etc. (streambank sites)
- Evidence of utilities
- Evidence of nearby wetland vegetation and/or hydric soils
- Site Description and Feasibility
- Potential Retrofit Type
- Site Cost Factor (0-4)
- Overall Site Suitability

The overall site suitability will be used to rank the field-evaluated sites for potential BMPs. The scores will range from 1 to 5. Scores with a 3 or higher will be selected for further evaluations. We expect the field evaluation to yield about 20 suitable sites. Both upland sites and regional downstream sites will be considered.

Deliverables:

- Maps and table showing top-ranked sites after site reconnaissance
- Meeting with LMRWMO

Task 5. Estimated Site Performance

Approach: Using a planning level approach, the suitable sites from Task 4 will be sized and then pollutant removals estimated. Because there are many ways to estimate these values, we will work closely with the LMRWMO to determine their method of choice. Estimated site performance for stormwater BMPs can be simulated using approved methods by the Minnesota Pollution Control Agency (MPCA) for site analysis like the Minimal Impact Design Standards (MIDS) calculator or the P8 model. Similarly, models like the Bank Stability

January 26, 2024

and Toe Erosion Model (BSTEM) can be used to estimate streambank erosion. However, with planning level data, modeling will likely not be much more accurate than simple approaches. For this stage of the evaluation, we suggest using a simpler approach for assessing performance and saving any desired modeling analysis for the final candidate sites (if needed).

Planning-level sizing and pollutant removal calculations for stormwater BMPs could be performed using MIDS, however, it does not lend itself to automation for a large number of potential sites. These calculations could also be made using minimal spreadsheet calculators for sizing (Wood and Pickering, 2013) and curve-based pollutant reductions (TetraTech, 2010). The latter method uses the treatment depth (volume treated/drainage area, inches) and performance curves for suspended solids and phosphorus to estimate pollutant removal for a range of stormwater BMPs.

For streambank erosion, the actual erosion reductions can be evaluated by using field measurements to estimate the sediment loss from aerial photos over time, and converting that volume into sediment mass, using modest calculations like the BWSR Stream & Ditch Calculator. Full stream restoration could assume that current sediment loss per year represents the potential sediment reduction. Associated phosphorus reduction would require an assumption of the phosphorus content of the sediment (% w), depending on the Natural Resources Conservation Service (NRCS) soil type.

Planning level costs for BMPs could be determined based on local BMP information from past projects. Both Rani and Geosyntec have cost data from prior stormwater BMPs and stream restoration projects. Alternatively, for stormwater, we could use a method developed by Wood and Pickering (2013) for volume-based costs. These stormwater cost numbers will be compared with more recent national cost numbers (Rossman and Bernagros, 2019; Krieger and Gruber, 2020). All planning-level costs need to include the appropriate engineering design costs (25-35%, if needed), corrections for inflation depending on the original cost information date, and should be cross-checked against construction costs for recent BMP in Minnesota.

Deliverables: Summary table of 15-25 candidate sites with size, construction cost, and estimated pollutant reduction.

Task 6. Develop Conceptual Designs

Approach: Additional field visits to the final candidate sites will be needed to refine LiDAR derived elevations and slopes. In addition, measurement of the soil layers will be used to assess the soil characteristics up to a depth of 6 feet. The soil data will determine whether infiltration BMPs are an option for design.

Conceptual stormwater BMPs will be designed using the standard requirements in the Minnesota Stormwater Manual ([link](#)). The volume-based sizing will be checked with HydroCAD and adjusted accordingly, depending on the site available space and other constraints. These conceptual designs will also have a more detailed estimate of costs based on quantities and pricing. Streambank stabilization solutions and conceptual design will vary significantly from site to site depending on the site-specific conditions of each area. Example solutions could include vegetative stabilization and buffer establishment, hard armoring (i.e. riprap, gabions), or overland/slope diversions to re-route surface waters away from eroding streambanks. In some cases, a combination of these measures may be most effective at mitigating erosion.

January 26, 2024

A conceptual design will be developed for 5 to 8 sites as an 11"x17" sheet showing BMP footprint with details using typical details and notes relevant to the proposed design. It is assumed that one round of comments and revisions will be made and addressed on the conceptual designs.

Deliverables: Conceptual designs for 5 to 8, quantity-based costs, graphics, with some detailing.

Task 7. Reporting

Approach: Our Team will prepare a draft and final project report based on the tasks in this project. Our report will detail the GIS desktop analysis, the site reconnaissance effort, the conceptual level design, construction costs and estimated pollutant removals for feasible sites, and conceptual designs with quantity-based costs for up to 8 selected sites. It is assumed that one round of comments and revisions will be made and addressed for both versions of the report. At the end of the project, all digital data will be provided to LMRWMO in an organized folder structure.

Deliverables:

- Draft report and figures
- Final report and figures
- Deliver project digital data (CAD, GIS, Word & Excel files)
- Meeting and presentation with LMRWMO

References

Krieger, J. and Gruber, E. 2020b. Life-cycle costing module for distributed stormwater control measures for the integrated decision support tool (iDST). <https://smartech.gatech.edu/handle/1853/62873>.

Rossman, L.A. and Bernagros, J.T., 2019. National Stormwater Calculator User's Guide – Version 2.0.0.1. EPA/600/R-13/085g, US-EPA, Washington, DC.

TetraTech, 2010. Stormwater Best Management Practices (BMP) Performance Analysis. Prepared for: United States Environmental Protection Agency – Region 1, Boston, MA. Prepared by: Tetra Tech, Inc., Fairfax, VA.

Wood J. and N.B. Pickering, 2013. Building Blue in Franklin, Massachusetts. Watershed Science Bulletin. Center for Watershed Protection, Ellicott City, MD.

January 26, 2024

QUALIFICATIONS & EXPERIENCE

We are excited to showcase our Team's experts from Geosyntec and Rani Engineering in hydrology, stormwater, and erosion control. The organization chart provided at the end of this section illustrates the reporting relationship of key personnel and areas of responsibility. Experience listed in the team biographies shows how each member is prepared for their tasks. Full resumes are also included in the appendix.

Geosyntec Staff

Geosyntec is a multidisciplinary consulting and environmental engineering firm that helps clients solve challenging issues involving the environment, natural resources, and civil infrastructure. With 2,000 employees, the company has 100 offices worldwide, with a local office in Minneapolis, Minnesota.

- **Subject Matter Experts:** Geosyntec has built a team of nationally recognized technical experts, with 65% having advanced technical degrees and 12% holding doctoral degrees in relevant fields.
- **Key Client Issues:** Watershed managers face many issues related to surface water, groundwater, and healthy communities. Our clients rely on us to provide high-quality work to help solve these problems.
- **Collaboration and Efficiency:** Geosyntec works collaboratively with clients to fully understand the problem. We provide rigorous assessments and then deliver a well-conceived plan and design.
- **Excellent Water Resources Staff:** Geosyntec offers an outstanding team of local and diverse individuals with water resources expertise and the desire to help communities.



Nigel Pickering, PhD, PE (MN, FL, OR), Project Manager (Minnesota). Dr. Pickering is a Senior Water Resources Engineer with 30+ years of experience in the academic, nonprofit, and consulting arenas, providing his expertise to watershed monitoring/modeling, water resources planning, and stormwater design and modeling. He is proficient with 20+ quantity and quality models commonly used in water resources. In particular, he has performed restoration assessments for many watersheds and cities in Massachusetts and Vermont, providing clients with a clear roadmap for future restoration efforts. Nigel has managed many large, long-term projects with full oversight from start to finish.



Renee Bourdeau, PE (NH), Project Advisor (New Hampshire). Ms. Bourdeau is Principal Engineer with 20 years of experience managing and implementing environmental compliance and monitoring projects. Her expertise includes sampling a wide variety of water-quality related media including stormwater, industrial wastewater and sediment. Renee has worked with municipalities and public agencies across Massachusetts and New England. Renee has specific expertise with managing field staff for sampling events, reviewing data, and making management decisions, designing, and constructing stormwater BMPs, preparing compliance documents, and negotiations with the US-EPA.



