AMENDMENT NO. 5
TO THE CONTRACT FOR PURCHASE OF SERVICES
(DESIGN PROFESSIONALS)
CONTRACT 8411

WEST WINGRA WATERSHED STUDY

RECITALS

This amendment is for additional work beyond the scope of the existing agreement and consists of converting the current model to another software package and additional analysis for the peak flow control solutions.

1. On May 2, 2019, the City of Madison, hereinafter called the "City", and Brown and Caldwell, hereinafter called the "Consultant" entered into a contract for a flood and stormwater modeling of the West Wingra Watershed, Legislative File No.54800.

2. Article 9 and Article 10, of the contract, provided for amendment of the contract for additional services.

3. The City has authority to execute an amendment to this contract as provided by Council Legislative File No. 55946.

NOW THEREFORE, The City and the Consultant hereby agree to amend the contract as follows:

A. PROJECT DESCRIPTION

Amend project Scope of Work per the attached file, entitled "West Wingra Watershed Study – Amendment No. 5, Contract 8411".

B. COMPENSATION

Amend Paragraph 24 of purchase of services contract to increase the contract by $31,774.00 for a new contract amount of $416,812.00.

IN WITNESS WHEREOF, the parties hereto have set their hands at Madison, Wisconsin.

CONTRACTOR:

Brown and Caldwell
(Type or Print Name of Contracting Entity)

By: _____
(Signature)

_____
(Print Name and Title of Person Signing)

Date: _____

CITY OF MADISON, WISCONSIN
a municipal corporation:

By: _____
Satya Rhodes-Conway, Mayor

Date: _____

Approved:

By: _____
David P. Schmiedicke, Finance Director

Date: _____

By: _____
Maribeth Witzel-Behl, City Clerk

Date: _____

Approved as to Form:

By: _____
Eric T. Veum, Risk Manager

Date: _____

By: _____
Michael P. May, City Attorney

Date: _____

West Wingra Watershed Study – Amendment No. 5
Contract 8411

Amendment No. 5 to West Wingra Watershed Study (City of Madison contract # 8411) describes the work to be done by Brown and Caldwell (BC or Consultant)

Task 6 Evaluate Flood Mitigation Alternatives

This amendment replaces Tasks 6.1 and 6.2 of the existing Scope of Services for the Stricker's/Mendota Watershed Study. It also renumbers *Task 6.3, Draft Watershed Proposed Solutions Report* to *Task 6.4, Draft Watershed Proposed Solutions Report*.

The Scope for *Task 6.1, Volume Control*, and the new *Task 6.3, Combine Volume Control and Peak Flow Controls Solutions*, will be finalized following the City's internal study on a portion of the Pheasant Branch Watershed completed by the City.

The City will be conducting some of the Tasks outlined in this amendment. Where this occurs, the words "City Provided" follows the Step Name. The City will provide the Consultant with the deliverable to use for the analysis.

Task 6.1 – Volume Control

The scope for Task 6.1 – Volume Control will be finalized following the City's internal study on a portion of the Pheasant Branch Watershed completed by the City. There is no scope or budget developed for this task.

Task 6.2 – Peak Flow Control

For purposes of the watershed studies, Peak Flow Control (PFC) is considered any stormwater control measure that has the ability to store or convey water, but not infiltrate water. These types of stormwater control measures could be referred to as Grey Infrastructure, however the term "Peak Flow Control Infrastructure (PFCI) will be used for purposes of this study.

This Task has 3 Parts. First, the Consultant will identify possible causes of flooding. Then, in Part 2, the Consultant will identify potential locations for solutions. Part 3 will combine Parts 1 and 2 to develop and evaluate solutions to mitigate the potential causes.

