Colorado Department of Public Health and Environment

APPENDIX B: BDR Template
Drinking Water Design Submittal

4300 Cherry Creek Drive South, B2
Denver, Colorado 80246-1530
CDPHE.WQEngReview@state.co.us
303-692-6298

COVER PAGE – BASIC INFO

A. Project and System Information			
System Name	Meadow Mountain Water Supply Company		
Project Title	Filtration System Upgrades: Ultrafiltration		
County	Boulder County		
PWSID	CO-0207504		
System Owner	Meadow Mountain Water Supply Company		
Representative	Warren Krise, Board President		
Address	P.O. Box 354		
	Allenspark CO 80510		
Email	rcbarkworth@yahoo.com		
Phone	303-261-2246	Fax	

Signatures of System Representatives			
Role	**Date**	**Typed Name**	**Signature**
Owner		Warren Krise, Board President	
The owner is an individual, corporation, partnership, association, state or political subdivision thereof, municipality, or other legal entity.			
Applicant / System Legal Representative		Warren Krise, Board President	
The system legal representative is the legally responsible agent and decision-making authority for a public water system (e.g. mayor, president of a board, public works director). The Designer or Consulting Engineer is not the legal representative.			

Directions: Prior to submission to the CDPHE (Department), the construction application must be signed by the Owner and/or a System Legal Representative. The Department expects the public water system to send a duplicate copy to the local County Health authority or County Commissioner (if no County Health authority) in whose jurisdiction(s) the drinking water facility is to be located. Signature is not required from the county.

I was the engineer in responsible charge for (identify portions of work)

Preparation of Basis of Design Report and review and revisions to Construction Drawings and Technical Specifications.

during the preparation of the basis of design report for the above-referenced project. To the best of my knowledge, the design is consistent with the most recent published version of the *Design Criteria for Potable Water Systems*, and that all site-specific deviations requests are listed in this report.

Ryan Duve
Typed Name of Professional Engineer

2/18/2014
Date Signed

Signature of Professional Engineer

36340
License #

P.E. Stamp and Signature

Colorado Department of Public Health and Environment

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COVER PAGE – BASIC INFO

Signed copy of first page, with Owner of MMWS Company, Warren Krise.

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Applicant / System Legal Representative	2/18/2014	Warren Krise, Board President	Warren Krise
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Ryan Duve
Typed Name of Professional Engineer

2/18/2014
Date Signed

Signature of Professional Engineer

36340
License #

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Basis of Design Report (BDR) Submittal Checklist

In accordance with the CPDWR and the Design Criteria for Potable Water Systems, the design review process must include a 'complete design' consisting of a basis of design report (BDR) and corresponding plans and specifications for review and approval by the Department.

Project and System Information				
Project Title	Filtration System Upgrades: Ultrafiltration			
System Name	Meadow Mountian Water Supply Company			
PWSID	CO-0207504			
County	Boulder County			
Date of Design Submittal				
Project Eligible for Streamlined Review? (See Appendix A Design Review Matrix)	Yes	☐	No	☐

Section Number and Basis of Design Report Requirements	**Applicant to fill out**	
	Included/ Addressed in Submittal? Yes/No/NA	**Location in Submittal (BDR, Plans, Other document)**
1. Basic Project Information – REQUIRED FOR ALL SUBMITTALS	Yes	BDR, Attachment A
2. Sources of Potential Contamination	Yes	BDR, Attachments B, and C
3. Water Quality Data	Yes	BDR, Attachment D
4. Process Flow Diagram/ Hydraulic Profile	Yes	BDR, Attachements F and G
5. Capacity Evaluation and Design Calculations	Yes	BDR, Attachment H
6. Monitoring and Sampling Evaluation	Yes	BDR, Attachment I
7. Geotechnical Report	NA	NA
8. Residuals Handling	Yes	BDR, Attachments J and K
9. Preliminary Plan of Operation	Yes	BDR
10. Supplemental or Other Pertinent Information	NA	NA
Plans and Specifications		
1. Plans and % complete (60%, 90%)	Yes	Attachment L
2. Other schematics	No	
3. Specifications	Yes	Attachment M

Section 1: Application for Construction Approval Form (DCPWS Section 1.2.1)

A. Project and System Information			
Project Title	Filtration System Upgrades: Ultrafiltration		
PWSID (Assigned by Division)	CO-0207504		
Design Company Name	Lidstone and Associates		
Design Engineer	Ryan Duve	CO License Number	36340
Address	4025 Automation Way Building E		
	Fort Collins, CO 80525		
Email	rdd@lidstone.com		
Phone	970-223-4705	Fax	970-223-4706

B. Public Water System (PWS) Type	Community (CWS)	☒	Non-Transient, Non-Community (NTNC)	☐	Transient, Non-Community (TNC)	☐
C. Current Primary Source Classification	Surface Water/ GWUDI	☒	Ground Water (GW)	☐	Consecutive / Purchased	☐

D. Design Submittal Scope (Check all that apply)

Source		*Treatment Facility*		*Storage Tank*		*Other*	
New ground water (GW) source	☐	New Treatment Facility	☐	New Distribution System Tank	☐	Response to Sanitary Survey	☐
New ground water under the direct influence of surface water (GWUDI) source	☐	Expansion of existing treatment facility	☐	New Tank used for disinfection contact time	☐	Response to Enforcement Order	☒
New surface water (SW) source	☐	Modification to existing treatment	☒	Modifications to existing tank	☒	State Revolving Fund (SRF) Project	☐
Existing source modification	☐					Technical, Managerial, Financial Evaluation	☐
Other (Please describe)							

E. Estimated Project Schedule and Cost Estimate		F. Rated Capacity (Calculations in Section 5)	
Estimated Bid Opening Date	NA, Pre-approved Contractor	Minimum Flow	<5 gpm
Estimated Completion Date	October 31, 2014	Monthly Average	365,000 gal/month or 8.5 gpm
Estimated Project Cost	$170,000	Peak Hour Flow	50 gpm

G. Brief project summary and description of waterworks affected by the project

The Meadow Mountain Water Supply Company (MMWSC) is currently under a drinking water enforcement order (Number DC-110829-1) for turbidity violations. The existing treatment facility consists of sedimentation, pre- and final filtration, UV inactivation, and chlorine disinfection. Currently, seasonal spring runoff inundates the facility with particles smaller in size than those which the facility can remove, resulting in seasonal turbidity violations. While turbidity itself is not considered a health risk, it can harbor pathogens from both UV inactivation and chlorine disinfection. Therefore, the goal of the recommended alternative is to comply with all Primary Drinking Water Regulations, specifically turbidity regulations, thereby providing greater protection for MMWSC customers. Ultrafiltration is the optimal treatment upgrade for the consumers of MMWSC. Treatment system upgrades included in this Basis of Design Report consist of minor repairs to the existing settling tank, installation of a new Innovative Water Technologies (IWT) ultrafiltration membrane system, in-line chlorination, installation of redwood baffles in the existing clearwell, and expansion of the existing residuals/overflow pond.

H. Scaled Map

See System Map (Attacment A) which identifies all environmental features and components of the MMWSC treatment and distribution system. The project area is not within a FEMA 100-year floodplain according to both the FEMA FIRM PANEL No. 08013CIND18 and Boulder County mapping website. The National Wetlands Inventory - Wetlands Web Services identifies two designated wetlands within the project area as can be seen on the System Map.

I. Implementation Plan and Schedule

According to the January 17, 2014 letter regarding the implementation/compliance schedule for Enforcement Order DC-110829-1 for MMWSC from Robert Pohl (CDPHE Enforcement Unit) and phone conversations which took place on January 15, 2014, the Division has approved the following compliance schedule:
* By February 20, 2014: Submit final design plans and specifications to the Division;
* By April 15, 2014: CDPHE will comment on or approve the final design plans and specifications;
* By May 15, 2014: Install IWT UF50 Membrane System and online analyzers;
* Make Overlfow Pond improvements prior to October 31, 2014;
* Construction will begin upon approval of the final design plans and specifications; and,
* Construction will be completed within 200 days of the beginning of construction.

J. Requested Deviations

No.	**DCPWS Requirement** (e.g., Section 4.3 Redundant filters)	**Site Specific Deviation Request** (additional information can be included in the supplemental information section see 1.2.10 of the DCPWS)	**Location in Submittal (page)**
1	Chapter 9, Section 9.0, f.	Raw water overflow and plant residuals are piped to the overflow pond. The overflow pond is considered a waste inpoundment under 6 CCR 1007-2. Meadow Mountain Water Supply Company will submit an Inpoundment and Preliminary Classification Report (IPCR) under the Solid Waste and Materials Management Program in order to classify the plant's discharge and determine if the pond jwill be classified as a Type A or B inpoundment. A signed copy of the IPCR Cover Sheet is included as Attachment K. Meadow Mountain Water Supply Company will have 12-months to conduct sampling and prepare a Demonstration Plan and submit it to the CDPHE Solid Waste Permitting Unit. We request approval of the proposed plant improvements and allow time to address pond improvements.	17 of 21
2			
3			
4			
5			
6			
7			

Section 2: Sources of Potential Contamination (DCPWS Section 1.2.2)

Project Title: Filtration System Upgrades: Ultrafiltration

100 Year Flood Plain

All water facilities must have the potential 100-year flood threat evaluated based on all available floodplain data from one or more of the following sources: the Colorado Water Conservation Board, U.S. Army Corps of Engineers, Housing and Urban Development, County Government, local flood districts, etc. A copy of any background information used in the 100-year flood threat determination process must be included along with a comparison of the site vertical elevation datum and floodplain reference elevation datum.

The 100-year flood threat was evaluated for:

Intake infrastructure and conveyance, water treatment facility, and distribution system

(e.g. Well, Water Treatment Facility, Tank)

100-year flood threat determination was based on the information enclosed from:

FEMA Firm Panel No 08013CIND1B and Boulder County Mapping Website (See Attachment B). There are no special flood hazards.

(e.g. FEMA floodplain map, U.S. Army Corp, elevation)

For Non-Community Public Water Systems, an authorized representative of the system responsible for operation and compliance must sign the Floodplain Certification.

I hereby certify that a judgment has been made after evaluating all available floodplain data and in my opinion, these waterworks, as located and designed, are not subject to flood damage by a 100-year event.

Typed Name of Authorized System Representative

Date Signed

Signature of Authorized System Representative

For Community Systems, a Professional Engineer licensed in Colorado must stamp and sign the Floodplain Certification.

I hereby certify that a Professional Engineering judgment has been made after evaluating all available floodplain data and in my professional opinion, these waterworks, as located and designed, are not subject to flood damage by a 100-year event.

Ryan Duve
Typed Name of Professional Engineer

2/18/2014
Date Signed

Signature of Professional Engineer

36340
License #

Contamination Sources

MMWSC is located in Allenspark, Colorado and lies within the North St. Vrain Watershed. Two creeks feed the treatment facility: South Fox Creek and Willow Creek. South Fox Creek Watershed is fed entirely by Rocky Mountain National Park (RMNP); the MMWSC intake is located approximately 25 feet outside the park boundary. The South Fox Creek Watershed consists of evergreen forest in the lower watershed and meadow and rock outcroppings in the upper watershed, extending to the summit of Meadow Mountain. Willow Creek Watershed is fed mainly by drainages originating from RMNP, though a small fraction of the watershed consists of US Forest Service land. The Willow Creek Watershed consists of less dense evergreen forest in the lower watershed and steeper hill slopes. The upper watershed also extends to the summit of Meadow Mountain and consists of subalpine and alpine meadow and rock outcroppings. There are no anthropomorphic activities, roads, or residences in either watershed upstream of the intakes. There is no record of mining, fires, or logging in either watershed; records extend to approximately 1915. According to the Rocky Mountain National Park Geologic Resource Evaluation Report, the predominant geology of each watershed is biotite gneiss, schist, and granite; lodgepole, limber, and ponderosa pines are the predominant overstory. Many large and small mammals inhabit the watersheds.

According to the 2004 CDPHE Source Water Assessment Report (Attachment C), the total susceptibility rating for the combined watershed was “moderately low.” The watershed was characterized by “moderate susceptibility” to dispersed contamination from deciduous forest and “high susceptibility” to contamination from evergreen forest. There was no perceived risk from residential uses, septic systems, roads/transportation, resource extraction, agriculture, silviculture, or historical uses such as abandoned mines. The Physical Setting Vulnerability Rating for one water source (likely South Fox Creek) was “moderate” while the other water source (likely Willow Creek) was considered “moderately high.” This is likely due to the close proximity of the intake structures to roads and the lack of restricted access.

Mitigation Strategy

Due to the remote location of the community and the limited sources of contamination, no mitigation will be pursued at this time beyond compliance with surface water treatment standards as required by the State of Colorado Primary Drinking Water Regulations and the State of Colorado Design Criteria for Potable Water Systems.

Section 3: Water Quality Data (DCPWS Section 1.2.3)

Project Title: Filtration System Upgrades: Ultrafiltration

Source Data

Water quality data has been collected and analyzed since the fall of 2011 at the S. Fox Creek Intake (five quarters of data over three years) and since the winter of 2012 at the Willow Creek Intake (four quarters of data over two years). Consecutive quarters were not used for water quality analysis since the turbidity problems occur only in the second quarter. It was deemed more critical to collect turbidity data during periods of high turbidity because turbidity during the rest of the year is typically below the detection limits of the tests (<0.5 NTU). Below are the ranges of tubidity values found at each source over the sampling periods detailed above. Water Quality Results Table can be found in Attachment D.

Willow Creek Source Water
- Turbidity <0.5-2.5 NTU

S. Fox Creek Source Water
- Turbidity <0.5-2.0 NTU

Process Selection Data

Water quality data has been collected and analyzed since the fall of 2011 at the S. Fox Creek Intake (five quarters of data over three years) and since the winter of 2012 at the Willow Creek Intake (four quarters of data over two years). Consecutive quarters were not used for water quality analysis since the turbidity problems occur only in the second quarter. It was deemed more critical to collect water quality data during the periods or high turbidity than during the periods of low turbidity. The following provides the range of values found at each source. Water Quality Results Table can be found in Attachment D. Temperatures range from 32 deg F in the winter to approximately 50 deg F in the summer.

Willow Creek Source Water
- pH 6.6-7.7
- Turbidity <0.5-2.5 NTU
- Alkalinity 10-15.2 ppm
- Hardness as CaCO3 5.9-13.5 ppm
- Color <5-15
- Conductivity 20-30 uS/cm
- Iron 0.044-0.309 ppm
- Manganese <0.002 ppm
- Dissolved Oxygen 8.8-10.1 ppm

S. Fox Creek Source Water
- pH 6.6-7.6
- Turbidity <0.5-2.0 NTU
- Alkalinity 11.3-16.0 ppm
- Hardness as CaCO3 8.8-12.0 ppm
- Color 17
- Conductivity 20-30 uS/cm
- Iron <0.01-0.050 ppm
- Manganese <0.002 ppm
- Dissolved Oxygen 9.1-9.5 ppm

Chlorine demand was determined based on dosing up to 2 mg/L as chlorine demand is <0.5 mg/L. Specifically, based on chlorine dosing and residuals after 30 minutes (after residual had stabilized) and pH of 6.9, chlorine demand is approximately 0.34 mg/L (y=1.1x-0.34, R^2=0.965) (see Attachment E for chlorine demand curve).

Other Pertinent WQ or Operational Data

Section 4: Process Flow Diagram/ Hydraulic Profile (DCPWS Section 1.2.4)

Project Title: Filtration System Upgrades: Ultrafiltration

Process Flow Diagram

Refer to Attachment F for Process Flow Diagram

Hydraulic Profile

Refer to Attachment G for Hydraulic Profile and Clearwell Pump Curve

Section 5: Capacity Evaluation and Design Calculations (DCPWS Section 1.2.5)

Project Title: Filtration System Upgrades: Ultrafiltration

Discussion of calculations included

Unit Processes (e.g. flocculation, hypochlorite addition)	**Unit Process Description at Rated Capacity**
Settling Tank	Raw water from the intakes enter an existing settling tank that is divided into 4-sections. The overall dimensions of the tank are121.5-inches long, 96-inches wide and 56-inches deep. Raw water enters Section 1 into a perforated PVC pipe to help diffuse the water velocity. There is an overflow pipe attached to the side of the tank that discharges to the existing overflow pond. Water flows through 6-circular well screens and into Section 2. Water then flows through a baffling system consisting of perforated PVC pipes and hoses to Section 3. Water flows over a weir into Section 4. Section 4 is equipped with float valves that are used to actuate the raw water supply control valves (Altitude Valves) to open and fill the tank. There is no rated capacity for the settling tank; however, it does provide some level of treatment as it does accumulate settlement on the bottom of the tank. There is no chemical addition to aid settling. Volume = 2,600 gallons Detention Time (average demand) = 520 min. @ 21,000 gpd Detention Time (maximum demand) = 52 min. @ 73,440 gpd
Pre-Filtration	Water is pumped from Section 4 of the settling tank into a set of existing bag filters consisting of two-20 micron filter bags in parallel and then through 2-20 micron filters in series Number of Filters: 4 (2 in parallel and 2 in series) Filter Pore Size: 20um Maximum Flow Rate: 50 gpm (72,000 gpd)
Ultrafiltration	A new Innovative Water Technologies (IWT) Ultrafiltraion UF50 Membrane System utilizing GE-Zenon Homespring UF211 membranes will be installed as part of the water treatment upgrades. The GE-Zenon Homespring Model UF211 is an approved alternative technology by the CDPHE Water Quality Control Division (see Attachment H). Number of Modules: 10 Membrane Pore Size: 0.02 um Surface Area Module: 288 sf Design Flux Rate: 17.36 gpd/sf Design Flow Rate: 3.5 gpm (50,000 gpd) Maximum Flux Rate: 26 gpd/sf Maximum Flow Rate: 5.2 gpm (75,000 gpd) Backwash: Automatic programable from 1, 2, 4, 8, and 24 per day per module at 14 gallons/backwash. Each module provides its own backwash water. Clean In Place (CIP): 400 ml of Unsented Household Bleach to soak manually, tiggered by low Transmembrane Pressure (TMP), estimated once per month per module.
Disinfection	Chlorination with 6,000 Gallon Clearwell. Improvements to the existing 6,000 clearwell will be made to improve contact time. The clearwell currently has no baffling. Baffling (redwood walls) will be installed to provide a baffling factor 0.3. Type: 3.3% Sodium hypochlorite solution in 25-gallon feed tank Clear Well Volume: 6,000 gallons Length to Width Ratio: 1.3 to 1 Detention Time at Peak Flow (50 gpm): 34 min (based on 1,700 gallons in 6,000 gallon clearwell) Baffling Factor: 0.3 (proposed)

	Log Inactivation: >4 at dose rate of 1.2 mg/L (based on 1,700 gallons, 32 degrees F, and pH of 7.5)
EXAMPLE	
Surface Water Treatment	Chemical addition (e.g., alum, polymers, alkalinity, carbon source, etc) Purpose (e.g., pH adjustment, enhanced sedimentation, pathogen removal) Dosage rate XX:1 Chemical and concentration Flocculation Method Volume = XXXX gallons Detention Time (average) = XX hrs. @ XX MGD Detention Time (peak) = XX hrs. @ XX MGD Mixing Method and Capacity Number basins, mixers Clarification Method Volume = XXXX gallons SOR = XXXX gpm/sqft. Detention Time (average) = XX hrs. @ XX MGD Detention Time (peak) = XX hrs. @ XX MGD Velocity = XX ft/min Loading = XX lbs/1000 cu. ft/d. Number basins Effluent collection method

	Filtration Type (e.g., Single Media or Multimedia) Surface Area = XXXX sq. ft. Depth = X inches Flow rate = X.X gpm/sq. ft. Number of units Media specs Backwash methods.
Pathogen Disinfection	Identify Primary and Backup Chlorination w/ chlorine contact chamber Type (e.g., gas, liquid) Volume = XXXXX gallons Length/Width Ratio = XX:1 Detention Time = XX min. @ Peak Flow Baffling Factor Log inactivation achieved

Section 6: Monitoring and Sampling Evaluation (DCPWS Section 1.2.6)

Project Title: Filtration System Upgrades: Ultrafiltration

Sampling locations and parameters to be monitored

Both raw water sources (South Fox Creek and Willow Creek) are metered prior to discharging to the Settling Tank. Filtered water is also metered.

Refer to Attachment I for sampling plan.

Discussion of control strategy

Raw Water Supply: Float Controls located in Section 4 of the Settling Tank are connected to the raw water Float Actuated Fill Valves (Altitude Valves) located near Section 1 of the Settling Tank. When the water level in the Settling Tank reaches a set low level, the floats will actuate the Float Actuated Fill Valves to open. The Float Actuated Fill Valves will close if the Float Controls reach a set high level.

Settling Tank: There are no controls assoicated with the Settling Tank other than what was discussed for the Raw Water Supply controls.

Clearwell Supply Pump: The Clearwell Supply Pump can be operated manually or automatically. The Clear Well Supply pump controls are connected to a float control located within the Clearwell. When the Clearwell reaches a set low level, the pump will turn ON to fill the Clearwell. The Clearwell pump pumps water through the existing 20um bag filters and then through the new IWT UF Membrane System. The Clearwell Supply Pump will turn OFF after the Clearwell has reached the set high level. Section 4 of the Settling Tank contains a low level switch that will turn OFF the Clearwell Supply Pump if the water in the tank gets too low. There is a high pressure switch located downstream of the pre-filters that will turn the pump OFF and alarm the operator if it reaches a high pressure setpoint indicating that the filter bags are fouled and need of replacement. A backup pump is available incase the pump should fail. There is a low level switch in the Clearwell. The plant operator will receive an alarm if the Clearwell level reaches a set low Clearwell level.

Pre-Filter System: There are no controls associated with the pre-filter system. Differential pressure is manually read. The bags are replaced when the the differential pressure reaches 20 psi or if the Clearwell supply pump's high pressure alarm is tripped.

IWT UF Membrane System: The new IWT UF Membrane System will be equipped with individual programmable controllers for each module (total of 10). The sole purpose of the controller is to conduct automated backwashes. Backwashes are programmed for 1, 2, 4, 8, or 24 times per day. Clean-In-Place (CIP) are performed manually. A new pressure sustaining valve (CLA-VAL 50-01) will be used to maintain upstream pressure. The minimum influent pressure is 30 psi. The pressure sustaining valve will also be used to adjust the flow through the plant.

Disinfection: The plant operator manually adjusts the chlorine feed rate.

Online Analyzers: New filtered water turbidimeter (Hach 1720E with SC200 Contoller) and post chlorinated chlorine residual analyzer (Hach CL 17) will be installed. The SC200 Controller will be outfitted with and SD memory card to

allow the plant operator to download turbidity data to a laptop. A high turbidity alarm will notify the plant operator. A low chlorine residual will also alarm the plant operator.

There is an existing autodialer that is used to call the plant operator during alarm events. The new alarms will be connected to the autodialer.

The treatment plant is equipped with a 16kW propane fueled generator and an automatic transfer switch. When utility power is lost, the transfer switch automatically switches to the generator power and the generator automatically starts to supply power to the plant. If for some reason the generator does not start, the autodialer calls the plant operator to notify him.

Section 7: Geotechnical Report (DCPWS Section 1.2.7)

Project Title: Filtration System Upgrades: Ultrafiltration
Geotechnical report
Not applicable--construction limited to installation in existing treatment facility.

Section 8: Residuals Handling (DCPWS Section 1.2.8)

Project Title: Filtration System Upgrades: Ultrafiltration

Residuals handling plan – Chapter 9 of the DCPWS

There are two sources of plant residuals; the Settling Tank and the IWT UF50 Membrane System. The operator manually vacuums the settled material with a pool vacuum and discharges the residuals to the existing overflow pond. No coagulant or chemicals are added to enhance settling. The UF50 backwash water will also discharge to the overflow pond. The quantity of solids from both sources of residuals is based on 100% turbidity removal and at the design flow rate of 35 gpm. The highest turbidity typically entering the plant is 2.5 ntu during spring runoff. It is assumed that the 20 micron filter bags will remove 0.5 ntu which will not contribute to the solids loading to the overflow pond.

Plant residuals gravity flow through a 4-inch PVC pipe to the overflow pond.

Settling Tank Residuals:
- The expected waste stream quantity is based on the typical cleaning cycle and duration. The tank is vacuumed at a rate of 50 gpm for a period of 30 minutes once a week. The calculated quanitity of water sent to the pond is 1,500 gal/week or 214 gpd (refer to Attachment J for spreadsheet calculations).

- The estimated solids quantity is based on 1 ntu of turbidity being removed by settling. The estimated quantity of solids removed is 0.421 lbs/day (refer to Attachment J for spreadsheet calculations).

UF50 Backwash:
- The expected waste stream quantity is based on 4 backwashes per day per module (total of 10 modules) at 14 gallons per backwash = 560 gpd (refer to Attachment J for spreadsheet calculations).

- The estimated solids quantity is based on 1 ntu of turbidity being removed by the membranes. The estimated quantity of solids is 0.421 lbs/day (refer to Attachement J for spreadshet calculations).

Anticipated Physical and Chemical Characteristics:
No chemicals are added to enhance the treatment process; therefore, settling tank residuals and backwash water residuals will not contain any treatment chemicals. However, during a Clean-In-Place and Maitenance Clean, 400 ml of unscented household bleach is added to a module and allowed to soak for a period of time to deep clean the membrane fibers. Any residual will be discharged to the pond.

Other Contributions:
- The settling tank is equipped with an overflow pipe that will overflow to the overflow pond.

Overflow Pond:
The overflow pond is an unlined non-discharging pond, but is likely seeping water into the ground. The pond is oval in shape with approximate dimensions of 30-feet by 33-feet by 3-feet deep for an estimated volume of 11,000 gallons.

An estimated average volume of water entering the pond is 774 gpd (214 gpd + 560 gpd) from the plant. Based on the estimated volume of the pond and the contribution from the plant, the pond has approximately 14 days of holding capacity.

The overflow pond is considered a waste impoundment under 6 CCR 1007-2. Meadow Mountain Water Supply Company will submit an Inpoundment and Preliminary Classification Report (IPCR) under the Solid Waste and Materials Management Progam in order to classify the plant's discharge and determine if the the pond will be classifed as a Type A or B inpoundment. A signed copy of the IPCR Cover Sheet is included as Attachment K. Meadow Mountain Water Supply Company will have 12-months to conduct sampling and prepare a Demonstration Plan and submit it to the CDPHE Solid Waste Permitting Unit.

Section 9: Preliminary Plan of Operation (DCPWS Section 1.2.9)

Project Title: Filtration System Upgrades: Ultrafiltration

Staffing and Operator Certification

The Meadow Mountaiin Water Supply Company employs one Level C water treatment operator and one Level 1 distribution system operator.

Steve Tedford, Level C Water Plant Operator, License No. 2534
Andrew Griffiths, Level 1 Distribution System Operator, License No. 22645

Meadow Mountain has been operating sufficiently at this manpower level for many years and there is no recommendation for additional staffing. If CDPHE classifies the plant as a Level B facility, the water treatment operator will need to obtain his Level B license.

Operating Considerations

There will be no expansion of plant capacity. The operating configuration and process is basically unchanged.

Section 10: Supplemental/Other Information (DCPWS Section 1.2.10)

Project Title: Filtration System Upgrades: Ultrafiltration

Supplemental Information

Additional deviation request information

PLANS AND SPECIFICATIONS (DCPWS Section 1.5)

Project Title: Filtration System Upgrades: Ultrafiltration
Plans Description and key sheets
Process Flow Diagram Scaled Floor Plan IWT UF50 Dimensional Drawings and Details Clear Well Baffling Plan Turbidimeter Wall Installation Detail (Refer to Attachment L)
Pertinent Specifications for Design
Section 11300 Ultrafiltration Membrane System 3M 100 Series 20 micron Filter Bags Data Sheet Cla-Val Model 50-01 Pressure Sustaining Valve Data Sheet and Purchase Specification Hach 1720 E Low Range Turbidimeter Data Sheet Hach CL17 Free Chlorine Analyzer Data Sheet Hach sc200 Universal Controller Data Sheet (Refer to Attachment M)
ATTACH PLANS AND INCLUDE SPECS.

ATTACHMENTS INDEX

Attachment A

TO ALLENSPARK

OVERFLOW POND

WATER TREATMENT PLANT

RECREATION AREA PARKING

SOUTH FOX CREEK DIVERSION

HIGH PRESSURE STATION

WILLOW CREEK DIVERSION

North Skinner Rd.

South Skinner Rd.

Meadow Mountain Dr.