David J. Vance, PG (GA), Project Advisor (Georgia). Mr. Vance is a professional geologist who is principally involved in ecosystem assessment and restoration. He has more than 17 years of experience throughout the U.S. in natural resources consulting focused on the interdisciplinary application of river science (applied fluvial geomorphology) to geomorphic and physical process characterization, fate and transport of sediment, and design of solutions to restore or stabilize stream and river systems, particularly in watersheds where natural flow regimes have been altered by urbanization, diversion, and/or damming.

January 26, 2024



Daniel Bourdeau, PE (NH, NJ, NY, MA, ME), CPESC, CPSWQ, Conceptual Design Lead (New Hampshire). Mr. Bourdeau is a Principal Engineer with 22 years of experience in civil and water resource engineering. He has expertise water/wastewater treatment process design, geotechnical engineering, hydrologic/hydraulic and water quality processes, and floodplain analysis. He has expertise in stormwater management including watershed assessments to identify BMP sites, BMP design and costing, and overseeing construction of a variety of stormwater BMPs.



Harsh Anurag, PhD, GIS Lead (Minnesota). Dr. Anurag is a Senior Staff Scientist with 8 years of experience in hydrology and climate change. His Ph.D. research investigated the impact of climate change on groundwater recharge in Minnesota. As part of his research, he investigated the impact of vegetation changes on statewide groundwater recharge. He also analyzed future recharge trends in Minnesota using climate projection data. He has worked on multiple projects involving extensive geospatial and geostatistical analysis using GIS (ArcGIS and geopandas/Python).



Julia Keay, PE (MA), CPESC, Conceptual Design Support, GIS Support, & Reporting (Massachusetts). Ms. Keay is a Project Engineer specializing in water resources and the design of stormwater BMPs, with a focus in low impact development and green infrastructure. Ms. Keay is trained in environmental sciences, water resources, watershed management, planning, hydrologic processes, hydraulics and fish passage engineering. Additionally, she has assisted in the development of erosion and sediment control plans and environmental permitting. She has particular expertise in hydrologic/hydraulic modeling with expertise in HydroCAD, EPA SWMM, HEC-HMS HEC-RAS and GIS. Ms. Keay also has expertise in linear optimization modeling (LINGO) and Visual Basic.



Hannah Holtzman, MS, GIS Support & Field Support (Minnesota). Ms. Holtzman is a Staff Scientist with 5 years of experience in hydrology and climate change. Her graduate research focused on reconstructing historic precipitation and temperature in Arctic Russia using organic geochemistry and lake proxy system modeling. She has experience collecting surface water samples, sediment cores, and groundwater samples. Hannah supports due diligence, site assessment/remediation, litigation support, and water resources projects through fieldwork, data analysis and visualization using ArcGIS, R, and Python.



Mike Hogan, CPESC, HAZWOPER, Field Support (Missouri). Mr. Hogan is a Professional Scientist with 11 years of experience as an environmental consultant and scientist. Areas of expertise include erosion and sediment control, surface water quality sampling and data management/interpretation, environmental permitting, natural resource investigations, hydrologic monitoring and data collection, and aquatic ecology. Mike's regulatory experience includes: NPDES permitting for construction stormwater, industrial stormwater, and industrial wastewater, U.S. Army Corps of Engineers (USACE) sections 401, 404, and 408 permitting for impacts to waters of the U.S. and levees, and protected species consultations with U.S. Fish and Wildlife Service (USFWS), and state agencies.

January 26, 2024

Rani Staff

RANI engineering As one of Minnesota's first minority-owned engineering design companies, Rani Engineering has become a highly recognized and award-winning firm. Located in Minneapolis, Rani provides professional and technical services to public and private sector clients nationwide. Their clients include MnDOT, the City of Minneapolis, Ramsey County, and Hennepin County. Rani is currently supported by 53 employees and growing with areas of expertise and services that include: Water Resources and Stormwater, Site Development, Land Surveying, Utility Coordination and Local Roads.

They focus on building partnerships that provide shared values built on a foundation of reliability and quality. Their collective team of experts is committed to client satisfaction. They support this commitment with dedication, experience, and project management focusing on frequent and in-depth communication. Their record of successful and collaborative projects shows that their top priority is satisfied clients. Rani Engineering is a small business certified by six local and federal certification programs.



Amanda Bergstrom, BS, PE (MN), LEED AP BD+C, CPESC, Field Lead. Amanda has 20 years of experience providing water resources engineering design, erosion control/SWPPP services, and stormwater permitting to watershed districts, the Metropolitan Council, MnDOT, and several counties and municipalities. She currently manages several MnDOT subcontracts, serves as task lead for erosion control on several MnDOT projects and leads the water resources practice group. She is certified in the Design of Construction SWPPP.



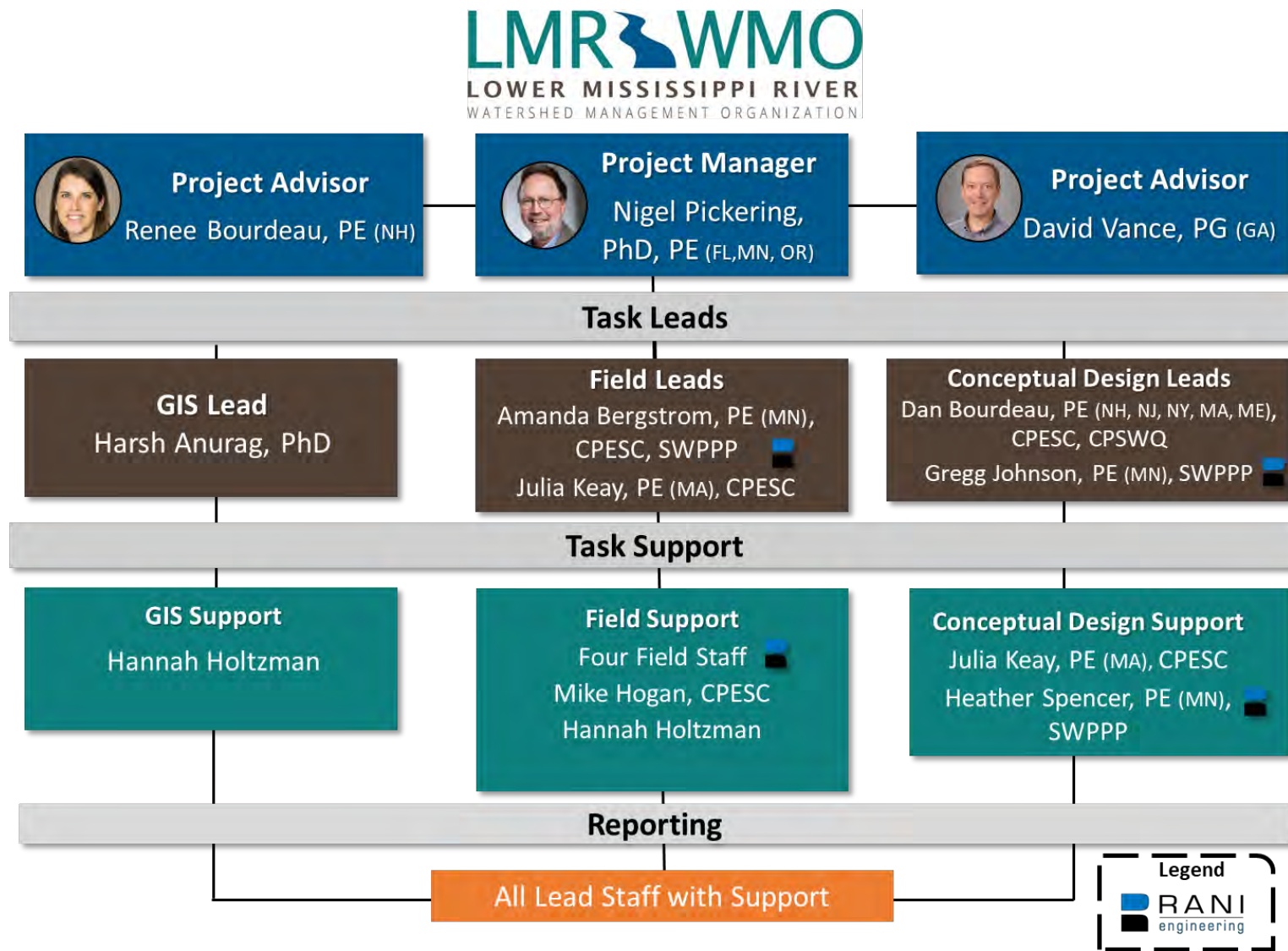
Gregg Johnson, BS, PE (MN), Design Lead. Gregg has 17 years of combined design engineering and construction project management and administration experience. As a design engineer, he has designed stormwater drainage systems, including urban sewer systems, infiltration, and filtration basins, underground stormwater treatment structures, culvert replacements, pond cleanouts, and restorations, as well as site development designs, including parking lots, utility connections, and stormwater management. Gregg was the lead designer for both of the Ford Parkway Slope Stabilization projects and the Woodhill Drainage Study. He is certified in Design of Construction Storm Water Pollution Prevention Plan (SWPPP) and Construction Site Management.



