



**Title:** Authorization to Contract for Pilot Model Scenario File Development

**Resolution number:** 22-056

**Prepared by:** Name: Kailey Cermak  
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**Reviewed by:** Name/Title: Brian Beck/Research and Monitoring Program Manager

**Recommended action:** Authorization to enter a contract with Stantec Consulting Services Inc. to develop land-use scenario files for pilot model scenario analysis.

**Schedule:** 9/9/22: Commence work  
 11/23/22: Scope of work complete

**Budget considerations:** Fund name and code: 5-5001-4340  
 Fund budget: \$30,000.00  
 Expenditures to date: \$745.50  
 Requested amount of funding: \$26,963.00

**Past Board action:**

Res #: 22-038	Title: Authorization to Submit Proposal to LCCMR for Development of 2D Watershed Model
Res #: 21-091	Title: Authorization to Execute Contract for 2D Pilot Model Build
Res #: 21-065	Title: Authorization to Release RFP for 2D Model Pilot Build
Res #: 21-051	Title: Authorization to execute memorandum of understanding (MOU) with the City of Edina
Res #: 21-024	Title: Authorization to submit proposal to LCCMR for development of a 2D watershed model

**Summary:**

The Minnehaha Creek Watershed District’s (MCWD or District) current modeling tools don’t provide the required granularity and features to answer pressing climate change questions. A critical first step within MCWD’s Climate Action Framework is building a new, high resolution, 2D watershed model to quantitatively assess the impact of climate change on our watershed. This tool will also support policy development and long-range planning with communities, by allowing MCWD to evaluate the impact of different adaptation strategies and projects, under future climate forecasts. To support this work, in July 2022, the Board of Managers authorized staff to submit a proposal for \$738,000 to the Legislative-Citizen Commission on Minnesota Resources (LCCMR) to develop the watershed-wide model.

In October 2021, in advance of the watershed-wide build, the District chose to pursue a pilot model build to constrain the technical and relational risk associated with large-scale model builds and inform how to effectively scale the model watershed-wide. This pilot model build is being pursued in partnership with the City of Edina, pursuant to a Memorandum of Understanding approved by the Board of Managers on August 26, 2021. The goal of the pilot model

build is to (1) develop an automated and repeatable workflow for transforming geospatial datasets into model-ready formats and (2) understand the benefits and drawbacks of each of the two tested modeling software to inform which is best suited to scale watershed-wide.

### *Pilot Model*

In January 2022, the District executed a contract with Kimley-Horn to deliver on the pilot model's scope of work that included:

- Task 1. Development of a Model Evaluation Framework
- Task 2. Development of Geospatial Workflows
- Task 3. Model Build
- Task 4. Scenario Analysis
- Task 5. Project Reporting

Kimley-Horn is currently working on the final stages of developing the documentation associated with the geospatial workflows (Task 2). The next step for the team is to begin building and calibrating the models to then advance into scenario analysis. The scenario analysis work is a critical stage within the evaluation process and will examine each modeling software on the basis of model operation and technical capacity. The District and Kimley-Horn developed a shared understanding in the scope of work that the District would supply the land-use files required for scenario analysis since they would benefit from an in-depth understanding of how MCWD's stormwater rules will apply to future development.

MCWD staff identified two factors while developing scenarios to maximize the pilot model build utility, which included creating scenarios that:

- 1) Represent actual questions and future situations to gain a realistic understanding of the level of effort and challenges associated with creating and utilizing the files within each modeling software
- 2) Provide larger organizational benefits that extend beyond the pilot model's needs

To accomplish these goals, Research and Monitoring staff collaborated internally with Policy-Planning and Project-Planning staff and externally with the City of Edina staff to refine the land-use scenarios to be used in the pilot model and landed on the following:

- Turbid-Lundsten Corridor scenario that depicts future land-use and required BMP's based on the western growth area visioning work to evaluate the impacts of proposed development and District regulation on water quantity
- Turbid-Lundsten Corridor scenario that depicts pre-settlement conditions to quantify and understand the corridor's original hydrology prior to landscape alterations
- Edina pilot geography scenario that depicts future land-use conditions for a fully re-developed commercial area and BMPs required based on MCWD's rules to understand the impact regulation has on water quality and water quantity during redevelopment

### *Scenario File Development Scope*

District Staff asked Stantec to prepare a scope of work, on the basis of its strong understanding of the hydraulic and hydrologic conditions within the subject areas and of the District's stormwater management rules, which together should allow Stantec to create scenario files efficiently and effectively. Stantec developed a scope of work (Attachment A) that outlines the GIS and engineering steps required to prepare the files associated with the three listed scenarios. Key areas of work include:

- Assessing permitting requirements based on the scenario's land-use change
- Determining size and placement of required BMP's and digitize

- Creating future pipe system that links future BMP's to existing receiving systems
- Developing depth-storage curves for all historic and future wetlands and ponds

In alignment with the pilot model's core objectives, staff has recognized that the scenario file development offers the opportunity to better understand and document how land-use scenarios are created and incorporated into each model and learn how to effectively develop such scenarios for future watershed-wide analysis. Therefore, the scope of work includes a technical memorandum to memorialize these learnings.

At the September, 8 2022, MCWD Board Meeting, staff will seek approval of a contract for \$26,963 with Stantec to develop the scenario files to be used in the District's pilot model project. Staff is recommending this contract be awarded to Stantec without competitive solicitation due to Stantec's intimate knowledge of the District's stormwater management rules and the hydraulic and hydrologic conditions of the subject areas. For these reasons, District staff suggests that Stantec is uniquely qualified to create the GIS files to support scenario analysis during the pilot model.

**Supporting documents:**

Attachment A: Stantec Consulting Services inc. Scope of Work



## RESOLUTION

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**Resolution number:** 22-056

**Title:** Authorization to Contract for Pilot Model Scenario File Development

- WHEREAS climate change is measurably changing the distribution, frequency and intensity of rainfall in Minnesota;
- WHEREAS a key pillar in Minnehaha Creek Watershed District's (MCWD) climate action framework is to understand and predict the impacts of climate change using new data analytical and planning tools;
- WHEREAS to support this strategy, the District has identified the need to develop a watershed-wide two-dimensional (2D) model that incorporates high resolution stormwater infrastructure and land surface data to improve our ability to inform current and future water resource management decisions in the face of climate change;
- WHEREAS in June 2022, the Board of Managers authorized staff to submit a proposal for \$738,000 to the Legislative-Citizen Commission on Minnesota Resources to develop a watershed-wide model;
- WHEREAS in advance of the watershed-wide build, the District chose to pursue a pilot 2D model build to constrain the technical and relational risk associated with a large scale, high-resolution model build;
- WHEREAS the pilot model is designed to answer outstanding technical questions related to building a 2D H&H model for the entire District, which includes developing automated workflows for stormwater infrastructure, landuse, soils and topography data, understanding benefits and drawbacks of tested software, and identifying which software is best suited to scale watershed-wide;
- WHEREAS on August 26,2021, the Board of Managers authorized the execution of a memorandum of understanding with the City of Edina to collaborate on stormsewer infrastructure data sharing and the development of the 2D Pilot Model;
- WHEREAS in January 2021, the District executed a contract with Kimley-Horn to deliver on the pilot model's scope of work that included (1) developing an evaluation framework, (2) developing an automated workflow for geospatial datasets, (3) the model build, (4) scenario analysis, and (5) project reporting;
- WHEREAS the scenario analysis work is a critical stage within the evaluation process and will examine the abilities and operational considerations of each modeling software;
- WHEREAS staff worked collaboratively to refine the scenario conditions to be assessed in the pilot model to ensure optimal benefit from the model output;
- WHEREAS in order to run the scenarios through each model, GIS files need to be created that depict the defined historic and future land-use conditions;
- WHEREAS the future land-use conditions require engineering perspective to evaluate how the District's permitting rules would apply to future development and to place and size the required BMP's;
- WHEREAS internal Governance Policy #6: Executive Limitations states that the Administrator will not purchase professional services in excess of \$25,000 without competitive process, but staff recommends, and the