<u>Part 1 – Identify Causes of Flooding</u>

The objective of this Part is to identify the major causes of flooding, but not necessarily solve them. This will:

- Guide later sections of this scope
- Provide big picture causes such that if the solutions presented in the final report cannot be implemented, then other options targeting the issue can be developed at a later date

General causes include:

- Undersized upstream infrastructure – aka, too much water going into a system not sized to handle it
- Downstream conditions not allowing water to leave the conveyance system – aka high tailwater or undersized downstream conveyance

The Consultant will use the inundation maps and flooding locations table generated in Task 4, and deliverables 1 and 2 under Task 4 to identify problem flooding areas throughout the watershed.

Using professional judgement and drainage network properties (including but not limited to contributing

area and existing storm infrastructure), the Consultant will identify 5-10 constriction points throughout the watershed for the 10-yr, 25-yr, and 100-yr, 24-hour MSE4 storm events. It is understood that different storm events may have different constriction points.

The Consultant will use the City of Madison Flood Mitigation Goals in the Modeling Guidance Document to guide selection of the constriction points.

Prior to finalizing the selection of constriction points, the Consultant will coordinate with City staff to ensure any priority locations and/or deficiencies are included in the list of selected constriction points.

Deliverables for this step shall include:

1) Color map of watershed with selected constriction points clearly identified for each storm event.
2) For each selected point, a brief description of why that point was selected for further study.

Part 2 – Identify Locations for PFC Infrastructure

(The City will provide the Deliverables from Part 2 for Consultant use. The Consultant is not responsible for work described under Part 2)

Using available information, identify areas where PFC Infrastructure could go and the amount of PFC that could be achieved.

Step 1: Overlay GIS Layers to Determine Suitable Areas for PFC Infrastructure (PFCI). (**City Provided)**

GIS layers that provide insight to siting PFCI were selected by the City. These layers include:

a) Right of Way
b) Ownership (Public)
c) Public Space Type (i.e. Park, Engineering, MMSD, County etc.)
d) Groundwater Table Depth
e) Topography – categorize slope
f) Bedrock Depth
g) Open Water
h) Tree Canopy
i) Utility Corridor
j) FEMA Floodplain
k) Conveyance Area
l) Storage Area
m) Landmarks/Historical Sites/Archeological Sites

Overlay the GIS layers to create a single shapefile.

Deliverables for this step shall include:

1) One (1) GIS layer (shapefile) with the above layers intersected.

Step 2: Code Layers to Allow for Identification of PFCI. (**City Provided)**

The following coding system has been developed to provide a system to identify areas suitable for PFCI.

Each layer shall be coded as follows:

a) Right of Way → 0000000000001
b) Ownership (Public) → 0000000000010
c) Engineering Owned Land → 0000000000100
d) Wetland→ 0000000001000
e) Excessive Cut Required → 0000000010000
f) Depth to Bedrock ≤ 5 feet → 0000000100000
g) Landuse is Open Water → 0000001000000

h) Tree Canopy Present → 0000010000000
i) Utility Corridor→ 0000100000000
j) FEMA Floodplain→ 0001000000000
k) Conveyance Area →0010000000000
l) Storage Area → 0100000000000
m) Landmarks/Historical Sites/Archeological Sites → 1000000000000

Code each layer and provide a single shapefile with the resulting codes.

Deliverables for this step shall include:
1) One (1) GIS layer (shapefile) with the above codes included in the appropriate fields.

Step 3: Compile Layer to Create All-Inclusive Code. (**City Provided)**

Using ArcGIS's Union function, compile an area layer such that the final layer has one field that provides a code with all constraints (for example, an area in the right-of-way, with public ownership, and bedrock less than 5 feet would have the code 0000100011).

Overlay the City's parcel layer with this layer. Mark areas with few (X or fewer) constraints as possible PFCI locations. City will determine number of constraints at a later date and will provide constraint layer to consultant.

Deliverables for this step shall include:
1) One (1) GIS layer (shapefile) with a compiled constraint code for each area.

Part 3 – Develop Solutions for PFCI

Step 1: Create a Model with All Potential PFCI.

This step creates a theoretical scenario to understand what the outcome would be if all available PFCI were implemented.

