R309-~~501~~ 511. ~~Public Drinking Water System~~ Hydraulic Modeling Requirements

R309-~~501~~ 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 purpose will be accomplished by requiring the public water system or its agent to evaluate the water delivery system using a hydraulic model and certify to the Division 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-~~501~~ 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-~~501~~ 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-~~501~~ 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 ~~with~~ that have system demands higher than required by R309-510 or with ~~fire flows~~ 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. Further, Certifications as defined by this rule, shall be part of the submission of plans for any public drinking water

project as defined in rule R309-500-5(1), except projects that meet one of the following criteria:

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

~~(i)~~ (A) addition of new sources~~, designed and reviewed~~ in accordance with R309-515~~-5, R309-515-6(5), or R309-515-7~~.

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

~~(iii)~~ (C) storage tank repair.

~~(iv)~~ (D) water main additions with no expansion of service (i.e. looping lines).

~~(v)~~ (E) adding transmission lines to storage or sources without ~~distribution service connections to storage~~ adding services connections.

~~(vi)~~ (F) adding pump station(s) from source or storage upstream of distribution service connections.

~~(b)~~ (ii) public drinking water projects that are a part of a planned phase of a master plan previously approved by the Executive Secretary per R309-500-6(3)(a).

~~(c)~~ (iii) the water system ~~has employed, appointed, or~~ maintains and updates a hydraulic model of the system, and has designated a professional engineer responsible for ~~the entire water system and the water system has the capability to conduct an analysis and update any hydraulic model of the system~~ overseeing the hydraulic analysis in meeting the requirements of R309-511 in writing to the Executive Secretary.

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

(b) 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.

(c) If there are existing deficiencies in the water system, the Executive Secretary 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 create new deficiencies within the water system.

(d) This rule does not waive the requirement of R309-550-5(3) if a proposed project does not qualify under R309-500-6(3) for plan waivers.

~~The requirements for this rule may be waived or reduced as determined by the Executive Secretary.~~

(2) Rule Elements.

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

(a) ~~Prepare a hydraulic model of the public drinking water system consistent with the demand requirements as set forth in this rule and rule R309-510.~~ 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) Perform a hydraulic modeling evaluation of the public drinking water system's delivery system affected by the proposed project, except as noted in R309-501-5(a), using the water demand requirements as set forth in rule R309-510.~~

~~(c)~~ (b) Calibrate the model using field measurements and observations.

~~(d)~~ (c) Certify in writing to the Executive Secretary that the design complies with the ~~flow and pressure~~ sizing requirements of R309-510 and the minimum water pressures of R309-105-9.

~~(e)~~ (d) Prepare and submit a Hydraulic Model Design Elements Report (see ~~the requirements of this report in~~ R309-~~501~~ 511-7).

~~(f)~~ Prepare a System Capacity and Expansion Report if required(see ~~the requirements of this report in~~ R309-~~501~~ 511-8).

R309-~~501~~ 511-5. Requirements for the Hydraulic Model.

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

~~(a)~~ (1) Include at least ~~50~~ 80 percent of the total pipe lengths in the distribution system affected by the proposed project.

~~(b)~~ (2) Account for ~~at least 75~~ 100 percent of the ~~total flow delivered by the public drinking water system~~ 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.

~~(c)~~ (3) Include all ~~12~~ 8-inch diameter and larger pipes. Pipes smaller than 8-inch diameter should 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.

~~(d) Include all 8 inch diameter and larger pipes connecting pressure zones, mixing zones from different sources, storage facilities, major demand areas, pumps, and control valves, or facilities that are known or expected to be significant conveyers of water.~~

~~(e)~~ (4) Include all pipes serving areas at ~~significant~~ higher elevations, dead ends, ~~or~~ remote areas of a distribution system, and areas with known under-sized pipelines~~, or portions of the system known or expected to be significant conveyors of water~~.

~~(f)~~ (5) Include all storage facilities~~, with~~ and accompanying controls or settings applied to govern the open/closed status of the facility that reflect standard operations.

~~(g)~~ (6) Include all ~~active~~ pump stations, drivers (constant or variable speed), and accompanying ~~with realistic~~ controls or settings applied to govern their on/off/speed status that reflect ~~standard operations~~ various operating conditions and drivers.

~~(h)~~ (7) Include all ~~active~~ control valves or other system features that could significantly affect the flow of water through the distribution system (i.e. interconnections with other systems, pressure reducing valves between pressure zones ~~etc.~~) reflecting various operating conditions.

~~(i)~~ (8) Impose peak ~~daily, peak hourly~~ day and peak instantaneous demands to

~~requirements as stipulated by rule R309-510 to appropriate portions of~~ the water system's facilities. ~~This will require multiple model simulations to account for the varying water demand conditions, as well as extended time duration simulations to evaluate changes in operating conditions over time.~~ These demands may be peak day and peak instantaneous demands per R309-510, the reduced demand approved by the Executive Secretary per R309-510-5, or the demands experienced by the water system which 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.

