

EXHIBIT "A"
WORK ORDER FORM
PURSUANT TO AN AGREEMENT BETWEEN
THE CITY OF FORT COLLINS
AND
Icon Engineering Inc.

DATED: February 21, 2012

Work Order Number: KCS-2015-2

Purchase Order Number: Charge # 504.5040452818.521130.3

Project Title: 2015 West Vine Basin Update (EPASWMM Conversion and HEC-RAS Unsteady Models for Canals)

Commencement Date: May 1, 2015

Completion Date: November 20, 2015

Maximum Fee: (time and reimbursable direct costs): \$ 59,980.00

*7300 Consulting Engineering SCS
for Clearview Channel
Improvements*

Project Description: Project includes the conversion of the West Vine hydrologic model from MODSWMM to EPASWMM 5.0 and updating the HEC-RAS unsteady flow models for three irrigation canals – the Pleasant Valley and Lake (PVL) Irrigation Company, the New Mercer Ditch (NMD) Company and the Larimer #2 (L#2C) Canal Company. Similar work will be completed for the Michaud Basin under a separate work order and will be coordinated with and incorporated with this study.

Scope of Services: See attached scope of work.

Service Provider agrees to perform the services identified above and on the attached forms in accordance with the terms and conditions contained herein and in the Services Agreement between the parties. In the event of a conflict between or ambiguity in the terms of the Services Agreement and this work order (including the attached forms) the Services Agreement shall control.

The attached forms consisting of four (4) pages are hereby accepted and incorporated herein by this reference, and Notice to Proceed is hereby given.

CC: Purchasing

Service Provider: Icon Engineering, Inc.

By: *Yodanis J. Christa* Date: 4-13-15

City of Fort Collins: Water Utilities Engineering Division

Submitted By: *[Signature]*
Project Manager
Date: 4/13/2015

Reviewed By: *[Signature]*
Water Utilities Engineering Manager

Date: 4-13-15

Reviewed By: *[Signature]*
Water Engineering & Field Serv. Manager

Date: 4/13/15

Approved By: _____
Utilities Executive Director

Date: _____

Approved By: _____
Purchasing & Risk Mgmt Director

Date: _____

Exhibit A
Scope of Work
West Vine Basin SWMM Conversion Project
City of Fort Collins
11/26/2014

ICON Engineering, Inc. is pleased to provide this proposal for engineering services to complete the SWMM conversion for the West Vine watershed. As discussed during our October 23rd meeting, the City is requesting that hydrologic modeling for the watershed be updated to the SWMM5 format in order to be used in support of ongoing updates to the flood hazard mapping within the basin. Our scope of work is outlined below. A fee spreadsheet has also been provided for your review.

Task 1: Correspondence:

Up to two (2) project meetings and up to four (4) periodic conference calls have been assumed for project correspondence. All other correspondence items will be made via phone calls and emails.

Task 2: Data Collection & GIS Conversions:

ICON will convert hydrologic basins and routing elements provided as part of the 2009 report for the *Canal System Capacity Analysis for the Pleasant Valley & Lake Canal (PVLC), New Mercer Ditch (NMD), and Larimer County Canal No. 2 (LCC No. 2) Canals* and subsequent information developed for the 2013 Hydraulics update (Appendix C) into a GIS database.

Topology adjustments will be made for sub-basins based on the City's current LiDAR topography. Sub-basin areas will be compared with originally modeling assumptions. Differences in basin areas will be discussed with City staff.

Task 3: SWMM 5.0 Conversion:

The existing MODSWMM model from previously hydrology updates will be converted to the SWMM5 program format. In general, the following steps will be performed to complete the conversion process.

SWMM5 Conversion Steps:

1. Rainfall / Runoff: Approximately 91 sub-basins will be converted maintaining the existing rainfall distribution and runoff parameters as the MODSWMM models.
2. Land-Use: Limited land-use and sub-basin changes have been assumed for this watershed. Significant changes based on changes in development or infrastructures are not anticipated with exception to surrounding Shields Street and the Aurthur's Ditch, where a recent design project by the City has modified hydrologic routing. The new routing will be account for in the analysis.
3. Routing Elements and Nodes: Approximately 120 node and conveyance elements make up the current West Vine study. Elevations for nodes in SWMM5 will be established from a GIS DTM at relative locations within each sub-basin. Adjustments will be made to best estimate the thalweg elevations using regional LiDAR data, contours, or other mapping sources. The majority of the MODSWMM routing elements for the current study reflect trapezoidal channels with channel overflows for floodplain areas. For the conversion, ICON will develop new transects representative of the DTM and routing conditions.
4. Detention Ponds: Approximately 12 detention ponds exist in the current West Vine study. No technical backup information was available within the City's appendix information. To develop the required values for SWMM5, ICON will visit each pond, conduct engineering level surveys and rectify pond information with updated topography and original modeling assumptions, where possible. Elevations, surface area, and outflow will be modeled to maintain consistency with the Dynamic interface. Any adjustments needed for ponds that do not correlate

well between current and past information will be discussed with the City staff.

5. Diversions: With exception to at the canal locations, diversions will be modeled using the inflow/outflow relationships established as part of the previous MODSWMM model. Any deficiencies in diversions will be discussed with City staff on a case-by-case basis.

6. Model Execution: The SWMM5 model results will be compared with past models to identify conveyance and volumetric differences. The SWMM5 model will also be run for the 2-, 5-, 10-, 25-, 50-, and 100-year storm events. The models will be executed using the Dynamic interface in SWMM. Results will be presented to City staff prior to producing the final project report.

Task 4: PVL, NMD, LCC#2 Canals:

New inflow hydrographs will be routed through the PV&L, NMD, and LCC#2 using the unsteady flow routine in HEC-RAS, version 4.1. Modeling will be based on the past HEC- RAS models prepared for the 2009 Canal Capacity study, converted to the current version. As with the 2009 study, canal spill flows will be balanced with inflow and outflows from the Michaud Basin upstream and Canal Importation Basin, downstream. Modeling for the Michaud Basin will be completed separately and coordinated with this study, as appropriate. Modeling within the Canal Importation Basin will be re-run from the updated analyses completed recently for the City. New outflow hydrographs within the West Vine basin will be exported from HEC-RAS and re-imported into the SWMM5 model at three separate locations. No geometric changes are anticipated with the HEC-RAS update; however time has been included to trouble shoot result differences between the original modeling in version and version 4.1.

Task 5: Submittals and Reports:

ICON will assemble a project report summarizing the background, data, methodology, and results from the study. Basin maps with hydrologic routing will be generated using GIS. Exhibits will also be prepared documenting the results for spills from each of the

Canals, for all flow frequencies. An exhibit will also be prepared comparing discharges for the original and revised models at key locations. Technical information will be assembled in project appendices.

Task 6: Review and Revisions:

Limited time has been included to address comments from the City.

Project Fees and Schedule:

A fee spreadsheet has also been provided for your review. We estimate that this project can be completed for \$59,980, and within approximately 4 months of notice to proceed. Please note that this fee assumes a portion of the canal work will be completed alongside a similar update for the Michaud Basin, adjacent to West Vine.

