Montana Department of
ENVIRONMENTAL QUALITY
WATER PROTECTION BUREAU

Agency Use	
Permit No.:	MT0031861
Date Rec'd	10-20-15
Amt Rec'd	$4,200.00
Check No.	15481
Rec'd By	SJM

FORM **1**

GENERAL INFORMATION
(See instructions before completing)

Section A – Montana Pollutant Discharge Elimination System

SPECIFIC QUESTIONS	MARK 'X' YES	NO	FORM ATTACHED	SPECIFIC QUESTIONS	MARK 'X' YES	NO	FORM ATTACHED
1. Is this facility a publicly owned treatment works which results in a discharge to state surface waters or waters of the U.S.? (FORM 2A)	○	◉	☐	2. Does or will this facility (*either existing or proposed*) include a concentrated animal feeding operation or aquatic animal production facility which results in a discharge to state surface waters or waters of the U.S.? (FORM 2B)	○	◉	☐
3. Is this a facility which currently results in a discharge of industrial wastewater to state surface water other than those described in 1 or 2 above? (FORM 2C)	○	◉	☐	4. Is this a proposed facility (*other than those described in 1 or 2 above*) which will result in a discharge of industrial wastewater to state surface waters? (FORM 2D)	○	◉	☐
5. Does this facility discharge only non-process wastewater, not subject to federal effluent guidelines or new source performance standards to state surface waters? (FORM 2E)	◉	○	☑	6 Does this facility discharge or propose to discharge storm water associated with industrial activity either alone or in combination with non-storm water discharges? (FORM 2F)	○	◉	☐
Montana Ground Water Pollution Control System (MGWPCS)							
7. Does this facility discharge sewage to ground water through infiltration, percolation or other methods of subsurface disposal? (GW-1)	○	◉	☐	8. Does this facility discharge industrial wastes, or other wastes, to ground water through infiltration, percolation, or other methods of subsurface disposal? (GW-2)	○	◉	☐

Section B – Facility or Activity Information

Facility Name: Montana Artesian Water Company

Facility Location: 1085 Egan Slough Road

City, State, Zip: Kalispell, MT 59901

Telephone Number: (406) 755-3515 County: Flathead

Township: 28 North Range: 20 West Section: 20 ; SE 1/4 NW 1/4 SE 1/4

Latitude: 48.171905 Longitude: -114.166820

Is the facility located on Indian lands? ☐ YES ◉ NO

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Section C – Facility Contact

Facility Contact Name/Title: Lew Weaver, Vice President

Mailing Address: 405 Pederson Road

City, State, Zip: Kalispell, MT 59901

Telephone Number: (406) 755-3515 Email: lewlarel@verizon.net

Montana Department of
ENVIRONMENTAL QUALITY
WATER PROTECTION BUREAU

Agency Use	
Permit No.:	MT0031861
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FORM **2E**

Facilities Which Do Not Discharge Process Wastewater

This form is to be completed by manufacturing, commercial, mining, silvicultural, or other dischargers applying for MPDES permits which discharge only non-process wastewater not regulated by an effluent limit guideline or new source performance standard [ARM 17.30.1322 (8)]. See attached instructions. Do not leave blank spaces; if a question does not apply, put "NA" in the space provided. You must print or type legibly; forms that are not legible or are not complete or are unsigned will be returned. You must maintain a copy of the completed Form 2E for your records.

Section A - Form 2E Status *(Check one)*

- [x] New — No prior Form 2E submitted for this site.
- [ ] Resubmitted — Permit Number: MT _ _ _ _ _ _ _
- [ ] Renewal — Permit Number: MT _ _ _ _ _ _ _
- [ ] Modification — Permit Number: MT _ _ _ _ _ _ _ (Discuss Modification in Section I)

Section B - Facility or Site Information *(See instruction sheet.)*:

Site Name: Montana Artesian Water Company

Site Location: Site physical address, mailing address at the site, or directions to the site

1085 Egan Slough Road

Nearest City or Town: Kalispell Zip Code: 59901 County: Flathead

Latitude: 48.171905 Longitude: -114.166820

Is this facility or site located on Indian Lands? [ ] Yes [x] No

Section C - Applicant (Owner/Operator) Information

Owner or Operator (Legal Entity): Montana Artesian Water Compnay

Mailing Address: 405 Pederson Road

City, State, and Zip Code: Kalispell, MT 59901

Phone Number: (406) 755-3515

Is the applicant listed above the owner? [x] Yes [ ] No

Status of Applicant *(Check one)* [ ] Federal [ ] State [x] Private [ ] Public [ ] Other (specify)_____