Heather Spencer, BS, PE (MN), SWPPP. Design Support. Heather 27+ years of global experience in site development, water resources, and municipal engineering. She has managed numerous projects in MN, FL, NY, Australia, Indonesia, and Jamaica, from scope development through planning, design, and construction. Heather's experience includes stormwater master planning, water quantity/quality planning, operations and maintenance planning, and capital improvement plans. Heather is proficient in XP-SWMM, PCSWMM, P8, and several other water resources models. She led the Como and Larpenteur Pond Condition Analysis projects for Ramsey County.

January 26, 2024

Organizational Chart



January 26, 2024

Geosyntec Project Experience

Below we have provided a snapshot of projects where Geosyntec has added value to the client's original project goals and turned challenges into opportunities. We provide highly skilled staff, local knowledge of the study area, and extensive experience with similar stormwater BMP siting and slope stabilization studies. Our focused approach will use streamlined methods to deliver cost-effective and feasible conceptual plans that will help the LMRWMO procure funding for implementing future stormwater and/or slope stabilization projects in the study area.



Upper Villa Park: Design and Installation of an Intelligent Stormwater Control System to Improve Water Quality, Roseville, Minnesota.

Geosyntec designed and installed an OptiRTC stormwater monitoring and control system as part of the Upper Villa Park water quality improvement project. The goal was to install an infiltration-based water quality retrofit in the Lake McCarrons subwatershed, to reduce phosphorus loading. Geosyntec designed the system, which had an automated butterfly valve at the outlet of a rainwater harvesting reuse cistern, water level sensors, and

an electric control panel. The system uses internet-based predictive weather information and real-time water level data to release water from the reuse cistern prior to storm events.

Client Name: Robert Fossum, Capitol Region Watershed District | bfossum@capitolregionwd.org

Contact Personnel from Geosyntec: David Richardson, PE, Nigel Pickering, PhD, PE



Statewide Watershed Based Plans, Massachusetts. MassDEP selected Geosyntec to develop a web-based tool for statewide Watershed-Based Plans (WBPs). For this project, Geosyntec developed an innovative watershed-planning tool that integrated science, engineering, public policy, and public education. Geosyntec's tool helped users develop WBPs that meet the nine

elements required by the U.S. Environmental Protection Agency (USEPA). A WBP is a prerequisite for communities or local organizations that wish to apply for federal grant funding for watershed restoration projects under Section 319 of the Clean Water Act. The tool allows organizations and communities to complete a technically robust WBP efficiently and allow the state to focus on funding on watershed restoration.

Client Name: Meghan Selby, Massachusetts Department of Environmental Protection | meghan.selby@mass.gov

Contact Personnel from Geosyntec: Julia Keay, PE, CPESC



Long Lake Stormwater Retrofit Design, Littleton, Massachusetts. Geosyntec was selected by the Town of Littleton to design innovative watershed-based approaches to managing stormwater discharges to Long Lake. Using LID stormwater techniques (bioswales, bioretention cells, rain barrels, and constructed wetlands) Geosyntec designed a comprehensive retrofit program to reduce sediment and nutrient loading to the lake. Geosyntec also

provided designs, permitting and construction oversight for daylighting of a stream that previously discharged to the pond via a culvert adjacent to the town beach.

Client Name: Matt Silverman, Town of Littleton Water Department | msilverman@lelwd.com

Contact Personnel from Geosyntec: Renee Bourdeau, PE, Daniel Bourdeau, PE, CPESC, CPSWQ

January 26, 2024



Cobbett's Pond Watershed Restoration Plan, New Hampshire. Geosyntec developed a comprehensive watershed restoration plan for Cobbett's Pond. This project included development of a phosphorus loading model, water quality and flow monitoring, aquatic vegetation survey, and stormwater BMP site selection, prioritization, ranking, and design. Geosyntec conducted a watershed reconnaissance using GIS-based information to identify and prioritize BMP sites. Based on the BMP ranking, Geosyntec has developed designs from conceptual to final design and through construction of five phases of BMP implementation. These phases include constructed wetlands, bioretention cells, vegetated swale corridors, wet ponds, and infiltration facilities. Geosyntec's initial watershed restoration plan was developed to support the client secure grants for all five phases of implementation.

Client Name: Derek Monson, Cobbett's Pond Improvement Association | 20turtlerock@gmail.com

Contact Personnel from Geosyntec: Julia Keay, PE, CPESC, Daniel Bourdeau, PE, CPESC, CPSWQ



Stormwater Program Assessment, City of Rochester, New Hampshire. Geosyntec assisted the City of Rochester as part of a three-year stormwater engineering contract to provide services in support of their Phase II Municipal Separate Storm Sewer Systems (MS4) Permit implementation including the development of a USEPA-approved Nutrient Control Plan. The final Nutrient Control Plan included nutrient control targets, management strategies, specific proposed BMP locations, identification of non-structural BMPs and prioritized ranking for BMP cost-effectiveness. The plan also included a watershed hot spot mapping effort to identify and prioritize nutrient reduction BMPs targeting public property. The mapping effort was validated with a field assessment and selection of priority BMP sites which are slated for conceptual design.

Client Name: Peter Nourse, City of Rochester | peter.nourse@rochesternh.net

Contact Personnel from Geosyntec: Renee Bourdeau, PE, Daniel Bourdeau, PE, CPESC, CPSWQ



Best Management Practice Plan Development, Boeing, St. Louis, Missouri. Boeing's 300-acre Production Facility in St. Louis drains the Coldwater Creek. These discharges are regulated under a Missouri Department of Natural Resources (MDNR) permit. Boeing hired Geosyntec to develop a Best Management Practice (BMP) Plan to reduce exceedances of many contaminants at the stormwater outfalls. Geosyntec visited the site, reviewed data, assessed sub-watersheds, sampled water quality, performed a BMP alternatives analysis, developed the BMP Plan, provided planning costs for installation and maintenance, and included conceptual designs for each alternative. The BMP Plan was approved by MDNR with positive feedback.

Client Name: Christian Reich, Boeing Company | christina.j.reich@boeing.com

Contact Personnel from featured team: Mike Hogan, CPESC



Lower Buttermilk Creek Bank Stabilization Project, Austin, TX. The Creek has high flows from upstream urbanization which have eroded the stream bank and undermining an existing storm drain. Geosyntec designed and implemented engineering solutions to stabilize the existing stream bank, protect threatened infrastructure, restore native vegetation, and preserve existing aquatic habitat. The approach used drilled pile and concrete retaining wall for bank stabilization combined with limestone block facing and reinforced vegetated soil slopes to resist erosion and keep a natural aesthetic.