Board finds, that it is appropriate to deviate from that policy in light of Stantec's unique knowledge of the hydrologic and hydraulic conditions of the Minnehaha Creek watershed and its work to date in developing and assisting in application of the District's permitting rules;

NOW, THEREFORE, BE IT RESOLVED that the Minnehaha Creek Watershed District Board of Managers authorizes the District Administrator, on advice of counsel, to execute a contract with Stantec Consulting Services Inc. to develop pilot model scenario files, in accordance with the submitted scope of work and in an amount not to exceed, \$26,963.

Resolution Number 22-056 was moved by Manager \_\_\_\_\_, seconded by Manager \_\_\_\_\_. Motion to adopt the resolution \_\_\_ ayes, \_\_\_ nays, \_\_\_ abstentions. Date: 9/8/2022

\_\_\_\_\_  
Secretary Date: \_\_\_\_\_



**Stantec Consulting Services Inc.**

7500 Olson Memorial Highway  
Suite 300  
Golden Valley MN 55427-4886

September 1, 2022

**Kailey Cermak**  
15320 Minnetonka Blvd  
Minnetonka, MN 55345

Dear Kailey Cermak,

**Reference: Development of Scenarios to Assist with Pilot 2D Model Effort**

## **Background**

The Minnehaha Creek Watershed District's (District) 2D Pilot Model Project aims to (1) develop automated and repeatable processes for building modeling tools and (2) evaluate which of the two tested models is best suited for the watershed-wide build. As part of the pilot project, various scenarios will be tested to understand how each of the two models under evaluation respond to and incorporate variables and regional differences that are seen across the District.

Stantec Consulting, Inc. (Stantec) is pleased to submit a scope of work and schedule for the development of files to utilize for the following two pilot model scenarios:

- Pre-development and future development model scenarios within the Turbid-Lundsten corridor area under current District stormwater standards
- Continuous or event-based scenario in the City of Edina area assuming commercial redevelopment under MCWD's current volume and rate control rules to evaluate the impact of infiltration practices on runoff, groundwater, and water quality.

In alignment with the pilot model's core objectives, District staff have recognized that the scenario file development also offers opportunity to better understand and document how land-use scenarios are incorporated into each model and learn how to effectively develop such scenarios for future watershed-wide analysis. As such, included within this scope of work is the development of a technical memorandum to document those learnings and scaling recommendations.

Stantec will coordinate closely with District staff to ensure model database input format is defined based on ICPR4 and ICM model inputs and available geospatial datasets to ensure that the workflow developed by Stantec is clear and reproducible.

Stantec proposes the following tasks to complete the project:

- Task 1 – Scenario Development for the Turbid – Lundsten Corridor
  - Task 1.1 – Future Land use Scenario Files for Turbid-Lundsten Corridor
  - Task 1.2 – Historic Land use Scenario Files for Turbid-Lundsten Corridor

Reference: Development of Scenarios to Assist with Pilot 2D Model Effort

- Task 2 – Scenario Development for the Edina Area-of-Study
  - Task 2.1 – Future Land use Scenario Files for Edina Area-of-Study
- Task 3 – Technical Memorandum

## Task 1 Scenario Development for the Turbid – Lundsten Corridor

The Turbid - Lundsten Corridor is a rural region within MCWD, for which future buildout scenarios have been visioned by the City of Victoria, in partnership with MCWD, as part of the Western Growth Area vision. Using the available datasets, Stantec will create files for use in the 2D models that are representative of the hydrologic and hydraulic conditions in the Turbid - Lundsten Corridor under the future landuse scenarios. Hydrologic and engineering principles will be used to simulate the future condition and approximate the size and location of future stormwater BMPs and trunk storm sewer lines / critical culverts based on the anticipated development and the District's current Stormwater Management Rule. The result of this task will be GIS files for review by MCWD, which can be used as input into the 2D models being developed for the Pilot Study.