SCALE IN FEET

0 200' 400' 800'

N

MEADOW MOUNTAIN WATER SUPPLY COMPANY

PROJECT NUMBER: COMMW102	ENGINEER: KAS
DRAWN DATE: 2/14/14	CHECKED: KAS
FILE: COMMW102-5FT CONT-BASE CO83-NF.DWG	APPROVED: KAS

SYSTEM MAP

MAP 1

REVISIONS:

Lidstone and Associates, Inc.
Engineering, Geology, & Water Resource Consulting

LEGEND

CRITICAL INFRASTRUCTURE

VALVE

BLEEDER

CREEK

MANHOLE

WETLANDS

SERVICE LINE

HYDRANT

INTAKE

PIPE LINES

4.0 IN.

2.5 IN.

2.0 IN.

1.5 IN.

0.75 IN.

Attachment B

http://maps.bouldercounty.org/boco/emapping/ Floodplain Management Boulder County

Convert Select

File Edit View Favorites Tools Help

Detailed Property Information for Account: R0086561

Property | Assessment | Sales | Public Lands | Zoning | Floodplain | Elections | Septic System | Plats | Other Views

Floodplain Information

100-year floodplain displayed

Print Page Print All

Address: 137 MEADOW MOUNTAIN MOUNTAINS

Parcel Number: 119726009002

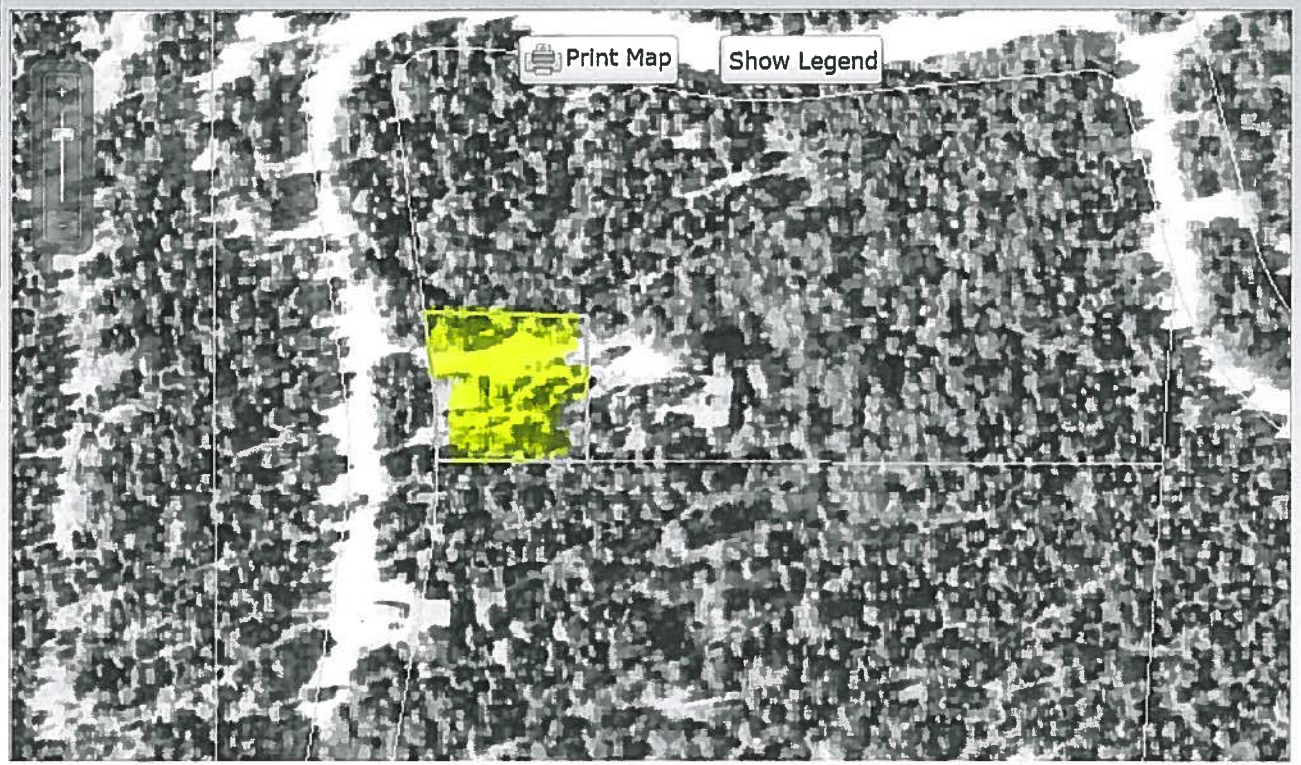
FloodZone: X

Floodway: No

FIRM Map Num: 08013C0200J

Floodplain Determination:

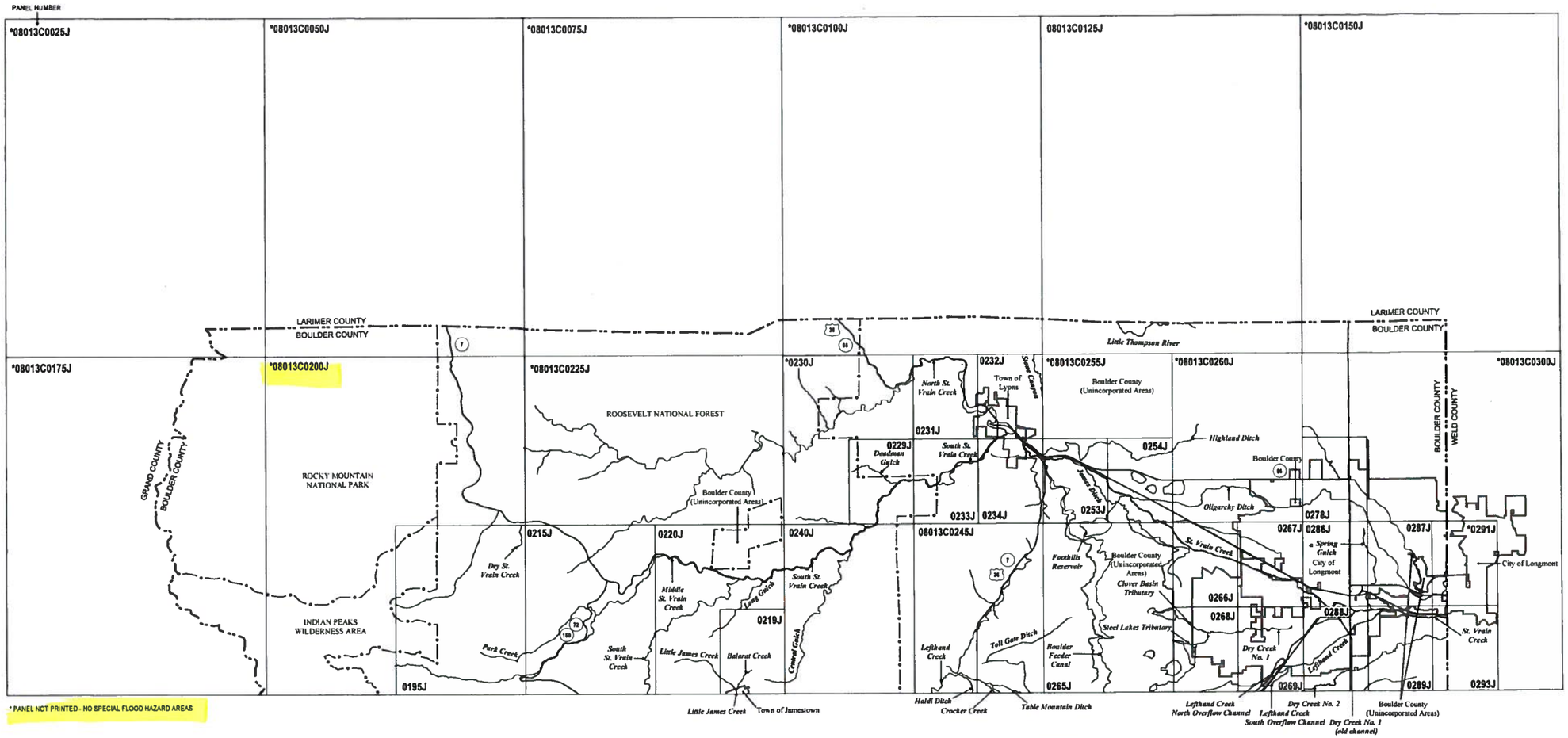
Permits



Questions? Flood Control Website or 303-441-3900

Online Floodplain Information Request Form

FEMA Map Service Center (Exit Boulder County)



* PANEL NOT PRINTED - NO SPECIAL FLOOD HAZARD AREAS

NOTE TO USER

Future revisions to this FIRM Index will only be issued to communities that are located on FIRM panels being revised. This FIRM Index therefore remains valid for FIRM panels dated December 18, 2012 or earlier. Please refer to the "MOST RECENT FIRM PANEL DATE" column in the Listing of Communities table to determine the most recent FIRM Index date for each community.

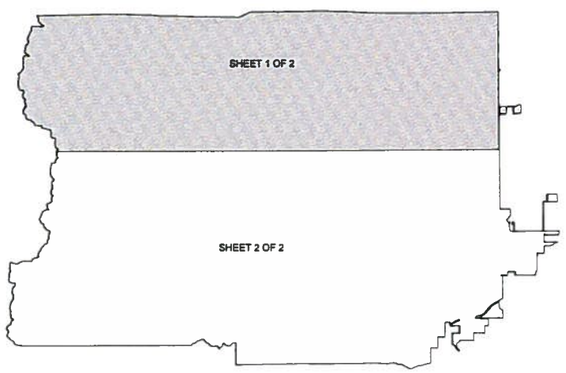
MAP DATES

This FIRM Index displays the map date for each FIRM panel at the time that this Index was printed. Because this Index may not be distributed to unaffected communities in subsequent revisions, users may determine the current map date for each FIRM panel by visiting the FEMA Map Service Center website at http://web1.msc.fema.gov, or by calling the Map Service Center at 1-800-358-9616.

Communities annexing land on adjacent FIRM panels must obtain a current copy of the adjacent panel as well as the current FIRM Index. These may be ordered directly from the Map Service Center at the number listed above.

FIRM Panel Dates For Printed Panels Of Boulder County, Colorado (And Incorporated Areas)					
Panel	Effective Date	Panel	Effective Date	Panel	Effective Date
08013C0125J	December 18, 2012	08013C0234J	December 18, 2012	08013C0268J	December 18, 2012
08013C0195J	December 18, 2012	08013C0245J	December 18, 2012	08013C0269J	December 18, 2012
08013C0215J	December 18, 2012	08013C0247J	December 18, 2012	08013C0278J	December 18, 2012
08013C0219J	December 18, 2012	08013C0253J	December 18, 2012	08013C0286J	December 18, 2012
08013C0220J	December 18, 2012	08013C0254J	December 18, 2012	08013C0287J	December 18, 2012
08013C0229J	December 18, 2012	08013C0265J	December 18, 2012	08013C0288J	December 18, 2012
08013C0231J	December 18, 2012	08013C0266J	December 18, 2012	08013C0289J	December 18, 2012
08013C0232J	December 18, 2012	08013C0267J	December 18, 2012	08013C0293J	December 18, 2012
08013C0233J	December 18, 2012				

BOULDER COUNTY, CO
INDEX LOCATOR DIAGRAM



MAP REPOSITORIES

(Maps available for reference only, not for distribution.)

BOULDER, CITY OF:
Municipal Building Plaza
1777 Broadway Street
Boulder, Colorado 80302

BOULDER COUNTY
(UNINCORPORATED AREAS):
Boulder County Transportation Department
2525 13th St, Suite 203
Boulder, Colorado 80306

ERIE, TOWN OF:
Town Hall
645 Holbrook Street
Erie, Colorado 80516

JAMESTOWN, TOWN OF:
Town Hall
118 Main Street
Jamestown, Colorado 80455

LAFAYETTE, CITY OF:
City Hall
1290 South Public Road
Lafayette, Colorado 80026

LONGMONT, CITY OF:
Service Center
1100 South Sherman Street
Longmont, Colorado 80501

LOUISVILLE, CITY OF:
City Hall
749 Main Street
Louisville, Colorado 80027

LYONS, TOWN OF:
Town Hall
432 Fifth Avenue
Lyons, Colorado 80540

NEDERLAND, TOWN OF:
Town Hall
45 West First Street
Nederland, Colorado 80466

SUPERIOR, TOWN OF:
Town Hall
124 East Coal Creek Drive
Superior, Colorado 80027

WARD, TOWN OF:
Town Office
1 Columbia Street
Ward, Colorado 80481

LISTING OF COMMUNITIES

COMMUNITY NAME	COMMUNITY NUMBER	LOCATED ON PANEL(S)	INITIAL IDENTIFICATION DATE	INITIAL NFIP MAP DATE	INITIAL FIRM DATE	MOST RECENT FIRM PANEL DATE
BOULDER, CITY OF	080024	0385, 0391, 0392, 0393, 0394, 0402, 0403, 0404, 0410, 0411, 0412, 0413, 0414, 0557, 0559, 0560, 0576, 0577, 0578	JUNE 14, 1974	JUNE 14, 1974	JULY 17, 1978	DECEMBER 18, 2012
BOULDER COUNTY UNINCORPORATED AREAS	080023	**0025, **0050, **0075, **0100, 0125, **0150, **0175, 0195, **0200, 0215, 0219, 0220, **0225, 0229, **0230, 0231, 0232, 0233, 0234, 0240, 0245, 0253, 0254, **0255, **0260, 0265, 0266, 0267, 0268, 0269, 0278, 0286, 0287, 0288, 0289, **0291, 0293, **0300, **0325, 0334, 0342, **0350, 0355, 0357, 0360, 0365, 0370, 0376, 0377, 0378, 0379, 0385, 0390, 0391, 0392, 0393, 0401, 0402, 0403, 0404, 0407, 0410, 0411, 0412, 0413, 0414, 0416, 0417, 0418, 0419, 0429, 0430, 0435, 0438, 0437, 0438, 0439, 0441, 0443, **0500, 0509, **0525, 0530, 0535, **0550, 0557, 0559, 0560, 0566, 0587, **0575, 0576, 0577, 0578, 0579, **0581, 0582, 0583, 0584, 0586, 0587, 0591, 0601, 0602, 0603, 0604, 0610, **0615	FEBRUARY 1, 1979	FEBRUARY 1, 1979	FEBRUARY 1, 1979	DECEMBER 18, 2012
ERIE, TOWN OF	080181	0429, 0435, 0438, 0437, 0438, 0439, 0441, **0442, 0443, **0444, **0453, **0461, **0463	JUNE 28, 1974	JUNE 28, 1974	OCTOBER 17, 1978	DECEMBER 18, 2012
JAMESTOWN, TOWN OF	080218	0219, 0357	JULY 11, 1975	JULY 11, 1975	JULY 18, 1983	DECEMBER 18, 2012
LAFAYETTE, CITY OF	080026	0418, 0419, 0436, 0438, 0439, 0443, **0581, 0582, 0601, 0602, 0603, 0604, 0610	MAY 24, 1974	MAY 24, 1974	MARCH 18, 1980	DECEMBER 18, 2012
LONGMONT, CITY OF	080027	**0260, 0266, 0267, 0268, 0269, 0278, 0286, 0287, 0288, 0289, **0291, 0293, **0300	OCTOBER 26, 1973	OCTOBER 26, 1973	JULY 5, 1977	DECEMBER 18, 2012
LOUISVILLE, CITY OF	085078	0579, **0581, 0582, 0583, 0584, 0601, 0603	MAY 4, 1973	MAY 4, 1973	MAY 4, 1973	DECEMBER 18, 2012
LYONS, TOWN OF	080029	0231, 0232, 0234, 0253	MAY 29, 1974	MAY 29, 1974	AUGUST 1, 1980	DECEMBER 18, 2012
NEDERLAND, TOWN OF	080255	0509, **0525, 0530,	AUGUST 22, 1975	AUGUST 22, 1975	AUGUST 1, 1979	DECEMBER 18, 2012
SUPERIOR, TOWN OF	080203	0579, 0583, 0584, 0587, 0591, 0592	JUNE 4, 1976	JUNE 4, 1976	SEPTEMBER 28, 1979	DECEMBER 18, 2012
*WARD, TOWN OF	080292	0334				

*NO SPECIAL FLOOD HAZARD AREAS IDENTIFIED
**PANEL NOT PRINTED

NATIONAL FLOOD INSURANCE PROGRAM

MAP INDEX

FIRM
FLOOD INSURANCE RATE MAP
BOULDER COUNTY, COLORADO AND INCORPORATED AREAS
(SEE LISTING OF COMMUNITIES TABLE)

MAP INDEX
SHEET 1 OF 2

PANELS PRINTED: 125, 195, 215, 219, 220, 229, 231, 232, 233, 234, 240, 245, 253, 254, 265, 266, 267, 268, 269, 278, 286, 287, 288, 289, 293

(SEE SHEET 2 FOR ADDITIONAL PANELS PRINTED)

MAP NUMBER
08013CIND1B

MAP REVISED

Attachment C

SOURCE WATER ASSESSMENT REPORT

Surface Water Sources and Ground Water Sources Under the Direct Influence of Surface Water

MEADOW MOUNTAIN WS

Public Water System ID: CO0207504

ALLENSPARK, CO

BOULDER County

11/8/2004

Colorado Department of Public Health and Environment
Water Quality Control Division
Source Water Assessment and Protection Program
4300 Cherry Creek Drive South
Denver, Colorado 80246-1530

SOURCE WATER ASSESSMENT SUMMARY

Background

The Colorado Department of Public Health and Environment (CDPHE) has completed a source water assessment for **MEADOW MOUNTAIN WS** as required by the 1996 Safe Drinking Water Act amendments and in accordance with Colorado's Source Water Assessment and Protection (SWAP) program. The purpose of this assessment is to analyze the potential susceptibility of each public drinking water source to contamination, and to supply pertinent information so that decision-makers voluntarily can develop and implement appropriate preventive measures to protect these water sources. The Safe Drinking Water Act requires that the public water system and its consumers be informed of the assessment results.

SWAP Process

The SWAP program is a multi-step two-phased process (Figure 1) designed to assist public water systems in preventing accidental contamination of their untreated drinking water supplies. These phases include the assessment phase and the protection phase as depicted in the upper and lower portions of Figure 1, respectively.

Figure 1. Source Water Assessment and Protection Process.

The assessment phase involves understanding where each public water system's source water comes from, what contaminant sources potentially threaten the water source(s), and how

susceptible each water source is to potential contamination. The product of the assessment phase is contained in this report.

The protection phase occurs when local decision-makers use the source water assessment results and other pertinent information to develop management and response strategies to protect the water sources from potential contamination.

Assessment Process

As depicted in the upper portion of Figure 1, the source water assessment for all public water systems consists of four primary elements. These elements include:

1) delineating the source water assessment area for each drinking water source;
2) conducting a contaminant source inventory to identify potential sources of contamination within each of the source water assessment areas;
3) conducting a susceptibility analysis to determine the potential susceptibility of each public drinking water source to the different sources of contamination and;
4) reporting the results of the source water assessment to the public water systems and the general public.

Public water systems were given the opportunity to review and provide corrections and/or feedback on draft versions of their source water assessment area delineations and their contaminant source inventories. All pertinent corrections and feedback were incorporated into this assessment.

Delineation of Source Water Assessment Area

The source water assessment area defines the area or region of the watershed or aquifer contributing untreated water to the public water system's source water intake. The area also defines where potential contamination of this water source could occur.

A public water system may have rights to use one or more source water types for drinking water. These source water types include:

- Surface water source - any "untreated" water source that is diverted directly from a stream, river, lake, pond or similar surface water body.
- Ground water source - any "untreated" water source that is diverted directly from an underground source of water (i.e., an aquifer).
- Ground water source under the direct influence of surface water - any "untreated", shallow, ground water source that testing has shown to be in hydrologic connection to a nearby surface water body.

For surface water systems and ground water systems under the influence of surface water, the source water assessment area includes the watershed drainage area above the intake, and any secondary diversion structures used to divert untreated water from other watersheds.

A public water system also may have purchased water sources. A purchased water source includes any "treated" surface water source, ground water source and/or ground water source under the influence of surface water that is purchased from another public water system.

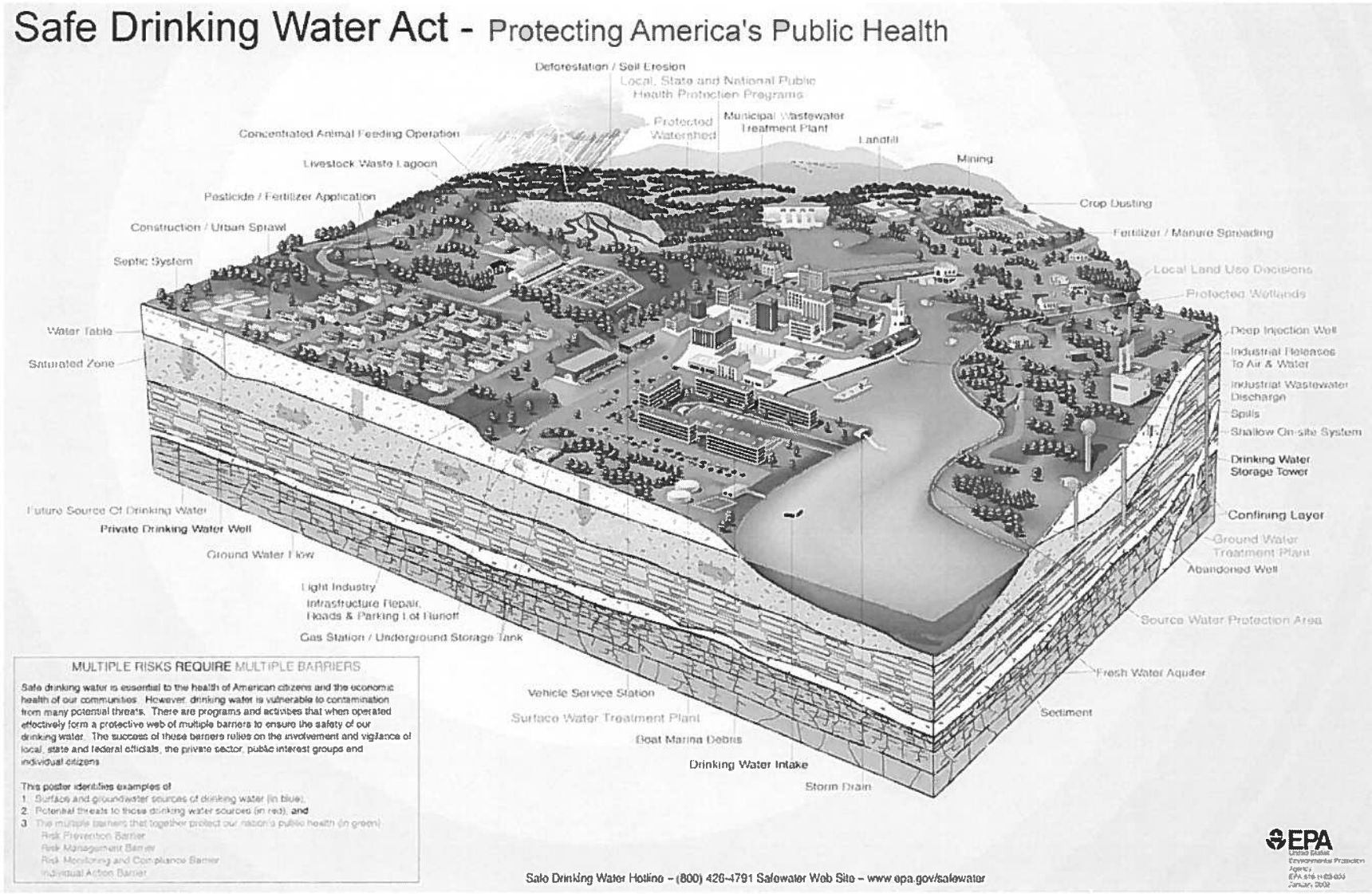
This assessment report presents the results only for active surface water sources and/or ground water sources under the direct influence of surface water that the public water system has rights to use for drinking water. Assessment results for any purchased water sources that the public water system may have are presented in the source water assessment report(s) for the public water system that supplies the purchased water source.

Contaminant Source Inventory

Drinking water sources are susceptible to contamination from a wide variety of natural and man-made threats. Figure 2 illustrates some of the potential contaminant sources that might be encountered for surface water and ground water sources, and how contaminants from these sources can enter the source water. Potential contaminant sources include anything likely to manufacture, produce, use, store, dispose, or transport regulated and unregulated contaminants of concern. Potential contaminant sources were divided into two groups for this assessment:

- Discrete contaminant sources – generally include facility-related operations from which the potential release of contamination would be confined to a relatively small area.
- Dispersed contaminant sources – generally include broad based land uses and miscellaneous sources from which the potential release of contamination would be spread widely over a relatively large area.

Figure 2. Examples of Potential Contaminant Sources and How Contaminants Can Enter Your Source Water.



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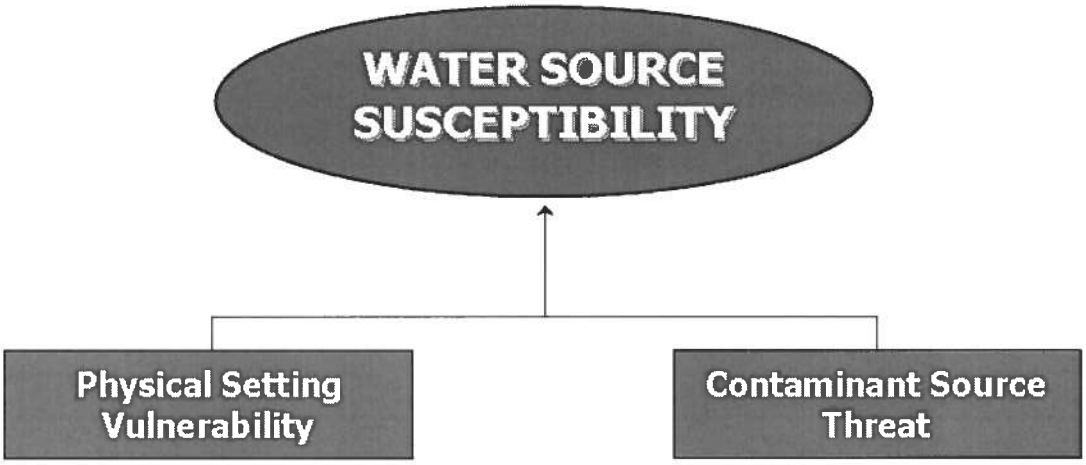
Susceptibility Analysis

The current analysis looks at the susceptibility of a water source to individual potential contaminant sources (referred to as individual susceptibility), as well as the total susceptibility of a water source to all of the individual potential contaminant sources that were inventoried within its source water assessment area. The susceptibility of a surface water source or a ground water source under the direct influence of surface water to an individual potential contaminant source depends on the two primary factors: physical setting vulnerability and contaminant source threat, as shown in Figure 3.

Figure 3. Components of Water Source Susceptibility.



Physical Setting Vulnerability – involves an evaluation of the ability of the watershed setting in the source water assessment area to provide a sufficient buffering capacity to mitigate potential contaminant concentrations in the source water. This ability is affected by physical characteristics like the total size of the source water assessment area, annual precipitation, soil properties and vegetative cover within the source water assessment area, as well as the structural soundness of the intake itself.

Contaminant Source Threat – involves an evaluation of the potential for a contaminant source to provide contaminants in sufficient amounts for the source water to become contaminated at concentrations that may pose a health concern to consumers of the water. The potential threat is affected by the types and volumes of potential contaminants that might be present, the likelihood that contaminants might be released, and the proximity of the contaminant source to the source water intake and its proximity to the surface water body supplying the untreated source water.

The total susceptibility of a water source is determined from its cumulative susceptibility to all of the discrete contaminant sources and all of the dispersed contaminant sources that were inventoried in its source water assessment area. In other words, the total susceptibility of a water source is a reflection of the combined individual susceptibilities posed by all of the discrete and all of the dispersed contaminant sources inventoried in the source water assessment area.

Therefore, the susceptibility of a water source to all discrete contaminant sources is a reflection of the combined individual susceptibilities posed by each discrete contaminant source that was inventoried. Likewise, the susceptibility of a water source to all dispersed contaminant sources is a reflection of the combined individual susceptibilities posed by each dispersed contaminant source that was inventoried.

In order to determine the susceptibility of a water source to potential contamination, the Colorado Department of Public Health and Environment developed a unique susceptibility analysis model and scoring system to evaluate the different physical setting vulnerability and contaminant threat factors that contribute to the susceptibility of a water source. This unique model and scoring system serves as the benchmark by which the potential susceptibility of other like water sources in the state can be measured or judged. *Therefore, the results of your source water assessment are not directly comparable to results from other states. These assessment results are only meaningful when compared to other surface water sources and ground water sources under the direct influence of surface water in Colorado.*

To provide the reader a general sense of the degree of potential risk to a water source, the total susceptibility scores, individual susceptibility scores and physical setting vulnerability scores are assigned qualitative ratings of Low, Moderately Low, Moderate, Moderately High, or High based on statistical indicators established by the Colorado Department of Public Health and Environment. In developing the qualitative ratings for these particular factors, a commonly applied statistical approach is used to group the scores for each of these factors into the five possible rating categories. This approach is not unlike what a teacher uses in grading student test scores. The statistical approach determines the factor score's relative position within the statewide populations of total susceptibility scores, individual susceptibility scores or physical setting vulnerability scores for the more than 500 surface water sources and ground water sources under the direct influence of surface water that were analyzed.

In general, the higher the susceptibility rating for the water source, the greater the risk for potential contamination of the water source. For example, a total susceptibility rating of Moderately High or High generally means that the potential vulnerability posed by the physical setting of the water source and the cumulative potential threats posed by the various contaminant sources are proportionately higher than the vulnerability and cumulative threats posed to an average surface water source or ground water source under the direct influence of surface water in the state. Similarly, an individual susceptibility rating of Moderately High or High generally means that the potential vulnerability posed by the physical setting of the water source and the potential threat posed by an individual contaminant source is proportionately higher than the vulnerability and individual threat posed to an average surface water source or ground water source under the direct influence of surface water in the state.

Likewise, the higher the physical setting vulnerability rating for the water source, the more vulnerable the water source is to potential contamination. A physical setting vulnerability rating of Moderately High or High generally means that the physical setting of the water source potentially provides proportionately less buffering capability to mitigate potential contaminant concentrations in the source water when compared to an average surface water source or ground water source under the direct influence of surface water in the state.

The results of the statistical evaluations are easier to understand by plotting the statewide distribution of the total and individual susceptibility ratings, and the physical setting vulnerability ratings for all surface water sources and ground water sources under the direct influence of surface water that were analyzed. The final statewide total susceptibility, individual susceptibility and physical setting vulnerability rating distribution plots generated from the evaluations are presented in the assessment results section of this report. These rating distribution plots present the numerical scoring ranges associated with a given rating category, and the number of water sources or contaminant sources throughout the state that received a specific rating.

The Colorado Department of Public Health and Environment has provided two source water assessment methodology documents that can be downloaded from the Colorado SWAP web site (**www.cdphe.state.co.us/wq/sw/swaphom.html**) and reviewed. These documents present a more detailed discussion on the assessment methodology used for surface water sources and ground water sources under the direct influence of surface water, and ground water sources for people who are interested.

Protection Process

Public water systems and communities are strongly encouraged to use their source water assessment information to voluntarily enter the protection phase of SWAP. The next step involves developing and continuously implementing a source water management or protection plan at the local level. **No statutory authority has been given to the Colorado Department of Public Health and Environment to force the adoption or implementation of source water protection measures. The authority to do so rests with local communities and governments.**

As depicted in the lower portion of Figure 1, the source water protection phase for all public water systems consists of four primary elements. These elements include:

1) involving stakeholders in the planning process;
2) developing a comprehensive protection plan for all of your drinking water sources;
3) implementing the protection plan on a continuous basis to reduce the risk of accidental contamination of the drinking water sources; and
4) monitoring the effectiveness of the protection plan and updating it accordingly as future assessment results indicate.

Involve Stakeholders

Public participation is crucial to the overall success of Colorado's SWAP program. Source water protection was founded on the concept that informed citizens, equipped with fundamental knowledge about their drinking water source and the threats to it, will be the most effective advocates for protecting this valuable resource.

The public water supplier or any other well-suited local interest group may take the lead in organizing public participation in the local SWAP protection planning effort. For public participation to be effective, there must be a well-organized effort to raise public awareness, identify groups and individuals interested in helping, and to define and implement the necessary assessment and planning tasks. The lead group is encouraged to involve all types of stakeholders – individuals, groups, organizations and local decision-makers affected by or concerned with the community's drinking water – in the local source water protection planning efforts.