Geosyntec's design restored stream functionality and protected residential properties.

Client Name: Charlie Kaough, City of Austin Watershed Protection | Charles.kaough@austintexas.gov

Contact Personnel from Geosyntec: Marty Christman, PE, CPESC, David Vance, PG

January 26, 2024

Rani Project Experience



Woodhill Drainage Study, MnDOT, Burnsville, MN. The TH13 reconstruction project in 2014 caused flooding issues for adjacent residential properties. We performed a topographic and boundary survey, then configured the hydrology model to evaluate pre-and post-construction conditions. With input from MnDOT and Burnsville, Rani used the post-construction model to evaluate options and found a combination of mitigation measures to alleviate the flooding. Rani prepared a report, final construction plans and specifications for the proposed design solution and construction phase engineering. The constructed project provided a solution to the flooding for roadway and the community.

Client Name: Alan Rindels, MnDOT Metro District Project Manager | alan.rindels@state.mn.us

Contact Personnel from Rani: Gregg Johnson, PE, SWPPP



Ford Parkway Bridge Drainage Remedy & Erosion Control, Ramsey County, St. Paul. The Saint Paul side of the Bridge had significant erosion on the side slopes plus the local drainage systems had failed. Rani developed solutions for both the drainage and erosion control issues. A topographic survey of the area was performed and used to analyze the existing drainage in the project area. The best remediation options were presented to the stakeholders to discuss pros and cons of each option and select a preferred solution. Rani prepared the construction plans, specifications, and engineering costs for the replacement storm sewer, and riprap and gabions for erosion control.

Client Name: Kathy Jaschke, Ramsey County Public Works | kathy.jaschke@co.ramsey.mn.us

Contact Personnel from Rani: Gregg Johnson, PE, SWPPP



Ford Parkway Bridge Drainage and Erosion Control, Hennepin County, Minneapolis, MN. The Minneapolis side of the Bridge had a drainage pipe system on the bank adjacent to the bridge that failed near the top of bank. In addition, there was surface erosion down the bank causing washout of the drainage system. Rani was hired as a sub-contractor for this project. Rani surveyed the steep (65%) west embankment and provided a hydrologic/hydraulic study for the project drainage area. This work was used provide design alternatives for the project team and allowed discussion of the best alternative with the stakeholders. For the final design, Rani provided construction survey staking and shop drawing review construction administration.

Client Name: Kristine Stehly, Hennepin County Public Works; kristine.stehly@hennepin.us

Contact Personnel from Rani: Gregg Johnson, PE, SWPPP

January 26, 2024

BUDGET & SCHEDULE

Budget

Task	Hours	Labor	Direct Costs	Total
1) Project Coordination	12	\$2,470	\$0	\$2,470
2) Data Review	60	\$10,322	\$0	\$10,322
3) Desktop Analysis	77	\$13,884	\$288	\$14,172
4) Site Reconnaissance	123	\$20,386	\$902	\$21,288
5) Estimate Site Performance	39	\$7,958	\$0	\$7,958
6) Develop Conceptual Designs	80	\$16,059	\$0	\$16,059
7) Reporting	44	\$8,225	\$0	\$8,225
TOTAL	435	\$79,304	\$1,190	\$80,494

*Budget includes direct costs for transportation and 10% overhead on sub-contractor labor

Rates and Hours

Staff Name	Position	Rate	Hours
Renee Bordeau, PE/David Vance, PG	Principal	275	5
Dan Bordeau, PE, CPESC, CPSWQ	Principal	275	6
Nigel Pickering, PhD, PE	Senior Professional	255	31
Julia Keay, PE, CPESC	Project Professional	230	46
Mike Hogan, CPESC	Project Professional	230	13
Harsh Anurag, PhD	Senior Staff Professional	180	91
Hannah Holtzman	Staff Professional	155	109
Sarah Squillace	Project Administrator	85	3
Rani Engineering Team (PEs)	Senior Professionals	230-250	21
Rani Field Staff	Junior Professionals	130	110

Timeline

Task / Month	2024								
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov
1) Project Coordination									
2) Data Review									
3) Desktop Analysis									
4) Site Reconnaissance									
5) Estimate Site Performance									
6) Develop Conceptual Designs									
7) Reporting									

January 26, 2024

SUBCONTRACTING



Geosyntec will subcontract most of the field work (Task 4) and share the conceptual design work (Task 6) with Rani Engineering in Saint Paul. They are an experienced local stormwater and surveying company. Please reference their key personnel biographies and relevant project experience in the Qualifications & Experience section above.

CONFLICT OF INTEREST

We do not perceive any conflict of interest if we were to be selected to provide our services for this project.

RESOURCES, ASSUMPTIONS, AND RESTRICTIONS

RESOURCES

- LMRWMO will provide a single point of contact for this project.
- LMRWMO will provide access to their GIS coordinator and local GIS layers for this project.
- LMRWMO will coordinate site access on private property (if needed) and notifications (if required).

ASSUMPTIONS

- One in-person kickoff meeting up to one hour long with LMRWMO staff and select Team staff.
- Two virtual meetings up to one hour long with LMRWMO staff and select Team staff.
- Periodic email check-in with LMRWMO point of contact and the Team project manager.
- Internal biweekly Team meetings with the Team Project manager and one to three team members.
- Up to 50-60 field sites, 15-25 candidate sites, and 5-8 conceptual designs (3 pages max.).
- Up to 3 days of field effort with 1 to 3 teams per day (60-70 h).
- One round of review each for the draft and final conceptual designs.
- One round of review each for the draft and final reports.
- All deliverables will be electronic.

RESTRICTIONS

- Geosyntec prefers a 30-day turnaround for invoices.

APPENDIX A: RESUMES



Proposed Role

Project Manager

Specialties

- Water Quality Modeling
- Hydrology & Hydraulics
- Groundwater Modeling
- Stormwater Assessment & Design

Water Resources Models

AQUATOX, BMPDSS/SUSTAIN, HEC-2/HEC-RAS, HSPF, HydroCAD, InfoWorks CS, LLRM, MODFLOW, SWMM, PondPack, P8, WAM, and WinSLAMM

Education

Ph.D., Agricultural Engineering, Cornell University, Ithaca, New York, 1990

M.S., Agricultural Engineering, Cornell University, Ithaca, New York, 1982

B.S., Agricultural Engineering, University of Natal, South Africa, 1977

Registrations and Certifications

Professional Engineer, Florida (51473), Minnesota (59980), Oregon (100879)

REPRESENTATIVE PROJECTS

Water Management Alternatives to Reduce Streamflow Impacts in the Charles and Neponset Rivers, Massachusetts Department of Environmental Protection, Worcester, Massachusetts. Lead engineer for water management alternatives to restore streamflow in the watersheds (two projects). Evaluated potential streamflow increases from alternatives such as: water conservation, alternative water supply, stormwater recharge, reduced sewer inflow/infiltration, and optimized pumping strategies. Stormwater recharge retrofits for 9 towns (~150 sq mi) were identified with GIS desktop analysis and field reconnaissance. Annual BMP recharge volumes, phosphorus removal efficiencies, and total costs were estimated.

Watershed Restorations to Meet Flow-Based TMDLs. VT Lead Scientist and Watershed Modeler to develop flow restoration plans (FRPs) for the watersheds of Centennial, Monroe, and Englesby Brooks (three projects). These FRPs must meet the current high-flow targets from the flow **State's** TMDLs. Efforts included GIS analysis, field identification, conceptual design, and modeling of structural stormwater practices to meet the flow restoration targets at the watershed outlets using the Vermont BMP Decision Support System (VT-BMPDSS) model. BMP storage volumes, cumulative effects of flow reduction, and total costs were estimated.

