Project Status, June 2018: CS-175; Dynamic Collection System Control

Summary
The two areas of focus for the project CS-175; Dynamic Collection System Control are: analysis of dynamic control for the GDRSS system, and an operator decision support dashboard. Here we provide a review of progress made for each of these tasks and discuss future work.

Updates

Dynamic Control for the GDRSS
In May, we developed a Market Based Control (MBC) framework to analyze the control of flows through the Conner Creek – Fairview – Freud complex. In this framework, upstream storage elements such as the Conner Creek Forebay "purchase" downstream capacity in the Conner Creek Retention Basin. We then used this framework to analyze the system response during different wet weather events.

During the month of June, we continued to develop our MBC framework for the Conner Creek complex marketplace and investigate outcome sensitivities to cost-curve parameter formulations therein. Preliminary results show that the downstream performance of the marketplace depends greatly on the magnitude difference in cost curve parameters. Simulations were run for many combinations of upstream cost parameters, effectively changing the upstream control point of highest discharge priority to release. To reorder the priority of control points requires cost curve parameters to span orders of magnitude, which creates a large search space to find cost curve combinations that provide effective control operations. This is an ongoing topic of investigation.

This month we also added the capability to operate multiple parallel marketplaces within the same simulation. Creating parallel marketplaces allows for subsystems – such as a grouping of ISDs in series – to be controlled with independent prices based upon states at a specified subset of locations. Subsystem grouping is determined primarily by grouping assets with a common local downstream point such as a screening facility or a main trunk line. In current simulations we have grouped 15 controllable assets into 5 individual marketplaces. Table 1 provides a further detail on the current groupings of controllable assets. This work is also an ongoing topic of investigation, and an important step towards application. However, to accomplish this task will also require access to level, flow, and state measures that we currently do not have credentials to access. Requested measures were compiled and shared with GLWA. Currently, we require assistance in gaining access to measures.

Marketplaces	Control Points	Downstream
1	Conner Creek Forebay, Conner Creek Storm Pump Station, Freud Storm Pump Station	Conner Creek Retention Basin, Fairview Pump Station
2	ISD002, ISD003, ISD004	Weatherby below ISD002, West Side Relief
3	ISD005	Clark Relief Below ISD005, DRI
4	ISD006, ISD007, ISD008, ISD009, ISD010	First – Hamilton, DRI
5	ISD011, ISD012, ISD013	Connant – Mt. Elliott, Lieb Screen Facility

Table 1 Grouping of control points into independent marketplaces.

Decision Support Dashboard
Last month, the team took time to develop and retool backend applications to support the Decision Support Dashboard such as improving GLWA data ingestion and developing processes for forecast data integration into our models and decision making. This month we continued to build our backend applications and completed a first version of a front-end visualization component. In June, a significant update was also made to our SWMM API. This update allows us to more easily read and interpret SWMM input file

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information into a python data structure. Developing a data structure for SWMM input files will give us more flexibility to supply different information to SWMM.

Leveraging the access to forecast data and updates to our SWMM API, the team developed a prototype for visualization of forecast data. This prototype, as seen in Figure 1, provides estimated depths of accumulated rainfall for subcatchment areas as defined in the GDRSS SWMM with the current forecast window set as 6 hours. This figure is updated every hour and is located here: https://s3.us-east-2.amazonaws.com/klabglwa/forecast_map.html.
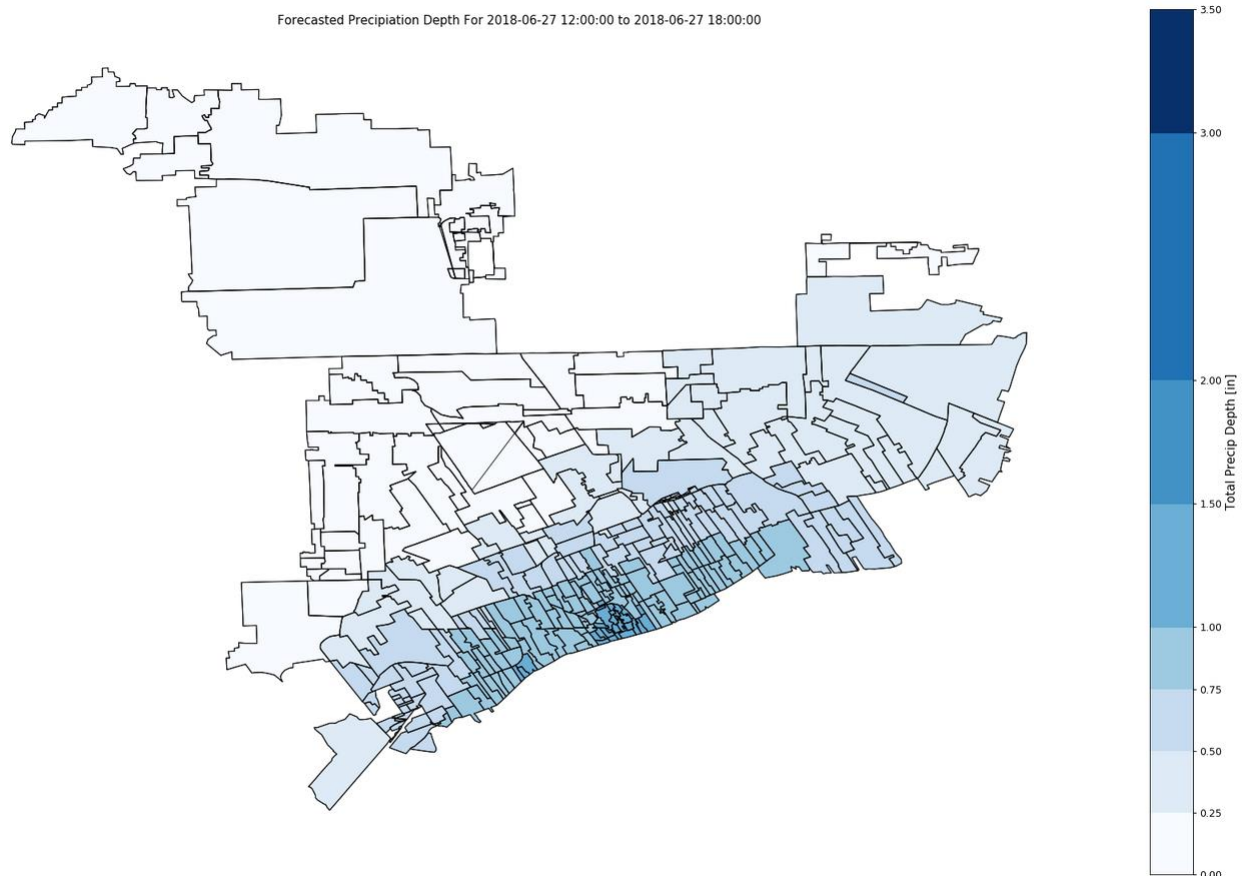

Figure 1. Visualization of forecasted precipitation depths for subcatchment areas in the GDRSS SWMM.

Future Work
What We Need: Assistance in receiving access to the remaining data on our "Wish-List."

Continued lines of investigation for control include parameter search-and-selection and the further development of the parallel marketplace framework. Work will also continue to build out the Decision Support Tool applications.

Reporting
We look forward to providing an update of our progress on July 31, 2018.

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Project Contacts:
Branko Kerkez
bkerkez@umich.edu

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