

R309-511. Hydraulic Modeling Requirements

Table of Contents

R309-511-1. Purpose.	2
R309-511-2. Authority.	2
R309-511-3. Definitions.	2
R309-511-4. General.	2
(1) Rule Applicability.....	2
(2) Rule Elements.	4
R309-511-5. Requirements for the Hydraulic Model.	4
R309-511-6. Elements of the Public Water System or Its Agent's Certification. .	5
R309-511-7. Hydraulic Model Design Elements Report.	7
R309-511-8. System Capacity and Expansion Report.	8

R309. Environmental Quality, Drinking Water.

R309-511. Hydraulic Modeling Requirements.

R309-511-1. Purpose.

The purpose of this rule is to ensure that the increased water demand created by new construction will not adversely affect existing or new water users. This will be accomplished by requiring the public water system or its agent to evaluate the water delivery system using a hydraulic model and by certifying to the Director that the project will not adversely impact the system. It is intended that the public water system or its agent will use the findings of the hydraulic model to design improvements providing satisfactory service to both existing and new water users. This rule requires the public water system or its agent to certify that the design meets minimum flow requirements of R309-510 and pressure requirements as set forth in rule R309-105-9.

R309-511-2. Authority.

This rule is promulgated by the Drinking Water Board as authorized by Title 19, Environmental Quality Code, Chapter 4, Safe Drinking Water Act, Subsection 104(1)(a)(ii) of the Utah Code and in accordance with Title 63G, Chapter 3 of the same, known as the Administrative Rulemaking Act.

R309-511-3. Definitions.

Definitions for certain terms used in this rule are given in R309-110 but may be further clarified herein.

"The public water system or its agent" is the individual responsible for signing the certification and preparing the Hydraulic Modeling Design Elements Report. This individual shall be a registered professional engineer, licensed to practice in the State of Utah.

R309-511-4. General.

(1) Rule Applicability.

(a) This rule applies to public drinking water systems categorized as community water systems as defined by rule R309-100-4(2), and to non-transient non-community water systems that have system demands higher than required by R309-510 or with demands for fire suppression. All public drinking water systems are still required to comply with R309-550-5 with respect to water main design, which may require a hydraulic analysis. Submission of the Hydraulic

Model Report, as defined in R309-511-7 and 8, is not required for projects meeting one of the following criteria:

(i) public drinking water projects that will not result in negative hydraulic impact, such as, but not limited to;

(A) addition of new sources in accordance with R309-515;

(B) adding disinfection, fluoridation, or other treatment facilities that do not adversely impact flow, pressure or water quality;

(C) storage tank repair or recoating;

(D) water main additions with no expansion of service (e.g., looping lines);

(E) adding transmission lines to storage or sources without adding service connections;

(F) adding pump station(s) from source or storage upstream of distribution service connections; or,

(G) public drinking water projects that have negligible hydraulic impact as determined by the Director.

(ii) public drinking water projects that are a part of a planned phase of a master plan previously approved by the Director per R309-500-6(3)(a);

(iii) the water system maintains and updates a hydraulic model of the system, and has designated a professional engineer responsible for overseeing the hydraulic analysis in meeting the requirements of R309-511 in writing to the Director; or,

(iv) the water system has a means that is deemed acceptable by the Director to gather real-time data indicative of hydraulic conditions in model scenarios of R309-511-5(9), and the real-time data show the system is capable of meeting the flow and pressure requirements for the additional demands placed on the existing system.

(b) Professional Engineer's certification of the hydraulic modeling results, as defined in R309-511-4(2)(c) and R309-511-6(1), shall be part of the submission of plans for any public drinking water project as defined in R309-500-5(1) except for the projects listed under R309-511-4(1)(a)(i).

(c) A public water system must clearly identify the reason in the plan submittal if it wishes to demonstrate that R309-511 does not apply to a new construction project. In some cases, supporting documentation may be needed.