The Consultant will meet with City staff for a brainstorming session. Consultants should be prepared with high-level, idyllic solutions to solve flooding. For example, a solution that could solve flooding could be to install 6' x 10' box culverts under every street in a watershed. Although this could solve flooding, it may not be feasible for a particular watershed. During this meeting, high-level, idyllic solutions will be discussed and the City will give guidance to the Consultant on which solutions to further evaluate.

Using the GIS layer provided by the City from Step 3 and the information from the meeting, maximize a PFCI in each watershed. These solutions may "oversolve" the flooding; this is acceptable for this step as the solutions will be refined in subsequent steps.

Solutions offered shall not make conditions worse downstream (worse is defined as increase peak water surface elevations), unless the upstream solution is paired with a downstream solution that mitigates the worsened condition.

Solutions may not increase peak flows to a downstream municipality.

A solution may solve multiple constriction points or there may be a solution for each identified constriction point.

This model will be called the *Maximum PFCI Model*. The Consultant will run the *Maximum PFCI Model* for the 10-yr, 25-yr, 100-yr and 500-yr, 24-hour MSE4 storm events. Note: solutions do not need to be provided for the 500-year, 24-hour event. The purpose of the 500-yr model run is to understand the effect the solutions have on that storm.

Deliverables for this step shall include:

1) A spreadsheet or list for each PFCI that includes rough sizing/dimensions where applicable (approximate storage volume required, increase in pipe size, diversion pipe size, etc.).
2) Color figures showing the maximum extent of flooding during each storm event. The figures shall be color coded to show depth of flooding (typical ranges utilized are: 0.01'-0.25', 0.25'-0.5', 0.5'-1.0', and greater than 1').
3) Table noting the flooding depth and duration for the locations identified during Task 4 for each design storm.
4) Model files and documentation.
5) GIS files generated for model development. All files shall be delivered to the City on an external hard drive.

At this point, Consultant will Pause on Proposed Tasks while City Conducts Internal Meetings with City agencies including, but not limited to, the Parks, Forestry and Streets Departments and the Office of the Mayor. Consultant is not expected to attend these meetings.

Step 2: Develop PFC Solutions Model

Using the information identified in Part 1 and 2, and the information the City collected during its internal meetings, the Consultant will develop solutions to solve the identified causes. Solutions could include:

- Above-ground detention basins
- Additional inlets
- Underground storage
- Enlarging greenways and pipes
- Pumping
- Locations to purchase property that is repeatedly flooded
- Other solutions the Consultant deems sound

It is expected that one (1) holistic set of solutions will be developed for the watershed.

The Consultant shall develop conceptual solutions to meet the goals of the watershed studies as outlined in the Modeling Guidance. These solutions will utilize the information developed for the constriction points, but should also meet the goals for areas of the watershed not addressed by the constriction point analysis.

Conceptual solutions should consider:

- Utility conflicts (using available data)
- Topographic relief (if pumps are required to get stormwater runoff to/from PFCI)
- Downstream flood impacts
- Environmental concerns (using available data including CARPC info, wetland indicators, etc)
- Permitting concerns

This model will be called the *PFC Solutions Model.* The Consultant will run the *PFC Solutions Model* for the 2-yr, 5-yr, 10-yr, 25-yr, 100-yr and 500-yr, 24-hour MSE4 storm events. The purpose of the model run is to understand the effect the solutions have on each incremental storm event.

The Consultant will develop conceptual cost estimates for each proposed PFCI.