Develop Protection Plan

A source water management or protection plan essentially identifies (1) the specific management tools the public water system and community will use or the actions they will take to protect their source water, and (2) how the public water system and community will carry them out. A companion contingency plan is usually developed as part of the overall management plan. The contingency plan is essentially an emergency response plan for the water system that lays out a coordinated plan for responding rapidly, effectively, and efficiently to any emergency incident that threatens or disrupts the community water supply. Emergency incidents are any man-made events (e.g., chemical contamination, fire, vandalism, terrorism) or natural events (e.g., drought, fire, tornado) that can adversely affect the capability of the public water system to provide a steady supply of safe drinking water to its consumers. Public water systems and communities are encouraged to be creative in developing these plans.

Implement Protection Plan

The reduction of risk of accidental contamination of drinking water sources is affected by how well the public water system and community carry out the specific management tools they use or the actions they take to protect their source water. This requires a proper commitment of funding resources and personnel by the public water system and community to implement the source water protection measures they have developed. Considering the high cost of cleaning up contaminants once they have been released to the environment, this commitment may well be a reasonable investment to protect the natural quality of the drinking water source and avoid potential costly treatment of a contaminated water supply and/or costly development of a new water supply. The Colorado Department of Public Health and Environment also encourages public water systems and decision-makers to use their source water assessment results in making local land use decisions. Public water systems and communities interested in developing and implementing source water protection measures may be able to find limited financial assistance through the Colorado Department of Public Health and Environment.

Monitor and Update Protection Plan

Public water systems and communities are encouraged to monitor the effectiveness of the source water protection measures they have implemented and to update their source water protection plan accordingly as future assessment results indicate. In developing a protection plan, each public water system is encouraged to identify measurable results that can be used to monitor the success of the protection measures they have implemented. Source water protection plans may need to be revised to address new potential threats over time as new assessment results become

available. As shown in Figure 1, SWAP was designed to be an iterative process, alternating back and forth between assessment and protection phases.

The primary elements of the protection phase discussed above are meant as a guide to public water systems and communities. In actual practice, developing and implementing source water protection may be more or less complicated depending on the local community's willingness to adopt and implement source water protection measures. Additional source water protection information can be obtained by going to the U.S. Environmental Protection Agency's source water protection website (**www.epa.gov/safewater/protect.html**). Staff members at the Colorado Department of Public Health and Environment also are available to provide assistance with source water protection efforts.

Assessment Results

The source water assessment for **MEADOW MOUNTAIN WS** rendered the following results:

- At the time of this assessment, the water supply consists of:
  - 2 active surface water sources
  - 0 active ground water sources under the influence of surface water
  - 0 active, purchased surface water sources and/or purchased ground water sources under the influence of surface water

- Table 1 presents the cumulative results of the total susceptibility of the water source(s) to potential contamination from both discrete and dispersed contaminant sources. Water sources with total susceptibility ratings of Moderately High or High generally are at greater risk for potential contamination than those receiving lower ratings. As shown in Table 1, 0 active water source(s) was/were determined to have a Moderately High or High susceptibility to potential contamination.

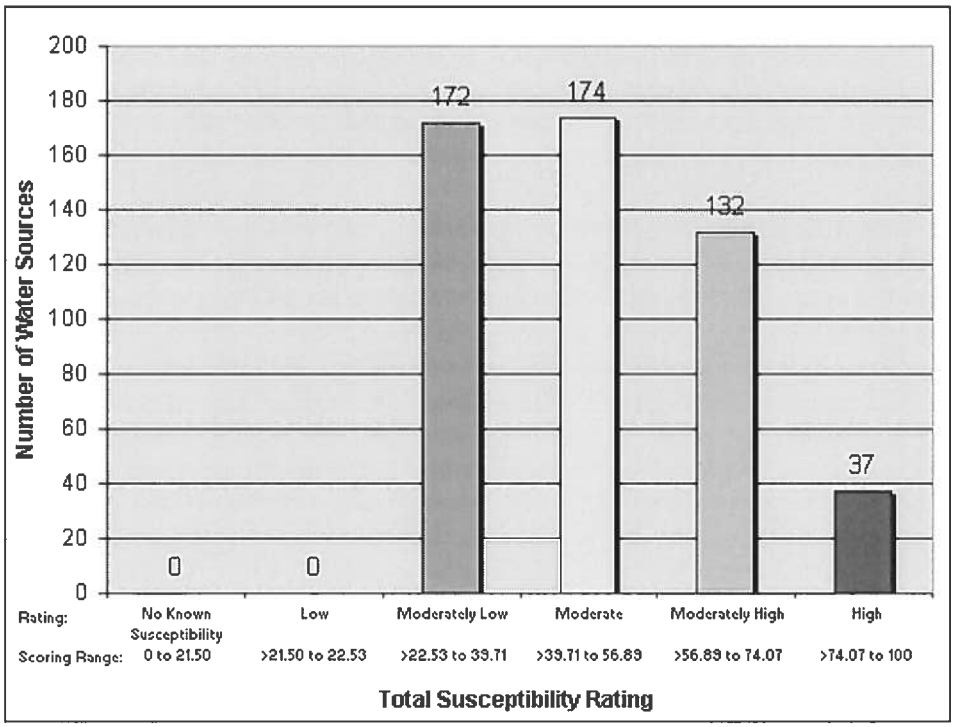
  There may be cases where the assessment was unable to verify the presence of discrete and dispersed contaminant sources based on the databases used for the contaminant inventory. In these cases, unless new information is identified and analyzed, the water source(s) is/are not currently known to be susceptible to potential contamination from any known discrete or dispersed contaminant sources. This situation is indicated in Table 1 by water sources receiving an overall susceptibility rating of "No Known Susceptibility."

  Table 1. Total Susceptibility Ratings for Water Sources.

Number of Water Sources	Susceptibility Rating
0	No Known Susceptibility
0	Low
2	Moderately Low
0	Moderate
0	Moderately High
0	High

Figure 4 presents the statewide total susceptibility rating distribution plot for all surface water sources and ground water sources under the direct influence of surface water that were analyzed. The rating distribution plot presents the numerical scoring ranges associated with a given rating category, and the number of surface water sources and ground water sources under the direct influence of surface water throughout the state that received a specific qualitative rating. By comparing the results in Table 1 to Figure 4, one can see how the total susceptibility of the water source(s) in Table 1 compared to the total susceptibility of the other surface water sources and ground water sources under the direct influence of surface water throughout the state.

Figure 4. Statewide Total Susceptibility Rating Distribution Plot.



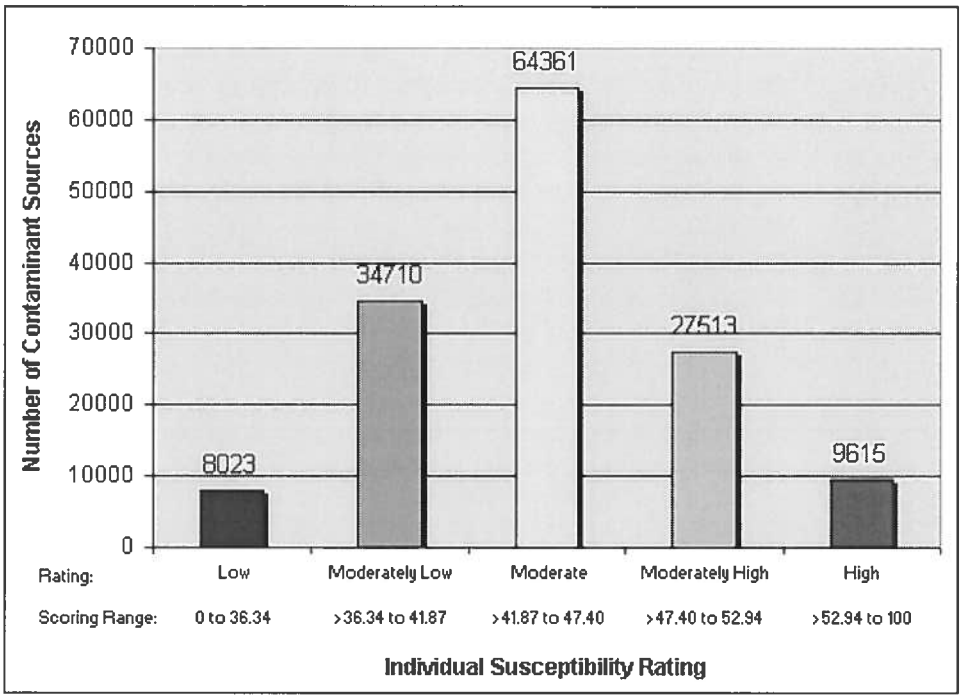
- Table 2 presents a summary of the individual susceptibility of the water source(s) to various types of discrete contaminant sources that were evaluated. Water sources with a Moderately High or High individual susceptibility to a discrete contaminant source generally are at greater risk for potential contamination from the discrete contaminant source than water sources receiving lower individual susceptibility ratings to similar or different discrete contaminant sources. The water source(s) has/have the greatest risk to potential contamination from the following types of discrete contaminant sources:

Table 2. Susceptibility of Water Source(s) to Discrete Contaminant Sources.

Contaminant Source Type	Individual Susceptibility Rating Summary (cumulative count for all water sources)				
	Low	Mod. Low	Moderate	Mod. High	High
EPA Superfund Sites	0	0	0	0	0
EPA Abandoned Contaminated Sites	0	0	0	0	0
EPA Hazardous Waste Generators	0	0	0	0	0
EPA Chemical Inventory/Storage Sites	0	0	0	0	0
EPA Toxic Release Inventory Sites	0	0	0	0	0
Permitted Wastewater Discharge Sites	0	0	0	0	0
Aboveground, Underground and Leaking Storage Tank Sites	0	0	0	0	0
Solid Waste Sites	0	0	0	0	0
Existing/Abandoned Mine Sites	0	0	0	0	0
Concentrated Animal Feeding Operations	0	0	0	0	0
Other Facilities	0	0	0	0	0
TOTAL:	**0**	**0**	**0**	**0**	**0**

Figure 5 presents the statewide rating distribution plot of the individual susceptibility to various types of discrete contaminant sources for all surface water sources and ground water sources under the direct influence of surface water that were analyzed. The rating distribution plot presents the numerical scoring ranges associated with a given rating category, and the number of discrete contaminant sources throughout the state that received a specific qualitative rating. By comparing the total count results in Table 2 to Figure 5, one can see how the individual susceptibility results of the water source(s) in Table 2 compared to the combined individual susceptibility results of the other surface water sources and ground water sources under the direct influence of surface water throughout the state.

Figure 5. Statewide Rating Distribution Plot of Individual Susceptibility to Discrete Contaminant Sources.



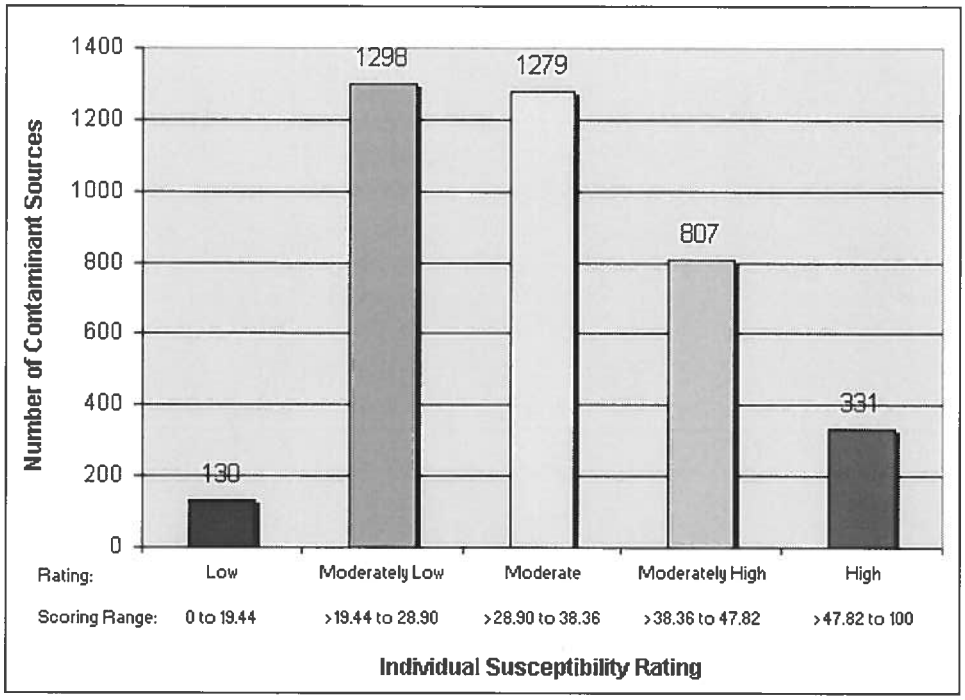
- Table 3 presents a summary of the individual susceptibility of the water source(s) to various types of dispersed contaminant sources that were evaluated. Water sources with a Moderately High or High individual susceptibility to a dispersed contaminant source generally are at greater risk of potential contamination from the dispersed contaminant source than water sources receiving lower individual susceptibility ratings to similar or different dispersed contaminant sources. The water source(s) has/have the greatest risk to potential contamination from the following types of dispersed contaminant sources:

Table 3. Susceptibility of Water Source(s) to Dispersed Contaminant Sources.

Contaminant Source Type	Individual Susceptibility Rating Summary (cumulative count for all water sources)				
	Low	Mod. Low	Moderate	Mod. High	High
LAND USE / LAND COVER TYPES:					
Commercial/Industrial/Transportation	0	0	0	0	0
High Intensity Residential	0	0	0	0	0
Low Intensity Residential	0	0	0	0	0
Urban Recreational Grasses	0	0	0	0	0
Quarries / Strip Mines / Gravel Pits	0	0	0	0	0
Row Crops	0	0	0	0	0
Fallow	0	0	0	0	0
Small Grains	0	0	0	0	0
Pasture / Hay	0	0	0	0	0
Orchards / Vineyards / Other	0	0	0	0	0
Deciduous Forest	0	0	2	0	0
Evergreen Forest	0	0	0	0	2
Mixed Forest	0	0	0	0	0
OTHER TYPES:					
Septic Systems	0	0	0	0	0
Oil / Gas Wells	0	0	0	0	0
Road Miles	0	0	0	0	0
TOTAL:	**0**	**0**	**2**	**0**	**2**

Figure 6 presents the statewide rating distribution plot of the individual susceptibility to various types of dispersed contaminant sources for all surface water sources and ground water sources under the direct influence of surface water that were analyzed. The rating distribution plot presents the numerical scoring ranges associated with a given rating category, and the number of dispersed contaminant sources throughout the state that received a specific qualitative rating. By comparing the total count results in Table 3 to Figure 6, one can see how the individual susceptibility results of the water source(s) in Table 3 compared to the combined individual susceptibility results of the other surface water sources and ground water sources under the direct influence of surface water throughout the state.

Figure 6. Statewide Rating Distribution Plot of Individual Susceptibility to Dispersed Contaminant Sources.



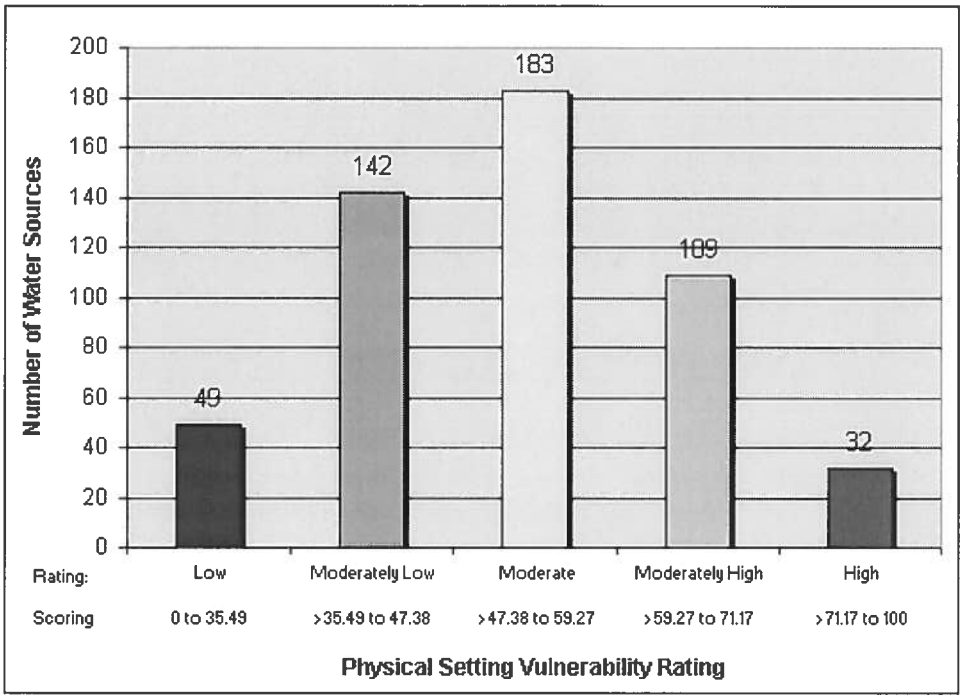
➢ Table 4 presents the cumulative results of the physical setting vulnerability ratings of the water source(s). A vulnerable physical setting generally means the water source(s) will be more susceptible to potential contamination. Water sources with physical setting vulnerability ratings of Moderately High or High generally are expected to have higher levels of potential susceptibility to contamination. As shown in Table 4, 1 active water source(s) was/were determined to have a Moderately High or High physical setting vulnerability.

Table 4. Physical Setting Vulnerability Ratings for Water Sources.

Number of Water Sources	Physical Setting Vulnerability Rating
0	Low
0	Moderately Low
1	Moderate
1	Moderately High
0	High

Figure 7 presents the statewide physical setting vulnerability rating distribution plot for all surface water sources and ground water sources under the direct influence of surface water that were analyzed. The rating distribution plot presents the numerical scoring ranges associated with a given rating category, and the number of surface water sources and ground water sources under the direct influence of surface water throughout the state that received a specific qualitative rating. By comparing the results in Table 4 to Figure 7, one can see how the physical setting vulnerability of the water source(s) in Table 4 compared to the physical setting vulnerability of the other surface water sources and ground water sources under the direct influence of surface water throughout the state.

Figure 7. Statewide Physical Setting Vulnerability Rating Distribution Plot.



The physical setting vulnerability remains important even where no or very few potential contaminant sources (discrete and/or dispersed) have been identified within the source water assessment area. In this case, if the physical setting vulnerability for a water source is estimated to be Moderately High or High, it could cause an increased susceptibility to contamination in the future if certain discrete and/or dispersed contaminant sources were located within the source water assessment area. This potential impact ultimately will depend on the degree of contaminant threat posed by the specific potential contaminant sources. Public water systems are strongly encouraged to consider this in their source water protection planning efforts, and to be vigilant to the introduction of potential contaminant sources within highly vulnerable physical settings. Such information may be useful to local land use planning agencies making land use and zoning decisions related to the siting of these future potential contaminant sources.

Additional Considerations

The source water assessment provides a screening-level evaluation of the likelihood that a potential contamination problem could occur rather than an indication that a potential contamination problem has or will occur. This evaluation is comparable to what a doctor might use to screen a patient for a particular medical condition. The results of this assessment reflect the best efforts of the Colorado Department of Public Health and Environment and its contractors to simplify several complex physical, chemical and operational processes, and to assemble quality data sets for use in the assessment. Future improvements to the source water assessment results are envisioned as additional data become available. The Colorado Department of Public Health and Environment is confident that this assessment provides useful information to communities concerning the contaminant sources to which their water supply is potentially most susceptible. Public water systems also can use this information to evaluate the need for improvement to current water treatment capabilities, so as to be better prepared for future contamination threats.

This report represents the public version of the source water assessment that the Colorado Department of Public Health and Environment is required to make available under the Safe Drinking Water Act. The public version differs from the public water system version in that more detailed supporting information (e.g., input data and maps) was provided to each public water system as part of their report. Some of this supporting information is viewed by the Colorado Department of Public Health and Environment and many public water systems as security sensitive. Under the Colorado Open Records Act, certain information can be withheld from public disclosure if the information can be characterized either as "details of security arrangements or investigations" [section 27-72-204(3)(a)(XVII) C.R.S] or as information whose disclosure "would do substantial injury to the public interest" [section 24-72-204(6)(a) C.R.S.]. The Colorado Department of Public Health and Environment has determined that the following security sensitive information meets one or both of the preceding characterization criteria and will be withheld from public disclosure:

- Location information about the public water system's intakes/wells, treatment facilities, and diversion/conveyance structures, as well as location information about potential sources of contamination. Location information would include location coordinates, physical addresses and maps showing the locations of the intakes/wells, treatment facilities, diversion/conveyance structures, and potential sources of contamination;
- Hazardous chemical quantities, type, processes, and/or likelihood of release;
- Well/intake depths; and
- Structural integrity information concerning the drinking water intakes/wells.

Public water systems also will be given the opportunity to provide the Colorado Department of Public Health and Environment with rationale for excluding additional supporting information from public disclosure once they have received and reviewed their source water assessment report. Their rationale must meet one or both of the preceding characterization criteria established under the Colorado Open Records Act to be acceptable.

Consumers are encouraged to contact ***MEADOW MOUNTAIN WS*** at ***303-747-2066*** if you are:

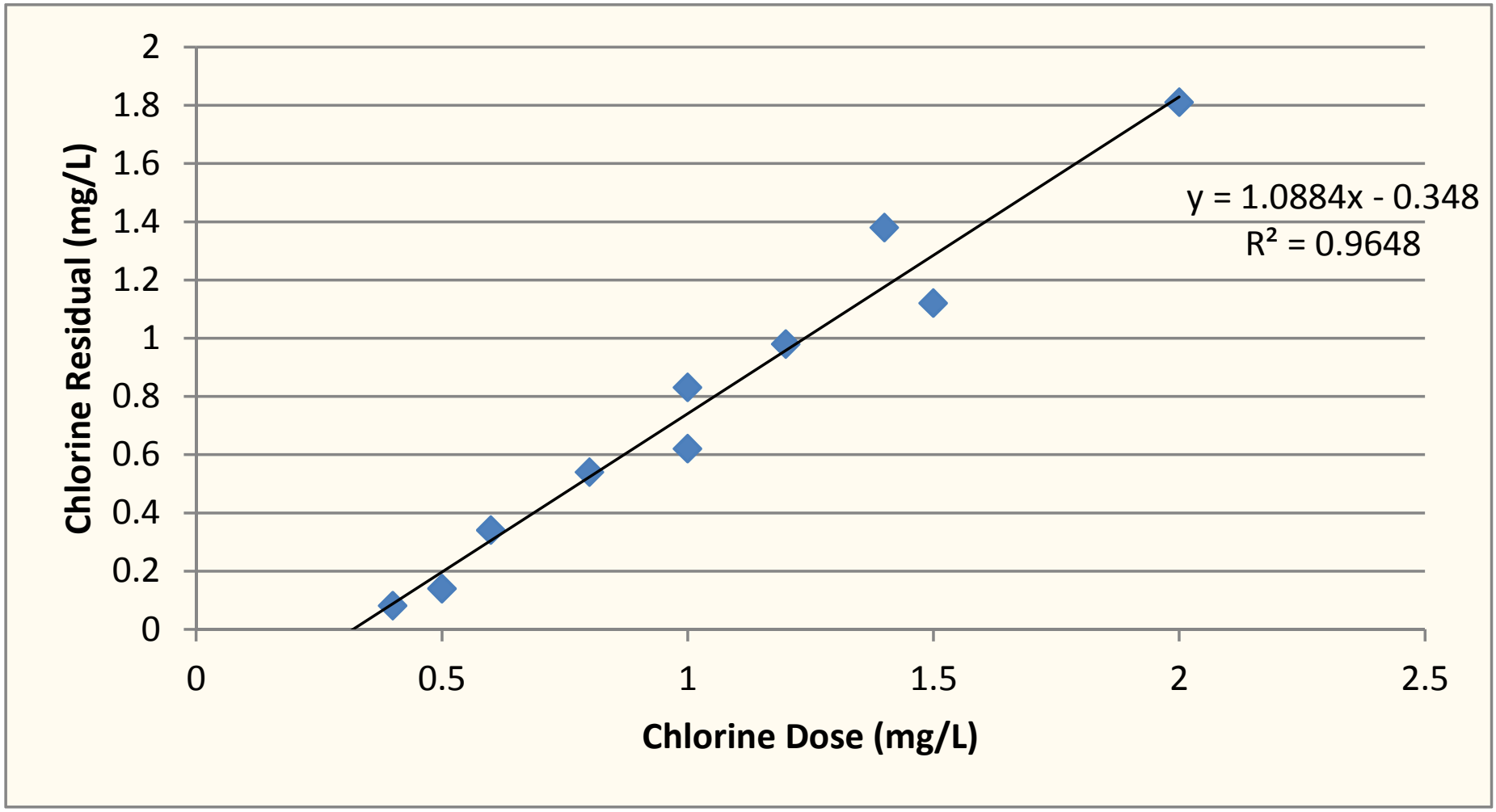
- interested in knowing more about the supporting information provided to the public water system; or
- interested in what source water protection measures the water system may be developing.

If you have questions concerning the results presented in the public version of the source water assessment, the methodologies used in the source water assessment, or the SWAP program in general, please contact the Colorado Department of Public Health and Environment at (303) 692-3592.

Attachment D

Water Type	Date	Turbidity NTU	Alkalinity ppm	Color CU	Conductivity uS/cm	Hardness ppm as CaCO3	Iron ppm	pH SU	DO ppm
Willow Creek Intake	2/14/2012	<0.5	14.0	<5	23	12.0	0.098	7.3	10.1
	3/3/2012	<0.5	10.0		22		0.309	7.7	
	4/26/2012	0.9	12.3	15	30	13.5	0.044	7.5	8.8
	4/30/2013	2.2							
	5/21/2013	2.2	15.2		20	5.9	0.044	6.6	
	6/25/2013	2.5							
	Average	1.3	12.9	15	24	10.5	0.124	7.3	9.4
S. Fox Creek Intake	11/22/2011	<0.5	11.3		28	8.8	0.042	7.2	9.1
	3/3/2012	<0.5	12.2		29		<0.01	7.6	
	4/26/2012	1.5	12.5	17	30	12.0	0.050	7.5	9.5
	4/30/2013	0.9							
	5/21/2013	2.0	16.0		20	6.9	0.040	6.6	
	6/25/2013	0.5							
	Average	0.9	13.0	17	27	9.2	0.044	7.2	9.3
Finished Water	11/22/2011	<0.5	11.5	<5	48	8.3	0.163	7.3	9.7
	4/26/2012	1.2	13.0	10		11.5	0.049	7.4	9.3
	4/30/2013	1.0							
	5/21/2013	2.8	16.3		30	7.1	0.047	6.3	
	Average	1.3	13.6	10	39	9.0	0.086	7.0	9.5

Attachment E


Chlorine Residual (mg/L)
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
0
0.5
1
1.5
2
2.5
Chlorine Dose (mg/L)
y = 1.0884x - 0.348
R² = 0.9648

Attachment F

FILL LINE

FLOAT CONTROL

FLOAT CONTROL

FILL LINE

FLOAT ACTUATED FILL VALVE

FLOAT ACTUATED FILL VALVE

CLEAR WELL SUPPLY PUMP

FLOW METER

FLOW METER

FINAL STAGE

3RD STAGE

2ND STAGE

1ST STAGE

GAUGE

GAUGE

DRAIN

FOOT VALVE

CLARIFIER

TO DRAIN LINE

RAW WATER SUPPLY FROM INFILTRATION GALLERY

RAW WATER SUPPLY FROM INFILTRATION GALLERY

20 MICROMETER PRE-FILTERS

2" Sch 40 Backwash Drain With Air Gap Field Installed by Contractor

FLUSH PUMP

BAG FILTER

BAG FILTER

BAG FILTER

BAG FILTER

Pressure Switch

PSH

Pre-Membrane Sample Tap

Post-Membrane Sample Tap

Pressure Sustaining Valve CLA-VAL 50-01

Effluent Flow Meter Use Existing

Chemical Feed Chlorination System

HIGH ZONE PUMP STATION

DRAIN

IWT UF 50
(See Detailed Drawing)

Combined Filter Effluent Turbidity

FLOAT CONTROL

CLEAR WELL

1

2

3

Effluent Chlorine Residual Analyzer

Post-Chlorination Sample Tap

ANTI FREEZE SOLENOID

S

LOW ZONE DISTRIBUTION

HIGH ZONE DISTRIBUTION

HIGH ZONE DISTRIBUTION

Legend:

EXISTING EQUIPMENT

NEW EQUIPMENT

1) HACH 1720E, Online Turbidimeter
2) HACH SC200 Controller
3) HACH CL17, Online Chlorine Analyzer
(On-Line Panel will be Wall Mounted)

Notes:

All new pressured pipe and fittings will be Sch. 80 PVC
All new drain pipe and fittings will be Sch. 40 PVC
All pipe modifications will be field determined by Contractor
Pipe Supports, Clamps and Stands field determined by Contractor
New piping will have flow arrows and be color banded
UF50 will be drilled and anchored to concrete floor
100 PSI Pressure Relief Valve will be installed on skid by Manufacturer
Pressure Gauges for each Membrane Module on Control Panel (See Detailed Drawing of the IWT UF50)
Membrane Modules can be programmed to backwash individually while other modules are producing water.