### Tasks:

#### *Stantec Task 1.1 Development of Future Land use Scenario Files for Turbid-Lundsten Corridor*

- Using the developed land use layers, Stantec will review future changes to impervious areas and will approximate stormwater treatment practice locations and sizes, based on the proposed District Stormwater Management Rule that has been developed as part of the Rules Revision process. This will consider soil types based on NRCS Web Soil Survey. BMP placement will be approximate and will be completed at the subcatchment scale, not the parcel scale. Stantec will sub-delineate catchments to the natural water-feature level, which will control the quantity of stormwater BMPs placed on the landscape in the future land use condition. Assumptions will be made regarding typical BMP depth and other characteristics based on engineering judgement. For example, BMPs will be assumed to be filtration basins with 0.8 in/hr filtration rate and 3 ft ponding depth with 3H:1V sideslopes.

#### *Stantec Task 1.2 - Development of Historic Land use Scenario Files for Turbid-Lundsten Corridor*

- Using GIS layers provided by MCWD that combine historic datasets to indicate where land was historically "wet," along with historic vegetation data provided by MCWD, Stantec will merge the two datasets to create a historic land use layer representative of pre-settlement conditions.

### Assumptions:

- MCWD will provide a template geodatabase, formatted in the MetroGIS standard, for Stantec to populate.
- MCWD will provide available data, in GIS format (coordinate system UTM 15N), clipped to the subwatershed extent with a 50 ft buffer, including:
  - Area-of-interest boundary
  - Subwatershed boundaries

**Reference: Development of Scenarios to Assist with Pilot 2D Model Effort**

- Existing land use
  - Before providing to Stantec, MCWD will merge hydrologic features, including natural and man-made water features (i.e. wetlands, stormwater ponds) with the land use file, to ensure land use includes water features accurately. This effort by MCWD will result in a more accurate understanding of the impervious cover in each subcatchment than if a land use file was used off the shelf. This will result in a better representation of how buildout under MCWD rules will affect the landscape.
- Future land use (including wetlands and development areas)
  - Before providing to Stantec, MCWD will merge hydrologic features, including natural and man-made water features (i.e. wetlands, stormwater ponds) with the land use file, to ensure land use includes water features accurately. This effort by MCWD will result in a more accurate understanding of the impervious cover in each subcatchment than if a land use file was used off the shelf. This will result in a better representation of how buildout under MCWD rules will affect the landscape.
- Current stormwater infrastructure (i.e. culverts, other surface water conveyance pipes)
  - The dataset provided by MCWD will be assumed to be complete, and will be based on both existing City GIS data, and a review of key waterbody crossings (bridges, culverts, etc.) in the study area (to be completed either via desktop review or via field verification). The dataset will include locations, as well as either measured or estimated conveyance dimensions and material.
- Public waters
- Wetlands
- Soils, including hydrologic soil group (HSG)
- LiDAR (2 ft contours and 1 m DEM)
- As the future Stormwater Management Rule has not yet been adopted, a version of the draft proposed Stormwater Management Rule standards will be agreed upon at the time this contract is executed.
- One set of files will be generated; both models being evaluated by the pilot study will be able to utilize the same scenario files

