

MSDGC's STATEMENT REGARDING COUNTY PROPOSED

HYDRAULIC MODEL RULES

The County is proposing a new “rule” pertaining to hydraulic modeling of the District’s sewers. In 2003, MSDGC completed a three-year project to develop a hydraulic model (MSDGC System Wide Model) of the sewer system; hydraulic modeling is a fundamental tool used in planning and designing of projects as well as measuring compliance with Consent Decree requirements. One of the largest models of its kind ever constructed at the time, the MSDGC System Wide Model provides the District with an extraordinary tool to evaluate existing and projected conditions within the sewer collection system. Since 2003, MSD has been making updates and refinements for more detailed analysis of individual projects. In 2003 the model was 100% calibrated and validated (C&V) and since then MSD has maintained a high standard of care of the model and enhanced it with the development of MSDGC Modeling Guidelines and Standards (2011). MSDGC’s Guidelines were independently reviewed and accepted by an Expert Panel. Over the last year, MSDGC has completed a comprehensive review and update of the model with:

- Nearly 40% of the System-wide Model has been recalibrated and revalidated
- 13% currently in the process of being recalibrated or revalidated and
- 11% has been partially complete;

In Summer 2016 MSDGC will have Model Guidelines (Version 4) that will provide additional enhancements following industry standards, rooted in good modeling practice.

MSDGC strongly objects to the proposed rule because the County’s interpretation of modeling and their misunderstanding of the industry standards will greatly impede the Consent Decree objectives and the City’s designated role as manager. The Objectives on page 11 of the Consent Decree recite “Defendants agree” (including City’s independent agreement) “to use sound engineering practices, consistent with industry standards, to perform investigations, evaluations and analyses and to design and construct any remedial measures required by this Decree; to use sound management, operational, and maintenance practices, consistent with industry standards, to implement all requirements of this Consent Decree. ...”.

The County has a track record of continuing to question hydraulic models for project designs resulting with more cost with additional data collection and modeling and delays to Consent Decree mandated projects. Phase 1 WWIP projects that have unnecessarily already been delayed by this tactic include: CSO 125 Stream Separation; CSO 217/483 Source Control Phase B; CSO 551 Sewer Separation; CSO 194 Sewer Separation; CSO 195 Sewer Separation; SSO 228 Elimination; and SSO 1000 Elimination. The County has also used this tactic to delay several small sewer replacement projects and watershed operations optimization projects. Some of these projects have been delayed years and now have critical levels of float to Consent Decree milestones.

The County’s approach to modeling is not based upon sound engineering and is not within industry standards. The County’s diversion from standard industry practices are summarized with the following key points:

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1. The County's proposed rule is being called "hydraulic modeling standards" but they are related only to one criterion used to assess models criterion called "model calibration and validation." The proposed rule would distort good modeling practice by singling out the model calibration and validation criterion above all other criteria.

Fact #1. MSDGC, following industry and professional practice, must consider other model evaluation criteria such as model resolution, network connectivity, attribute accuracy, model stability, and continuity error which are just as important for improving the accuracy of the models. This is reflected in our new model review approach using model report cards to be published in February 2016.

2. The County states the proposed rule is required because only 2% of the sewers modeled in the District have been calibrated and validated to MSDGC Modeling Guidelines and Standards Manual - Version 3 (MSDGC's Modeling Standards). This statement is not correct.

Fact #2. All (100%) of the modeled area was calibrated and validated in 2003 to the then current industry standard. At that time MSDGC did not have a published Modeling Guidelines and Standards Manual. This effort required a significant effort and investment of \$12 million (\$4M flow monitoring) in a collaborative effort with staff and a 9-firm consultant team. The result was development of an advanced state-of-the-art collection system model that was accepted and endorsed by the Defendants, Consent Decree Regulators and modeling industry professionals. The County was involved with development of the 2003 hydraulic model.

Fact #3. MSDGC's modeling guidelines during the original model development effort are summarized in the Interim Partial Consent Decree Exhibit 4 titled "Model and Data Collection Work Plan". Section 6.5 of this Exhibit specifically discussed model calibration procedures. MSDGC, the Defendants, and the Regulators never stated that updated modeling guidelines published in 2011 should be retroactively applied to prior models. Though MSDGC has continued to refine and update the modeling procedures to reflect technology upgrades and industry advances, it is inappropriate to use this updated information to judge the prior models. This is equivalent to driving 45 miles per hour down a roadway in 2015 having a posted speed limit of 50 mph and getting a retroactive ticket in 2017 because the speed limit was changed to 30 mph. The County is proposing these changes that are not expected or required by the Consent Decree or Regulators and are outside of industry standards.

Fact #4. The County as a Defendant to the Consent Decree was in full agreement with the modeling procedures and work plan included in Exhibit 4 of the Interim Partial Consent Decree. It is not acceptable for the County to state in an email to Director Checco dated January 22, 2016, "The WaPUG standards should have been used by MSDGC during the original model development in 2003. Instead, MSDGC developed its own "standards"." The

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County was a party to developing the modeling procedures and work plan in 2003. The modeling procedures developed were approved by USEPA, Ohio EPA, and ORSANCO and represented best industry practices.

