

# HYDRAULIC ANALYSIS REPORT & FIRE FLOW MODELING REQUIREMENTS

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## Overview

Colorado Springs Utilities (Utilities) requires any Applicant submitting an Annexation, Master Plan, Concept Plan, or Development Plan which proposes the installation of new water main to submit a Hydraulic Grade Line (HGL) Request Form for review. The Applicant shall submit the HGL Request Form to Utilities' Water Planning and Design (WPD) by email, fax, or mail prior to any formal application to the City Land Use Review Division.

Based on review of the HGL Request Form, Utilities may require the applicant to provide a Hydraulic Analysis Report (HAR) to establish the on-site and off-site water system requirements necessary to support the proposed development. In general, an HAR will be required for any Master Plan project or for any Concept Plan or Development Plan submitted within a previously approved Master Planned area that has not been modeled. Additionally, an HAR will generally be required for any site proposing high fire flow demand, sites without adequate existing infrastructure for the proposed uses, and sites without adequate looping. Utilities will provide the necessary system information to the Applicant in the HGL Request Form for completion of the HAR. The requirement for a HAR is established by Utilities Rules and Regulations: "A property Owner or developer is responsible for the cost of engineering, construction, and materials for all water system infrastructure and related appurtenances necessary to serve the Premises or development."

The approved HAR shall identify connection points, proposed size and material of infrastructure, the extent of the system extensions, and any modifications to the existing system necessary to serve the proposed development based on demands and fire flow requirements specified in the HAR.

Utilities may require that water mains and other facilities in the applicant's development be oversized to serve areas outside the applicant's project. The HAR will identify the project's eligibility for reimbursement or cost recovery for oversized facilities. Any subsequent requests for oversized reimbursement or Recovery Agreements shall be based on the approved HAR and the ultimate fire flow requirements, as determined by Utilities.

The HAR should be submitted at the Master Plan or Concept Plan stage but shall be submitted no later than at the initial Development Plan submittal, unless otherwise identified by Utilities. The HAR shall be approved no later than prior to the approval of any Development Plan for the site.

The applicant may request Utilities complete the required modeling for the site. Fees for Utilities to complete the HAR will be assessed based on the latest Utilities Rules and Regulations.

### 1. HGL Request Form

The HGL Request Form shall be submitted to WPD by email, FAX or mail. WPD will respond with a HGL Response Form outlining the project requirements.

#### The HGL Request Form shall include:

- a. Project name and location with the associated file numbers as assigned by the City Land Use Review Division.
- b. Engineer name, address, phone number, fax number, and email address.
- c. Owner/Developer name and email address.

- d. Proposed land uses with associated acreage, maximum anticipated fire flow and anticipated maximum day demand.
- e. Site Plan with proposed connection points and preliminary alignment of pertinent water mains.

**2. HGL Response Form from WPD**

The HGL Response form will indicate whether or not the propose project will require a HAR be submitted for the project.

**The HGL Response Form shall include:**

- a. HGL and pressure zone peaking factors to be used for the site.
- b. Offsite demands to be added to site demand. Onsite mains and facilities may need to be oversized to accommodate offsite demands. Requests for Cost Recovery and Reimbursement should be documented in the HAR.
- c. Connection locations and coordinates.
- d. Looping Requirements.
- e. Existing System Notes: WPD will note any existing system constraints and recommendations for upgrade.
- f. Water Quality Notes: WPD will note any water quality concerns.

**3. Hydraulic Analysis Report (HAR) Contents**

If it is determined that a HAR is required for development, one copy of the Hydraulic Analysis Report shall be submitted to WPD for review. The HAR must be signed and sealed by a Registered Professional Engineer.

**The HAR shall include:**

- Signature page
- Copy of the HGL Request Form
- Copy of the HGL Response Form
- Demand table
- Node table
- Pipe table
- Site map with the network map overlaid
- Network map with maximum fire flow per building area or phase
- Summary table
- Printout of model output file for the critical hydrants in each building area or phase and Hydraulic Model software information
- Electronic copy of the model input file (in EPANET.inp input file format)

**a. Signature Page**

The signature page shall include the Hydraulic Analysis Report Statement signed by a Registered Professional Engineer.

**b. HGL Request Form**

**c. HGL Response Form from WPD**

**d. Demand Table**

The site should be broken down into logical building areas given the site layout and proposed phasing. Each building area should have a complete loop and a critical hydrant, typically the hydrant with the largest required fire flow and/or the highest flange elevation. The table should be broken down into these building areas and phases. The demand table should list the uses, associated acreage, and total building square footage for each building area and phase. If the building construction type and square footage is unknown, upper and lower limits may be established. The average demand per use or range of uses and the peaking factor for the pressure zone should be taken from the input and output requirements developed by WPD. These factors should be used to calculate the maximum day demand or range of demand for each building.

**e. Node Table**

Provide an input data table with all nodes modeled. Node data tables shall, at a minimum, include node ID as shown on the network map, elevation in feet for all nodes using FIMS Datum, and the node demand in GPM. All elevations shall be based on proposed ground elevation.

**f. Pipe Table**

Provide an input data table for all pipes modeled. Pipe data tables shall include, at a minimum, pipe ID as shown on the network map, length in feet, diameter in inches, and the coefficient of friction.

**g. Site Map**

A copy of the site map with proposed grading, building locations, and street and access locations shall be provided with the node and pipe network overlaid.

**h. Network Map**

A network map shall be provided showing the pipes and nodes with associated labels. The maximum fire flow capacity or ranges of capacity should be shown for the critical hydrant in each building area and phase.

**i. Summary Table**

A summary table should be provided for each building area and phase showing the maximum capacity for the critical hydrant along with any ranges based on upper and lower uses and building sizes. The summary should also identify the need for oversized reimbursement or Recovery Agreements.

**j. Output Files**

Hardcopies of the modeling output files shall be provided for the critical hydrant in each zone. This should include, at a minimum, pipe flow in gpm, pipe velocity in fps, pipe head loss in feet per 1000 feet, node demand in gpm, head in feet, and pressure in psi. Hydraulic analysis software shall be identified. Software must be compatible with EPANET.

**k. Electronic Copy of Model Input File**

An electronic copy of the model input file used for the HAR shall be included with the HAR submittal. The input file shall be in EPANET \*.inp file format.

**4. Final Fire Flow Modeling**

All final fire flow modeling will be completed by Utilities after the initial construction plans are submitted and reviewed for the water system extension by both Utilities Development Service and the Colorado Springs Fire Department (CSFD). The applicant is responsible for coordinating review with CSFD and all other applicable outside agencies. A Utility Design CAD File (UDCF) must be uploaded via the Utilities website and a hardcopy or pdf provided to Utilities prior to any modeling. Fire flow reports may be requested via the internet, by email, or by fax and must be accompanied by the Fire Flow Request Form. Utilities will perform up to two model runs for each project per year. Additional runs will be charged to the Applicant based on rates established in the latest Utilities Rules and Regulations.

Fire flow modeling for existing hydrants will be provided by Utilities. One report will be provided for each site per year per applicant. The Applicant will be charged for additional reports based on rates established in the Utilities Rules and Regulations.