**Deliverables and meetings:**

- Populated GIS geodatabase, in the format prescribed by MCWD (assumed to be metro-GIS standard), that captures key hydrologic and hydraulic conditions under future landuse condition within the Turbid – Lundsten corridor.
  - Layer of polygons of future wetlands and BMPs/ponds, with associated storage volume and stage-storage curves, based on typical grading design assumptions.
  - Layer of linework identifying key conveyance systems (pipes, ditches) from future devices to existing receiving systems.
  - Layer of future landuse, including wetlands, ponds, and BMPs.
- Populated GIS geodatabase, in the format prescribed by MCWD (assumed to be metro-GIS standard), that captures key hydrologic and hydraulic conditions under pre-settlement condition within the Turbid-Lundsten corridor.
  - Layer of polygons of historic wet areas with associated estimated storage volumes; this will assume a typical wetland depth (i.e. 2-3 feet).



Reference: Development of Scenarios to Assist with Pilot 2D Model Effort

- Layer of historic landuse, in pre-settlement condition, combining historic vegetation and historic wet areas.

## Task 2 Scenario Development for Edina Pilot Geography

The Edina pilot geography is an urban area with mixed commercial and residential land use. The neighborhood was developed prior to MCWD stormwater rules being implemented, and as a result, there is minimal stormwater treatment in the subwatershed. Through the 2D pilot modeling, we understand that the District wishes to understand how future redevelopment of the commercial area would incorporate stormwater management practices, and how those practices will affect progress toward the District's future water quality and quantity goals. The area-of-interest for land use database development to support scenario analysis under this scope of work has been identified to be only the commercial area (50<sup>th</sup> & France Ave) within the larger pilot model area.

Stantec will apply knowledge of MCWD's current Stormwater Management Rule, hydrologic and hydraulic principles, and engineering design practices, to approximately size and place stormwater BMPs throughout the subwatershed, as they may reasonably be constructed as part of future redevelopment. Throughout the process, Stantec will document the workflow, to serve as a template for the development of a script to automate the process when and if the 2D model is ready for full watershed buildout, or as other regions of interest are investigated.

### Tasks:

#### *Stantec Task 2.1 Development of Future Land use Scenario Files for Edina Area-of Study*

- Using the developed land use layers, Stantec will review future changes to impervious areas and will approximate stormwater treatment practice locations and sizes, based on current District Stormwater Management Rule. This will consider soil types based on NRCS Web Soil Survey. BMPs placement will be approximate, and will be completed at the subcatchment scale, not the parcel scale. Stantec will aggregate catchments to the water-feature level (stormwater BMP or natural water feature); this aggregation will control the quantity of stormwater BMPs placed on the landscape in the future land use condition. Assumptions will be made regarding typical BMP depth and other characteristics based on engineering judgement. For example, BMPs will be assumed to be filtration basins with 0.8 in/hr filtration rate and 3 ft ponding depth with 3H:1V sideslopes.
- Documentation of workflow process in the form of technical memorandum and/or flowcharts, to use for future tool / model / script buildout.

### Assumptions:

- Future commercial areas will be based on Met Council's future land-use dataset.
- MCWD will provide available data, representing existing and future conditions, in GIS format, clipped to the subwatershed extent with a 50 ft buffer, including:
  - Area-of-interest boundary
  - Subwatershed boundaries
  - Current land use
  - Future land use (MetCouncil)

Reference: Development of Scenarios to Assist with Pilot 2D Model Effort

- Before providing to Stantec, MCWD will merge hydrologic features, including natural and man-made water features (i.e. wetlands, stormwater ponds) with the land use file, to ensure land use includes water features accurately. This effort by MCWD will result in a more accurate understanding of the impervious cover in each subcatchment than if a land use file was used off the shelf. This will result in a better representation of how buildout under MCWD rules will affect the landscape.
- Current stormwater infrastructure, including storm sewer network and existing stormwater BMPs
- Public waters
- Wetlands
- Soils
- One set of files will be generated; both models being evaluated by the pilot study will be able to utilize the same scenario files

#### ***Deliverables and meetings:***

- Populated GIS geodatabase, in metro-GIS format, that captures key hydrologic and hydraulic conditions under future full commercial redevelopment future condition within the Edina area-of-interest.
  - Layer of polygons of future BMPs/ponds, with associated storage volume and stage-storage curves, based on typical grading design assumptions.
  - Layer of linework identifying key conveyance systems (pipes) from future devices to existing receiving systems.
  - Layer of future land use, including ponds and BMPs.