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Section D - Existing or Pending Permits, Certifications, or Approvals ☒ None

☐ MPDES _____ ☐ RCRA _____

☐ PSD (Air Emissions) _____ ☐ Other _____

☐ 404 Permit (dredge & fill) _____ ☒ Other MT DEQ - PWS

Section E - Nature of Business (provide a brief description)

Montana Artesian Water Company bottles uncarbonated and unflavored drinking water from an artesian well located at the site. Water is bottled at the site and stored on pallet shelving in the water plant until picked up by the distributor and trucked to distributing markets.

Standard Industrial Classification (SIC) Codes

Provide at least one SIC code which best reflects the principal products or services provided by this business.

Code	A. Primary	Code	B. Second
1 5149	Wholesale Trade	2	
Code	**C. Third**	**Code**	**D. Fourth**
3		4	

Section F - Facility or Site Contact Person/Position

Name and Title, or Position Title Lew Weaver, Vice President

Mailing Address 405 Pederson Road

City, State, and Zip Code Kalispell, MT 59901

Phone Number (406) 755-3515 Email lewlarel@verizon.net

Section G - Receiving Surface Water(s)

For each outfall, list the latitude and longitude to the nearest second and the name of the receiving waters.

Outfall Number	Latitude	Longitude	Receiving Surface Waters
001	48.171598	-114.165485	Unnamed Tributary of Flathead River
002	48.171909	-114.165502	Unnamed Tributary of Flathead River
003			
004			
005			

MAP: Attach a USGS topographic quadrangle map extending one mile beyond the property boundaries of the site or activity identified in Section B depicting the facility or activity boundaries, major drainage patterns, and the receiving surface waters stated above.

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Section H - Type of Waste

Check the box(es) indicating the general type(s) of wastes discharged.

☐ Sanitary Wastes ☐ Restaurant or Cafeteria Wastes ☐ Non-contact Cooling Water

☐ Construction Dewatering ☐ Contaminated Groundwater ☐ Disinfected Water (Hydrostatic Testing)

☐ Suction Dredge *(specify intake size)*

☒ Other Non-process Wastewater *(identify)* non-contact heating water & bottle rinse water

If any additives are used, list them here. Briefly describe their composition and amounts, (or attach MSDS).
There are no additives in the discharge water. Discharge consists of water conveyed through the geothermal heat pump (non-contact) and bottle rinse water.

Section I - Outfall Information
(This section must completed for each outfall identified in Section G)

Outfall # 001

Treatment System - describe any treatment system(s) or best management practices (BMP's) used to reduce pollutants.
There is no treatment designed to reduce pollutants. Water is diverted from the public water supply well located on-site and flows through two, 10-ton Bosch geothermal heat pumps (model TW122). The heat pumps are non-contact so the water is not exposed to any contaminants.

Frequency and Duration of Discharge

Except for leaks or spills, will the discharge described in this form be intermittent or seasonal? ☒ Yes ☐ No

If yes, describe the frequency of flow and duration:
Water discharged from non-contact heating water will be both seasonal and intermittent. Water flows through the heat pump only when a call for heat is made. At full capacity the heat pump will utilize 60 gpm. The annual water demand for heating is estimated to be 4,002,956 gallons. The majority of the water will be utilized between October and March annually. The average daily discharge will range from 0 gallons to 86,400 gallons on the coldest winter days.

Other Information (Optional)

Use the space below to expand upon any of the above questions or to bring to the attention of the reviewer any other information you feel should be considered in establishing permit limitations. Attach additional sheets, if necessary.
Water from the supply well is estimated to range from 51 to 53 degrees Fahrenheit. Water will be discharged to the UT of the Flathead River at a temperature between 43 and 45 degrees Fahrenheit.

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Section J - Effluent Characteristics (See Instructions) Please refer to the laboratory results provided in Appendix B of the attached Technical Memorandum.