(d) If there are existing deficiencies in the water system, the Director may allow a new construction project to proceed in accordance with the plan review requirements in R309-500 through 550 as long as the public water system demonstrates that the new construction project is located in a hydraulically separated area and does not adversely impact the existing deficiencies, or does not create new deficiencies within the water system.

(2) Rule Elements.

The public water system or its agent, in connection with the submission of plans and specifications to the Director, shall perform the following:

(a) conduct a hydraulic modeling evaluation consistent with the requirements as set forth in this rule and R309-510. This model shall include either the entire public drinking water system or the specific areas affected by the new construction if hydraulically separated areas exist within the water system;

(b) calibrate the model using field measurements and observations;

(c) certify in writing to the Director that the design complies with the sizing requirements of R309-510 and the minimum water pressures of R309-105-9;

(d) prepare and submit a Hydraulic Model Design Elements Report (see R309-511-7); and,

(f) prepare a System Capacity and Expansion Report if required (see R309-511-8).

R309-511-5. Requirements for the Hydraulic Model.

The following minimum requirements must be incorporated into hydraulic models that are constructed to meet these requirements:

(1) include at least 80 percent of the total pipe lengths in the distribution system affected by the proposed project;

(2) account for 100 percent of the flow in the distribution system affected by the proposed project. Water demand allocation must account for at least 80 percent of the flow delivered by the distribution system affected by the proposed project if customer usage in the system is metered;

- (3) include all 8-inch diameter and larger pipes. Pipes smaller than 8-inch diameter shall also be included if they connect pressure zones, storage facilities, major demand areas, pumps, and control valves, or if they are known or expected to be significant conveyers of water such as fire suppression demand. Model piping does not need to include service lateral piping;
- (4) include all pipes serving areas at higher elevations, dead ends, remote areas of a distribution system, and areas with known under-sized pipelines;
- (5) include all storage facilities and accompanying controls or settings applied to govern the open/closed status of the facility that reflect standard operations;
- (6) if applicable, include all pump stations, drivers (constant or variable speed), and accompanying controls or settings applied to govern their on/off/speed status that reflect various operating conditions and drivers;
- (7) include all control valves or other system features that could significantly affect the flow of water through the distribution system (e.g., interconnections with other systems and pressure reducing valves between pressure zones) reflecting various operating conditions;
- (8) impose peak day and peak instantaneous demands to the water system's facilities. These demands may be peak day and peak instantaneous demands per R309-510, the reduced demand approved by the Director per R309-510-5, or the demands experienced by the water system that are higher than the values listed in R309-510. This may require multiple model simulations to account for the varying water demand conditions. In some cases, extended period simulations are needed to evaluate changes in operating conditions over time. This will depend on the complexity of the water system, extent of anticipated fire event and nature of the new expansion;
- (9) calibrate the model to adequately represent the actual field conditions using field measurements and observations;
- (10) if fire hydrants are connected to the distribution system, account for fire suppression requirements specified by local fire authority or use the default values stated in R309-510-9(4). For significant fire suppression demand, extended simulations must contain the run time for the period of the anticipated fire event. In some cases, a steady-state model may be sufficient for residential fire suppression demand; and,
- (11) account for outdoor use, such as irrigation, if the drinking water system supplies water for outdoor use.

R309-511-6. Elements of the Public Water System or Its Agent's Certification.

(1) The public water system or its agent's certification. The Director relies upon the professional judgment of the registered professional engineer who certifies that the hydraulic analysis and evaluation have been done properly and that the flow and pressure requirements have been met. The public water system or its agent shall, after a thorough review, submit a document to the Director certifying that the following requirements have been met:

- (a) the hydraulic model requirements as set forth in rule R309-511-5;
- (b) the appropriate demand requirements as specified in this rule and rule R309-510 have been used to evaluate various operating conditions of the public drinking water system;
- (c) the hydraulic model predicts that new construction will not result in any service connection within the new expansion area not meeting the minimum distribution system pressures as specified in R309-105-9;
- (d) the hydraulic model predicts that new construction will not decrease the pressures within the existing water system such that the minimum distribution system pressures are not met, as specified in R309-105-9;
- (e) the calibration methodology is described and the model is sufficiently accurate to represent conditions likely to be experienced in the water delivery system; and,
- (f) identify the hydraulic modeling method, and if computer software was used, the software name and version used.