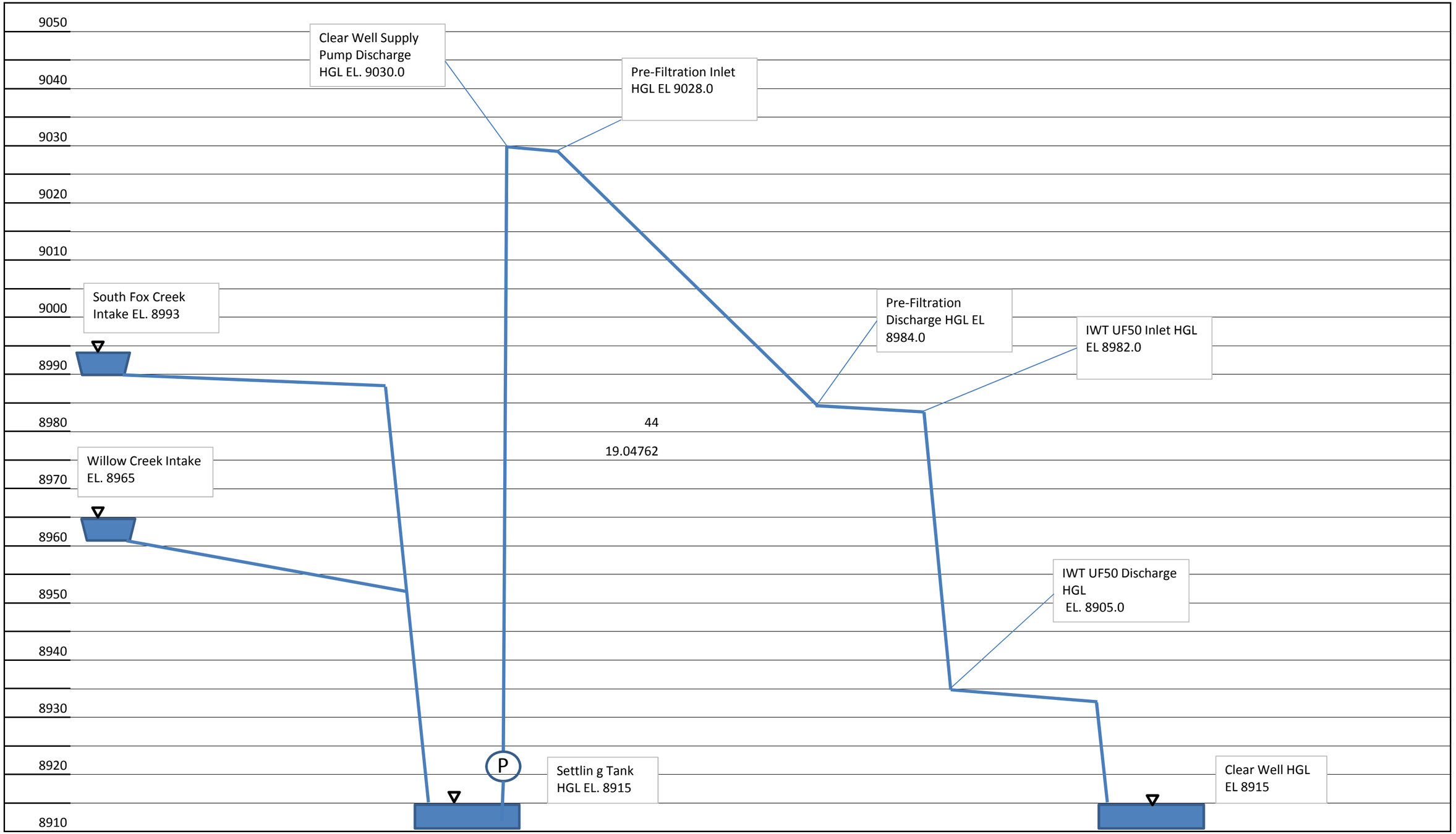
Innovative Water Technologies

MATL	Machine Number: IWT UF50
Checked By Date	Meadow Mountain Water Supply
Drawn By Date: CSP 12/26/13	Revised Drawing of COMWW102 by IWT
Design Approval Date: JEP 12/26/13	Scale: No Scale — Sheet 1 of 1
Revised By: L.A.LLC — Date: 2/14/14	

L:\COMWW102\ACAD\COMWW102_Meadow Mountain Water Supply.dwg, 11x17, 2/14/2014 3:43:26 PM, som, PDF Report Writer

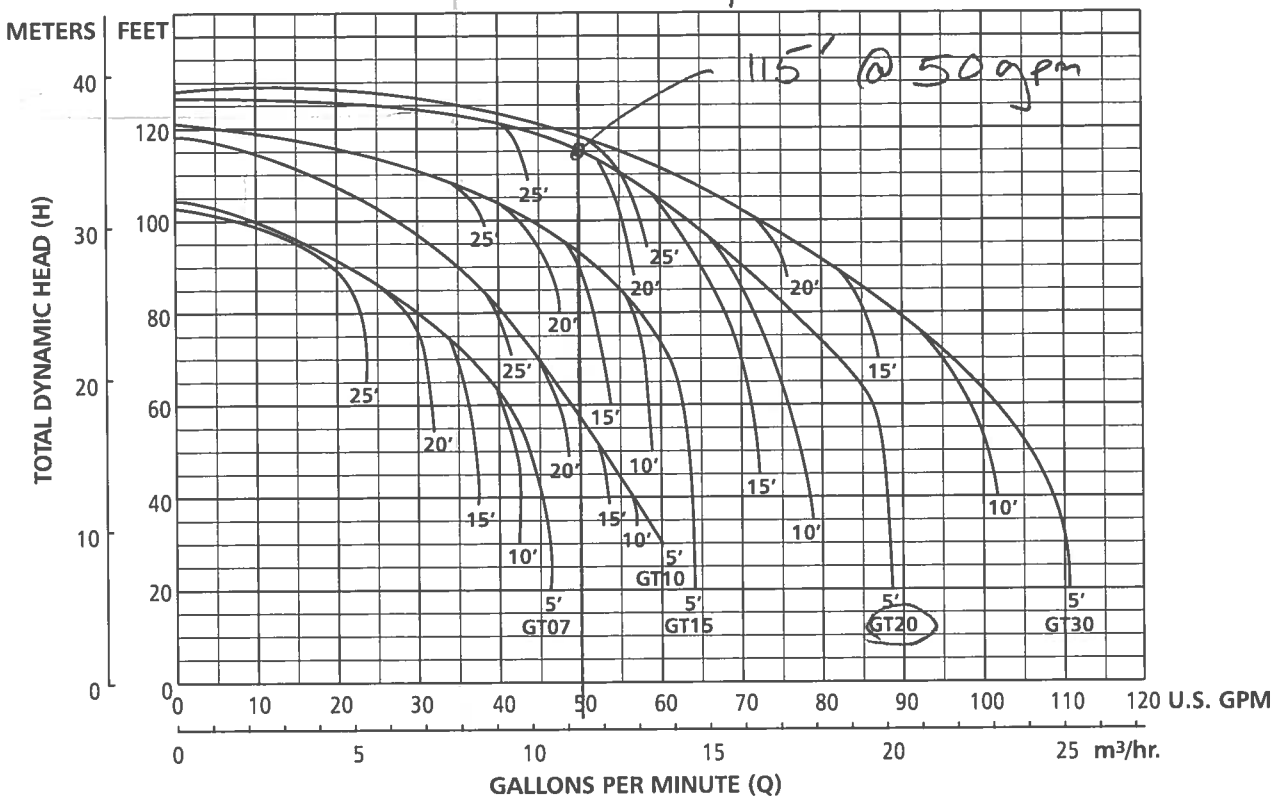
Attachment G

MEADOW MOUNTAIN RAW WATER SUPPLY AND TREATMENT SYSTEM HYDRUALIC PROFILE



PERFORMANCE CURVE

Clearwell Supply Pump



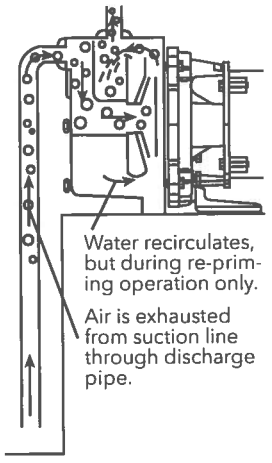
Single and three phase have same performance.

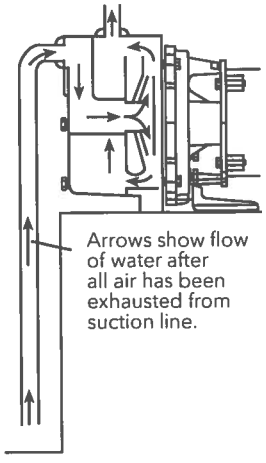
PERFORMANCE RATINGS

Model	PSI Discharge Pressure	Suction Lift in Feet				
		5	10	15	20	25
GT07/ GT073	20	44	41	36	31	24
	30	34	31	26	22	14
	40	10	4	0	0	0
GT10/ GT103	20	53	51	49	46	41
	30	43	41	38	36	32
	40	29	22	16	8	0
GT15/ GT153	20	63	59	54	49	39
	30	60	55	51	46	37
	40	45	38	33	20	14
GT20/ GT203	20	86	77	70	59	46
	30	80	72	67	57	44
	40	65	60	57	50	43
GT30/ GT303	20	105	100	88	76	60
	30	92	90	84	75	57
	40	73	67	62	55	50

Performance ratings are in GPM.

SELF-PRIMING (AFTER INITIAL PRIME)①





Attachment H

STATE OF COLORADO

John W. Hickenlooper, Governor
Christopher E. Urbina, MD, MPH
Executive Director and Chief Medical Officer

Dedicated to protecting and improving the health and environment of the people of Colorado

4300 Cherry Creek Dr. S.
Denver, Colorado 80246-1530
Phone (303) 692-2000
Located in Glendale, Colorado

http://www.cdphe.state.co.us

Laboratory Services Division
8100 Lowry Blvd.
Denver, Colorado 80230-6928
(303) 692-3090

Colorado Department
of Public Health
and Environment

June 23, 2011

Jack Barker
Owner/CEO
Innovative Water Technologies
29625 Industrial Park Road
Rocky Ford, CO 81067

Subject: Updated acceptance of the GE/Zenon Homespring Model UF211 as an Alternative Filtration Technology to meet the *Colorado Primary Drinking Water Regulations* (CPDWR) requirements for *Giardia lamblia* and *Cryptosporidium* Removal

Dear Mr. Barker;

Per our meeting on June 1, 2011, the Water Quality Control Division (the Division) has received and reviewed the additional information for the GE/Zenon Homespring filtration system including its incorporation into the Sunspring filtration system in accordance with Article 1.11.2 and Article 7 of the *Colorado Primary Drinking Water Regulations* (CPDWR). The design meets or exceeds the requirements of the *State of Colorado Design Criteria for Potable Water Systems* and is accepted for use as an Alternative Filtration Technology subject to the performance conditions outlined in Table 1 and the Additional Design Criteria given in Table 2.

The acceptance was revised from both the March 16, 2007 letter to reflect current pre-filter products and membrane skids as well as correct other manufacturer requested modifications. The March 16, 2007 acceptance letter is therefore superseded.

This acceptance addresses the following items:

- GE/Zenon Homespring UF211 filter and housing
- IWT UF 5, 10, 20, 30, 40, 50 pre packaged filtration skids
- IWT Sunspring SS24 and SS36 skids

This acceptance applies only to the GE Homespring Filtration system and associated IWT filtration skids and does not constitute construction approval for installation in public water systems. **Review and construction approval for the design of any public water system proposing to use this technology will be handled on an individual basis by the Division as required by Article 1.11.2 of the *Colorado Primary Drinking Water Regulations* (CPDWR).**

As part of this review, the Division has evaluated the following documents:

- March 16, 2007 Colorado Acceptance of the GE Homespring Filtration Unit

  - June 2005 Bio Vir Laboratories Inc. Purifier Test Report
  - NSF Standard 53 Certification
- Specifications sheet and drawing for the IWT UF 5-50
- Specifications sheet for the Sunspring SS24 and SS36
- WQA Certificate of Compliance (gold seal) for Sunspring SS24 and SS36 (12/20/2010)

Any change orders or addenda that address treatment or piping must be submitted to this office for review and acceptance by the Division prior to use in Colorado by a regulated public water system. This includes any changes made to the UF211 or to the IWT skids including piping layouts and pre-filters. The Division will review any additional third party verification reports and issue a revised acceptance letter if appropriate.

Table 1. Homespring UF211 Conditions of Acceptance:

Compliance Credit Granted to meet the requirements of the CPDWR *	
Giardia lamblia	3.0 – Log
Cryptosporidium	3.0 – Log
Virus	no credit granted
*** NOTE:** Compliance credit awarded is simply for meeting minimum requirements of the CDPWR Article 7 (Surface Water Treatment Rules - SWTR) and does NOT reflect demonstrated performance of the micro or ultrafiltration system in any way. Actual removals in these types of systems can frequently exceed 4.5-5.0 log removal of *Giardia, cryptosporidium,* or testing surrogates. The Division highly recommends that water systems compare manufacturer literature to determine the absolute performance of any system selected. These filters may be used as final compliance filters as part of a multiple treatment barrier approach to meeting SWTR requirements (Article 7, CPDWR). In addition to the above filtration, the water system MUST provide a minimum of **4.0-Log virus inactivation** by disinfection. Also, please note that the Division will evaluate the filter log removal credit and compliance monitoring criteria for systems that are classified as Bin 2 or higher as part of Article 7.4 of the CPDWR on a case- by-case basis.	
Technical Specifications – Membrane Element	
Filter Manufacturer	**GE/Zenon**
Filter Model	**UF211**
Maximum Flow Rate (per filter)	4.5 gallons per minute (valid over temperatures 0 – 30 °C)
Maximum Daily Production (gallons)	5000 gallons per day
Maximum Transmembrane Pressure	40 pounds per square inch differential (psid)
Maximum Inlet Pressure	100 pounds per square inch (psig)
Minimum Outlet Pressure (backpressure)	35 pounds per square inch (psig)
Turbidity Performance Standards	< 0.1 NTU 95% of the time Not to exceed 0.5 NTU

Pre-filtration	Pre-filtration is required when raw water turbidity exceeds **5 NTU.** • Submittals should include at least **6 raw water turbidity measurements**, **TWO** taken in April, **TWO** taken in May and **TWO** taken in June Pre-filtration may consist of filtration previously installed at a facility or proposed new pre-filtration. Individual design submittals will need to provide documentation that proposed pre filtration both: • Meets applicable ANSI/NSF 61 requirements • Removes sufficient turbidity to function as a pretreatment barrier (Can be a statement from the manufacturer).

Table 2: Pre-Accepted IWT Skids Conditions of Acceptance:

Technical Specifications – Skids								
Skid Manufacturer	**IWT**							
Skid Type	**IWT UF**						**Sunspring**	
Skid Model Number	**UF5 – 1 filter**	**UF10 – 2 filters**	**UF20 - 4 filters**	**UF30–6 filters**	**UF40 – 8 filters**	**UF50 – 10 filters**	**SS24 – 1 filter**	**SS36 – 2 filters**
Maximum Daily Production (gallons)	5,000	10,000	20,000	30,000	40,000	50,000	5,000	10,000

Table 3: Homespring/IWT Additional Design Criteria:

Additional Design Criteria
1. Bypass piping to divert water around the filter will not be approved.
2. All systems used for compliance with the CPDWR Article 7 (surface water treatment) shall have the following on EACH filter: a. Influent solenoid valve b. Effluent check valve
3. A means to restrict or control flow across each filter shall be provided (flow restrictor on the effluent of the filter is allowable).
4. A 20 micron prefilter is required for the Homespring units.
5. A means to measure the flow across the filtration process shall be provided.
6. Systems shall provide a discussion justifying how the design flow of 4.5 gpm per filter will be maintained. Water systems design documentation must take into account peaking factors and instantaneous demand for filtration and must not take the daily production (6500 gallons per day) unless there is evidence that the flow is consistent throughout the day. a. Example: If a school is a public water system (operating hours 7 AM to 7 PM daily) and provides the Division information that it utilizes 12,000 gallons per day; they may NOT

only provide two filtration units. While 12,000 gallons per day equates to about 8.5 gpm as an average flow, this doesn't take into account that the school is closed throughout the night and not using water. The school would need to provide justification as to why only two filters would be necessary – perhaps the water plant runs 24 hours per day and fills a tank which can handle the peak demand during the day. If on the other hand, the school only operates the water plant during business hours, they may need to provide three or even four filter units in order to meet the required demand.

7. Pressure gauges shall be installed to properly monitor differential pressure on each filter. The public water system may use differential pressure gauges or individual inlet and outlet gauges and calculate differential pressure. Pressure transducers are an acceptable alternative to permanent gauges. The method of pressure measurement must be called out as part of the design submittal.
8. A pressure relief valve is required on inlet to each set to deploy at 100 psi.
9. The overall water treatment system design shall include provisions for protection from water hammer and pressure surges.
10. Adequate backflow prevention must be provided for the waste line. "Clean in Place" waste shall be properly disposed of via permitted or accepted methods.

Additional Operations and Maintenance Criteria

1. An Integrity Test Kit must be available for each installation and an individual who has obtained the Certified Homespring Technician certificate will be required to conduct integrity tests. Alternately, the Division will waive this requirement if the public water system is operated by a contractor who has the necessary training certificate and possesses a single Integrity Test Kit for multiple systems.
    a. Maintenance and integrity testing shall be performed only by a Certified Homespring Technician. The PWS can either employ an individual who has obtained the Certified Homespring Technician certificate or must have a routine maintenance contract with a Certified Homespring Technician. Article 9 of Title 25, C.R.S., requires that every water treatment facility and water distribution system be under the supervision of a certified operator holding a certificate in a class equal or greater than the minimum class required for the classification of the facility or water system. Please see the CDPHE Water and Wastewater Operators Certification Requirements Regulation 100 for additional information.
2. Integrity tests must be performed at least once per calendar week that the membrane produces treated water for distribution. If a filter fails an integrity test, the filter shall be removed from service immediately and replaced with a functional filter. The Division shall be notified within 24 hours in the event of a treatment failure.
3. The water system shall keep records of the following operational parameters (to be reviewed during a Sanitary Survey):
    a. Integrity test date, results (pass or fail), and initials of person performing the test
    b. CIP dates
    c. Filter replacement date and reason for replacement.
4. Water systems must maintain an operation and maintenance manual for the Homespring filtration system. All integrity tests and CIP procedures shall follow manufacturer prescribed procedures.
5. Chemicals used for CIP shall be certified under ANSI/NSF 60.

Please be aware that any point source discharges of water from treatment facilities are potentially subject to a discharge permit under Colorado's State Discharge Permit System. Any point source discharges to state waters without a permit are subject to civil or criminal enforcement action.

Please direct any further correspondence regarding this acceptance to:

Tyson Ingels, P.E.
Colorado Department of Public Health and Environment
Water Quality Control Division
4300 Cherry Creek Drive South
Denver, CO 80246

If you have any questions or comments, please call Tyson Ingels at 303-692-3002.

Sincerely,

Tyson Ingels, P.E.
Lead Drinking Water Engineer
Engineering Section
Water Quality Control Division

cc: Chia Kung
Global Product Manager – Membranes
Pentair Residential Filtration, LLC
5730 North Glen Park Rd.
Milwaukee, WI 53209

ec: CDPHE-WQCD-ES
CDPHE-WQCD-CA

3M™ 100 Series - High Performance Liquid Filter Bags

The 3M™ 100 series high performance liquid filter bag is constructed of polypropylene melt blown microfibers, allowing for very fine particle capture at high efficiencies. All 3M 100 series liquid filter bags are over 90% efficient at their suggested application rating. The 3M filter offers an excellent balance of high efficiencies with very low initial pressure drops. The bag construction makes this filter an easy to use, convenient, high performance alternative to filter cartridges.

The 3M 100 series liquid filter bag can also adsorb unwanted trace oils that frequently occur in processed fluids. The high amount of surface area due to the polypropylene microfiber construction, results in oil holding capacities from 10-20 times the filter's own weight.

Applications

• Acids and bases	• Machine coolants
• Amines	• Makeup water
• Carbon beds	• Organic solvents
• Completion fluids	• Photo chemicals
• Deep wells	• Plating solutions
• Desalination	• RO membranes
• DI resins	• Storm Water
• Glycol	• Wastewater
• Groundwater clean-up	• Waterflood

Materials of Construction

Filter Media:

Meltblown polypropylene microfiber filter media provides high particle removal efficiency for high quality filtration with broad chemical compatibility.

No silicone is intention ally used in materials of construction or in manufacturing.

The raw materials composing these filters are FDA compliant according to CFR Title 21.

Sealing Ring:

Available in "A" - Stainless Steel, and "B" - Polypropylene
Available in "P" - Polypropylene Collar*

Performance Data

Loading Capacity

Product Model Number	123	124	125	126	128
Dirt - grams at 25 gpm (5.6 cu m/hr)	125	121	146	155	351
Mineral Oil - grams at saturation	1385	2280	2050	1640	2845

*Only on 128 grade.

Loading: The data above shows typical loading capacities of the different micron rated filters. Loading capacity is determined by challenging a filter with a dispersion of silica test dust in water at the recommended flow rate. Pressure drop is monitored and testing is terminated at 35 psid (2.4 bar). The loading capacity reported is the dry weight gain of the bag.

Particle Removal Efficiency (microns)

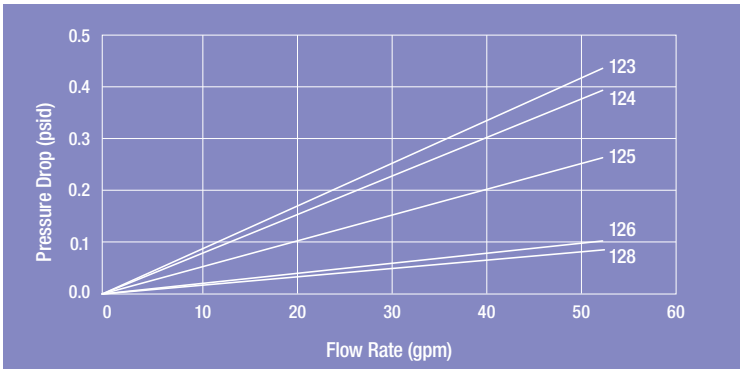
Product Number	123	124	125	126	128
Efficiency @95%	1.5	2.5	7.5	10 .0	34.0
Efficiency @90%	1.3	1.3	6.5	8.0	29.0
Efficiency @75%	0.9	1.0	2.5	7.0	21.0
Efficiency @50%	<0.7	<1.0	<1.0	4.5	7.0

Efficiency: The Series 100 High Performance Filter Bags are rated using a silica test challenge in water at 25 gpm (5.7 cu m/hr). The results reported are typical initial efficiencies taken within ten minutes of the start of the test and are cumulative data.

Operating Conditions

Maximum Operating Temperature:	180° F (82° C)
Recommended Flow (in water):	25 gpm (5.7 cu m/hr
Suggested Maximum Flow (in water):	50 gpm (11 cu m/hr)
Suggested Maximum Differential Pressure:	35 psid (2.4 bar)

Clean Pressure Drop Versus Flow Rate (psid)



Pressure Drop: The Series 100 High Performance Filter Bags have low initial pressure drop (Δp) in water as the chart indicates. The chart includes the pressure drop of a typical single vessel to assist you in sizing your filter system.

Disposal

Disposal of used filter bags must comply with applicable federal, state and local laws and regulations.

Product Specifications

Product Model Number	Sealing Ring Material	Micron Rating Initial Efficiency	Part Number	Length	Bags per Case
113A	Stainless Steel	1.5 micron @ 95%	70-0202-3727-0	110 Series #1 Size: 16 in (41 cm)	10
113B	Polypropylene		70-0202-2776-8		
113D	Stainless Steel		70-0202-3728-8		
114A	Stainless Steel	2.5 micron @ 95%	70-0202-3729-6		
114B	Polypropylene		70-0202-2779-2		
114D	Stainless Steel		70-0202-3730-4		
115A	Stainless Steel	7.5 micron @ 95%	70-0202-3731-2		
115B	Polypropylene		70-0202-2782-6		
115D	Stainless Steel		70-0202-2783-4		
116A	Stainless Steel	10 micron @ 95%	70-0202-3732-0		
116B	Polypropylene		70-0202-2785-9		
116D	Stainless Steel		70-0202-3733-8		
118A	Stainless Steel	34 micron @ 95%	70-0202-3734-6		
118B	Polypropylene		70-0202-2788-3		
118D	Stainless Steel		70-0202-2789-1		
123A	Stainless Steel	1.5 micron @ 95%	70-0202-2790-9	120 Series #2 Size: 32 in (81 cm)	10
123B	Polypropylene		70-0202-3736-1		
123D	Stainless Steel		70-0202-3737-9		
124A	Stainless Steel	2.5 micron @ 95%	70-0202-3738-7		
124B	Polypropylene		70-0202-3739-5		
124D	Stainless Steel		70-0202-3740-3		
125A	Stainless Steel	7.5 micron @ 95%	70-0202-3874-0		
125B	Polypropylene		70-0202-3741-1		
125D	Stainless Steel		70-0202-2798-2		
126A	Stainless Steel	10 micron @ 95%	70-0202-3742-9		
126B	Polypropylene		70-0202-3743-7		
126D	Stainless Steel		70-0202-2801-4		
128A	Stainless Steel	34 micron @ 95%	70-0202-3744-5		
128B	Polypropylene		70-0202-3745-2		
128D	Stainless Steel		70-0202-2804-8		
128P	Polypropylene Collar		70-0202-9267-1		8

Sealing Ring Diameters: "A" Versions: 7.03" (17.9 cm), "B" Versions: 7.20" (18.3cm), "C" Versions: 7:00" (17.8 cm)

Important Notice

The information described in this literature is accurate to the best of our knowledge. A variety of factors, however, can affect the performance of the Product(s) in a particular application, some of which are uniquely within your knowledge and control. **INFORMATION IS SUPPLIED UPON THE CONDITION THAT THE PERSONS RECEIVING THE SAME WILL MAKE THEIR OWN DETERMINATION AS TO ITS SUITABILITY FOR THEIR USE. IN NO EVENT WILL 3M PURIFICATION INC. BE RESPONSIBLE FOR DAMAGES OF ANY NATURE WHATSOEVER RESULTING FROM THE USE OF OR RELIANCE UPON INFORMATION.**

It is your responsibility to determine if additional testing or information is required and if this product is fit for a particular purpose and suitable in your specific application.

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3M

Your Local Distributor:

3M Purification Inc.
400 Research Parkway
Meriden, CT 06450
U.S.A.
Phone (800) 243-6894
(203) 237-5541
Fax (203) 630-4530
www.3Mpurification.com

70070812873 REV 0213b

Attachment I

MEADOW MTN WATER SUPPLY
Calendar Year 2014 Monitoring Schedule
Mailing Address: PO BOX 354 ALLENSPARK, CO 80510

Public Water System ID	Water System Name	Primary County	Federal System Type	State Source Type	Population
CO0207504	MEADOW MTN WATER SUPPLY	BOULDER	Community	Surface Water	80

Minimum Certification Required for Treatment Operator	Minimum Certification Required for Distribution System Operator
D	1

Contact Information

All public water systems are required to maintain an Administrative Contact, Treatment Operator (if applicable), and Distribution System Operator (if applicable). If the information below is incorrect or blank please send us a contact update form. This form is available by visiting http://wqcdcompliance.com. The contact update form is located under 'Facility Operator Certification'.
For operator certification information please visit http://www.ocpoweb.com. You may search for individual operator certification levels/expirations by clicking on the 'Information' menu bar and selecting 'State Certified Operators'.

Administrative Contact	Treatment Operator	Distribution System Operator	Owner
RACHEL BARKWORTH	STEPHEN TEDFORD	ANDREW GRIFFITHS	

General Information

The Drinking Water Monitoring Schedule is provided for your reference and to assist in developing your sampling schedule. An example schedule has been posted to http://wqcdcompliance.com/schedules. Schedules will be posted to the website every Wednesday to show up-to-date information (please allow a few weeks for us to process your sample results data). If you have questions about your schedule please contact your representative (contact information) or call us at 303-692-3556.

Laboratory sampling results may be submitted to the Compliance Assurance Unit via email to cdphe.drinkingwater@state.co.us or fax 303-758-1398. Please do not email results directly to Compliance Assurance personnel unless otherwise directed. Please remember to use the Sample Point ID and the Facility ID (listed below) on all state reporting forms when submitting laboratory sample results.

- All systems on a **3 year Lead and Copper** schedule must sample during the **calendar year and months specified** in the 'Lead and Copper Sample Schedule' under the 'Distribution System Sample Schedules' section.