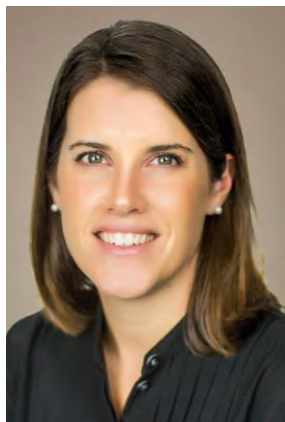
Design and Construction of Stormwater Wetlands, Medford and Milford, MA, Massachusetts Department of Environmental Protection, Worcester, Massachusetts. Managed two state grants to design and install stormwater wetland practices in Medford and Milford, Massachusetts to reduce phosphorus loading.

Statewide Water Budget Methodology, Massachusetts Executive Office of Energy and the Environment, Boston Massachusetts. Developed a statewide water budget methodology for assessing streamflow impacts on small subbasins from the effects of water withdrawal, wastewater discharge, irrigation, piped water, and impervious area. Worked with MassGIS to create the first statewide water resources database and a database standard for piped water systems. Automated the methodology using VB/Python scripts.

Upper/Middle Charles Total Maximum Daily Load (TMDL) Project, Massachusetts Department of Environmental Protection, Worcester, Massachusetts. Developed an HSPF water quality model for a nutrient TMDL. Used GIS and custom scripts to import data into a standard model database. Provided full project oversight including: QAPP, streamflow monitoring, sampling, cross-section surveying, pond bathymetric/sediment surveys, aquatic plant assessment, modeling, scenarios, output and graphs, public meetings, and prepared final report.

Hydrologic and Hydraulic Modeling of Moonlight Brook, Newmarket, New Hampshire. Evaluated survey data, GIS mapping, existing HEC-HMS, HEC-RAS, and HydroCAD models, and historical drainage reports. Developing a PCSWMM model for Moonlight Brook to evaluate scenarios for buildout conditions and green infrastructure implementation to address future flooding under climate change conditions.

Evaluation of Biofiltration Swale Media Mixes for Maximizing Phosphorus Removal, WSDOT, Tumwater, Washington. Investigated ways to improve phosphorus removal from roadside swales. Researched metal-based additives, peat materials, wood-based products, and shell-based products using batch adsorption isotherms, soil columns, and micro-swales.



Proposed Role

Project Advisor

Specialties

- Climate Adaptation Planning & Mitigation
- Green Infrastructure Design
- Integrated Planning for Wastewater & Stormwater
- Watershed Planning
- Nutrient Control Planning
- Stormwater Master Planning

Education

M.S., Water Resources and Civil Engineering,
University of New Hampshire, Durham, New
Hampshire, 2010

B.S., Environmental Science, Plattsburgh
State University of New York, Plattsburgh,
New York 2004

Registrations and Certifications

Professional Engineer, New Hampshire,
Number 15092

REPRESENTATIVE PROJECTS

Morrissey Boulevard Redesign for Reconstruction, Department of Conservation and Recreation, Massachusetts. Ms. Bourdeau assisted in the development of conceptual green infrastructure designs to reduce flooding and improve water quality in areas along Morrissey Boulevard. The reconstruction includes raising the existing boulevard to accommodate sea level rise projections as well as address current areas that currently experience flooding that will be exaggerated due to increased frequency and intensity of rain events in the future.

NPDES Stormwater Compliance, Town of Newbury, Massachusetts. Project manager assisting the Town of Newbury with implementation of their NPDES Phase II MS4 permit. Activities included preparation of public education and outreach materials; preparation of Stormwater Water Pollution Prevention Plans; outfall wet weather sampling; operation and maintenance plans; preparation of an illicit discharge detection and elimination plan; and annual training.

NPDES Stormwater Compliance, Town of Exeter, New Hampshire. Project Manager and technical lead assisting the Town of Exeter with implementation of their Phase II MS4 permit including the development of a Stormwater Management Program (SWMP), Illicit Discharge Detection Elimination (IDDE) Plan, stormwater ordinance, and public education and outreach materials to meet their current and future regulatory obligations.

NPDES Stormwater Compliance, City of Rochester, New Hampshire. Project manager assisting the City of Rochester with implementation of their NPDES Phase II MS4 permit. Activities include preparation of Stormwater Management Program; preparation of education and outreach materials; preparation of illicit discharge detection and elimination program; dry and wet weather outfall screening/sampling; outfall catchment investigations; preparation of Stormwater Water Pollution Prevention Plans (SWMPP); quarterly SWPPP inspections; operation and maintenance plans; inspection of City owned stormwater best management practices; annual employee training; and development of rules and regulations related to construction best management practices for new properties.

NPDES Stormwater Compliance, Pease Development Authority. Project Manager assisting Pease Development Authority (PDA) in the implementation of a Consent Decree between PDA and USEPA Region 1 to manage stormwater under a municipal separate storm sewer system (MS4) permit. Tasks include development of public education materials, illicit discharge detection and elimination plan, construction and post-construction controls and writing land development ordinances/regulations.



Proposed Role

Project Advisor

Specialties

- Clean Water Act Mitigation Design & Compliance
- Clean Water Act Regulatory Assessment & Permitting
- Applied Fluvial Geomorphology

Education

M.S., Geology, East Carolina University, Greenville, NC, 2004

B.S., Geology, University of West Georgia, Carrollton, GA 1999

Registrations and Certifications

Registered Professional Geologist, Georgia No. 002156

National Level - Wildland Hydrology – Geomorphic Assessment to Natural Channel Design, Levels I-IV

North Carolina Stream Restoration Institute, Stream Restoration Assessment and Design Levels I-III

REPRESENTATIVE PROJECTS

McKellan-Kerr Arkansas River Navigation System (MKARNS) Geomorphological Investigations, USACE Tulsa District, various Counties, Oklahoma. Performed investigations where USACE has six separate locations for proposed Confined Disposal Facilities that require geotechnical and geomorphological investigations. Responsible for compiling and interpreting the geomorphological data from 37 cores (including age dating) to reconstruct the geomorphic history both pre- and post-construction and operation of the MKARNS, and identify processes (mechanical, hydrological, physical, biochemical, and anthropogenic) that may affect the preservation of archaeological sites.

Whiskey Bay Pilot Channel Feasibility Study, Williams Pipelines, Louisiana. Mr. **Vance led a multiproxy investigation to investigate stabilization alternatives for Williams' aerial ethane crossing (a 1,700-ft span) over the Atchafalaya River.** He is leading the performance of geotechnical subsurface investigations, bathymetric multi-beam sonar, unmanned aerial vehicle LiDAR and aerial imagery, depth of cover surveys for buried pipelines, geomorphic field observations, and historical channel migration assessment and aerial image analysis. Mr. Vance is also leading preparation of a feasibility report for Williams that outlines alternatives and potential paths forward for continued operations of the aerial crossing and the possibility of a decommissioning and replacement via a horizontal directional drill.

Navigable Rivers Pipeline Hazards Evaluation, Boardwalk Pipelines, US. Mr. Vance led a team evaluating riverine hazards for nearly 400 navigable riverine crossings inclusive of the Mississippi River and other similarly sized rivers and coastal systems. The results of the evaluations provide the pipeline operator with important decision-making information on the hazard status of the asset and potential future threat profile.

Santa Ana-Delhi Channel Improvement Project - Geomorphic Assessment and Final Design, Orange County Flood Control District, Costa Mesa, California. Mr. Vance led the multi-disciplinary team to assess and design the restoration of a 4,000-foot stretch of tidally influenced flood control channel to create additional freshwater and tidally influenced wetlands adjacent to the Upper Newport Bay Ecological Reserve. The team assessed geomorphic, ecological and hydraulic attributes of the system to aid in alternatives analysis and is presently in final design and permitting and will begin construction oversight in 2025.