(This section must completed for each outfall identified in Section G)

Outfall #: 001 / 002

Pollutant or Parameter	Maximum[1]		Average		No. of Samples	Analytical Method	Source of Estimate
	Concentration	Units	Concentration	Units			
pH (Minimum)			NA				
pH (Maximum)			NA				
Flow							
Total Suspended Solids (TSS)							
Biochemical Oxygen Demand (BOD_5)							
Chemical Oxygen Demand (COD)							
Total Organic Carbon (TOC)							
Oil & Grease							
Chlorine, Total Residual (TRC)							
Fecal Coliform Bacteria							
Ammonia, Total, as N							
Dissolved Oxygen							
Kjeldahl Nitrogen, Total, as N							
Nitrate + Nitrite, as N							
Phosphorus, Total, as P							
Total Dissolved Solids							
Specific Conductivity							
Chloride							
Sulfate							
Alkalinity, as $CaCO_3$							
Acidity, as $CaCO_3$							
Other:							
Other:							
Metals (Total Recoverable), Cyanide, Phenols and Hardness							
Antimony							
Arsenic							
Beryllium							
Cadmium							
Chromium							
Copper							
Lead							
Mercury							
Nickel							
Selenium							
Silver							
Thallium							
Zinc							
Cyanide							
Total Phenolic Compounds							
Hardness, as $CaCO_3$							
Use this space (or a separate sheet) to provide information on other metals requested by the permit writer, or general permit.							

Footnote:
1. Except pH, enter minimum and maximum value in applicable row and column.

Section K - Mixing Zone

Is the Applicant requesting a mixing zone in the receiving water pursuant to the Administrative Rules of Montana (ARM) Title 17, Chapter 30, Subchapter 5? ☐ Yes, see below ☐ No

Type of Mixing Zone:

☐ Standard Mixing Zone for surface water, see ARM 17.30.516 for informational requirements.

☒ Source Specific Mixing Zone, see ARM 17.30.518 for informational requirements.

Specify which outfalls will require a mixing zone:

☒ 001 ☒ 002 ☐ 003 ☐ 004 ☐ 005

Section L - Supplemental Information

Please refer to attached Technical Memorandum for additional information on the recieving water and the proposed discharge / mixing zone.

Section M - CERTIFICATION

Applicant Information: This form must be completed, signed, and certified as follows:

- For a corporation, by a principal officer of at least the level of vice president;
- For a partnership or sole proprietorship, by a general partner or the proprietor, respectively; or
- For a municipality, state, federal, or other public facility, by either a principal executive officer or ranking elected official.

All Applicants Must Complete the Following Certification:

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information; including the possibility of fine and imprisonment for knowing violations. [75-5-633, MCA]

A. Name (Type or Print) Lew F. Weaver	
B. Title (Type or Print) Vice President	C. Phone No. (406) 755-3515
D. Signature Lew F Weaver	E. Date Signed 10-13-2015

The Department will not process this form until all of the requested information is supplied, and the appropriate fees are paid. Return this form and the applicable fee to:

Department of Environmental Quality
Water Protection Bureau
PO Box 200901
Helena, MT 59620-0901
(406) 444-3080

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Section I – Outfall Information

Treatment System – describe any treatment system(s) or best management practices (BMP's) used to reduce pollutants.

There is no treatment designed to reduce pollutants. Water is diverted from the public water supply well, sent through ultra-violet disinfection, and used to rinse water bottles before they are filled and sealed. Rinse water is collected in floor drains located beneath the rinse station. Water collected in the drains shall flow directly to the outfall.