Monitoring Information

Distribution System Sample Schedules

Facility ID	Facility Name	Facility Type
DS001	DISTRIBUTION SYSTEM	Distribution System

Microorganisms and Disinfectants

TOTAL COLIFORM BACTERIA (TCR) Sample Schedule:

1 sample(s) **per Month** during the collection period

Collection Period:

January 1, 2014 to December 31, 2014

CHLORINE Sample Schedule:

Measure **every time** you collect a TOTAL COLIFORM BACTERIA (TCR) sample

Distribution System Sample Schedules

Facility ID	Facility Name	Facility Type
DS001	DISTRIBUTION SYSTEM	Distribution System

Disinfection Byproducts

TTHMs and HAA5s (Stage 2) Sample Schedule:

1 sample(s) **per sample point** for a **TOTAL of 1 sample(s) per Year**

Collection Period:

August 1, 2014 to August 31, 2014

Collection Restriction:* Sample(s) **must be collected between August 1 and August 31*

State Sample Point ID(s) (System Location ID(s)):
DBP001 (HIGH DBP SITE - UNDEFINED - CONTACT WQCD)

Lead and Copper

LEAD AND COPPER Sample Schedule:

5 sample(s) **must be collected every 3 Years**

Collection Period:

June 1, 2016 to September 30, 2016

Collection Restriction:* Sample(s) **must be collected between June 1, 2016 and September 30, 2016*

Non-Distribution System Sample Schedules

Facility ID	Facility Name	Facility Type	Sample Point ID	Sample Point Name	Sample Point Type
001	MEADOW MTN SWTP01	Treatment Plant	001	ENTRY POINT	Entry Point

Daily Schedules

CHLORINE (EPRD) Sample Schedule:

1 sample(s) **per Day** during the collection period

Collection Period:

While Operating

TURBIDITY (CFE) Sample Schedule:

1 sample **per Day** during the collection period

Collection Period:

While Operating

Note: Sample collected at a location representative of the combined filtered water

Yearly Schedules

NITRATE Sample Schedule:

1 sample(s) **per Year**

Collection Period:

January 1, 2014 to December 31, 2014

VOLATILE ORGANICS GROUP Sample Schedule:

1 sample(s) **per Year**

Collection Period:

January 1, 2014 to December 31, 2014

3 Year Schedules

SYNTHETIC ORGANICS GROUP Sample Schedule:

1 sample(s) **per 3 Years**

Collection Period:

January 1, 2014 to December 31, 2016

9 Year Schedules

FLUORIDE Sample Schedule:

1 sample(s) **per 9 Years**

Collection Period:

January 1, 2011 to December 31, 2019

INORGANICS GROUP Sample Schedule:

1 sample(s) **per 9 Years**

Collection Period:

January 1, 2011 to December 31, 2019

Non-Distribution System Sample Schedules

Facility ID	Facility Name	Facility Type	Sample Point ID	Sample Point Name	Sample Point Type
001	MEADOW MTN SWTP01	Treatment Plant	001	ENTRY POINT	Entry Point

9 Year Schedules

NITRITE Sample Schedule:

1 sample(s) **per 9 Years**

Collection Period:

January 1, 2011 to December 31, 2019

Satisfied Schedules

COMBINED RADIUM (-226 & -228) Sample Schedule:

1 sample(s) **per 9 Years**

Collection Period:

~~January 1, 2011 to December 31, 2019~~
****Sample Result(s) Received****

COMBINED URANIUM Sample Schedule:

1 sample(s) **per 9 Years**

Collection Period:

~~January 1, 2011 to December 31, 2019~~
****Sample Result(s) Received****

GROSS ALPHA, WITHOUT RADON & URANIUM Sample Schedule:

1 sample(s) **per 9 Years**

****Collection Restriction:*** Sample(s) **must** be collected at the **same time** as the COMBINED URANIUM sample(s)*

Collection Period:

~~January 1, 2011 to December 31, 2019~~
****Sample Result(s) Received****

Compliance Schedules

CCR Compliance Schedule
Your 2014 *DRAFT* CCR will be posted at http://wqcdcompliance.com/ in March

Activity Name	Activity Due Date	Activity Completion Date
SUBMIT CCR REPORT TO STATE	June 30, 2014	Activity Not Completed
SUBMIT CERTIFICATE OF DELIVERY	June 30, 2014	Activity Not Completed

Facility Specific Levels

Facility ID	Facility Name	Facility Type
DS001	DISTRIBUTION SYSTEM	Distribution System
Analyte Name	**Level**	**Level Type**
CHLORINE	Detectable	Minimum
CHLORINE	4.0 mg/L	Maximum
Facility ID	**Facility Name**	**Facility Type**
001	MEADOW MTN SWTP01	Treatment Plant
Analyte Name	**Level**	**Level Type**
TURBIDITY	5 NTU	Maximum
TURBIDITY	1 NTU	95th Percentile
CHLORINE	0.2 mg/L	Minimum

Facility Information			Sample Point Information	
Facility ID	**Facility Name**	**Facility Type**	**Sample Point ID**	**Sample Point Name**
001	MEADOW MTN SWTP01	Treatment Plant	001	ENTRY POINT
002	WILLOW CREEK	Intake	002	RAW WATER
003	FOX CREEK	Intake	003	RAW WATER
DS001	DISTRIBUTION SYSTEM	Dist System/Zone	DBP001	HIGH DBP SITE - UNDEFINED - CONTACT WQCD
			RPDN	REPEAT DOWNSTREAM
			RPOR	REPEAT ORIGINAL
			RPOT	REPEAT OTHER
			RPUP	REPEAT UPSTREAM
			RTOR	ROUTINE ORIGINAL

Time Period Definitions		
Time Period	**Start Date**	**End Date**
First Quarter	January 1, 2014	March 31, 2014
Second Quarter	April 1, 2014	June 30, 2014
Third Quarter	July 1, 2014	September 30, 2014
Fourth Quarter	October 1, 2014	December 31, 2014
First 6 Months	January 1, 2014	June 30, 2014
Second 6 Months	July 1, 2014	December 31, 2014
Year	January 1, 2014	December 31, 2014

Analyte Group Definitions		
Analyte Group Name	**Analytes in Group**	**Number of Analytes in Group**
INORGANICS GROUP	ANTIMONY | ARSENIC | BARIUM | BERYLLIUM | CADMIUM | CHROMIUM | MERCURY | NICKEL | SELENIUM | SODIUM | THALLIUM	11
SYNTHETIC ORGANICS GROUP	1,2-DIBROMO-3-CHLOROPROPANE | 2,4,5-TP | 2,4-D | ALDICARB | ALDICARB SULFONE | ALDICARB SULFOXIDE | ATRAZINE | BENZO(A)PYRENE | BHC-GAMMA | CARBOFURAN | CHLORDANE | DALAPON | DI(2-ETHYLHEXYL) ADIPATE | DI(2-ETHYLHEXYL) PHTHALATE | DINOSEB | DIQUAT | ENDOTHALL | ENDRIN | ETHYLENE DIBROMIDE | HEPTACHLOR | HEPTACHLOR EPOXIDE | HEXACHLOROBENZENE | HEXACHLOROCYCLOPENTADIENE | LASSO | METHOXYCHLOR | OXAMYL | PENTACHLOROPHENOL | PICLORAM | SIMAZINE | POLYCHLORINATED BIPHENYLS (PCB) | TOXAPHENE	31

Analyte Group Definitions		
Analyte Group Name	**Analytes in Group**	**Number of Analytes in Group**
VOLATILE ORGANICS GROUP	1,1,1-TRICHLOROETHANE | 1,1,2-TRICHLOROETHANE | 1,1-DICHLOROETHYLENE | 1,2,4-TRICHLOROBENZENE | 1,2-DICHLOROETHANE | 1,2-DICHLOROPROPANE | BENZENE | CARBON TETRACHLORIDE | CHLOROBENZENE | CIS-1,2-DICHLOROETHYLENE | DICHLOROMETHANE | ETHYLBENZENE | O-DICHLOROBENZENE | P-DICHLOROBENZENE | STYRENE | TETRACHLOROETHYLENE | TOLUENE | TRANS-1,2-DICHLOROETHYLENE | TRICHLOROETHYLENE | VINYL CHLORIDE | XYLENES (TOTAL)	21

Attachment J

Estimated Residuals for the Meadow Mountain Water Plant

Settling Tank Wastewater Production

Vacuum/Flow Rate (gpm)	Average Time To Vacuum Tank Bottom (min)	Frequency of Cleanings Per Week	Flow Rate (gal/week)	Flow Rate (gpd)
Enter	Enter	Enter	Calc	Calc
50	30	1	1500	214

Settling Tank Residuals Production (No Coagulant Added)

Average Flow Rate (gpm)	Average Flow Rate (gpd)	Estimated Turbidity Removed NTU	*Sludge Produced g TSS/m^3 NTU	Sludge Produced (lbs/day)
Enter	Enter	Enter	Enter	Calc
35	50,400	1	1	0.421

Backwash Water Production

Gallons per Backwash (gal/BW)	Number of Backwashes Per Day Per Module (BW/day)	Number of Modules	Number of Backwashes Per Day (BW/day)	Flow Rate (gpd)
Enter	Enter	Enter	Enter	Calc
14	4	10	40	560

Backwash Solids Production

Average Flow Rate (gpm)	Average Flow Rate (gpd)	Estimated Turbidity Removed NTU	*Sludge Produced g TSS/m^3 NTU	Sludge Produced (lbs/day)
Enter	Enter	Enter	Enter	Calc
35	50,400	1	1	0.421

*MWH, Water Treatment Principles and Design, 2nd Addition, Page 1658, Table 20-4

Notes:

1. Maximum turbidity during runoff is 2.5 ntu. Assume 20um filter bags remove 0.5 ntu.
2. Number of backwashes and backwashes per day provided by Membrane Filter Supplier (SunSpring Innovative Water Technologies).

Attachment K

SUBMIT TO:
Jennifer.Hanke@state.co.us
CDPHE
HMWMD-SWP-B2
4300 Cherry Creek Dr. S.
Denver, CO 80246-1530

Waste Impoundment IPCR Cover Sheet
(to be electronically submitted with the IPCR)
(6 CCR 1007-2 Section 9.1.8)

Solid Waste and Materials Management Program
(303) 692-3408

Colorado Department of Public Health and Environment

Sec. I – FACILITY INFORMATION	**All Sites Complete**					
Facility Name	Meadow Mountain Water Treatment Plant			**Date**	02/20/2014	
Location Address with City & Zip *(Or Optional Property Description Below)*	137 Meadow Mountain Drive, P.O. Box 162, Allenspark, CO, 80510			**County**	Boulder	
Township	3N	Range	73W	Section	26	
Latitude	40.1935 N	Longitude	105.5410 W	**Operating/ Active?**	_X Yes ___No	
Government Facility	___Federal _____State ___County __X__Municipal ___N/A			**Commercial**	__Yes _X_No	
Facility Type	Water Treatment Facility Backwash Pond					
Facility Notes						

Sec. II – CONTACT (AND BILLING) INFORMATION		
Contact Type	Please check all that apply for this person: _X_ Primary Contact _X_Owner ___Operator _ Billing ___Other: _____	
Full Name	Rachel Barkworth	**Phone # 303-823-2318**
Title	President of Triple Creek Ranch Homeowners	**Cell # 303-261-2246**
Organization Name	Meadow Mountain Water Supply Company	**Fax #**
Mailing Address	P.O. Box 354, Allenspark, CO 80510	
Email Address	rcbarkworth@yahoo.com	
Contact Type	Please check all that apply for this person: __ Primary Contact ___Owner _X_Operator ___Billing ___Other: _____	
Full Name	Steve Tedford	**Phone # 303-747-2066**
Title	Water Treatment Plant Operator	**Cell #**
Organization Name	Meadow Mountain Water Supply Company	**Fax #**
Mailing Address	P.O. Box 394, Allenspark, CO 80510	
Email Address	sbtedford@msn.com	
Contact Type	Please check all that apply for this person: __ Primary Contact _X_Owner ___Operator _X_Billing ___Other: _____	
Full Name	Barry Mauerman	**Phone # 303-747-0317**
Title	Treasurer MMWSC	**Cell #**
Organization Name	Meadow Mountain Water Supply Company	**Fax #**
Mailing Address	P.O. Box 354, Allenspark, CO, 80510	

Email Address	mauerman@nedernet.net	
Contact Type	Please check all that apply for this person: __ Primary Contact _X_Owner __Operator __Billing __Other: _____	
Full Name	Warren Krise	**Phone # (970) 667-8999**
Title	President MMWSC	**Cell #**
Organization Name	Meadow Mountain Water Supply Company	**Fax #**
Mailing Address	453 Clubhouse Court, Loveland, CO 80537	
Email Address	dwkrise@comcast.net	

Complete Applicable Sections

PCR = Impoundment and Preliminary Classification Report

ıpoundment Name	Impoundment Location	Proposed Type A	Proposed Type B	Description of Waste Managed (if known)	IPCR Approved Y/N (CDPHE use)	Demonstration Plan Needed (Y/N/Unknowr (CDPHE use)
verflow/Backwash Pond	Refer to Page 1 Section 1	X		Unknown, Demonstration Plan to be submitted.		

Submitted By: __Warren Krise Date of Submittal: 02-20-2014_____
Phone Number: 970-667-8999

Title of Response Letter: _____ Date of Response: _____

Comments:

le Code 3.15.1
acility in SharePoint: ____
oject in SharePoint: ____
ocument sent to Records Center: ____
ectronic/Paper copy provided to Permitter: _____ / Format: _____

Attachment L

DRAWINGS INDEX

- Site Map
- Plant Process Flow Diagram
- IWT UF50 Membrane Skid
- Plant Scaled Floor Plan
- Clearwell/Tank Baffle Plan
- Turbidimeter Well Installation Detail

TO ALLENSPARK

OVERFLOW POND

WATER TREATMENT PLANT

RECREATION AREA PARKING

SOUTH FOX CREEK DIVERSION

HIGH PRESSURE STATION

WILLOW CREEK DIVERSION

North Skinner Rd.

South Skinner Rd.

Meadow Mountain Dr.

SCALE IN FEET

0 200' 400' 800'

N

MEADOW MOUNTAIN WATER SUPPLY COMPANY

PROJECT NUMBER: COMMW102	ENGINEER: KAS
DRAWN DATE: 2/14/14	CHECKED: KAS
FILE: COMMW102-5FT CONT-BASE CO83-NF.DWG	APPROVED: KAS

SYSTEM MAP

MAP 1

REVISIONS:

Lidstone and Associates, Inc.
Engineering, Geology, & Water Resource Consulting

LEGEND

CRITICAL INFRASTRUCTURE

VALVE

BLEEDER

CREEK

MANHOLE

WETLANDS

SERVICE LINE

HYDRANT

INTAKE

PIPE LINES

4.0 IN.

2.5 IN.

2.0 IN.

1.5 IN.

0.75 IN.

FILL LINE

FLOAT CONTROL

FLOAT CONTROL

FILL LINE

FLOAT ACTUATED FILL VALVE

FLOAT ACTUATED FILL VALVE

CLEAR WELL SUPPLY PUMP

FLOW METER

FLOW METER

FINAL STAGE

3RD STAGE

2ND STAGE

1ST STAGE

GAUGE

GAUGE

DRAIN

FOOT VALVE

CLARIFIER

TO DRAIN LINE

RAW WATER SUPPLY FROM INFILTRATION GALLERY

RAW WATER SUPPLY FROM INFILTRATION GALLERY

20 MICROMETER PRE-FILTERS

2" Sch 40 Backwash Drain With Air Gap Field Installed by Contractor

FLUSH PUMP

BAG FILTER

BAG FILTER

BAG FILTER

BAG FILTER

Pressure Switch

PSH

Pre-Membrane Sample Tap

Post-Membrane Sample Tap

Pressure Sustaining Valve CLA-VAL 50-01

Effluent Flow Meter Use Existing

Chemical Feed Chlorination System

HIGH ZONE PUMP STATION

DRAIN

IWT UF 50
(See Detailed Drawing)

Combined Filter Effluent Turbidity

FLOAT CONTROL

CLEAR WELL

1

2

3

Effluent Chlorine Residual Analyzer

Post-Chlorination Sample Tap

ANTI FREEZE SOLENOID

S

LOW ZONE DISTRIBUTION

HIGH ZONE DISTRIBUTION

HIGH ZONE DISTRIBUTION

Legend:

EXISTING EQUIPMENT

NEW EQUIPMENT

1) HACH 1720E, Online Turbidimeter
2) HACH SC200 Controller
3) HACH CL17, Online Chlorine Analyzer
(On-Line Panel will be Wall Mounted)

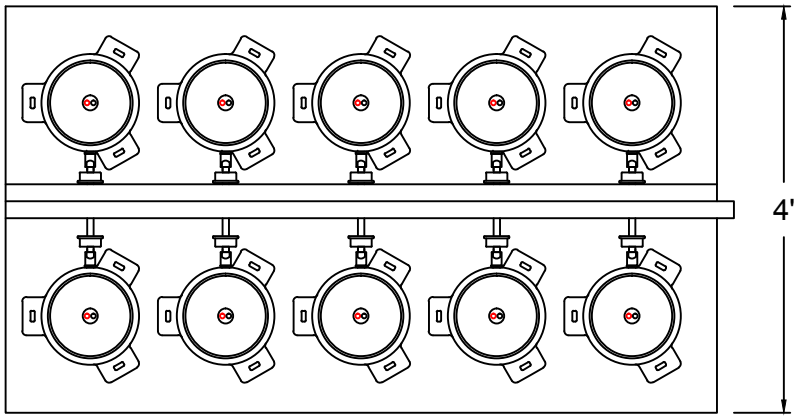
Notes:

All new pressured pipe and fittings will be Sch. 80 PVC
All new drain pipe and fittings will be Sch. 40 PVC
All pipe modifications will be field determined by Contractor
Pipe Supports, Clamps and Stands field determined by Contractor
New piping will have flow arrows and be color banded
UF50 will be drilled and anchored to concrete floor
100 PSI Pressure Relief Valve will be installed on skid by Manufacturer
Pressure Gauges for each Membrane Module on Control Panel (See Detailed Drawing of the IWT UF50)
Membrane Modules can be programmed to backwash individually while other modules are producing water.

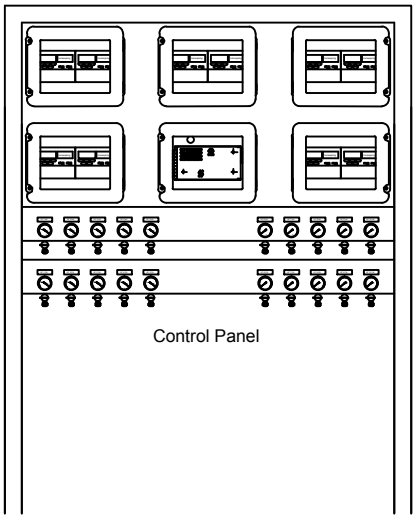
Innovative Water Technologies

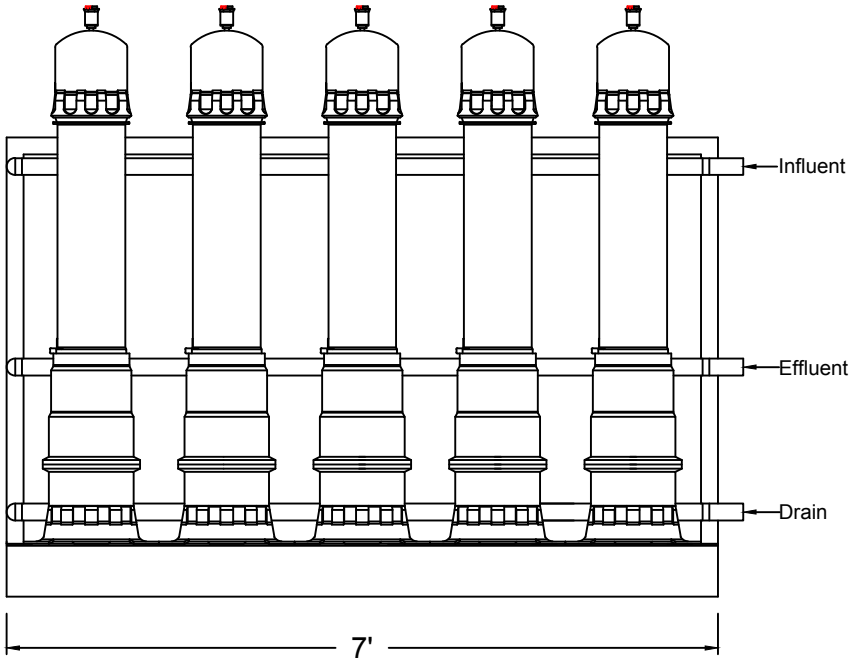
MATL	Machine Number: IWT UF50
Checked By Date	Meadow Mountain Water Supply
Drawn By Date: CSP 12/26/13	Revised Drawing of COMWW102 by IWT
Design Approval Date: JEP 12/26/13	Scale: No Scale — Sheet 1 of 1
Revised By: L.A.LLC — Date: 2/14/14	

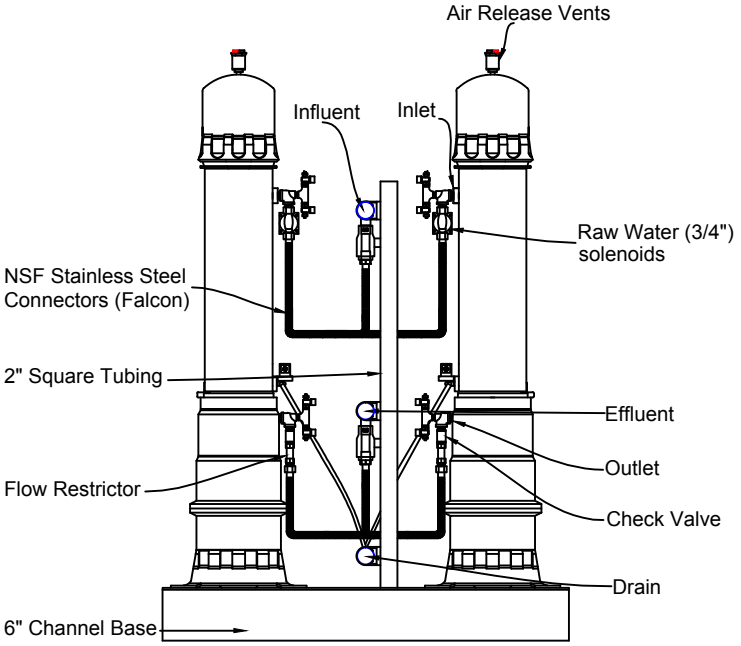
L:\COMWW102\ACAD\COMWW102_Meadow Mountain Water Supply.dwg, 11x17, 2/14/2014 3:43:26 PM, som, PDF Report Writer



GE UF211 Homesprings (10)



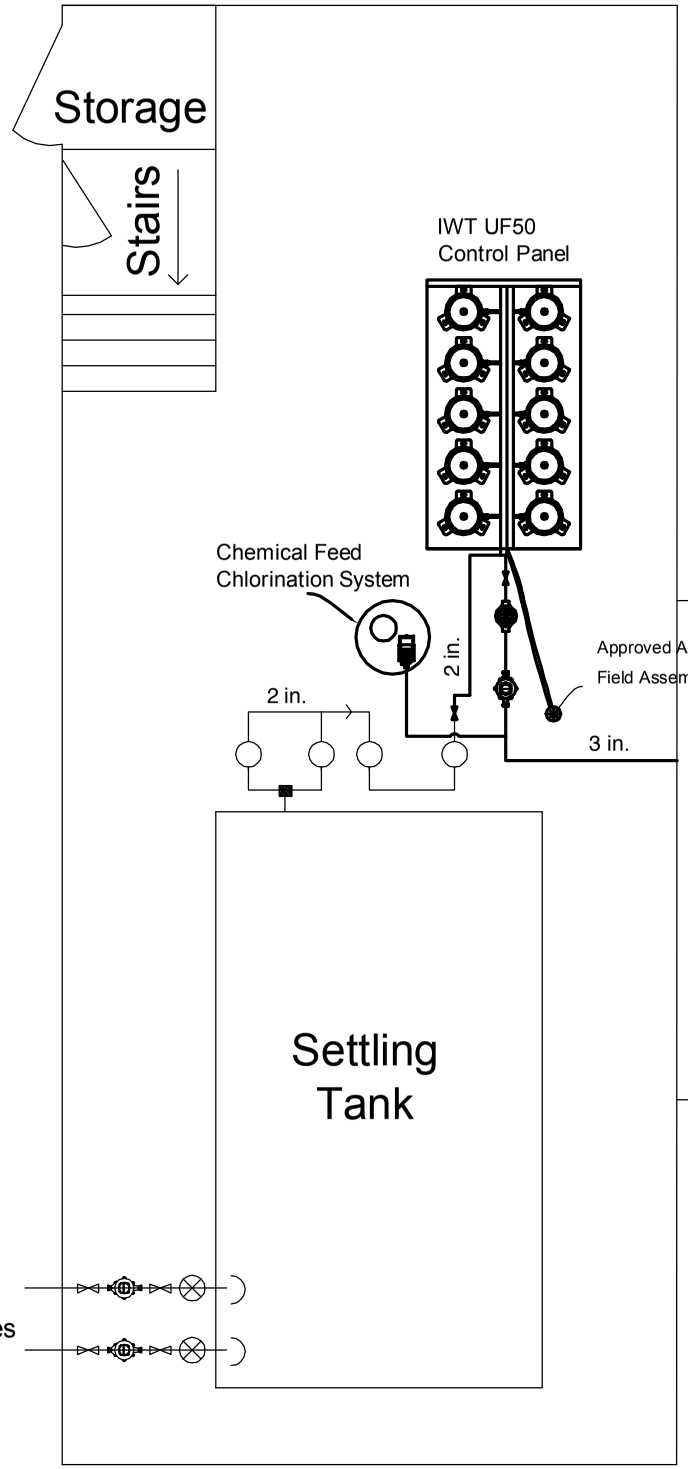




Right Side View

rethinking water
Innovative Water Technologies

MATL: Aluminum	Meadow Mountain Water Supply
Revised Date	Part Description: IWT UF 50
Drawn By Date: CSP12/26/13	Part Number:
Design Approval Date: JEB 12/26/13	Scale: / Sheet 1 of 1



Key:

- Float Activated Fill Valve
- Clearwell Supply Pump
- 20 Micron Pre-Filters
- Pressure Sustaining Valve
- Flow Meter
- Isolation Ball Valve

Plant Configuration and Piping can change as needed in field. (Field Fit)

IWT responsibilities does not include any new Pumps. Existing raw water pumps "Clearwell Supply Pump" will provide pressure and flow required for the new system.

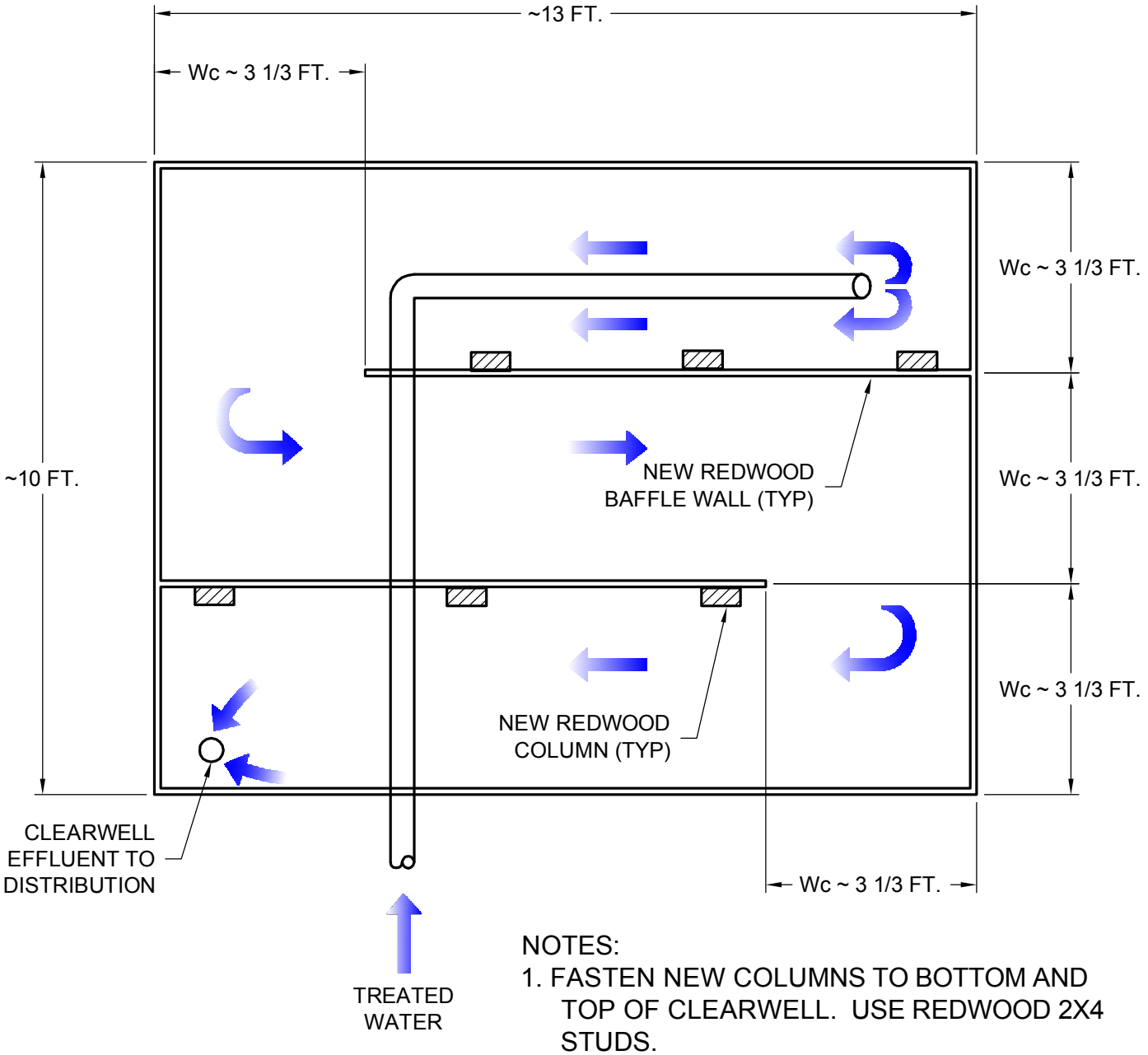
Online Analyzers location will be field determined by System Owner and Operator.

Additional Valving and Sample Taps will be installed to CDPHE specifications, per Process Flow Diagram

rethinking water
Innovative Water Technologies

MATL	Machine Number:
Checked By Date	Meadow Mountain Treatment Facility
Drawn By Date: CSP 2/10/14	Scaled Floor Plan
Revised By Date: LA,LLC 2/14/14	Approved By Date: JEB 2/10/14
Scale: 0 ft. 5 ft.	Sheet 1 of

Ellerbeck and Associates, Inc.
Engineering, Geology & Water Resource Consulting

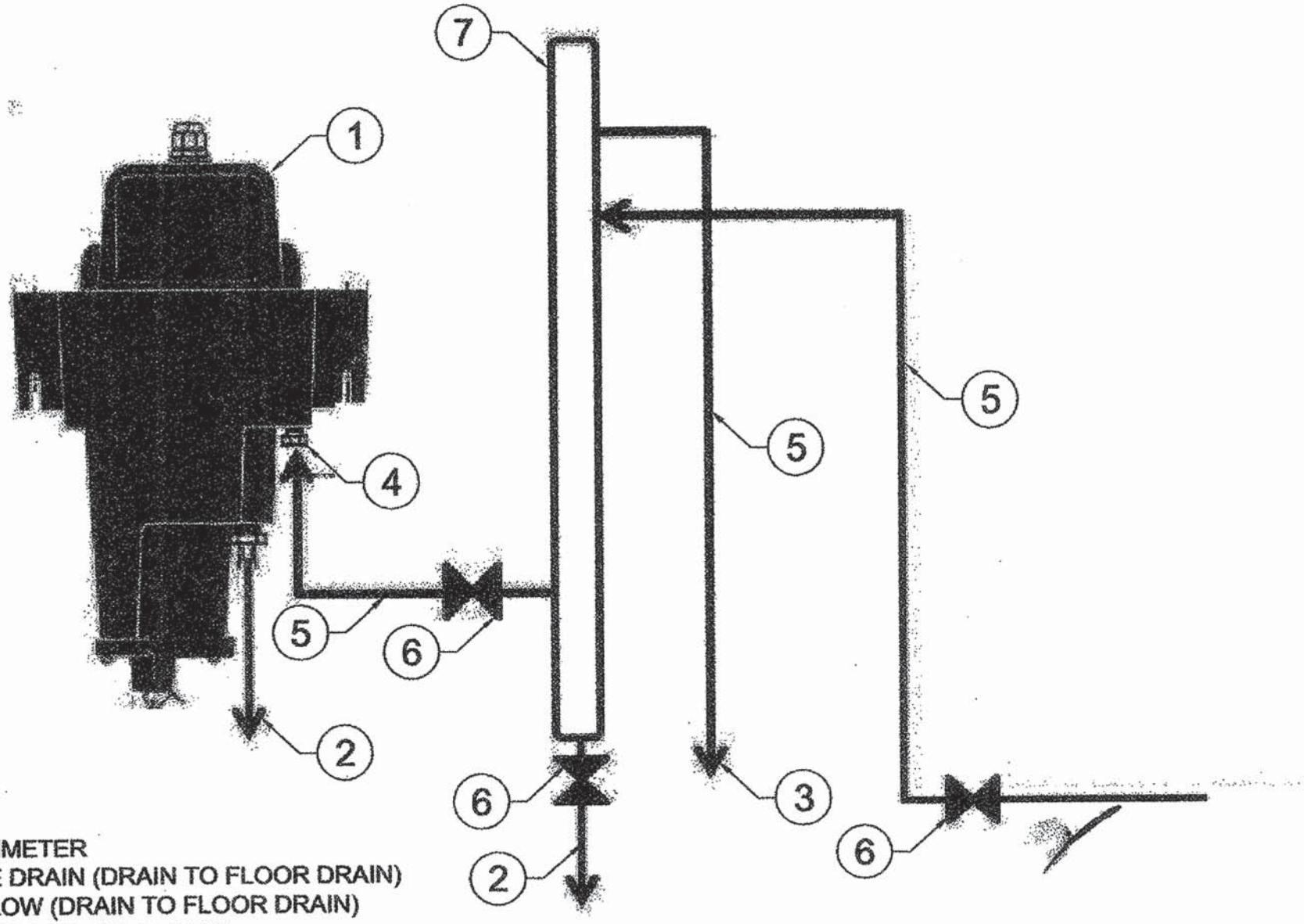


NOTES:

1. FASTEN NEW COLUMNS TO BOTTOM AND TOP OF CLEARWELL. USE REDWOOD 2X4 STUDS.
2. FASTEN REDWOOD 2X8 BOARDS TO COLUMNS TO BUILD WALL. USE 1/2-INCH CARRIAGE BOLTS, 1 PER COLUMN.
3. CLEAN AND DISINFECT CLEARWELL ACCORDING TO AWWA C652.