Proposed Role

GIS Lead & Reporting

Specialties

- Hydrology & Hydrologic Modeling
- GIS Geospatial Analysis
- Programming & Data Analysis

Education

Ph.D., Hydrology, University of Minnesota, Minneapolis, Minnesota, 2021

M.S., Geological Engineering, Indian Institute of Technology, Roorkee, India, 2016

B.S., Geological Engineering, Indian Institute of Technology, Roorkee, India, 2016

Registrations and Certifications

40-hour OSHA HAZWOPER

REPRESENTATIVE PROJECTS

Mixing Zone Study Review, Cargill Inc, Eddyville, Iowa. Evaluated a multi-port diffuser mixing zone study for scientific defensibility. Conducted dilution calculation to assess the mixing performance of the diffuser design. Performed geospatial analysis using ArcGIS and geopandas/Python.

Site Remediation, Former Remington Site, Fortune 500 Corporation, Elmira, New York. Collected and characterized soil samples. Helped creating multiple site and soil characterization maps using ArcGIS. Helped managing and updating environmental field database.

Feasibility Study: Natural Attenuation and Flow Augmentation, Confidential Client, Minnesota. Helped complete an innovative feasibility study that combines flow augmentation and natural attenuation for NPDES compliance in mine drainage discharge. Assisted in the development of watershed model to estimate the flow from mine pits. Created sampling location maps using ArcGIS.

Vapor Intrusion Investigation and Remediation, OSRAM Sylvania, Inc., Ann Arbor, Michigan. Helped prepare more than 20 maps using ArcGIS assessing the vapor intrusion investigation results.

Phase 1 Environmental Site Assessment, Confidential Client, Fergus Falls, Minnesota. Completed historical site review as part of the Phase 1 environmental assessment. Reviewed historical topographic maps, fire Insurgisance maps and aerial photographs of the site.

Project Oasis, LCY Electronic Materials Inc., Casa Grande, Arizona. Conducted flow/velocity/slope calculations in gravity sewer pipes for the greenfield chemical processing facility. Also reviewed the sanitary design drawings.

Research Project, *University of Minnesota.* Conducted geostatistical analysis on groundwater well observation data in Minnesota using ArcGIS and QGIS. Generated and published maps illustrating the results of the geostatistical analysis in a scientific journal.

Research Project, *Risk Management Solutions (India).* Conducted land use/land cover analysis using ArcGIS on proprietary data. Developed automated workflows with ArcGIS automation models to ingest and analyze geospatial data. Integrated these workflows into a user-friendly app using Visual C# and ArcGIS.



Proposed Role

Field Lead, Conceptual Design Support & Reporting

Specialties

- Water Resource Engineering
- Stormwater Management
- Green Infrastructure

Education

M.S., Civil Engineering, University of Massachusetts, Amherst, Massachusetts, 2013

B.S., Environmental Sciences, University of Massachusetts, Amherst, Massachusetts, 2007

Registrations and Certifications

Professional Engineer (PE) No. 57037 (Massachusetts)

Certified Professional in Erosion and Sediment Control (CPESC) No. 7705

REPRESENTATIVE PROJECTS

Massachusetts Statewide Watershed Based Plans, Massachusetts Department of Environmental Protection. Ms. Keay is currently project managing development of numerous watershed-based plans (WBPs) with partner organizations throughout Massachusetts using the web-based statewide WBP tool that Geosyntec developed. Ms. **Keay's responsibilities included modeling, guidance writing,** design, geographic information systems (GIS), database organization and coordination.

Upper Manhan River National Water Quality Initiative (NWQI) Watershed Assessment Plan, Massachusetts Association of Conservation Districts. Ms. Keay is currently project manager of the NWQI Watershed Assessment Plan for the five-town Upper Manhan River watershed in Massachusetts. The project includes stakeholder engagement, GIS desktop analysis, watershed characterization, pollutant loading modeling, field investigation, prioritization of potential stormwater best management practices, and drafting of a final NWQI Watershed Assessment Plan.

Ayer Ponds Management Plan, Ayer, Massachusetts. Ms. Keay participated in field watershed investigations for six ponds located in Ayer, MA and recommended potential BMPs for managing stormwater and reducing phosphorus loading to the ponds. These interconnected ponds exhibit a wide range of water quality and ecological conditions, public uses, and resource management challenges. The primary project objective was to establish an updated, scientific basis for the long-term management of the ponds.

Water Integration for Squamscott-Exeter (WISE), University of New Hampshire, Exeter, Stratham, and Newfields, New Hampshire. Ms. Keay conducted various technical tasks for the development of an Integrated Municipal Stormwater and Wastewater Plan for meeting new, more stringent state and federal wastewater and stormwater permit requirements in the Exeter/Squamscott River watershed. This included codeveloping an optimization model for evaluating the optimal combination of management measures in the Squamscott-Exeter Watershed within the towns of Newfields, Exeter and Stratham (i.e., the combination of different BMP types, which achieved a target nitrogen load reduction within the watershed with the minimum possible monetary capital cost).

BMP Design, Cobbett's Pond Association, Windham, New Hampshire. Ms. Keay served as assistant project manager for design and permitting of stormwater improvement at a **site within the Cobbett's Pond watershed within Windham's municipal stormwater system.** Improvements included stream and wetland restoration. Her responsibilities included permitting support, preparing construction level design plans and specifications, and assisting the management of the project.

Vermont 3-Acre Sites Engineering Design and Permitting, City of South Burlington, Vermont. Ms. Keay is currently project manager for this project, which involves design and **permitting for four different "3-Acre" sites in South Burlington, Vermont. For each of the four sites,** the scope of work includes engineering feasibility analysis, survey, location of utilities, test pitting, infiltration testing, hydrologic modeling, conceptual design, preliminary design, permitting, 100 percent design, creation of specifications as well as submission and approval of a Notice of Intent under the Vermont General Permit 3-9050. Ms. Keay is responsible for client communication, subcontractor coordination, project management, and is technically involved with the full scope of work for each of the four sites.



Proposed Role

Conceptual Design Lead

Specialties

- Stormwater Management
- Green Infrastructure
- Construction Management
- Low-Impact Development Design

Education

M.S., Environmental Engineering, University of Massachusetts (Amherst), 2004

B.S., Civil Engineering, University of Massachusetts (Dartmouth), 2002

Registrations and Certifications

Registered Professional Engineer: NH No. 12882; NJ No. GE 48897; NY No. 096987; MA No. 47558; ME No. 13309

Certified Professional in Erosion and Sediment Control: CPESC No. 3586

Certified Professional in Surface Water Quality: CPSWQ No. 0331

REPRESENTATIVE PROJECTS

Watershed Restoration Plan, Cobbett's Pond Association, Windham, New Hampshire.

Mr. Bourdeau served as lead engineer for design, permitting, and construction oversight of **stormwater improvement at several sites within the Cobbett's Pond watershed** located in **Windham's municipal stormwater system** area. Improvements included stream restoration, flow-through constructed wetlands, bioretention facilities, and vegetated water quality swales. His responsibilities included preparing construction level design plans and specifications, preparing bid documents, cost estimates, and performing construction management.

Green Infrastructure for Sustainable Coastal Communities, Coastal New Hampshire. Mr. Bourdeau served as Project Manager and lead engineer for the design of several green infrastructure practices including bioretention cells, rain gardens, and a subsurface flow gravel wetland. His responsibilities under this grant project included project management, preparing design drawings and specifications, cost estimates, bidding support, working with contractors and public works to implement retrofit GI practices, and public outreach and training.