(2) The format of the public water system or its agent's submission.

The public water system or its agent shall submit to the Director the following documentation:

- (a) the certification as required in R309-511-6(1). The certification shall be signed, dated, and stamped by a registered professional engineer, licensed to practice in the State of Utah;
- (b) a Hydraulic Model Design Elements Report (see R309-511-7). The document shall be signed, dated, and stamped by a registered professional engineer, licensed to practice in the State of Utah; and,
- (c) for community public water systems, the water system management shall certify that they have received a copy of input and output data for the hydraulic model with the simulation showing the worst case results in terms of water system pressure and flow.

- (3) The submission of supporting documentation.

The public water system or its agent shall submit a System Capacity and Expansion Report (see R309-511-8) if requested by the Director. The document shall be signed, dated, and stamped by a registered professional engineer, licensed to practice in the State of Utah.

R309-511-7. Hydraulic Model Design Elements Report.

The public water system or its agent shall prepare a Hydraulic Model Design Elements Report along with, and in support of, the certification stated in R309-511-6(1). The Hydraulic Model Design Elements Report shall contain, but is not limited to, the following elements:

- (1) if the public drinking water system provides water for outdoor use, the report must describe the criteria used to estimate this demand. If the irrigation demand map in R309-510-7(3) is not used, the report shall provide justification for the alternative demands used in the model. If the irrigation demands are based on the map in R309-510-7(3) the report must identify the irrigation zone number, a statement and/or map of how the irrigated acreage is spatially distributed, and the total estimated irrigated acreage. The indicated irrigation demands must be used in the model simulations;
- (2) the total number of connections served by the water system including existing connections and anticipated new connections served by the water system after completion of the construction of the project;
- (3) the total number of equivalent residential connections (ERC) including both existing connections as well as anticipated new connections associated with the project. The number of ERCs must include high as well as low-volume water users. The determination of the ERCs shall be based on flow requirements using the anticipated demand as outlined in R309-510, or based on alternative sources of information that are deemed acceptable by the Director;
- (4) the methodology used for calculating demand and allocating it to the model; a summary of pipe length by diameter; a hydraulic schematic of the distribution piping showing pressure zones, general pipe connectivity between facilities and pressure zones, storage, elevation and sources; and a list or ranges of values of the friction coefficient used in the hydraulic model according to pipe material and condition in the system. All coefficients of friction used in the hydraulic analysis shall be consistent with standard practices;
- (5) a statement stating either "yes fire hydrants exist or will exist within the system" or "there are no fire hydrants connected to the system and there is no plan to add fire hydrants with this project." Either statement will require the identification of the local fire authority's name, address, and contact information, as well as the fire flow quantity and duration if required;

(6) the locations of the lowest pressures within the distribution system, and areas identified by the hydraulic model as not meeting each scenario of the minimum pressure requirements in R309-105-9; and,

(7) calibration method and quantitative summary of the calibration results (e.g., comparison tables, graphs).

R309-511-8. System Capacity and Expansion Report.

The public water system or its agent may be required to prepare a System Capacity and Expansion Report along with a Hydraulic Model Design Elements Report, as specified above, in support of the certification. It is intended that the System Capacity and Expansion Report be prepared, maintained, and used by the public water system's management to make informed decisions about its capability to provide water service to future customers and need only be submitted to the Division if requested by the Director. The System Capacity and Expansion Report shall consist of the elements described in R309-110-4 under the definition of "Master Plan" and shall be updated if significant growth or changes to the water system have occurred.

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