PROJECT: COMMW102	PROPOSED BAFFLING PLAN IN 6,000 GALLON CLEARWELL / STORAGE TANK
DATE: 2/14/14	
ENGINEER: KAS	
CHECKED: CDL	
REVISIONS: RDD	

Lidstone and Associates, Inc.
Engineering, Geology, & Water Resource Consulting



1. TURBIDIMETER
2. SAMPLE DRAIN (DRAIN TO FLOOR DRAIN)
3. OVERFLOW (DRAIN TO FLOOR DRAIN)
4. SAMPLE INLET (1/4 IN. NPT)
5. CLEAR FLEXIBLE TUBING
6. PVC BALL VALVE
7. SAMPLE WELL (1 IN. PVC PIPE WITH TEES AND CAPS. DRILL 1/4 iN. HOLE IN TOP CAP TO VENT

NOTE: MOUNT EQUIPMENT TO EQUIPMENT PANEL

TURBIDIMETER WALL INSTALLATION DETAIL

NOT TO SCALE

5
D101

Attachment M

SPECIFICATIONS INDEX

SECTION 11300
ULTRAFILTRATION MEMBRANE SYSTEM

1. General

1.1 DESCRIPTION

.1 This section contains the requirements for a pressure ultrafiltration (UF) membrane equipment system packaged water treatment plant, for the treatment of surface water.

.2 This section specifies the overall performance requirements and operation of the UF membrane system. .

1.2 REFERENCE STANDARDS

.1 Refer to CDPHE Design Criteria for Potable Water Systems and CDPHE Primary Drinking Water Regulations.

1.3 PROCESS DESCRIPTION

.1 The UF Membrane process shall utilize a modular system of hollow fiber, self supporting, non-woven, porous media, composed of a polymeric material, capable of being individually integrity tested, with automatically programmed backwashes.

.2 Ultrafiltration membranes are in direct contact with raw water. Through system pressure of at least 45 psi the water is applied to a header connected to the membrane modules that are preplumbed on an aluminum skid. The raw water pressure forces water through the UF membranes producing filtrate water. Intermittent backwashes (1, 2, 4, 8 or 24 a day) shall be programmed by the controllers for each membrane module, or alternatively a PLC for all modules, for preset backwashes of the membrane module hollow fibers. This water pressure scouring action re-suspends rejected solids away from the membrane surface and flushes them away. During the backwash filtered water is to be systematically reversed through the membranes. Membranes are to be periodically cleaned utilizing an oxidant on an as needed basis.

1.4 PROCESS PARAMETERS

.1 Production Flow Rate Requirements

.1 Membranes and related equipment are to be designed for an average net daily production of 10,000 gallons/day and maximum net daily production of 12,000 gallons/day during the summer (water temperature $\geq$ 10 ^{o}C) and an average net daily production of 25,000 gallons/day and maximum net daily production of 50,000 gallons/day during the winter (water temperature $\geq$ 3 ^{o}C), with one module out of service.

The above capacities are based on plant operation 24 hours per day. The plant shall be designed with ten (10) membrane train(s) to produce the maximum net daily production rate of 50,000 gallons in 24 hours.

.2 The production flow rate is to be based on the following raw water parameters:

Parameter	Range
Turbidity (NTU)	<0.5 – 2.5
TSS (mg/l)	ND
pH (units)	6.6 – 7.7
Color (units)	<5 - 17
Iron (mg/L)	<0.01 – 0.31
Manganese (mg/L)	<0.002
Design Temperature (^{o}C)	0.1 to 10
TOC (ppb)	1
Total Hardness (mg/L as $CaCO_3$)	5.9 – 13.5
Total Alkalinity (mg/L as $CaCO_3$)	10 - 16
Total Chlorine Residual (mg/L as Cl_2)	0.0

ND = Not Detected

.2 Filtrate Requirements

.1 Filtrate from the UF membrane system is to meet the following requirements:

Parameter	Filtrate Limits	
	< 95% (Monthly Average)	**Not to Exceed**
Turbidity (NTU)	0.3	0.5

x

.3 Process Redundancy

.1 Membranes and related equipment are to be designed to ensure that the Maximum Daily Flow of up to 50,000 gallons/day can be treated in 24 hours of operation with one (1) module out of service.

.4 Design Flux Rate

.1 Design flux rate shall be a maximum of 26.4 gpd/sf based on the raw water quality conditions specified herein to produce the maximum net daily production values specified, at the design temperature with one module.

.2 The packaged plant is all made of aluminium, stainless steel, plastic and copper.

.3 The package plant will be housed in a weather proof building. Ambient temperature is controlled to 5^{o}C during winter months and 25^{o}C during the summer.

.4 The system configuration is to facilitate safe and reasonable access for all operations and maintenance.

1.5 QUALITY CONTROL

.1 Membrane modules and prefilters are to be NSF 61 certified for potable water application.

.2 All Furnished wetted parts are to be NSF 61 certified for potable water application.

.3 All UF membrane system components are to be new.

.4 The UF membrane system is an integrally coordinated package to be furnished by a single membrane equipment manufacturer. Each membrane module must be capable of being integrity tested individually and taken off line while the other modules are still in operation.

.5 The UF membrane system shall meet or exceed the requirements of the *State of Colorado Design Criteria for Potable Water Systems* and be pre-accepted for use as an Alternative Filtration Technology by the Colorado Department of Public Health Environment.

2. Products

2.1 ACCEPTABLE MANUFACTURER

.1 The pressure UF membrane skid packaged treatment plant shall be limited to those manufactured by:

.1 Innovative Water Technologies, Inc. (IWT), Utilizing GE-Zenon Membranes

.2 Engineer approved equal.

.2 An Engineer approved manufacturer must have furnished similar UF membrane systems that have been in operation for a minimum of two years.

2.2 UF MEMBRANE SYSTEM COMPONENTS

.1 Membranes

.1 The ultrafiltration membrane hollow fibers shall have a nominal pore size of 0.02 um.

.2 Raw water is to be applied to the outside of the fibers and filtered water is to be collected from the inside of the fibers (the "lumen"). Outside-In flow pattern

.3 Membranes shall be constructed of chemically resistant materials.

.1 Membranes are to be capable of being immersed in cleaning solutions of sodium hypochlorite with concentrations up to 500 ppm at a temperature less than 40 ^{o}C.

.2 Membranes are to be capable of being immersed in cleaning solutions with a pH between 2 and 10 (30 – 40 ^{o}C).

.2 Membrane Modules

.1 A module is a unit assembly of UF hollow fibers, and is the base serviceable element of the membrane filtration process.

.2 The modules are to be constructed such that the fibers are arranged vertically, and permanently bonded in position at both vertical ends of the module.

.3 The internal lumens of the fibers shall terminate within the sealed module housings, not relying on seal points such as o-rings or gaskets.

.4 Membrane modules are to be constructed of chemically resistant materials matching the immersed chemical resistance of the fibres.

.5 The filtration area of each module is to be based on the wetted external surface area of the fibers. The combined filtration area of each module must be at least 280 square feet.

.3 Membrane Train

.1 A membrane train is to be composed of multiple membrane modules connected by a header on supplied aluminium skid(s). Each membrane skid includes all integral piping, pre filters, pipe clamps, valving, gauges, and sample taps.

.2 All of the modules are to be connected to a filtrate header servicing each train. There will be an influent header for the raw water and an effluent header for the filtered water.The modules are to be designed to be backpulsed via individual programmable controllers that can handle all modules on the packaged plant. Each module must be able of being backpulsed independent of each other without having to take the other modules off line.

.3 All membrane module connections, piping, valves, fittings, gauges, sample taps, are to be designed for the operational positive and negative pressures of the system

.4 Each group of modules or train shall be constructed to facilitate a rapid drain during backpulse and cleaning operations. The drain is to be affected through the bottom of the membrane modules(s) and drain valve which shall be connected to a waste header on the skid.

.4 Ancillary Systems

.1 Package plant auxillary equipment

.1 Raw water strainers, prefilters, control panels, isolation valves, check valves, pressure gauges, discharge pressure safety valves, pressure regulators, and pressure switches.

.2 A Membrane Integrity Tester (MIT) shall be supplied by the ultrafiltration membrane equipment manufacturer.

.2 Backpulse System

.1 This system includes backpulse tanks, valving, controllers, isolation valves, instruments and controls, and associated components, and is to be furnished by the membrane equipment supplier. A controller will be supplied to which each individual membrane module can be individually backpulsed without taking the other modules off line.

.2 Each individual membrane module shall provide its own backwash water and not require a separate source of backwash water.

.3 System must be able to perform a Backpulse (BP) performed, manually or automatically on individual membrane modules while all other modules are in operation.

.4 Backpulse system shall be a minimum 96% efficient meaning that a maximum 4% of the water is permitted for backwashing.

.5 The operator will program the backwash controller for each module based on time and be able to be programmed to backwash 1, 2, 4, 8 or 24 times per day.

.3 Maintenance Clean In Place (CIP)

.1 A Maintenance Clean in Place (CIP) can be performed as frequently as once per week and is utilized to reduce head loss due to fouling. Each individual membrane module can be taken off line without taking the other modules offline and a CIP can be performed. CIP is accomplished by utilizing a sodium hypochlorite soak of the membranes for at least one hour.

.2 System must be able to have a Clean in Place (CIP) performed on individual membrane modules while all other modules are in operation.

.4 Recovery Clean System

.1 A Recovery Clean (RC) is utilized to recover lost capacity of the membranes due to particulate fouling which cannot be removed through the processes of air scouring, backpulsing, and Clean in Place. The RC operation is facilitated by the same equipment supplied for performance of the maintenance clean and is a similar operation of longer duration.

.2 System must be able to have recovery cleans performed on individual membrane modules while all other modules are in operation.

2.3 MEMBRANE INTEGRITY TEST SYSTEM

.1 Integrity testing of the membrane fibers and modules is a fundamental operation to the production of safe quality filtrate. This operation is regulated under the provisions of the Long-Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR).

.2 Integrity testing involves the application of air from the air compressor to the lumens of the membrane fibers, to a specific pressure. The system shall have a manual membrane integrity testing unit that monitors the pressure decay of the applied pressure over a period of 5 minutes. A second integrity test shall be initiated if the set point limits of the first test are exceeded. The individual membrane module is to be isolated from operation upon failure of the second test. The membrane integrity test is to be manually performed.

2.4 PIPING

.1 Piping is to be furnished as per the membrane equipment supplier system standards and shall be Schedule 80 PVC.

.2 All piping within the internal limits of the supplied skid mounted equipment is to be furnished by the membrane equipment supplier. Interconnecting piping, outside of supplied skid limits is to be supplied by others.

.3 All piping is to be terminated with ANSI standard flanges or NPT pipe connections.

2.5 VALVES AND ACTUATORS

.1 Control valves and actuators associated with the ancillary systems are to be furnished by the membrane equipment supplier.

2.6 CONTROL SYSTEM AND INSTRUMENTATION

.1 The membrane system controls are to be furnished by the membrane equipment supplier and facilitate an automated operation with manually initiated membrane cleaning sequences and manual MIT process.

2.7 ELECTRICAL REQUIREMENTS

.1 The system shall be designed to operate on 120volt, single phase power. The electrical panel(s) furnished with the membrane equipment shall be built to UL standards. Electrical power and control equipment shall be housed in a NEMA 12 rated electrical enclosure. Wiring materials and methods shall meet appropriate NEC requirements.

3. Execution

3.1 GENERAL

.1 Not used.

3.2 INSTALLATION

.1 Installation of the Membrane Filtration System shall be by the membrane equipment manufacturer's staff or a General Contractor and is not within the scope of this procurement document.

3.3 TESTING AND COMMISSIONING

.1 System testing and commissioning is to be provided by the membrane equipment manufacturer.

3.4 TRAINING

.1 Operational training is to be provided to the facility's operations and maintenance personnel by the membrane equipment manufacturer.

END OF SECTION

3M™ 100 Series - High Performance Liquid Filter Bags

The 3M™ 100 series high performance liquid filter bag is constructed of polypropylene melt blown microfibers, allowing for very fine particle capture at high efficiencies. All 3M 100 series liquid filter bags are over 90% efficient at their suggested application rating. The 3M filter offers an excellent balance of high efficiencies with very low initial pressure drops. The bag construction makes this filter an easy to use, convenient, high performance alternative to filter cartridges.

The 3M 100 series liquid filter bag can also adsorb unwanted trace oils that frequently occur in processed fluids. The high amount of surface area due to the polypropylene microfiber construction, results in oil holding capacities from 10-20 times the filter's own weight.

Applications

• Acids and bases	• Machine coolants
• Amines	• Makeup water
• Carbon beds	• Organic solvents
• Completion fluids	• Photo chemicals
• Deep wells	• Plating solutions
• Desalination	• RO membranes
• DI resins	• Storm Water
• Glycol	• Wastewater
• Groundwater clean-up	• Waterflood

Materials of Construction

Filter Media:

Meltblown polypropylene microfiber filter media provides high particle removal efficiency for high quality filtration with broad chemical compatibility.

No silicone is intention ally used in materials of construction or in manufacturing.

The raw materials composing these filters are FDA compliant according to CFR Title 21.

Sealing Ring:

Available in "A" - Stainless Steel, and "B" - Polypropylene
Available in "P" - Polypropylene Collar*

Performance Data

Loading Capacity

Product Model Number	123	124	125	126	128
Dirt - grams at 25 gpm (5.6 cu m/hr)	125	121	146	155	351
Mineral Oil - grams at saturation	1385	2280	2050	1640	2845

*Only on 128 grade.

Loading: The data above shows typical loading capacities of the different micron rated filters. Loading capacity is determined by challenging a filter with a dispersion of silica test dust in water at the recommended flow rate. Pressure drop is monitored and testing is terminated at 35 psid (2.4 bar). The loading capacity reported is the dry weight gain of the bag.

Particle Removal Efficiency (microns)

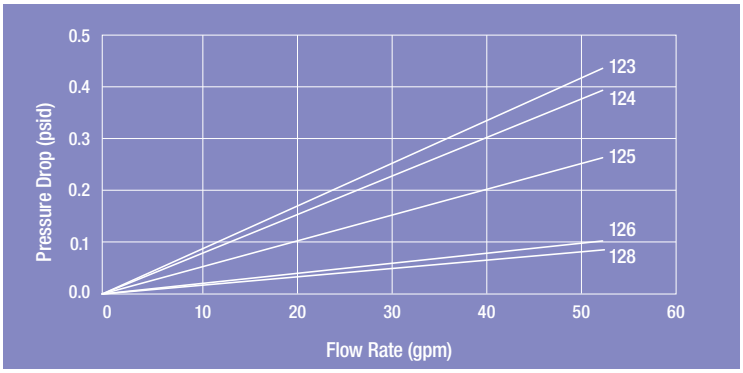
Product Number	123	124	125	126	128
Efficiency @95%	1.5	2.5	7.5	10 .0	34.0
Efficiency @90%	1.3	1.3	6.5	8.0	29.0
Efficiency @75%	0.9	1.0	2.5	7.0	21.0
Efficiency @50%	<0.7	<1.0	<1.0	4.5	7.0

Efficiency: The Series 100 High Performance Filter Bags are rated using a silica test challenge in water at 25 gpm (5.7 cu m/hr). The results reported are typical initial efficiencies taken within ten minutes of the start of the test and are cumulative data.

Operating Conditions

Maximum Operating Temperature:	180° F (82° C)
Recommended Flow (in water):	25 gpm (5.7 cu m/hr
Suggested Maximum Flow (in water):	50 gpm (11 cu m/hr)
Suggested Maximum Differential Pressure:	35 psid (2.4 bar)

Clean Pressure Drop Versus Flow Rate (psid)



Pressure Drop: The Series 100 High Performance Filter Bags have low initial pressure drop (Δp) in water as the chart indicates. The chart includes the pressure drop of a typical single vessel to assist you in sizing your filter system.

Disposal

Disposal of used filter bags must comply with applicable federal, state and local laws and regulations.

Product Specifications

Product Model Number	Sealing Ring Material	Micron Rating Initial Efficiency	Part Number	Length	Bags per Case
113A	Stainless Steel	1.5 micron @ 95%	70-0202-3727-0	110 Series #1 Size: 16 in (41 cm)	10
113B	Polypropylene		70-0202-2776-8		
113D	Stainless Steel		70-0202-3728-8		
114A	Stainless Steel	2.5 micron @ 95%	70-0202-3729-6		
114B	Polypropylene		70-0202-2779-2		
114D	Stainless Steel		70-0202-3730-4		
115A	Stainless Steel	7.5 micron @ 95%	70-0202-3731-2		
115B	Polypropylene		70-0202-2782-6		
115D	Stainless Steel		70-0202-2783-4		
116A	Stainless Steel	10 micron @ 95%	70-0202-3732-0		
116B	Polypropylene		70-0202-2785-9		
116D	Stainless Steel		70-0202-3733-8		
118A	Stainless Steel	34 micron @ 95%	70-0202-3734-6		
118B	Polypropylene		70-0202-2788-3		
118D	Stainless Steel		70-0202-2789-1		
123A	Stainless Steel	1.5 micron @ 95%	70-0202-2790-9	120 Series #2 Size: 32 in (81 cm)	10
123B	Polypropylene		70-0202-3736-1		
123D	Stainless Steel		70-0202-3737-9		
124A	Stainless Steel	2.5 micron @ 95%	70-0202-3738-7		
124B	Polypropylene		70-0202-3739-5		
124D	Stainless Steel		70-0202-3740-3		
125A	Stainless Steel	7.5 micron @ 95%	70-0202-3874-0		
125B	Polypropylene		70-0202-3741-1		
125D	Stainless Steel		70-0202-2798-2		
126A	Stainless Steel	10 micron @ 95%	70-0202-3742-9		
126B	Polypropylene		70-0202-3743-7		
126D	Stainless Steel		70-0202-2801-4		
128A	Stainless Steel	34 micron @ 95%	70-0202-3744-5		
128B	Polypropylene		70-0202-3745-2		
128D	Stainless Steel		70-0202-2804-8		
128P	Polypropylene Collar		70-0202-9267-1		8

Sealing Ring Diameters: "A" Versions: 7.03" (17.9 cm), "B" Versions: 7.20" (18.3cm), "C" Versions: 7:00" (17.8 cm)

Important Notice

The information described in this literature is accurate to the best of our knowledge. A variety of factors, however, can affect the performance of the Product(s) in a particular application, some of which are uniquely within your knowledge and control. **INFORMATION IS SUPPLIED UPON THE CONDITION THAT THE PERSONS RECEIVING THE SAME WILL MAKE THEIR OWN DETERMINATION AS TO ITS SUITABILITY FOR THEIR USE. IN NO EVENT WILL 3M PURIFICATION INC. BE RESPONSIBLE FOR DAMAGES OF ANY NATURE WHATSOEVER RESULTING FROM THE USE OF OR RELIANCE UPON INFORMATION.**

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3M

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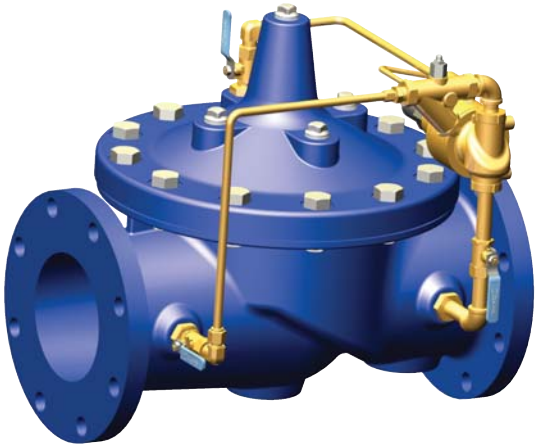
CLA-VAL™

MODEL 50-01 (Full Internal Port)
650-01 (Reduced Internal Port)

Pressure Relief & Pressure Sustaining Valve



- **Accurate Pressure Control**
- **Optional Check Feature**
- **Fast Opening to Maintain Line Pressure**
- **Slow Closing to Prevents Surges**
- **Completely Automatic Operation**

The Cla-Val Model 50-01/650-01 Pressure Relief Valve is a hydraulically operated, pilot-controlled, modulating valve designed to maintain constant upstream pressure within close limits. This valve can be used for pressure relief, pressure sustaining, back pressure, or unloading functions in a by-pass system.

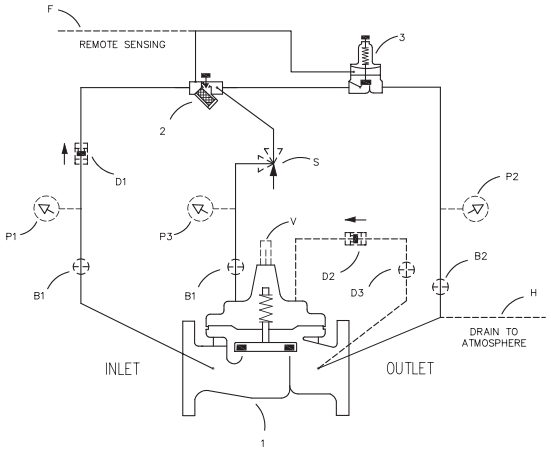
In operation, the valve is actuated by line pressure through a pilot control system, opening fast to maintain steady line pressure but closing gradually to prevent surges. Operation is completely automatic and pressure settings may be easily changed.

If a check feature is added, and a pressure reversal occurs, the down-stream pressure is admitted into the main valve cover chamber, closing the valve to prevent return flow.

Schematic Diagram

Item Description

1 Hytrol (Main Valve)
2 X42N-2 Strainer & Needle Valve
3 CRL Pressure Relief Control

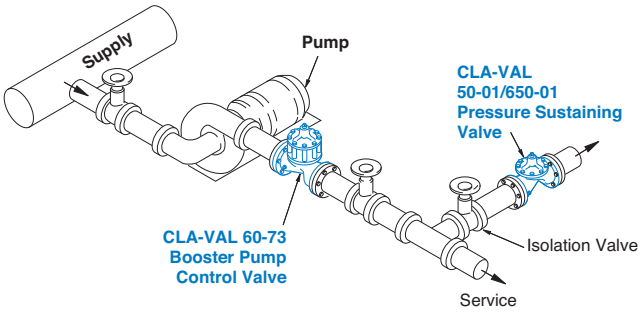


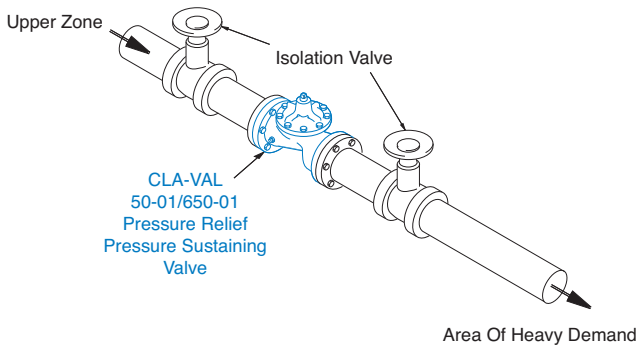
Optional Features

Item Description

B CK2 (Isolation Valve)
D Check Valves with Isolation Valve
F Remote Pilot Sensing
H Drain to Atmosphere
P X141 Pressure Gauge
S CV Speed Control (Opening)
V X101 Valve Position Indicator

Typical Applications





Pressure Relief Service

This fast opening, slow closing relief valve provides system protection against high pressure surges on pump start up and pump shut down by dissipating the excess pressure to a safe location.

Pressure Sustaining Service

When installed in a line between an upper zone and a lower area of heavy demand, the valve acts to maintain desired upstream pressure to prevent "robbing" of the upper zone. Water in excess of pressure setting is allowed to flow to an area of heavy demand, control is smooth, and pressure regulation is positive.

CLA-VAL™

Model 50-01 (Uses Basic Valve Model 100-01)

Pressure Ratings (Recommended Maximum Pressure - psi)

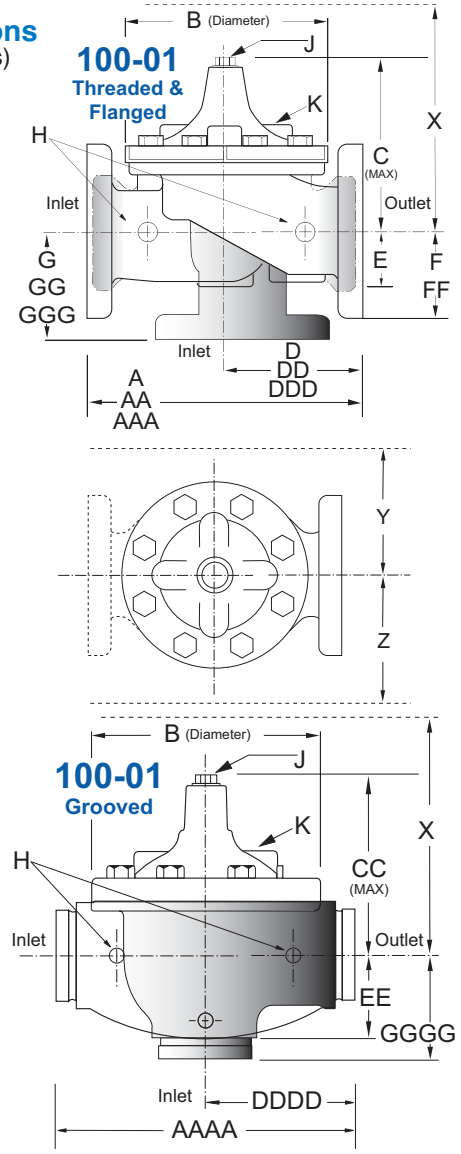
Valve Body & Cover		Pressure Class				
		Flanged			Grooved	Threaded
Grade	Material	ANSI Standards*	150 Class	300 Class	300 Class	End‡ Details
ASTM A536	Ductile Iron	B16.42	250	400	400	400
ASTM A216-WCB	Cast Steel	B16.5	285	400	400	400
ASTM B62	Bronze	B16.24	225	400	400	400

Note: * ANSI standards are for flange dimensions only.
Flanged valves are available faced but not drilled.
‡ End Details machined to ANSI B2.1 specifications.
Valves for higher pressure are available; consult factory for details

Materials

Component	Standard Material Combinations		
Body & Cover	Ductile Iron	Cast Steel	Bronze
Available Sizes	1" - 36"	1" - 16"	1" - 16"
Disc Retainer & Diaphragm Washer	Cast Iron	Cast Steel	Bronze
Trim: Disc Guide, Seat & Cover Bearing	Bronze is Standard Stainless Steel is Optional		
Disc	Buna-N® Rubber		
Diaphragm	Nylon Reinforced Buna-N® Rubber		
Stem, Nut & Spring	Stainless Steel		
For material options not listed, consult factory. Cla-Val manufactures valves in more than 50 different alloys.			

Dimensions
(In inches)



Model 50-01 Dimensions (In Inches)

Valve Size (Inches)	**1**	**1 1/4**	**1 1/2**	**2**	**2 1/2**	**3**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**24**	**30**	**36**
A Threaded	7.25	7.25	7.25	9.38	11.00	12.50	—	—	—	—	—	—	—	—	—	—	—	—
AA 150 ANSI	—	—	8.50	9.38	11.00	12.00	15.00	20.00	25.38	29.75	34.00	39.00	41.38	46.00	52.00	61.50	63.00	76.00
AAA 300 ANSI	—	—	9.00	10.00	11.62	13.25	15.62	21.00	26.38	31.12	35.50	40.50	43.50	47.64	53.62	63.24	64.50	76.00
AAAA Grooved End	—	—	8.50	9.00	11.00	12.50	15.00	20.00	25.38	—	—	—	—	—	—	—	—	—
B Dia.	5.62	5.62	5.62	6.62	8.00	9.12	11.50	15.75	20.00	23.62	28.00	32.75	35.50	41.50	45.00	53.16	56.00	66.00
C Max.	5.50	5.50	5.50	6.50	7.56	8.19	10.62	13.38	16.00	17.12	20.88	24.19	25.00	39.06	41.90	43.93	54.60	61.50
CC Max. Grooved End	—	—	4.75	5.75	6.88	7.25	9.31	12.12	14.62	—	—	—	—	—	—	—	—	—
D Threaded	3.25	3.25	3.25	4.75	5.50	6.25	—	—	—	—	—	—	—	—	—	—	—	—
DD 150 ANSI	—	—	4.00	4.75	5.50	6.00	7.50	10.00	12.69	14.88	17.00	19.50	20.81	—	—	30.75	—	—
DDD 300 ANSI	—	—	4.25	5.00	5.88	6.38	7.88	10.50	13.25	15.56	17.75	20.25	21.62	—	—	31.62	—	—
DDDD Grooved End	—	—	—	4.75	—	6.00	7.50	—	—	—	—	—	—	—	—	—	—	—
E	1.12	1.12	1.12	1.50	1.69	2.56	3.19	4.31	5.31	9.25	10.75	12.62	15.50	12.95	15.00	17.75	21.31	24.56
EE Grooved End	—	—	2.00	2.50	2.88	3.12	4.25	6.00	7.56	—	—	—	—	—	—	—	—	—
F 150 ANSI	—	—	2.50	3.00	3.50	3.75	4.50	5.50	6.75	8.00	9.50	10.50	11.75	15.00	16.50	19.25	22.50	25.60
FF 300 ANSI	—	—	3.06	3.25	3.75	4.13	5.00	6.25	7.50	8.75	10.25	11.50	12.75	15.00	16.50	19.25	24.00	25.60
G Threaded	1.88	1.88	1.88	3.25	4.00	4.50	—	—	—	—	—	—	—	—	—	—	—	—
GG 150 ANSI	—	—	4.00	3.25	4.00	4.00	5.00	6.00	8.00	8.62	13.75	14.88	15.69	—	—	22.06	—	—
GGG 300 ANSI	—	—	4.25	3.50	4.31	4.38	5.31	6.50	8.50	9.31	14.50	15.62	16.50	—	—	22.90	—	—
GGGG Grooved End	—	—	—	3.25	—	4.25	5.00	—	—	—	—	—	—	—	—	—	—	—
H NPT Body Tapping	.375	.375	.375	.375	.50	.50	.75	.75	1	1	1	1	1	1	1	1	2	2
J NPT Cover Center Plug	.25	.25	.25	.50	.50	.50	.75	.75	1	1	1.25	1.5	2	1.5	1.5	1.5	2	2
K NPT Cover Tapping	.375	.375	.375	.375	.50	.50	.75	.75	1	1	1	1	1	1	1	1	2	2
Stem Travel	0.4	0.4	0.4	0.6	0.7	0.8	1.1	1.7	2.3	2.8	3.4	4.0	4.5	5.1	5.63	6.75	7.5	8.5
Approx. Ship Wt. Lbs.	15	15	15	35	50	70	140	285	500	780	1165	1600	2265	2982	3900	6200	7703	11720
X Pilot System	11	11	11	13	14	15	17	29	31	33	36	40	40	43	47	68	79	85
Y Pilot System	9	9	9	9	10	11	12	20	22	24	26	29	30	32	34	39	40	45
Z Pilot System	9	9	9	9	10	11	12	20	22	24	26	29	30	32	34	39	42	47

Note: The top two flange holes on valve size 36 are threaded to 1 1/2"-6 UNC.