### **TASK 3: Technical Memo and Meetings**

Documentation of the process used to generate scenario files is critical in the pilot phase, as the District wishes to understand the level of effort required to generate scenarios to input into the models. Documentation of this scope of work will also memorialize decisions, identify efficiencies, and serve as a basis for future scripting as the District evaluates the potential to develop scripts for watershed-wide buildout of scenario files.

#### ***Tasks:***

- Stantec will prepare a technical memorandum to document the approach used to produce historic and future land use GIS layers.
  - The documentation will include identifying any differences in approach in rural undeveloped areas versus urban areas, as well as identifying differences in approach based on the type of future planning data utilized (i.e., using Met Council standard future land use, versus a City's specific comprehensive plan data).
  - The memorandum will include a summary of workflow used to produce the resulting files, including identification of key decision points within the process.

Reference: Development of Scenarios to Assist with Pilot 2D Model Effort

- As a key component of the work is to create future land use scenarios that account for the future creation of stormwater management practices based on current District regulations, all assumptions and calculations used to develop approximate future stormwater practices will be documented with the intent of informing future automation / scripting of the process.
- As Stantec completes the scope of work, recommendations for scaling the process to the entire watershed will be considered and documented in the memo.

*Time has been allocated to allow close coordination between Stantec and MCWD staff, as well as coordination with City of Edina staff, as may be deemed necessary by MCWD. This activity includes any meetings (one meeting expected), but will be utilized as necessary to progress the project forward. Assumptions:*

- Coordination & meeting time will not exceed 8 hours each for the Project Manager and Technical Lead, and 6 hours for the GIS Technician.
- Stantec will respond to one round of comments from District staff on the technical memo.

**Deliverables and meetings:**

- Technical memorandum as described above.

**Fee Estimate**

Project Summary		Hours	Labour
Total		191.00	\$26,963.00

  

Task Number	Task Name	Hours	Labour
<b>1.1</b>	<b>T-L Corridor Future</b>	<b>85.00</b>	<b>\$11,651.00</b>
	Future BMP buildout based on MCWD rules	54.00	\$7,595.00
	Delineate catchments to water-feature level	31.00	\$4,056.00
<b>1.2</b>	<b>T-L Corridor Historic</b>	<b>27.00</b>	<b>\$3,535.00</b>
	Digitize / compile historically wet areas	21.00	\$2,774.00
	Combine wet areas with vegetation to generate landuse	6.00	\$761.00
<b>2.1</b>	<b>Edina Future</b>	<b>38.00</b>	<b>\$5,477.00</b>
	Future BMP buildout based on MCWD rules	29.00	\$4,216.00
	Further refinement of catchments (combining) to logical break points	9.00	\$1,261.00
<b>3.1</b>	<b>Memo &amp; Meetings</b>	<b>41.00</b>	<b>\$6,300.00</b>
	Prepare memo	19.00	\$2,748.00
	Project coordination, including coordination w/ MCWD & City of Edina	22.00	\$3,552.00

The total cost above includes all reimbursable expenses including mileage, printing, and equipment costs.

Reference: Development of Scenarios to Assist with Pilot 2D Model Effort

## Schedule

Below are the estimated amounts of time that will be required to complete each task.

Task 1.1 – 1.5 weeks

Task 1.2 – 1 week

Task 2.1 – 1.5 weeks

Task 3.1 – 1.5 weeks

**Total – 5.5 weeks**

Sincerely,

**STANTEC CONSULTING SERVICES INC.**



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