Deliverables for this step shall include:

1) A spreadsheet or list for each PFCI that includes rough sizing/dimensions where applicable (approximate storage volume required, increase in pipe size, diversion pipe size, etc.).
2) Conceptual drawings (1 per PFCI) showing:
a. The footprint, inlet/outlet/etc. for storage or greenway modifications.
b. Increase/decrease/abandonment/etc. for alternatives with storm sewer size changes.
c. Locations of additional inlets.
d. Location of pump station, pump station footprint, and inlet/outlet sewers
e. Locations of properties to be purchased.
f. Utility conflicts from existing available GIS data.
g. Known wetlands/FEMA floodplains/environmental areas of concern.
3) Conceptual cost estimates utilizing unit costs provided by the City for items identified by the Consultant.
4) Color figures showing the maximum extent of flooding during each storm event. The figures shall be color coded to show depth of flooding (typical ranges utilized are: 0.01'-0.25', 0.25'-0.5', 0.5'-1.0', and greater than 1').
5) Table noting the flooding depth and duration for the 25 locations identified during Task 4.
6) Number of structures removed from flooding during the 100-year event.
7) Model files and documentation.
8) GIS files generated for model development. All files shall be delivered to the City on an external hard drive.

Part 4- Assess the 500-yr Storm and Potential Upgrades

The purpose of this Part is to further understand where it may be practical to purchase property and/or where PFCI could be maximized to achieve additional flood control benefits. In some cases, this may not be practical or feasible, therefore solution is considered partially theoretical.

Using the model from Part 3 as a base, the Consultant will increase the capacity of all conveyance, storage, and/or pumps in the model to relieve as much flooding as possible for the 500-yr event while staying within the ownership boundaries of the PFC devices. For example, if a PFCI is going to be proposed for an open lot owned by the City of Madison, maximize the PFCI on the land owned by the City but do not go outside those boundaries. This model is called the *Upsized PFC Solutions Model.*

The solutions may involve increase infrastructure upstream and/or downstream of the solutions identified in Part 3, as long the solution stays within the ownership boundaries.

The Consultant will run the *Upsized PFC Solutions Model* from Part 3 for the 500-yr event and compare the results from this model to the results of the Part 3 *PFC Solutions Model* run for the 500-yrevent.

As part of the comparison, the Consultant will identify the location and number of buildings that are no longer inundated with the upsized PFCI. For purposes of this analysis, inundation will be identified as water touching a structure.

The Consultant will prepare a conceptual cost estimate for upsized PFCI identified in Part 4.

Deliverables
1) Comparison of infrastructure costs between the *PFC Solutions Model* and *the Upsized PFC Solutions Model* for the 500-yr event
2) Count of buildings inundated in the 500-yr event compared to the inundated buildings for the PFC Solutions model during the 500-yr event
3) Model files and documentation

Task 6.3 – Combine Volume Control and Peak Flow Controls Solutions

The scope for Task 6.3 – Combine Volume Control and Peak Flow Controls Solutions will be finalized

following the study on a portion of the Pheasant Branch Watershed completed by the City. There is no scope or budget developed for this task.

Task 6.4 Draft Watershed Proposed Solutions Report

The scope of work for Task 6.4 is identical to the original scope of work for Task 6.3.

Task 11 (BC Phase 013): Conversion of InfoSWMM to XPSWMM Format

Overview

This amended scope of services describes the tasks that will be conducted by Brown and Caldwell (BC or Consultant) to convert the existing InfoSWMM hydrologic / hydraulic model for the Strickers / Mendota Watershed to an XPSWMM 2D (Version 2016.1 or newer) format.

This work will be conducted as a new task to be added to the Strickers / Mendota Watershed Study contract between the City of Madison and BC dated March 25, 2019 (Enactment Date). All terms and conditions of that contract remain in effect for the scope of work described in this amendment.

This work will be conducted as Task 11 (Phase 013) "Convert InfoSWMM to XPSWMM".

TASK 11 Convert Existing InfoSWMM 2D model to XPSWMM 2D and Associated Efforts

11.1 BC will convert the existing InfoSWMM hydrologic and hydraulic model as described in original Scope of Work to XPSWMM 2D software (v 2016.1). The conversion process will include all hydrologic and hydraulic factors necessary to run XPSWMM 2D. The conversion will also include re-naming to a 20 character (or less) naming convention for the subcatchments and links.

11.2 BC will work with City and other consultants to review, develop and update the Modeling Guidance Document. Coordination will be conducted via email or phone.