Regional Subsurface Infiltration Facility, Exeter, New Hampshire. Mr. Bourdeau serves as Project Manager and lead engineer for the design of a retrofit regional subsurface infiltration facility at the Winter Street playground. He led a successful grant application for the Town to fund the design and construction of this stormwater best management practice. His responsibilities under this grant project included project management, pre-design investigation activities, preparing design drawings and specifications, cost estimates, bidding support, and grant support. He led the design team through challenges of runoff capture volume, seasonal high groundwater, deep storm drain inverts, and limited available property.

Stormwater Services and MS4 Support, Rochester, New Hampshire. Mr. Bourdeau serves as Project Manager for an ongoing contract with the City of Rochester for stormwater support services including MS4 permit compliance support. He led the development of a nutrient control plan to quantify nutrient load export and develop optimization strategies to reduce nutrient loads from the City of Rochester. Tasks included evaluating the current land uses for the City and developing nutrient load estimates, evaluating structural and non-structural stormwater BMPs for nutrient reduction, and creating optimization scenarios to evaluate life cycle costs and probability of permit compliance under future MS4 permits. He has also been responsible for providing the city with MS4 permit support including stormwater ordinance and planning regulations development, stormwater master planning, permit compliance program development, internal MS4 audit support, and permit resource allocation. He has also provided technical assistance to the City to evaluate a proposal by US-EPA for a nonpoint source general permit framework.

Stormwater Planning and Design Support Services, Pioneer Valley Planning Commission, Southwick, Massachusetts. Mr. Bourdeau served as lead engineer for the **planning, design and permitting, and pollutant load modeling of portions of the Town's municipal storm sewer system**. He was the lead engineer for the design and permitting for several traditional stormwater management systems at five sites within the Congamond Lakes watershed. These systems included deep sump catch basins and particle separator devices. His responsibilities included developing construction specification level design plans and preparing bid documents, cost estimates and wetland permits. Additional tasks included hydrologic and pollutant loading modelling and state and federal permitting support.



Proposed Role

GIS Support & Field Support

Specialties

- Hydrology and Hydrogeology
- Geographic Information Systems
- Data Analysis and Visualization
- Site Investigation and Remediation
- Environmental Forensics

Education

MS, Geological Sciences, The State University of New York at Buffalo, Buffalo, New York, 2023

BS, Geology, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, 2019

BA, Archaeology, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, 2019

Registrations and Certifications

OSHA 40-hour HAZWOPER Certified

America Red Cross First Aid, CPR, and AED Certified

REPRESENTATIVE PROJECTS

Water Quality Outcomes in Illinois, The Conservation Fund, Illinois. Mapped and analyzed land cover, soil, and watershed data for conservation easements in Illinois using **ArcGIS**. Used the **EPA's Pollution Load Estimation Tool (PLET)** to quantify nutrient loads from conservation easements and load reductions associated with conservation practices.

Litigation Support, Confidential Client, Multiple Sites. Provided technical support to a team of attorneys in the defense of several cases brought against a chemical manufacturer. Conducted statistical analyses and data visualization of analyte data in ArcGIS, R, and Python. Reviewed historical aeriels to assess land use change.

Litigation Support, Confidential Client, New York, New York. Assisted in applying, assessing, and visualizing a positive matrix factorization model to identify primary fingerprints of dioxin and furan sources at a CERLA Mega-Site. Performed statistical analysis and data visualization in R and Python.

Former Remington Site, Fortune 500 Corporation, Elmira, New York. Part of on-Site team that collected groundwater samples for analysis of a variety of contaminants of concern (COCs) and performed sitewide well gauging. Assisted with quality control (QC) of tables and figures and preparation of tables for reports.

Environmental Site Assessment, Confidential Client, Multiple States. Performed Phase I ESA site visits across the Midwest and assisted with preparation of Phase I Due Diligence reports. Assisted with Phase II sub-slab soil vapor sample collection.

Research Project, University at Buffalo, Lake Imandra, Russia. Analyzed lipid biomarkers in Arctic lake sediments, including compound specific stable isotope analysis to reconstruct precipitation patterns through time. Processed raw data using scripts in MATLAB and R. Calibrated a lake proxy system model and ran sensitivity tests to guide interpretations of stable isotope shifts in the paleoclimate record. Visualized results using R and Python.

Research Project, University at Buffalo, Red Pond, New York. Assisted with periodic sediment coring, lake water monitoring using a water quality sonde, and lake water sampling using a Van Dorn sampler



Proposed Role

Field Support

Specialties

- Erosion and Sediment control
- Surface Water Quality
- Aquatic Ecology
- Natural Resource Investigations

Education

BS, Soils, Environmental, and Atmospheric Sciences,

University of Missouri – Columbia, 2013

Registrations and Certifications

Certified Professional in Erosion and Sediment Control

24-hour HAZWOPER

Missouri State Highway Patrol Boaters License

REPRESENTATIVE PROJECTS

BMP Plan Development, St. Louis, Missouri. As the project manager, Mike led the development of a site-wide Best Management Practices (BMP) Plan at the Boeing St. Louis manufacturing facility. The BMP Plan was required by a special NPDES condition and required site assessment, pollutant mapping, source sampling, and a BMP alternatives analysis. Geosyntec developed recommendations for areas draining to seven permitted stormwater outfalls based on historical data, feasibility of implementation, and installation/maintenance costs.

Parking Lot Rehabilitation Program SWPPP and NPDES Permitting, Michigan, Illinois, Ohio. Mike serves as the Project Manager and technical lead on this parking lot rehabilitation program, which includes five to ten stores per year. Parking lot projects are reviewed against local and state construction stormwater regulations to determine if construction NPDES permits and local erosion/sediment control permit requirements apply, and if so, permit applications and documents, including SWPPPs and Soil Erosion Control Plans are developed. As Project Manager and Technical Expert, Mike is responsible for scope, schedule, and budget, as well as development and final review of all permitting documents.

Lake Springfield Master Planning, Springfield, Missouri. As field manager and the technical lead on water/sediment quality, Mr. Hogan coordinated and led field efforts to collect surface water samples throughout the Lake Springfield watershed, sediment sampling within Lake Springfield, bathymetric mapping, and sediment depth profiling. The data collected were used to support master planning efforts by characterizing the existing water and sediment quality of the lake, understanding the geomorphology of the lake bottom, and identifying data gaps based on future potential beneficial uses of the lake during re-development efforts.

North Branch Watershed Workgroup NARP, Deerfield, Illinois. Mike served as the field manager for data collection to support the development of Nutrient Assessment and Reduction Plan (NARP), per Illinois EPA requirements. The scope included continuous instream monitoring at eight locations within the North Branch Chicago River watershed for dissolved oxygen, pH, temperature, and conductivity. Mike oversaw the installation of sondes for continuous monitoring and the collection of discrete biweekly surface water samples that were analyzed for nutrients and chlorophyll to support NARP development. Additionally, Mike executed sediment oxygen demand monitoring at several sites using EPA methods and oversaw the development of a stage/discharge rating curve to understand flow regimes at one of the sites.



Amanda Bergstrom, PE (MN), CPESC, LEED AP BD+C

TH 95 Hydraulics Design (S.P. 8209-111) | MnDOT - METRO District | Bayport to Lakeland, MN

Project Manager/Design Lead

MnDOT needed to resurface TH 95 from 0.2 miles north of Bayport to 0.1 miles south of I-94 in Lakeland, including a bituminous mill and overlay, ADA pedestrian ramp upgrades for improved sidewalk access in downtown Bayport, and drainage.

Amanda was responsible for direct communication with MnDOT personnel and provided QA/QC and drainage design oversight for preliminary and final design phases. She provided hydraulics analysis and design for six drainage crossings below TH 95 into Union Pacific Railroad (UPRR) right-of-way as well as an investigative drainage study and restoration plan for a 230 LF washed-out sloped ravine below the TH 95 bridge intersection with the UPRR. The drainage plan set included removals, drainage plan, plan and profiles, tabulations, erosion and sediment control plan, contour plans for slope restoration areas, and turf establishment plan.