Fact #5. For the County to continue to state MSDGC's model does not accurately predict the flows and overflows in the collection system is untrue. MSDGC also objects to the County's statement that "Failure of MSD to meet its own Modeling Standards and the generally and widespread accepted WaPUG modeling standards results in the single largest risk to not complying with the Consent Decree". USEPA has opined on MSDGC's original and updated hydraulic models and have "blessed" them as appropriate for compliance with the Consent Decree. It is the County's position - not the City's - not the Consent Decree Regulators - not industry experts, that MSDGC's model poses a risk of non-compliance with the Consent Decree.

Fact #6. MSDGC has created model calibration and validation (C&V) status dashboard maps which show model C&V status geographically as percent of modeled area. This objective method allows quantification of sewershed C&V status. This is important to determine which project phases the model is suitable for using including screening of alternatives, planning a project, preliminary design, or final design. Models need more refinement in order to be applicable to detailed design of a project. Models do not need to be fully C&V to be suitable for screening options or planning projects.

3. The County is proposing new "standards" that fall short on modeling best practices or the industry standard. For modeling, the "industry standard" is to maintain flexibility in terms of "guidelines," not rigid "standards," which are often impossible to follow.

Fact # 7. MSDGC has a solid track record for using a very high level standard of care for modeling and its proper uses. The County verified this fact in 2012 when they hired a third party, Tetra Tech, to evaluate the Lower Mill Creek Partial Remedy (LMCPR) model. Tetra Tech's findings were that MSDGC maintained a high standard of care for the model. In its evaluation, Tetra Tech rejected the County's position on using rigid model C&V criteria and stated that model C&V is not intended to be a pass/fail test. This report stated:

"A critical aspect of modeling is the understanding of the model purpose. The validation of the model should be relevant to the objectives. The MSDGC regulatory compliance standard is based on annual performance; thus, the model should be tested for its overall performance on an annual basis. Because volume is the most critical parameter, the volume prediction should fall within an acceptable range on an averaged basis."

Fact #8. Rigid standards often create a situation of unnecessarily increasing project costs for minimal benefit. Tetra Tech noted this fact in their 2012 model evaluation report, "Model development is expensive and can reach a point of diminishing results." Applying rigid

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standards as proposed by the County would cause costly delays in model C&V, which will delay planning and design of projects without net benefit.

Fact #9. Some Consent Decree Utilities, like Pittsburgh, do not follow the European WaPUG standards in modeling their \$billion wet weather plans due to the rigid nature of those standards. WaPUG recognized some utilities are incorrectly applying their guidelines as rigid standards and has removed them from their website in 2015. WaPUG intends to issue new guidelines that emphasize use of engineering judgement in lieu of rigid standards.

Fact #10. USEPA has not issued rigid modeling standards but rather publishes general guidelines for sound engineering practices appropriate for hydraulic modeling. MSDGC complies with all USEPA modeling guidelines and procedures.

Fact #11. The County has consistently ignored the use of professional engineering judgment related to hydraulic modeling – particularly with applying the former rigid WaPUG standards. Modeling is a science that by its nature requires judgment for proper interpretation. The County places importance on checking clearly defined boxes for interpreting model data and results but this is not rigidly accepted industry standard. MSDGC contacted WaPUG Board Members regarding the use of “standards”. WaPUG Board Members agree rigid standards are not appropriate for hydraulic modeling. Engineering judgment is an appropriate substitute because available data is limited in both amount and quality. The County’s position that “standards are in place for a reason” is simply not appropriate for modeling.

4. The County’s proposed rule includes two components that are not based on WaPUG or industry standards: (1) rigid continuous calibration and validation criteria which will reduce the efficiency and cost-effectiveness of continuous calibration and (2) antecedent moisture modeling (flow chart at the end of the rule).

Fact #12. MSDGC does not agree with County’s preference to apply rigid criteria when it is clearly not industry standard or best practice.

Fact #13. Modeling industry experts do not endorse the County’s proposed modeling rule language. Centuries of collective experience from modeling professionals at AECOM, Arcadis, Black & Veatch, Brown & Caldwell, CDM, CH2M Hill, General Electric, HNTB, Jacobs, Power Engineering, Strand, and XCG disagree with the County’s position. These are the highest ranked firms in the Country according to AWWA, WEF, and ENR due to their vast experience and expertise.

5. The County’s approach to this proposed rule frustrates design of projects and sound management for implementation of Consent Decree measures. The County’s diversion from Consent Decree implementation is summarized with the following key points:

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- The County's proposed rule impedes the management function of the City per the 1968 Agreement. The County does not recognize the City as a co-Defendant to the Consent Decree.
- The County's proposed rule contradicts the objectives of the Consent Decree because it does not comply with industry standards.
- The County's proposed rule unnecessarily delays the design of Consent Decree – and critical Asset Management projects.