11.3 Meetings: BC budgeted two (2) face-to-face meetings with the City to discuss the conversion process from InfoSWMM 2D to XPSWMM 2D software.

Budget

A total budget increase for the scope described above (Amendment #2) is $31,774.00.

Task	Phase/Task Name	Original Scope Effort	Adjusted Total Hours	Adjusted Total Effort
6.1	Volume Control	N/A	N/A	N/A
6.2	Peak Flow Control	$55,392 [1]	525	$64,056
6.3	Combine Volume Control and Peak Flow Control	N/A	N/A	N/A
6.4	Draft Watershed Proposed Solutions Report	$8,266 [2]	71	$8,266
11.1	Model Conversion	N/A	186	$20,174
11.2	Update Modeling Guidance Document	N/A	9	$1,253
11.3	Meetings	N/A	9	$1,683
	Total	**$63,658**	**800**	**$95,432**
			Amendment #5 Amount (Increased Effort)	**$31,774**

[1] Original Tasks 6.1 & 6.2
[2] Task 6.3 in original contract

Original contract amount:	$ 225,000.00
Amendment #1:	$ 12,539.00
Amendment #2	$ 87,229.00
Amendment #3	$ 38,025.00
Amendment #4	$ 22,245.00
Amendment #5:	$ 31,774.00
Amended Contract Amount:	**$ 416,812.00**

The assumptions below completely replace the assumptions identified in the original contract.

ASSUMPTIONS

The following assumptions were made by Brown and Caldwell (BC) in the development of the approach, schedule and budget provided. This list of Assumptions replaces the Assumptions list in the original contract.

1) BC assumes all other items in the original contract's Scope of Work will not change as a result of this amendment.
2) City staff will meet with BC representatives as needed, provide interim reviews of developed materials on an agreed-upon schedule, make timely decisions regarding submittal details, and generally participate in the project to the extent necessary for BC to perform the needed services.
3) The City shall furnish BC all available maps, orthophotographs, stormwater conveyance system drawings, stormwater management plans, parcel graphical and tabular data, previous stormwater management planning data, and other relevant stormwater management data in a digital format if available. Data included in this material may be relied upon without independent verification in performing the Scope of Work. It is also assumed that the above information will be provided at no cost to the project.
4) Some information provided by the City may be inaccurate or unreliable. BC cannot be responsible for inaccuracies in the existing data supplied by the City. BC agrees that professional judgement shall be used when reviewing documentation by the City and shall identify any issues early if data appears inaccurate or incomplete. For missing data, BC will determine critical field measurements necessary for reliable model construction. BC will receive concurrence from the City on data requiring field survey and missing data that does not require field measurements.
5) The City shall provide available design plans, as-built data, stormwater management plans, and/or any other pertinent data for existing structural management measures to be included in the InfoSWMM model. BC budgeted for up to ten (10) existing structural stormwater management measures to be incorporated into the InfoSWMM model. No field work is included to confirm that structural measures were built per plan (where record drawings do not exist), were not modified after construction, or do not have other conditions that cause them not to function as designed. If concerns are identified, the City will assist with field evaluations, including structure inspections or survey verification to verify accuracy of information.
6) One (1) BC representative is budgeted to attend the Progress and Update Meetings and Focus Group meetings. Two (2) BC representatives are budgeted to attend the Public Information Meetings (unless otherwise noted in the Scope of Work).
7) City will host and be responsible for all logistics concerning the Public Information Meetings including, but not limited to, securing location, publicizing events, securing presentation equipment and tables/chairs, posting materials to the City's website, etc. The City will also provide City representatives to answer questions on the City's behalf at each meeting. The meeting dates and times will be made in consultation with BC.
8) Budget assumes consistent hydrologic methods and rainfall distributions are used throughout the project area and duration of the project.
9) Storm sewer and culvert segments 18 inches in diameter (or equivalent) and larger will be included in the models. Smaller diameter storm sewers will be included only where necessary to demonstrate compliance in meeting City flood-reduction goals as identified in the Modeling Guidance Document
10) Subbasins will be delineated as a single subwatershed to the existing storm sewer (subbasins will not be delineated for individual blocks that do not discharge to their own existing storm sewer) during existing conditions. It is understood that these areas may be subdivided further during the proposed conditions analysis if stormwater control measures are proposed for these areas and the proposed stormwater control measure analysis requires further subdividing.
11) BC assumes the GIS data depicting existing inlets (with the exception of those being surveyed) is of sufficient accuracy to perform the Aggregate Inlet Capacity Analysis. BC is not obligated to verify the location or size of inlets. If concerns or deficiencies in the information are identified, the City will assist with field evaluations, including structure inspections or survey verification to verify accuracy of information.