Model 650-01 (Uses Basic Valve Model 100-20)

Pressure Ratings (Recommended Maximum Pressure - psi)

Valve Body & Cover		Pressure Class		
		Flanged		
Grade	Material	ANSI Standards*	150 Class	300 Class
ASTM A536	Ductile Iron	B16.42	250	400
ASTM A216-WCB	Cast Steel	B16.5	285	400
ASTM B62	Bronze	B16.24	225	400

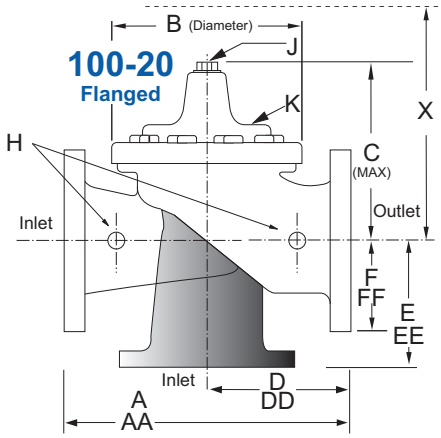
Note: * ANSI standards are for flange dimensions only.
Flanged valves are available faced but not drilled.
Valves for higher pressure are available; consult factory for details

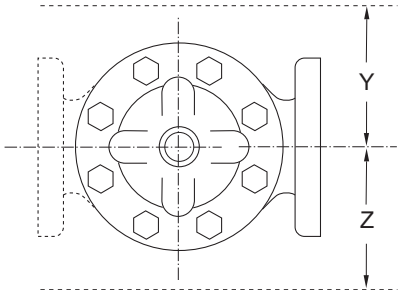
Materials

Component	Standard Material Combinations		
Body & Cover	Ductile Iron	Cast Steel	Bronze
Available Sizes	3" - 48"	3" - 16"	3" - 16"
Disc Retainer & Diaphragm Washer	Cast Iron	Cast Steel	Bronze
Trim: Disc Guide, Seat & Cover Bearing	Bronze is Standard Stainless Steel is Optional		
Disc	Buna-N® Rubber		
Diaphragm	Nylon Reinforced Buna-N® Rubber		
Stem, Nut & Spring	Stainless Steel		

For material options not listed, consult factory.
Cla-Val manufactures valves in more than 50 different alloys.

Dimensions
(In inches)





Model 650-01 Dimensions (In Inches)

Valve Size (Inches)	**3**	**4**	**6**	**8**	**10**	**12**	**14**	**16**	**18**	**20**	**24**	**30**	**36**	**42**	**48**
A 150 ANSI	10.25	13.88	17.75	21.38	26.00	30.00	34.25	35.00	42.12	48.00	48.00	63.25	65.00	76.00	94.50
AA 300 ANSI	11.00	14.50	18.62	22.38	27.38	31.50	35.75	36.62	43.63	49.62	49.75	63.75	67.00	76.00	94.50
B Dia.	6.62	9.12	11.50	15.75	20.00	23.62	27.47	28.00	35.44	35.44	35.44	53.19	56.00	66.00	66.00
C Max.	7.00	8.62	11.62	15.00	17.88	21.00	20.88	25.75	25.00	31.00	31.00	43.94	54.60	61.50	61.50
D 150 ANSI	—	6.94	8.88	10.69	CF*	CF*	CF*	CF*	CF*	CF*	CF*	—	—	—	—
DD 300 ANSI	—	7.25	9.38	11.19	CF*	CF*	CF*	CF*	CF*	CF*	CF*	—	—	—	—
E 150 ANSI	—	5.50	6.75	7.25	CF*	CF*	CF*	CF*	CF*	CF*	CF*	—	—	—	—
EE 300 ANSI	—	5.81	7.25	7.75	CF*	CF*	CF*	CF*	CF*	CF*	CF*	—	—	—	—
F 150 ANSI	3.75	4.50	5.50	6.75	8.00	9.50	11.00	11.75	15.88	14.56	17.00	19.88	25.50	28.00	31.50
FF 300 ANSI	4.12	5.00	6.25	7.50	8.75	10.25	11.50	12.75	15.88	16.06	19.00	22.00	27.50	28.00	31.50
H NPT Body Tapping	.375	.50	.75	.75	1	1	1	1	1	1	1	1	2	2	2
J NPT Cover Center Plug	.50	.50	.75	.75	1	1	1.25	1.25	2	2	2	2	2	2	2
K NPT Cover Tapping	.375	.50	.75	.75	1	1	1	1	1	1	1	1	2	2	2
Stem Travel	0.6	0.8	1.1	1.7	2.3	2.8	3.4	3.4	4.5	4.5	4.5	6.5	7.5	8.5	8.5
Approx. Ship Wt. Lbs.	45	85	195	330	625	900	1250	1380	2365	2551	2733	6500	8545	12450	13100
X Pilot System	13	15	27	30	33	36	36	41	40	46	55	68	79	85	86
Y Pilot System	10	11	18	20	22	24	26	26	30	30	30	39	40	45	47
Z Pilot System	10	11	18	20	22	24	26	26	30	30	30	39	42	47	49

*Consult Factory

Note: The top two flange holes on valve sizes 36 thru 48 are threaded to 1 1/2"-6 UNC.

50-01 Valve Selection	100-01 Pattern: Globe (G), Angle (A), End Connections: Threaded (T), Grooved (GR), Flanged (F) Indicate Available Sizes																		
	Inches	1	1¼	1½	2	2½	3	4	6	8	10	12	14	16	18	20	24	30	36
	mm	25	32	40	50	65	80	100	150	200	250	300	350	400	450	500	600	750	900
Basic Valve 100-01	Pattern	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G, A	G	G	G, A	G	G
	End Detail	T	T	T, F, Gr*	T, F, Gr	T, F, Gr*	T, F, Gr	F, Gr	F, Gr*	F, Gr*	F	F	F	F	F	F	F	F	F
Suggested Flow (gpm)	Maximum	55	93	125	210	300	460	800	1800	3100	4900	7000	8400	11000	14000	17000	25000	42000	50000
	Maximum Surge	120	210	280	470	670	1000	1800	4000	7000	11000	16000	19000	25000	31000	39000	56500	63000	85000
Suggested Flow (Liters/Sec)	Maximum	3.5	6	8	13	19	29	50	113	195	309	442	530	694	883	1073	1577	2650	3150
	Maximum Surge	7.6	13	18	30	42	63	113	252	441	693	1008	1197	1577	1956	2461	3560	3975	5360

100-01 Series is the full internal port Hytrol. *Globe Grooved Only

650-01 Valve Selection	100-20 Pattern: Globe (G), Angle (A), End Connections: Flanged (F) Indicate Available Sizes														
	Inches	3	4	6	8	10	12	14	16	18	20	24	30	36	42	48
	mm	80	100	150	200	250	300	350	400	450	500	600	750	900	1000	1200
Basic Valve 100-20	Pattern	G	G, A	G, A	G, A	G	G	G	G	G	G	G	G	G	G	G
	End Detail	F	F	F	F	F	F	F	F	F	F	F	F	F	F	F
Suggested Flow (gpm)	Maximum	260	580	1025	2300	4100	6400	9230	9230	16500	16500	16500	28000	33500	33500	33500
	Maximum Surge	440	990	1760	3970	7050	11000	15900	15900	28200	28200	28200	56500	58600	58600	58600
Suggested Flow (Liters/Sec)	Maximum	16	37	65	145	258	403	581	581	1040	1040	1040	1764	2115	2115	2115
	Maximum Surge	28	62	111	250	444	693	1002	1002	1777	1777	1777	3560	3700	3700	3700

100-20 Series is the reduced internal port size version of the 100-01 Series.

Pilot System Specifications

Adjustment Ranges

0 to 75 psi Max.
20 to 105 psi
20 to 200 psi *
100 to 300 psi

*Supplied unless otherwise specified.
Other ranges available, please consult factory.

Temperature Range

Water: to 180°F

Materials

Standard Pilot System Materials

Pilot Control:	Bronze ASTM B62
Trim:	Stainless Steel Type 303
Rubber:	Buna-N® Synthetic Rubber
Tubing & Fitting:	Copper and Bronze

Optional Pilot System Materials
Pilot Systems are available with optional Aluminum, Stainless Steel or Monel materials.

When Ordering, Please Specify

1. Catalog No. 50-01 or No. 650-01
2. Valve Size
3. Pattern - Globe or Angle
4. Pressure Class
5. Threaded or Flanged
6. Trim Material
7. Adjustment Range
8. Desired Options
9. When Vertically Installed

CLA-VAL®

CLA-VAL™

E-50-01/650-01 (R-1/2013)

CLA-VAL
PO Box 1325 Newport Beach CA 92659-0325
Phone: 949-722-4800 • Fax: 949-548-5441

CLA-VAL CANADA
4687 Christie Drive
Beamsville, Ontario
Canada L0R 1B4
Phone: 905-563-4963
Fax: 905-563-4040

CLA-VAL EUROPE
Chemin dés Mesanges 1
CH-1032 Romanel/
Lausanne, Switzerland
Phone: 41-21-643-15-55
Fax: 41-21-643-15-50

www.cla-val.com

Represented By:

Purchase Specification

Model No. 50-01/650-01
PRESSURE RELIEF, PRESSURE SUSTAINING VALVE

Sizes 1 1/4" - 24"

Function

The valve shall maintain a constant upstream pressure by bypassing or relieving excess pressure and shall maintain close pressure limits without causing surges. If upstream pressure decreases below the spring setting, the valve shall close.

"Tying" of equipment into packages for the purpose of thwarting competition shall be considered to be in non-compliance with these specifications. Manufacturers shall price items under different subsections or sections separately.

Main Valve

The valve shall be hydraulically operated, single diaphragm-actuated, globe or angle pattern. The valve shall consist of three major components: the body with seat installed, the cover with bearings installed, and the diaphragm assembly. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve, separating operating pressure from line pressure. Packing glands and/or stuffing boxes are not permitted and there shall be no pistons operating the main valve or pilot controls.

Main Valve Body

No separate chambers shall be allowed between the main valve cover and body. Valve body and cover shall be of cast material. Ductile Iron is standard and other materials shall be available. No fabrication or welding shall be used in the manufacturing process. Total shipping weight, in all respects, shall be equal to or greater than the Hytrol 100-01/100-20 body.

The valve shall contain a resilient, synthetic rubber disc with a rectangular cross-section contained on three and one-half sides by a disc retainer and forming a tight seal against a single removable seat insert. No O-ring type discs (circular, square, or quad type) shall be permitted as the seating surface. The disc guide shall be of the contoured type to permit smooth transition of flow and shall hold the disc firmly in place. The disc retainer shall be of a sturdy one-piece design capable of withstanding opening and closing shocks. It must have straight edge sides and a radius at the top edge to prevent excessive diaphragm wear as the diaphragm flexes across this surface. No hourglass-shaped disc retainers shall be permitted and no V-type or slotted type disc guides shall be used.

The diaphragm assembly containing a non-magnetic 303 stainless steel stem of sufficient diameter to withstand high hydraulic pressures shall be fully guided at both ends by a bearing in the valve cover and an integral bearing in the valve seat. The seat shall be a solid, one-piece design and shall have a minimum of a five-degree taper on the seating surface for a positive, drip-tight shut off. No center guides shall be permitted. The stem shall be drilled and tapped in the cover end to receive and affix such accessories as may be deemed necessary. The diaphragm assembly shall be the only moving part and shall form a sealed chamber in the upper portion of the valve separating operating pressure from line pressure.

The flexible, non-wicking, FDA approved diaphragm shall consist of nylon fabric bonded with synthetic rubber compatible with the operating fluid. The center hole for the main valve stem must be sealed by the vulcanized process or a rubber grommet sealing the center stem hole from the operating pressure. The diaphragm must withstand a Mullins Burst Test of a minimum of 600 psi per layer of nylon fabric and shall be cycle tested 100,000 times to insure longevity. The diaphragm shall not be used as the seating surface. The diaphragm shall be fully supported in the valve body and cover by machined surfaces which support no less than one-half of the total surface area of the diaphragm in either the fully open or fully closed position.

Purchase Specification

The main valve seat and the stem bearing in the valve cover shall be removable. The cover bearing and seat in 6” and smaller size valves shall be threaded into the cover and body. Valve seat in 8” and larger size valves shall be retained by flat head machine screws for ease of maintenance. The lower bearing of the valve stem shall be contained concentrically within the seat and shall be exposed to the flow on all sides to avoid deposits. To insure proper alignment of the valve stem, the valve body and cover shall be machined with a locating lip. No “pinned” covers to the valve body shall be permitted. Cover bearing, disc retainer, and seat shall be made of the same material. All necessary repairs and/or modifications other than replacement of the main valve body shall be possible without removing the valve from the pipeline. Packing glands and/or stuffing boxes shall not be permitted and components including cast material shall be of North American manufacture.

The valve manufacturer shall warrant the valve to be free of defects in material and workmanship for a period of three years from date of shipment provided the valve is installed and used in accordance with all applicable instructions. Electrical components shall have a one-year warranty.

The valve manufacturer shall be able to supply a complete line of equipment from 1 1/4” through 24” sizes and a complete selection of complementary equipment. The valve manufacturer shall also provide a computerized cavitation chart which show flow rate, differential pressure, percentage of valve opening, Cv factor, system velocity, and if there will be cavitation damage.

Material Specification

Valve Size: 2-inch
Main Valve Body and Cover: Ductile Iron
Main Valve Trim: Stainless Steel
End Detail: Threaded
Pressure Rating: Class 150
Temperature Range: 0 to 180 Degrees F
Rubber Material: Buna-N Synthetic Rubber
Coating: Epoxy
Desired Options:

Pilot Control System

The pressure relief pilot shall be a direct-acting, adjustable, spring-loaded, diaphragm valve designed to permit flow when controlling pressure exceeds the adjustable spring setting. The pilot control is normally held closed by the force of the compression on the spring above the diaphragm and it opens when the pressure acting on the underside of the diaphragm exceeds the spring setting. Pilot control sensing shall be upstream of the pilot system strainer so accurate control may be maintained if the strainer is partially blocked.

A full range of spring settings shall be available in ranges from 0-450 psi.

Material Specification for Pilot Control:

Pressure Rating: Class 150
Trim: Stainless Steel Type 303
Rubber Material: Buna-N® Synthetic Rubbe
Tubing and Fittings: Copper and Bronze
Adjustment Range: 0 to 70 psi
Operating Fluids: Filtered Water
Desired Options:

The valve shall be a Cla-Val Co. Model No. 50-01/650-01 Pressure Relief and Pressure Sustaining Valve as manufactured by Cla-Val Co., Newport Beach, CA 92659-0325.

1720E Low Range Turbidimeter

The Model 1720E Low Range Turbidimeter is the newest is a long line of successful Hach turbidimeters—from the unsurpassed world leader in turbidity measurement.

Features and Benefits

USEPA Reporting

The 1720E Low Range Turbidimeter applies the instrument design and meets performance criteria established by the U.S. Environmental Protection Agency (USEPA) in Method 180.1, making it suitable for regulatory reporting.

Accuracy

Continuously flowing sample flows through the patented* bubble removal system, which vents entrained air from the sample stream and eliminates the most significant interference in low level turbidity measurement. The 1720E Turbidimeter is not affected by variations in flow and pressure.

Nephelometric Measurement

Incandescent light directed from the sensor head assembly down into the turbidimeter body is scattered by suspended particles in the sample. The sensor's submerged photocell detects light scattered at 90° from the incident beam. Sample enters the center column of the turbidimeter, rises into the measuring chamber and spills over the weir into the drain port. This configuration results in an optical flat surface free of turbulence.

Simplicity

A simplified two-module design includes the sensor and the controller interface. The controller accepts two turbidity sensors—adding a second 1720E sensor makes a system with two complete turbidimeters. Connections are simple plug & play.

Data Collection and Display

The 1720E Turbidimeter uses the sc200 Controller to receive data from up to two sensors. A built-in data logger collects turbidity measurement at user selectable intervals (1-15 minutes), along with calibration and verification points, alarm history, and instrument setup changes. Communications using MODBUS®/RS485 or MODBUS®/RS232.

Experience

The 1720E Turbidimeter reflects nearly 50 years of Hach leadership in turbidity measurement science. Hach has the largest turbidimeter installation base in the world. And, Hach offers a two-year warranty on the 1720E.

U.S. patent 5,831,727

Fast Calibration and Verification

Calibration and verification can be performed without loss of sample flow using the ICE-PIC™ Calibration/Verification Module. One-point calibration with prepared StablCal™ Stabilized Formazin Solution eliminates the errors of user-prepared formazin suspension dilution. Features of the ICE-PIC Module include:

- *Calibrate or verify the performance of each sensor in less than one minute*
- *Factory calibrated and provided with a certificate of accuracy*
- *Cost effective, one-time investment. No consumables are needed*
- *Small, lightweight design can be used for spot verification in the facility*
- *Available in 20 and 1.0 NTU*

DW PW IW

DW = drinking water *WW = wastewater municipal* ***PW = pure water / power***
IW = industrial water ***E = environmental*** *C = collections* ***FB = food and beverage***

HACH®
Be Right™

Specifications*

Range
0.001-100 Nephelometric Turbidity Units (NTU)

Accuracy
(Defined according to ISO 15839.)
±2% of reading or ±0.015 NTU (whichever is greater) from 0 to 40 NTU; ±5% of reading from 40 to 100 NTU

Displayed Resolution
0.0001 NTU up to 9.9999 NTU; 0.001 NTU from 10.000 to 99.999 NTU

Repeatability
(Defined according to ISO 15839.)
Better than ±1.0% of reading or ±0.002 NTU, whichever is greater

Response Time
Initial response in 1 minute, 15 seconds for a full-scale step change

Signal Average Time
User selectable from 6, 30, 60, 90 seconds; default 30 seconds

Sample Temperature
0 to 50°C (32 to 122°F)

Sample Flow Required
200 to 750 mL/minute (3.1 to 11.9 gal/hour)

Operating Temperature
Single sensor system:
0 to 50°C (32 to 122°F)
Two sensor system:
0 to 40°C (32 to 104°F)

Operating Humidity
5 to 95% non-condensing

Storage Temperature
-20 to 60°C (-4 to 140°F)

Power Requirements
100-230 Vac, 50/60 Hz, auto selecting; 40 VA

Sample Inlet Fitting
1/4" NPT female, 1/4" compression fitting (provided)

Drain Fitting
1/2" NPT female, 1/2" hose barb (provided)

Recorder Outputs
Two selectable for 0-20 mA or 4-20 mA; output span programmable over any portion of the 0-100 NTU range; built into the sc100 Controller

Alarms
Three set-point alarms, each equipped with an SPDT relay with unpowered contacts rated 5A resistive load at 230 Vac; built into the sc200 Controller

Enclosure
NEMA-4X (indoor)/IP66 Controller

Digital Communication
Network card compatible; MODBUS®/RS485, MODBUS/RS232, LonWorks® protocol (optional)

Compliance
Standard Methods 2130B, USEPA 180.1, Hach Method 8195

Certifications
Safety:
Listed by ETL to UL 61010A-1: Certified by ETL to CSA C22.2 No. 1010.1: CE certified by Hach Company to EN 61010-1

Immunity:
CE certified by Hach Company to EN61326 (industrial levels)

Emissions:
Class A: EN 61326, CISPR 11, FCC Part 15, Canadian Interference-Causing Equipment Regulation ICES-003

Mounting
Turbidimeter body and head assembly: wall and floor stand

sc200 Controller:
wall, pole, panel, and floor stand

Dimensions
Turbidimeter body and cap:
25.4 x 30.5 x 40.6 cm (10 x 12 x 16 in.)

Shipping Weight
1720E Turbidimeter and sc200 Controller:
6.12 kg (13.5 lbs.)

1720E Turbidimeter:
4.54 kg (10 lbs.)

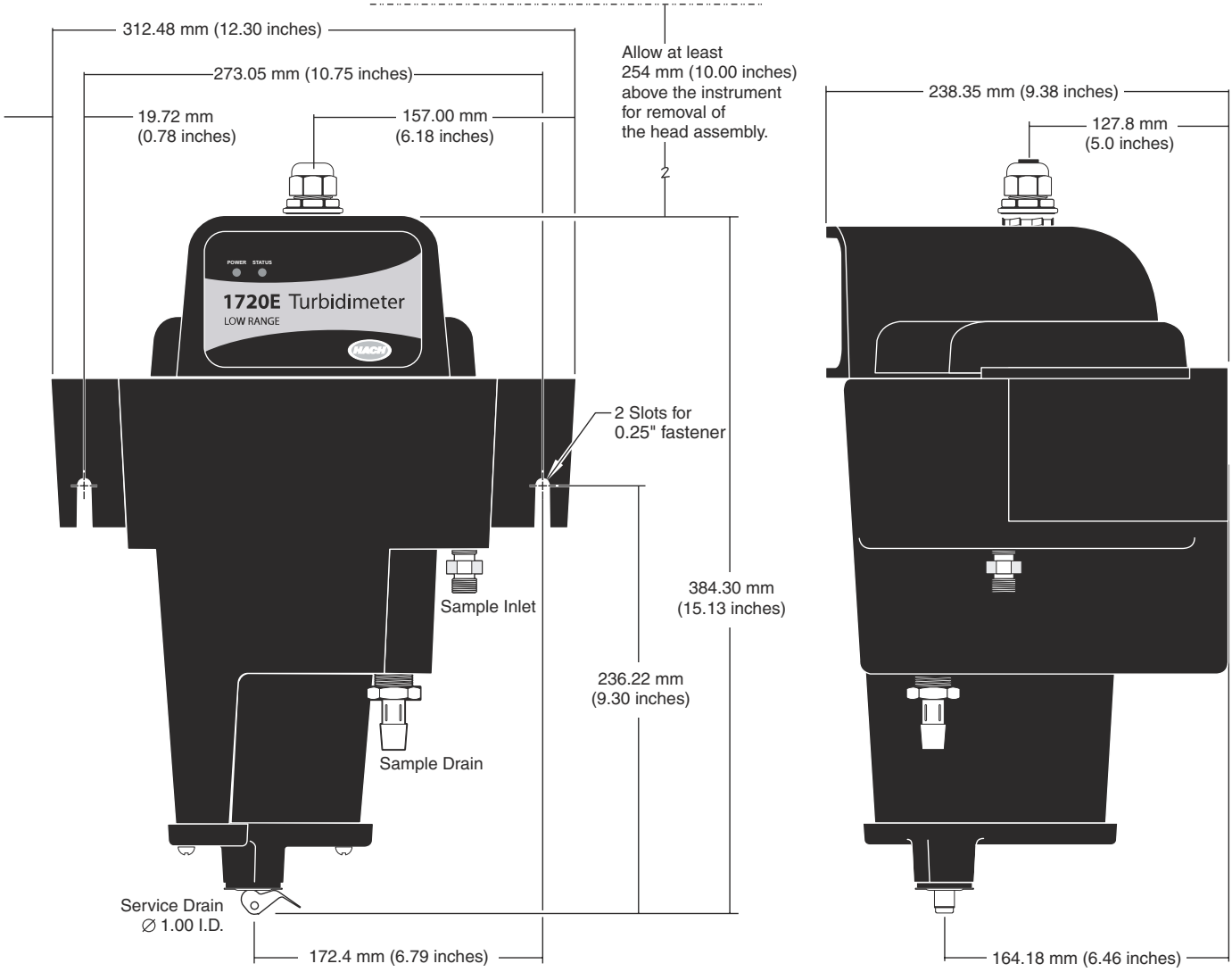
**Specifications subject to change without notice.*

Engineering Specifications

1. The turbidimeter shall be a microprocessor-based, continuous-reading, on-line nephelometric instrument
2. The turbidity monitoring system shall include one or two turbidimeter(s) and one interface unit.
3. The turbidimeter shall measure turbidity in the range of 0.001-100 NTU
4. Accuracy shall be ±2% of reading or ±0.015 NTU (whichever is greater) from 0 to 40 NTU; ±5% of reading from 40 to 100 NTU
5. Displayed resolution shall be 0.0001 NTU from 0 to 9.999 NTU and 0.001 NTU from 10.000 to 9.999 NTU.
6. Repeatability shall be better than ±1.0% of reading or ±0.002 NTU (whichever is greater).
7. The turbidimeter shall meet all design and performance criteria specified by USEPA method 180.1.
8. Light shall be directed through the surface of the sample and the detector shall be immersed in the sample, eliminating glass windows and flow cells.
9. Optical components shall be mounted in a sealed head assembly that can be removed for calibration/ service without disturbing sample flow.
10. The turbidimeter body shall be constructed of corrosion-resistant polystyrene.
11. An internal bubble removal system shall be included to vent entrained air from the sample stream.
12. Calibration of the turbidimeter shall be either formazin-based (20 or 1 NTU) or instrument comparison-based calibration method.
13. User selectable signal averaging, bubble removal, alarm and recorder output hold, and self-test diagnostics shall be provided.
14. Connections between the turbidimeter(s) and the controller shall be “plug and play.”
15. The Interface unit shall allow operators to control sensor and interface functions with menu-driven software and shall provide data logging of measurement data.
16. The interface unit shall have a built-in data logger with the capacity to store data on 15-minute intervals for up to 6 months.
17. The interface unit shall be housed in a NEMA-4X (indoor) industrial metal/plastic enclosure.
18. The DC power supply shall be housed in the interface unit
19. The DC power supply shall automatically accept input in the range of 100 to 230 Vac, 50/60 Hz.
20. All system components shall be ETL listed to UL 61010A-1, certified to CSA C22.2 No. 1010.1, and CE certified by manufacturer to EN 61010-1.
21. All system components shall be CE certified by the manufacturer to EN 61326 (industrial levels) for immunity and emissions, Class A.
22. All system components shall meet FCC Part 15 for North America and Canadian Interference-Causing Equipment Regulation ICES-003, and CISPR 11 Class A levels for rest of the world.
23. The turbidimeter shall be Hach Company Model 1720E Low Range Turbidimeter with the sc200 Controller.

Dimensions

The 1720E turbidimeter can be installed on a wall or a floor stand. No tools are needed to connect the controller unit to the turbidimeter. The distance between the two units can be a maximum of 9.62 m (31.6 ft) with the use of an extension cable.



Ordering Information

1720E Turbidimeter

6010101	1720E Turbidimeter, sensor only
2978100	1720E Turbidimeter with sc200 Controller, 1 channel
2978200	1720E Turbidimeter with sc200 24 Vdc Controller, 1 channel
2976800	1720E Turbidimeter with sc200 Controller, 2 channel
2976900	1720E Turbidimeter with sc200 24 Vdc Controller, 2 channel

Cables

5796000	Extension Cable, 7.7 m (25 ft.)

Note: Power cables must be ordered separately.

Accessories

5743200	Floor Stand
9218200	SD card reader (USB) for connection to PC
9218100	4 GB SD card

Calibration Supplies

ICE-PIC Calibration/Verification Module / 1720E:

5225000	20 NTU Module
5221500	1 NTU Module

StablCal Comparative Calibration Standards

2660153	20.0 NTU, 1 L each (Calibration Cylinder, P/N 44153-00, must be ordered separately.)

StablCal Verification Standards

2697953	0.3 NTU, 1 L each
2698053	0.5 NTU, 1 L each
2723353	0.1 NTU, 1 L each
2659853	1.0 NTU, 1 L each
2746353	40.0 NTU, 1 L each

Formazin Calibration Standards

4415600	Formazin Calibration Kit for user-prepared calibration (includes 500 mL of 4000 NTU Formazin, TenSette® Pipet, and calibration cylinder)
246149	Formazin Primary Standard, 4000 NTU, 500 mL (replacement for P/N 4415600)
4415300	Calibration Cylinder, 1 L

To complete your turbidity measurement system, choose from these Hach controllers...

Model sc200 Controller

(see Lit. #2665)

LXV404.99.00552	sc200 controller, 2 channel, digital
LXV404.99.00502	sc200 controller, 1 channel, digital
LXV404.99.00542	sc200 controller, 2 channel, digital & mA input

Model sc1000 Controller

(see Lit. #2403)

LXV402.99.00002	sc1000 Display Module
LXV400.99.1R572	sc1000 Probe Module, 4 sensors, 4 mA Out, 4 mA In, 4 Relays, 110-230V
LXV400.99.1B572	sc1000 Probe Module, 4 sensors, 4 mA Out, 4 mA In, 4 Relays, RS-485 (MODBUS), 110-230V
LXV400.99.1F572	sc1000 Probe Module, 4 sensors, 4 mA Out, 4 mA In, 4 Relays, PROFIBUS DP, 110-230V
LXV400.99.1R582	sc1000 Probe Module, 6 sensors, 4 mA Out, 4 mA In, 4 Relays, 110-230V

Lit. No. 2457 Rev 1
C11 Printed in U.S.A.

At Hach, it's about learning from our customers and providing the right answers. It's more than ensuring the quality of water—it's about ensuring the quality of life. When it comes to the things that touch our lives...

Keep it pure.

Make it simple.

Be right.

For current price information, technical support, and ordering assistance, contact the Hach office or distributor serving your area.

In the United States, contact:

HACH COMPANY World Headquarters
P.O. Box 389
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Telephone: 800-227-4224
Fax: 970-669-2932
E-mail: orders@hach.com
www.hach.com

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HACH®

Be Right™

CL17 CHLORINE ANALYZER

Applications

- Beverage
- Collection Systems
- Drinking Water
- Field Use
- Food QC Lab
- Pharmaceutical
- Power
- Semiconductor
- Wastewater

Dependable colorimetric DPD free or total chlorine analysis.

The Hach CL17 Chlorine Analyzer uses fast, reliable, and economical DPD chemistry for up to 30 days of unattended operation. Predictable maintenance and minimal use of reagents means low cost of ownership.