~~(j)~~ (9) ~~Using field measurements and observations~~ Calibrate the model to adequately represent the actual field conditions using field measurements and observations.

~~(k)~~ (10) ~~Account for fire flow conditions~~ 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 anticipated fire event. In some cases, a steady state model may be sufficient for residential fire suppression demand.

~~***Guidance: Extended simulations must be considered because conditions vary with time. As an example, one of the model simulations must account for the condition of fire flow, if applicable. During this event it is possible that the water demand will exceed the water supply for the duration of the fire fighting activities. The duration of the fire flow event or like activities shall be consistent with anticipated events for the water system being evaluated. Under these conditions the levels in storage tanks will diminish and the distribution pressures will also diminish. Consequently, the run time must extend for the period of the anticipated event.***~~

(l) (11) Account for irrigation demand ~~during the irrigation season. An exception to this requirement may be granted if auxiliary sources and systems are available during the entire irrigation season or if sufficient institutional controls and enforcement tools exist to eliminate the need to account for irrigation demand~~ if the drinking water system supplies irrigation water.

R309-~~501~~ 511-6. Elements of the public water system or its agent's certification.

(1) The public water system or its agent's certification.

~~The individual preparing and signing the certification shall be a registered~~

~~professional engineer, licensed to practice in the State of Utah.~~ The public water system or its agent shall, after a thorough review, submit a document to the Executive Secretary certifying that the following requirements have been met:

(a) The ~~minimum~~ hydraulic model requirements as set forth in rule R309-~~501~~511-5.

(b) The appropriate demand requirements as specified in this rule and rule R309-510 have been used to evaluate ~~the~~ various operating conditions of the public drinking water system ~~under various situations including fire flow where fire hydrants are connected to the distribution system~~.

(c) The hydraulic model predicts that new construction will not ~~create areas where~~ result in any service connection within the new expansion area not meeting the minimum distribution system pressures as specified in rule R309-105-9 ~~are not achieved~~.

(d) The hydraulic model predicts that new construction will not decrease the pressures within the existing water system to such that the minimum distribution system pressures as specified in R309-105-9 are not met.

~~(d)~~ (e) The calibration methodology is described and the model is sufficiently accurate to represent conditions likely to be experienced in the water delivery system.

(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 Executive Secretary 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.

(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.

~~(2)~~ (3) **The submission of supporting documentation.**

The public water system or its agent shall submit ~~the following supporting documentation with the certification only~~ a System Capacity and Expanion Report (see R309-511-8) if requested by the Executive Secretary. The document shall be signed, dated, and stamped by a registered professional engineer, licensed to practice in the State of Utah.

~~(a) A Hydraulic Model Design Elements Report (see the requirements of this report in R309-501-7).~~

~~(b) A System Capacity and Expansion Report (see the requirements of this report in R309-501-8).~~

~~(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. Along with the certification required by R309-501-6(1) the water system management shall identify the hydraulic modeling method, and if computer software was used, the software name and version number used.~~

~~**(3) The format of the public water system or its agent's submission.**~~

~~The public water system or its agent shall submit to the Executive Secretary a single document containing: the certification as required by R309-501-6(1) and the Hydraulic Model Design Elements Report. The System Capacity and Expansion Report is only required to be a part of this document if requested by the Executive Secretary. The document shall be signed, dated, and stamped by a registered professional engineer, licensed to practice in the State of Utah.~~

R309-~~501~~ 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, and is not limited to, the following elements:

~~(a)~~ (1) If the public drinking water system provides water for irrigation the report must describe the criteria used to estimate this demand. If the irrigation demand map ~~listed~~ in R309-510-7 (3) is not used, the report shall provide justification for the alternative ~~flows~~ demands used in the model. If the irrigation demands are based on the map ~~listed~~ in R309-510-7 (3) ~~is used~~ the report must identify the irrigation zone number, a statement and/or map of how the irrigated acreage is spatially distributed, and the total ~~acreage~~ estimated irrigated acreage. The

indicated ~~flow~~ irrigation demands must be used in the model simulations.

~~(b)~~ (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.

~~(c)~~ (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 ERC's must include high as well as low volume water users. The determination of the equivalent residential connections 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 Executive Secretary..

~~(d) The water demand applied to each node and the reasons for its selection, listing of the various pipe segments within the distribution system with their associated pipe material, diameter, and length. A schematic of the distribution piping showing node points, elevations, length and size of lines, pressure zones, demands, and coefficients used for the hydraulic analysis will suffice.~~

(4) Provide 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 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.

~~(e)~~ (5) A statement, 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~~)~~.

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

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

R309-~~501~~ 511-8. System Capacity and Expansion Report.

The public water system or its agent ~~shall~~ 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 Executive Secretary. 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 ~~every five years as a minimum, unless waived by the Executive Secretary~~ if significant growth or changes to the water system have occurred.