12) Inlet-clogging factors will be evaluated and may be adjusted to calibrate the model as identified in Task 3 and as further identified within the Modeling Guidance document. Upon calibration and QA/QC of the model these factors will be utilized for the proposed condition model.
13) Other than field work specifically identified in the Scope of Work, no other field work will be conducted, including, but not limited to, field survey, wetland delineations, geotechnical, and/or environmental investigations.
14) The scope of work includes preparation of conceptual drawings for up to ten (10) Peak Flow Control Infrastructure (PFCI) measures. The drawings will include a single ArcGIS-derived plan sheet at a suitable scale to show the intent of the proposed mitigation measure and the elements described in the scope of work. These drawings are not suitable for bidding or permitting purposes.
15) BC assumes all mitigation measures will be located within the City of Madison.
16) The scope of work includes planning level cost estimates using City-provided unit prices. Independent verification of unit prices will not be conducted as a part of this scope of work completed, however estimates must consider issues such as constructability. BC agrees to work with the City on probable cost estimates based on specific mitigation solutions.
17) No federal, state, or local government permit preparation work is included in the scope of work however it is expected that review with the responsible regulatory agency will be completed as identified in Task 6.
18) BC assumes that the City will provide one set of comments and edits for each draft document, prior to BC finalization.
19) All work will be conducted by December 31, 2020. Should the contract extend into 2021, a budget amendment for rate increases will be requested.
20) A maximum of 10 constriction points for each storm event will be identified under Task 6.2, Part 1. A description of the constriction points and general causes of flooding at the construction point will be provided as a deliverable under Task 6.2, Part 1. Reporting under subsequent steps will occur at the 25 locations identified under Task 4. The constriction points may be at these locations and included in reporting, however, additional reporting points will not be added to the 25 locations. Specific description of how various mitigation measures impact constriction points is not included in this scope of work.
21) The City will conduct all work described under Task 6.2, Part 2, and provide deliverables to BC in the format described. The BC is not responsible for the quality or the accuracy of data and information provided by the City under Task 6.2 Part 2. BC may rely on this data without independent verification.
22) The Maximum PFCI Model described under Task 6.2, Part 3, Step 1 will include a maximum of 15 mitigation measures. A single XPSWMM model incorporating all potential PFCI will be created. Iterations or alternatives to this model are not included in the scope of work.
23) The PFC Solutions Model described under Task 6.2, Part 3, Step 2 will include a maximum of 10 mitigation measures. A single XPSWMM model incorporating the various mitigation measures will be developed. Alternatives consisting of individual mitigation measures, or various subsets of mitigation measures, are not included in the scope of work.
24) Under Task 6.2 a total of five (5) meetings are budgeted. Meetings include;
    a. Task 6.2, Part 1 (1 meeting),
    b. Task 6.2, Part 3, Step 1 (2 meetings),
    c. Task 6.2, Part 3, Step 2 (1 meeting), and
    d. Task 6.2, Part 4 (1 meeting).
25) As described under Task 11, the City understands that the model metadata including the source of link and node data such as inverts and diameters will not be held in XPSWMM. These data will be held in a companion ArcGIS database.