Accurate Results

The Hach CL17 Chlorine Analyzer uses colorimetric DPD chemistry to monitor water continuously for free or total residual chlorine with the same method (Standard Method 4500-Cl G and equivalent to DIN EN ISO Method 7393-2:2000-04) that is used for grab sample analysis. This analysis method is not affected by changes in sample pH, temperature, chlorine concentration (within the measurement range), pressure or flow, offering more accuracy than other methods in the market today.

Simple, Predictable Maintenance

Monthly routine maintenance for the CL17 can be performed in 15 minutes including changing reagents and cleaning the colorimetric cell. No special tools are required. Under typical use, the CL17 will operate unattended for 30 days.

Recalibration Not Necessary

Calibration of the CL17 with a chlorine standard or against a reference analysis is possible; however, it is neither necessary nor recommended due to its factory-established embedded calibration curve.

EPA Compliant

EPA compliant according to 40 CFR 140.74.

HACH®
Be Right™

Specifications*

Range	0 to 5 mg/L free or total residual chlorine
Accuracy	±5% or 0.04 mg/L (ppm) as CL_2, whichever is greater
Precision	3% or 0.01 mg/L (ppm) as CL_2, whichever is greater
Minimum Detection Limit (MDL)	0.04 mg/L (ppm) or better
Cycle Time	2.5 minutes
Inlet Pressure to Instrument	1 to 5 psig (1.5 psig is optimum)
Inlet Pressure to Sample Conditioning	1.5 to 75 psig
Sample Conditioning	200 to 500 mL per minute minimum required
Sample Temperature	5 to 40°C (41 to 104°F)
Operating Temperature	5 to 40°C (41 to 104°F)
Operating Humidity (non-condensing)	90% at 40°C (90% at 104°F) maximum
Interferences	Other oxidizing agents such as bromine, chlorine dioxide, permanganate and ozone will cause a positive interference. Hexavalent chromium will cause a positive interference: 1 mg/L Cr^{6+} = approximately 0.02 mg/L as Cl_2. Hardness must not exceed 1,000 mg/L as $CaCO_3$.
Recorder Outputs	One 4-20 mA with an output span programmable over any portion of the 0 to 5 mg/L range, 130 V isolation from earth ground, 500 ohm maximum One isolated recorder output, 4–20 mA (can be adjusted to 0–20 mA), recommended load impedance 3.6 to 500 ohms. Optional AquaTrend® Network interface
Alarm Relay Outputs	Two alarms selectable for sample concentration alarm, analyzer system warning, or analyzer system shut-down alarm. Each is equipped with an SPDT relay with contacts rated for 5A resistive load at 230 Vac.
Sample Inlet Connection	1/4-inch OD polyethylene tube, quick-disconnect fitting
Drain Connection	1/2-inch ID flexible hose, hose barb
Air Purge (optional)	1/4-inch OD tube, quick-disconnect fitting, 0.1 cfm instrument quality air at 20 psig maximum
Certification	CE approved ETL listed to UL 1262 ETL certified to CSA 22.2 No. 142
Enclosure	ABS plastic, two clear polycarbonate windows, IP62-rated with the gasketed door latched
Mounting	Wall mount
Display	LCD, 3-1/2-digit measurement readout and six-character alphanumeric scrolling text line
Light Source	Class 1 LED (light emitting diode) with a peak wavelength of 520 nm; 50,000 hours estimated minimum life
Power	100 to 115/230 Vac, 50/60 Hz (switch selectable), 90 VA maximum, 2.5 Amp fuse
Dimensions	31.4 x 45.4 x 179.4 cm (12.35 x 17.88 x 7.06 in.)
Shipping Weight	7.3 kg (16 lbs.)

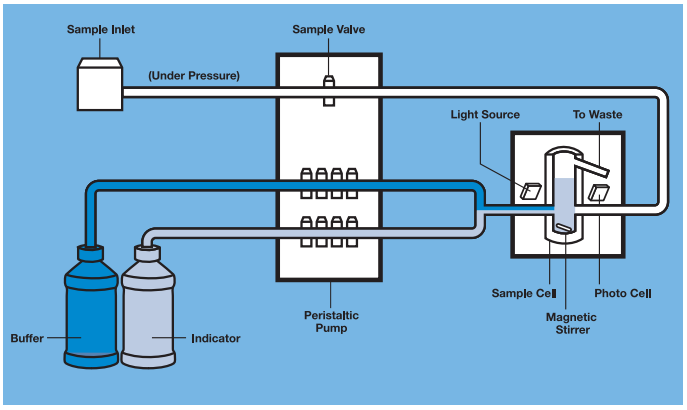
**Subject to change without notice.*

Principle of Operation

The CL17 Chlorine Analyzer has three operating components:

- *A linear peristaltic pump to precisely control the volume of incoming samples and reagents.*
- *A colorimeter with seal-free, solid-state mixing system that includes a self-cleaning stir bar.*
- *One-month supply of reagents (indicator and buffer)*

A zero reference point is established with the first sample in the cycle by measuring blank absorbance. (This compensates for the sample's color intensity and turbidity before the chlorine measurement is made.) Then, indicator and buffer reagents are added to the sample while a magnetic stirrer mixes the solution and the sample changes color. A compact colorimeter then measures the light transmitted through the sample. The measured color intensity is compared to an embedded calibration curve. Finally, the sample cell is flushed with new sample so that the cycle can repeat itself every 2.5 minutes.



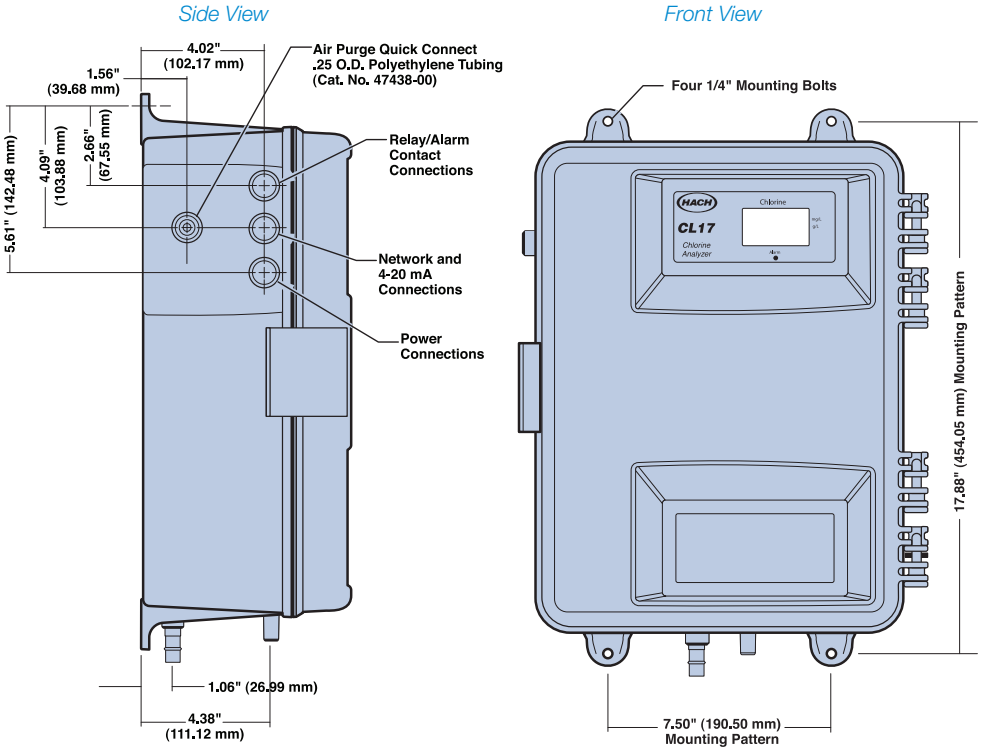
Method of Analysis

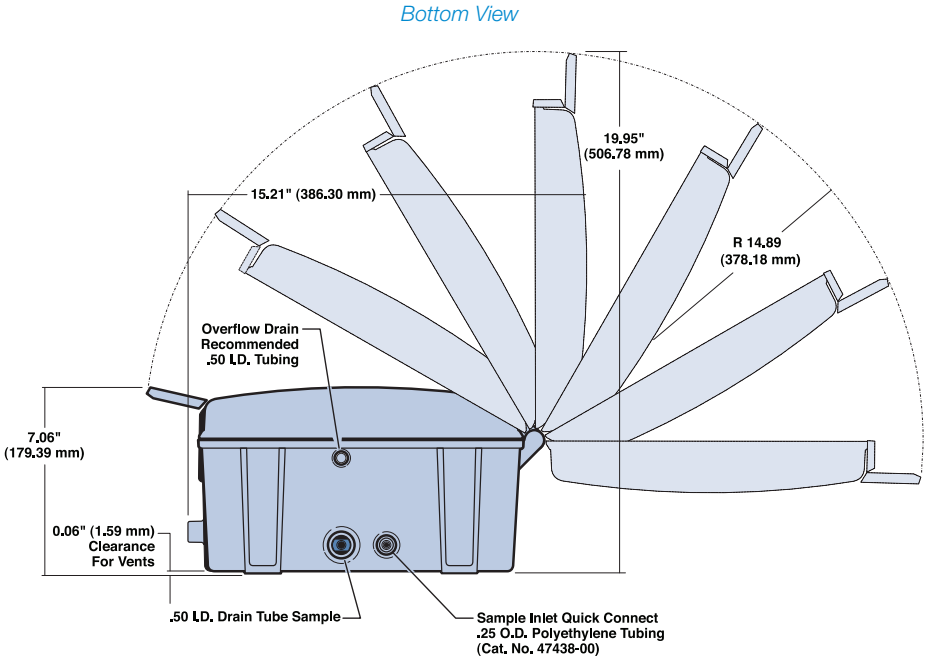
Free Residual Chlorine—The CL17 Chlorine Analyzer uses an aqueous buffered colorimetric indicator, N,N-diethylphenylenediamine (DPD), to determine levels of chlorine. DPD turns a magenta color in response to the amount of free residual chlorine (as hypochlorous acid or hypochlorite ion). The reaction takes place at a buffered pH of 6.3 to 6.6.

Total Residual Chlorine—To measure total residual chlorine (free residual chlorine plus mono-, di- and trichloramines) an additional reagent is used. By adding potassium iodide to the sample, chloramines in the sample oxidize iodide to iodine, which then oxidizes the DPD indicator to the magenta color at a buffered pH of 5.1.

Dimensions

The CL17 is designed to be wall-mounted with four 1/4-inch screws. Adequate clearance must be left at the sides and bottom of the case for plumbing and electrical connections. The sample inlet connection is 1/4-inch quick-disconnect fitting and the drain connection is 1/2-inch I.D. flexible hose. Electrical connections are inside the instrument case. Holes for three 1/2-inch conduit fittings are provided.





Ordering Information

Hach CL17 Chlorine Analyzers are shipped with a one-month supply of reagents, maintenance kit, installation kit, and manual. (The power cord is ordered separately.)

5440001 Model CL17 Free Residual Chlorine Analyzer

5440002 Model CL17 Total Residual Chlorine Analyzer

5440003 Model CL17 Free Residual Chlorine Analyzer with AquaTrend® Network Capability

5440004 Model CL17 Total Residual Chlorine Analyzer with AquaTrend® Network Capability

Accessories

5448800 Power Cord, 125V, 10A, 1.83 m (6 ft.)

5448900 Power Cord, 230V, 10A, 1.83 m (6 ft.), continental European plug

5444300 Maintenance Kit, 1 year, includes tubing, caps, funnel, and fittings

5444301 Maintenance Kit with preassembled tubing, 1 year, includes tubing, caps, funnel, and fittings

4643600 Flow Meter with 1/4-inch OD tubing

4427800 Serial I/O Kit

5449000 CL17 CAL/Verification Kit

Reagents

Reagent sets include all three of the required reagents [DPD indicator powder (added to indicator solution), indicator and buffer solutions] is sufficient for a 30-day operating period.

2556900 Reagent Set, CL17 free chlorine

2557000 Reagent Set, CL17 total chlorine

2297255 DPD Indicator Powder (free and total)

2314011 Free Chlorine Indicator Solution, 473 mL

2314111 Free Chlorine Buffer Solution, 473 mL

2263411 Total Chlorine Indicator Solution, 473 mL

2263511 Total Chlorine Buffer Solution, 473 mL

2835900 Calibration Refill Kit

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Outside United States: 970-669-3050 tel 970-461-3939 fax int@hach.com
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HACH® Be Right™

Hach sc200™ Universal Controller

Product Overview

One Controller for the Broadest Range of Sensors

The sc200 Universal Controller is the most versatile controller on the market. The new sc200 controller is the only controller that allows the use of digital and analog sensors, either alone or in combination, to provide compatibility with the broadest range of sensors. It replaces the Hach sc100 digital and GLI53 analog controllers with advanced features for easier operator use.

The sc200 controller platform can be configured to operate either 2 Digital Sensor Inputs, or 1 or 2 Analog Sensor Inputs, or a combination of Digital and Analog Sensor Inputs. Customers may choose their communication options from a variety of offerings ranging from MODBUS RTU to Profibus DPV1.

Choose from up to 29 digital or analog sensors for up to 15 different parameters.

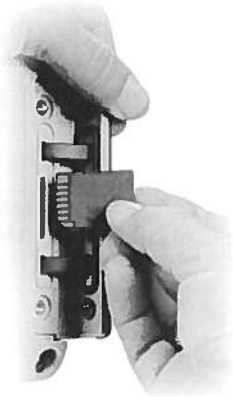
Features and Benefits

Maximum Versatility

- *Standardized controller eliminates the need for a variety of dedicated controllers*
- *Multi-channel controller operates either 1 or 2 sensors reducing inventory holding costs and providing an inexpensive option to add a second sensor at a later time*
- *"Plug and Play" operation with all Hach digital sensors*
- *True dual sensor controller provides 4-20 mA outputs to transmit primary and secondary measurement values*

Ease of Use and Confidence in Results

- *New display and guided calibration procedures reduce operator error*
- *Password protected SD card reader offers a simple solution for data download and transfer*
- *Visual warning system provides critical alerts*



Communication Options

- *MODBUS RS232/RS485 or Profibus DPV1*

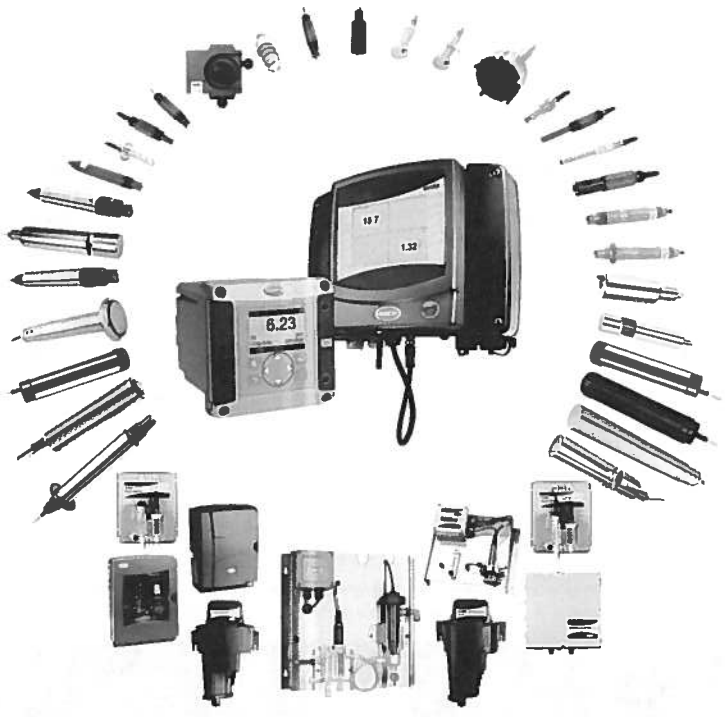
Controller Configuration	Functionality
2 Channel Digital Controller	Maximum versatility and flexibility: • Plug and play with all Hach digital sensors • Mix and match with Hach digital and GLI analog sensors
2 Channel Controller with 1 Analog and 1 Digital Sensor Input	• Plug and play with any one Hach digital sensor • Mix and match with any one GLI analog sensor
1 or 2 Channel Analog Controller	• Mix and match up to two GLI analog sensors

DW = drinking water *WW = wastewater municipal* ***PW = pure water / power***
IW = industrial water ***E = environmental*** *C = collections* ***FB = food and beverage***

Controller Comparison

Features	Current sc100™ Controller	GLI53 Controller	*NEW!* sc200™ Controller	Benefits
Display	64 x 128 pixels 33 x 66 mm (1.3 x 2.6 in.)	64 x 128 pixels 33 x 66 mm (1.3 x 2.6 in.)	160 x 240 pixels 48 x 68 mm (1.89 x 2.67 in.) Transreflective	• Improved user interface—50% bigger • Easier to read in daylight and sunlight
Data Management	irDA Port/PDA Service Cable	N/A	SD Card Service Cable	• Simplifies data transfer • Standardized accessories/ max compatibility
Sensor Inputs	2 Max Direct Digital Analog via External Gateway	2 Max Analog Depending on Parameter	2 Max Digital and/or Analog with Sensor Card	• Simplifies analog sensor connections • Works with GLI and Hach's digital sensors
Analog Inputs	N/A	N/A	1 Analog Input Signal Analog 4-20mA Card	• Enables non-sc analyzer monitoring • Accepts mA signals from other analyzers for local display • Consolidates analog mA signals to a digital output
4-20 mA Outputs	2 Standard	2 Standard	2 Standard Optional 4 Additional	• Total of six (6) 4-20 mA outputs enables up to 3 mA outputs per sensor input
Digital Communication	MODBUS 232/485 Profibus DP V1.0	N/A	MODBUS 232/485 Profibus DP V1.0	• Unprecedented combination of sensor breadth and digital communication options

To complete your measurement system, choose from Hach's portfolio of controller and sensor products...



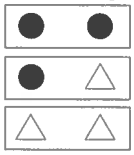
Choose from Hach's Broad Range of Digital and Analog Sensors

Parameter	Sensor	Digital or Analog
Ammonia	AMTAX™ sc, NH4D sc	●
Chlorine	CLF10 sc, CLT10 sc, 9184 sc	●
Chlorine Dioxide	9185 sc	●
Conductivity	3400, 3700	△
Dissolved Oxygen	LDO™, 5740 sc	●
Dissolved Oxygen	5500	△
Flow	U53, F53 Sensors	△
Nitrate	NITRATAX™ sc, NO3D sc	●
Oil in Water	FP360 sc	●
Organics	UVAS sc	●
Ozone	9187 sc	●
pH/ORP	pHD	●
pH/ORP	pHD, pH Combination, LCP	△
Phosphate	PHOSPHAX™ sc	●
Sludge Level	SONATAX™ sc	●
Suspended Solids	SOLITAX™ sc, TSS sc	●
Turbidity	1720E, FT660 sc, SS7 sc, ULTRATURB sc, SOLITAX sc	●

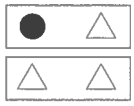
● = Digital △ = Analog

The diagrams below demonstrate the versatility and flexibility for the base controller units. Connect any of the appropriate sensors listed above to meet your measurement needs. Operation of analog sensors require the controller to be equipped with the appropriate sensor card.

2 Channel Digital Controller Configurations



2 Channel Controller with 1 Analog and 1 Digital Sensor Input Configurations



2 Channel Analog Controller Configurations

Engineering Specifications

The controller shall be a microprocessor based instrument.

2. The enclosure shall be 1/2 DIN format, NEMA4X rated for wall, pole and panel mounting.
3. The controller shall offer both 100–240 Vac 50/60 Hz and 24 Vdc power options.
4. The controller shall offer two analog 0/4-20 mA output signals with independent PID control functions and optional four additional 4-20 mA outputs.
5. The controller shall accept either Digital Sensors or Sensor Modules for pH, Conductivity, DO, Paddle Wheel Flow, and Ultra Sonic Flow sensors.
6. The controller shall have single channel and dual channel options.
7. The controller shall have options for MODBUS RS232, MODBUS RS485 and Profibus DPV1 communication.
8. The display contrast shall be adjustable.
9. The Menu shall be available in at least 19 different languages.
10. The controller shall have 2 Data logs, 128 kb each. The logged data shall be downloadable on a SD card in XML format.
11. The controller shall be Hach Company sc200 Universal Controller.

Specifications*

sc200 General Specifications

Display
Graphic dot matrix LCD with LED backlighting
Transreflective

Display Size
48 x 68 mm (1.89 x 2.67 in.)

Display Resolution
240 x 160 pixels

Height x Width x Depth
144 x 144 x 181 mm (5.7 x 5.7 x 7.1 in.)

Weight
1.70 kg (3.75 lb)

Power Requirements
100 – 240 Vac ±10%, 50/60 Hz
24 Vdc -15% + 20%

Operating Temperature
-20 to 60°C (-4 to 140°F), 0 to 95% RH non-condensing

Storage Temperature
-20 to 70°C (-4 to 158°F), 0 to 95% RH non-condensing

Analog Output Signal
Two 0/4 to 20 mA isolated current outputs, max 500Ω

Operational Mode
Primary or secondary measurement or calculated value (dual channel only)

Functional Mode
Linear, Logarithmic, Bi-linear, PID

Optional 4 additional 4/20 mA isolated current outputs, max 500Ω @ 18-24 Vdc (customer-supplied power source)

Security Levels
Two password protected levels

Enclosure Materials
Polycarbonate, Aluminum (powder coated), Stainless Steel

Mounting Configurations
Wall, pole and panel mounting

Enclosure Rating
NEMA4X / IP66

Conduit Openings
1/2" NPT Conduit

Relays
Four electromechanical SPDT (Form C) contacts, 1200W, 5 A, 250 Vac

Operational Mode
Primary or secondary measurement, calculated value (dual channel only) or timer

Functional Mode
Alarm, Timer, Feeder Control, PWM or FM Control, System Alarm

Digital Communication
MODBUS RS232/RS485, Profibus DPV1 optional

Memory Backup
Flash memory

Electrical Certifications
EMC: Certified CE compliant for conducted and radiated emissions (EN 50081-2) and immunity (EN 61000-6-2)

General Purpose: UL through ETL

Class I, Div. 2 (Groups A, B, C, and D): CSA (pending)

sc200 for Hach Analog pH/ORP Sensors

Measuring Range
-2.0 to 14.0 pH or -2.00 to 14.00 pH
- 2,100 to 2,100 mV

Repeatability
±0.1% of range

Response Time
0.5 s

Temperature Range
PT100/PT1000: -20 to 200°C (-4 to 392°F)
NTC300: -20 to 110°C (-4 to 230°F)
Manual: -25 to 400°C (-13 to 752°F)

Temperature Accuracy
±0.5°C (0.9°F)

Temperature Drift
±0.03% of reading /°C

Temperature Compensation
Automatic from -20 to 110°C (-4 to 230°F) or manual

Temperature Sensors
PT100/PT1000/NTC300

Temperature Compensation Curves
Nernst, for Pure Water: Ammonia, Morpholine, User Defined (linear)

Sensor-to-Controller Distance (maximum)
pHD or LCP sensor: 914 m (3000 ft.)
pH Combination electrode w/ preamplifier: 300 m (958 ft.)
pH Combination electrode w/o preamplifier: 30 m (100 ft.), depending on environment this distance is shorter

Calibration Methods
2-point buffer (pH only)
1-point buffer (pH only)
2-point sample (pH only)
1-point sample (pH or ORP)

Specifications continued

sc200 for Hach Analog Contacting Conductivity Sensors

Measuring Range
Conductivity
µS/cm: 0-2.000, 0-20.00, 0-200.0 or 0-2,000
mS/cm: 0-2.000, 0-20.00 or 0-200.0

Resistivity
0-19.99 MΩ•cm or 0-999.9 kΩ•cm

TDS
0-9999 ppm or 0-9999 ppb

Repeatability, Precision (0-20 µS/cm, K=1)
±0.02 mS/cm

Repeatability (20-200,000 µS/cm, K=1)
±0.1% of reading

Response Time
0.5 s

Temperature Range
-20 to 200°C (-4 to 392°F)

Temperature Accuracy
±0.5°C (0.9°F)

Temperature Drift
> 20 µS/cm: ±0.02% of reading / °C
< 20 µS/cm: ±0.004 µS/cm

Temperature Compensation
Automatic from -20 to 200°C (-4 to 392°F) or manual

Temperature Sensor
PT100/PT1000

Temperature Compensation Curves
Linear, Ammonia, Natural water, User Defined, none

Sensor-to-Controller Distance (max)
91m (300 ft.)

Calibration Methods
Zero
GLI DRY-CAL
1-point sample

sc200 for Hach Analog Inductive Conductivity Sensors

Measuring Range
Conductivity
µS/cm: 0-200.0 or 0-2,000
mS/cm: 0-2.000, 0-20.00, 0-200.0 or 0-2,000
S/cm: 0-2.000

% Concentration
0-99.99% or 0-200.0%

TDS
0-9999 ppm repeatability

Repeatability > 500 µS/cm
±0.5% of reading

Repeatability < 500 µS/cm
±2.5 µS/cm

Response Time
1 s

Temperature Range
-20 to 200°C (-4 to 392°F)

Temperature Accuracy
±0.5°C (0.9°F)

Temperature Drift
> 500 µS/cm: ±0.02% of reading / °C
< 500 µS/cm: ±0.1 µS/cm

Temperature Compensation
Automatic from -20 to 200°C (-4 to 392°F) or manual

Temperature Sensors
PT1000

Temperature Compensation Curves
Linear, Natural water, User Defined, none**

Concentration Curves
H_3PO_4: 0-40%; HCl: 0-18%; HCl: 22-36%; NaOH: 0-16%; $CaCl_2$: 0-22%; HNO_3: 0-28%; HNO_3: 36-96%; H_2SO_4: 0-30%; H_2SO_4: 40-80%

Sensor-to-Controller Distance

Full-scale value	*Maximum length*
200 to 2,000 µS/cm	61m (200 ft.)
2,000–2,000,000 µS/cm	91m (300 ft.)

Calibration Methods
1-point Cond (or Concentration or TDS)
Zero

***Available curves depend on the selected type of measurement (Conductivity, Concentration or TDS).*

Continued on next page.

Specifications *continued*

Linearity 3700 Inductive Conductivity Sensors

1.5 mS/cm – 2 S/cm
1% or reading

< 1.5 mS/cm
±15 µS/cm

Linearity 3700 Inductive Conductivity Sensors with Multiple Point Calibration

1.5 mS/cm – 2 S/cm
0.5% or reading

< 1.5 mS/cm
±5 µS/cm

sc200 for Hach Analog Dissolved Oxygen Sensors

Measuring Range
0 to 40 ppm
200% saturation

Repeatability
±0.05% of range

Response Time
0.5 s

Temperature Range
0 to 50°C (32 to 122°F)

Temperature Accuracy
±0.5°C (0.9°F)

Temperature Drift
±0.02% of reading / °C

Temperature Compensation
Automatic from 0 to 40 ppm or manual

Temperature Sensor
NTC30K / Manual

Sensor-to-Controller Distance (max)
305 m (1000 ft.)

Calibration Methods
Sample
Air
Saturation

sc200 for Hach UltraSonic Flow Sensor

Flow Rate
0-9999, 0-999.9, 0-99.99 with selectable flow rate units and multiplier

Volume
0-9,999,999 with selectable volume units

Depth
0-1200.0 inches, 0-100.0 feet, 0-30,000 mm, or 0-30.00 meters

Input Filter
999 sec

Totalizers
8-digit resettable LCD software totalizer

Totalized Flow
Gal., $ft.^3$, acre-ft., lit., m^3

Repeatability
±0.1% of span

Sensor-to-Controller Distance (max)
100 m (328 ft.)

Calibration Methods
Cal Depth 1 point
Cal Depth 2 point

sc200 for Hach Paddle Wheel Flow Sensor

Flow Rate
Function of Structure Type: 0-9999, 0-999.9, 0-99.99 with selectable flow rate units and multiplier

Volume
0-9,999,999 with selectable volume units

Input Filter
999 sec

Totalizers
8-digit resettable LCD software totalizer

Totalized Flow
Gal., $ft.^3$, acre-ft., lit., m^3

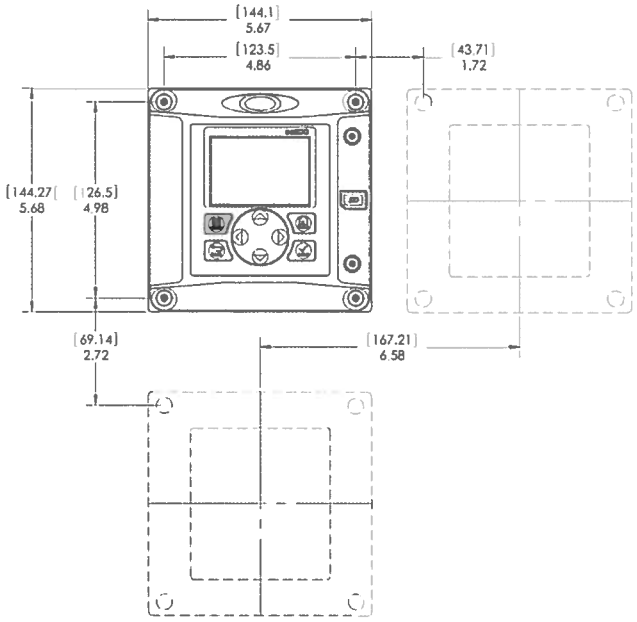
Sensor-to-Controller Distance (max)
GLI impeller Sensors: 610m (2000 ft.)
Non-GLI Sensors: 91m (300 ft.)

*Specifications subject to change without notice.

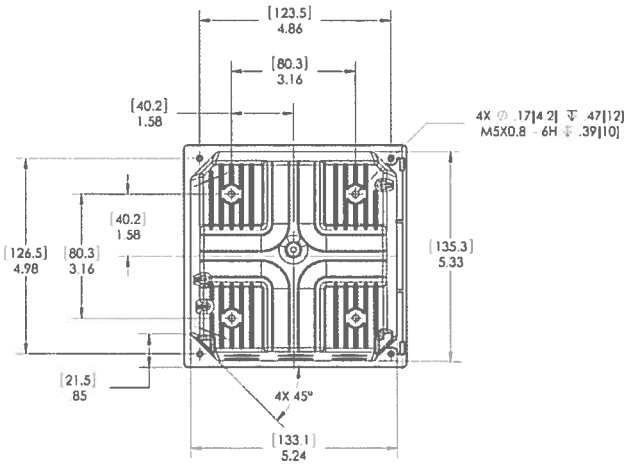
Dimensions

The sc200 controller unit can be installed on a surface, panel, or pipe (horizontally or vertically). No tools are needed to connect the controller unit to any Hach digital sensor. NOTE: Dimensions are in inches [millimeters].

Minimum Spacing Dimensions for Group Mounting



Mounting Dimensions



Bottom View