Final Design Plan: TH 93 and 19 (S.P. 4004-34) | MnDOT - District 7 | Henderson, MN
Task Lead for Erosion Control, Turf Establishment, and SWPPP

MnDOT is reconstructing 3.6 miles of TH 93 from TH 169 to the City of Henderson to address flooding issues within the City, including replacement of the Rush River bridge, an additional overflow bridge north of Rush River, installation of a box culvert bridge below TH 93, additional guardrail, culvert replacements, and ADA improvements. Amanda managed the Rani team and provided oversight and QC for the Erosion Control and Turf Establishment Plans, SWPPP and provided the Wetland Impact Exhibits for the wetland permitting.

Preliminary and Detail Design for State Projects TH23 (SP 4206-23) and TH14 (SP 4101-90) | MnDOT – District 8 | Florence, MN

Task Lead for Erosion Control, Turf Establishment, and SWPPP

MnDOT is replacing the existing box culvert with a new box culvert including a temporary stream diversion on SP 4206-23 TH 23. SP 4101-90 is a box culvert replacement of the existing box culverts with new box culverts including temporary stream diversions in a known Topeka Shiner stream (Medary Creek). Amanda provided oversight and QC for the Erosion Control and Turf Establishment Plans and the SWPPP.

I-494 Airport to 169 Design-Build (S.P. 2785-424) | MnDOT – METRO District | Edina to Richfield, MN

Task Lead for Vegetation Management, Erosion Control, and Turf Establishment

MnDOT is constructing E-ZPass lanes on I-494 from Hwy 100 to I-35W in each direction and adding a new ramp at the I-35W and I-494 interchange. Rani coordinated utility relocation work orders throughout the duration of the project and provided Erosion Control Plans, Turf Establishment Plans, and Vegetation Preservation and Removal Plans for all design packages, including all MOT packages and SWPPP updates. A Noxious Weed Control and Soils Management Plan was provided for the overall project. Rani staff also provided drainage design support. Amanda managed the Rani team and lead the Vegetation Management and Erosion Control tasks.

Proposed Role

Rani Project Manager
Field Lead

Specialties

- Water resources engineering design
- Erosion control/SWPPP services
- Stormwater permitting

Professional Registrations

Professional Engineer:
MN 52674

LEED AP Building Design +
Construction: MN 137-AP-
BD+C

Design of Construction
SWPPP Certified: MN

Certified Professional in
Erosion & Sediment Control
(CPESC): MN 5661

Education

Bachelor of Science,
Geological Engineering,
University of Minnesota -
2003



Proposed Role

Conceptual Design Lead

Specialities

- Design engineering
- Construction site management
- Project administration

Professional Registrations

Professional Engineer:
MN 54277

Accessible Design in the
Public Right-of-Way: MN

Construction Site
Management: MN

Design of Construction
SWPPP: MN

Education

Bachelor of Science, Civil
Engineering, University of
North Dakota - 2007

Gregg Johnson, PE (MN)

Ford Parkway Bridge - Hennepin County, Hennepin County, Minneapolis, MN Lead Project Engineer

The historic Ford Parkway Bridge, which spans the Mississippi River connecting Minneapolis and St. Paul, has experienced significant erosion on the banks surrounding the bridge abutments over the years. Gregg analyzed the existing hydrological and hydraulic conditions of a failed storm sewer system causing severe erosion of the Mississippi River's west bank under the Ford Parkway Bridge. Gregg generated reports documenting the results and presented them to Hennepin County Public works. He then assisted in the preliminary remediation design concept of gabion baskets installation, which would withstand the extraordinarily high stormwater flow volume, velocity, and shear stress coming from the bridge deck and drainage area at the top of the Riverbank.

Historic Kern Bridge Removal & Salvage, Blue Earth County, Mankato, MN Permitting and Erosion Control Design Lead

Gregg reviewed the design plans and the proposed written demolition plan for construction feasibility for removing the Kern Bridge over the LeSueur River. The design included constructing a pad in the middle of the River with boulder and riprap fill for a crane to be positioned on to lift the bridge and swing it to one side of the riverbank. The riprap and boulder pad had to be removed, and the River bottom, banks, and surrounding area restored to original conditions. He coordinated with the demolition contractor on specific project limitations and with Kern County, MnDOT project owners, and the MnDNR on specific requests and specifications for this sensitive project.

Ford Parkway Erosion Control St. Paul, Ramsey County, St. Paul, MN Lead Project Engineer

The Ford Parkway Bridge over the Mississippi River, also known as the Intercity Bridge, provides an important connection between St. Paul and Minneapolis. The slopes of the Mississippi River on the underside of both embankments have seen significant erosion and the drainage systems have failed. Gregg investigated and analyzed storm sewer failures and erosion issues on the east bank of the Mississippi River Ford Parkway Bridge. Phase 1 included identifying sources of drainage failures and exploring several options to redirect stormwater from the bridge deck away from the main abutment experiencing erosion. The solution was to reroute a new storm mainline that outlet under the bridge at the River to the Woodlawn Drainage Tunnel one block away. Phase 2 involved designing the repair and protection with riprap of the eroding bridge abutment bank due to deficient substructure storm drains and designing gabion basket protection on two roadway storm drain outfalls that cut steep channels in the bank to the River. Gregg assisted Ramsey County in obtaining MnDOT state aid funds for both project phases.



Heather Spencer, PE (MN)

Woodhill Drainage Study and Plan Development, Minnesota Department of Transportation - Metro District, Burnsville, MN

Quality Manager

Following the construction of TH 13 in Burnsville, residents were experiencing flooding. This project included assessing the situation, developing options, and developing plans. Heather provided senior oversight and guidance for developing a 2D XP-SWMM Model to evaluate existing conditions and test alternatives for mitigation. After MnDOT and other project stakeholders selected a preferred alternative, Heather provided a quality control and assurance review on the final design plans for constructing a large rain garden with a filtration system, protective berms, and storm sewer modifications

Pond Condition Analysis - Larpenteur & Como Ponds, Ramsey County Procurement, Ramsey County, MN

Project Manager

Rani Engineering was tasked to provide a condition and Hydrologic/Hydraulic Analysis of the Larpenteur/Como Diversions Ponds System. The analysis included a review of existing documentation, field investigation, XP-SWMM modeling of the system, and recommendations for maintenance and improvement of the system. Heather managed the project, performed the XP-SWMM modeling, and wrote the final report summarizing the findings and recommendations.

Bryant Avenue South Reconstruction, City of Minneapolis, Minneapolis, MN

Water Resources Design Lead

The City of Minneapolis requested engineering and design services for the preliminary planning and detailed design to reconstruct 2.5 miles of Bryant Avenue South. This project aimed to improve pedestrian safety and access, create an All Ages and Abilities bicycle connection in the area, support existing and future transit services, use green infrastructure to collect and treat stormwater runoff and accommodate business deliveries and customer access. The project included ADA-compliant curb ramps, boulevards with trees, removal of sidewalk obstructions, signal improvements, new signage, and new pavement markings. Heather coordinated with the City to establish design criteria. She oversaw the green stormwater BMP design, including surface infiltration swales with curb-cut pre-treatment inlets and underground infiltration trenches with pre-treatment catch basins. She also managed storm sewer, SWPPP, and erosion control design.

Proposed Role

Conceptual Design Support

Specialties

- Water resources
- Site development
- Municipal engineering
- Master Planning
- H & H Modeling

Professional Registrations

Professional Engineer:
MN 54654

Design of Construction
SWPPP: MN

Education

Bachelor of Science, Civil &
Environmental Engineering,
Cornell University - 1997



CONTACT INFO:

Nigel Pickering, PhD, PE

Senior Engineer

npickering@geosyntec.com

(612) 253-8214

Paul Brookner, PG

Senior Principal

pbrookner@geosyntec.com

(612) 253-8203

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