Frequency and Duration of Discharge

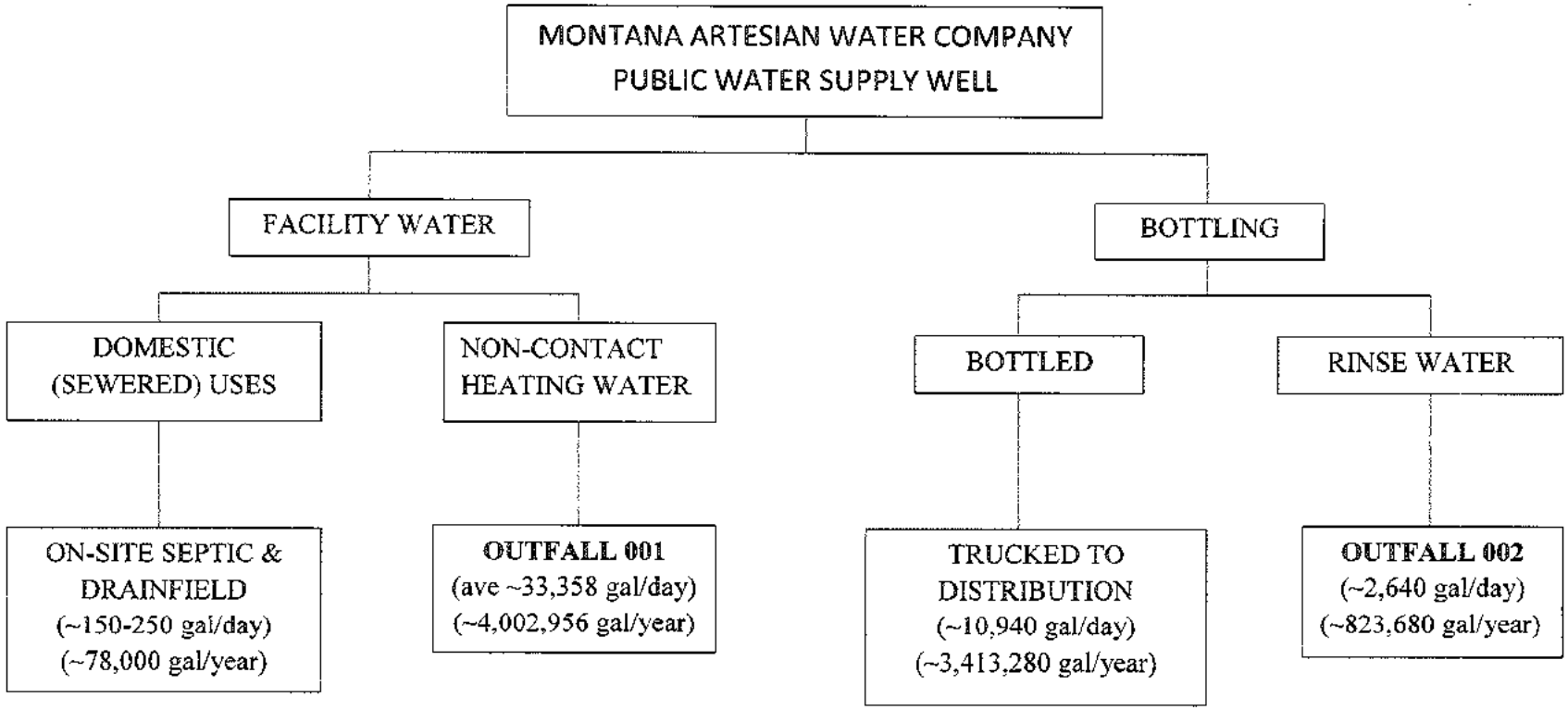
Except for leaks and spills, will the discharge described in this form be intermittent or seasonal? If yes describe the frequency of flow and duration:

Rinse water discharged to the drain shall be intermittent, but is not anticipated to have a large seasonal variation.

Water will be diverted from the wellhead under artesian pressure via a 6-inch nipple welded to the side of the casing. Water is conveyed to a 2,000 gallon stainless steel storage tank. As shown in **Figure 5** (attached), the water is routed from the storage tank through a series of paper filters and a ultra-violet disinfection system before entering the bottling line. System operating pressure is controlled by a booster pump located ahead of the disinfection system. Montana Artesian Water Company will bottle water with a filling station capable of filling at a rate of 7,000 – 20 ounce bottles per hour. The bottling plant is a Monobloc model RFC 18-18-6 rotary rinser-filler-capper. Water bottles are rinsed, filled, and capped in the bottling plant. From there the bottles are conveyed to the labeling and wrapping machines where the bottles are labeled, sorted, and cased before being stacked on pallets. The pallets are stored on shelving at the plant until they are picked up by the distributor and trucked to distributing markets.

The bottles are rinsed prior to being filled. The Monobloc model RFC rinser utilizes 700 to 1,000 liters or 185 to 264 gallons per hour. The rinse water is discharged on the floor of the bottling plant and conveyed to the trench floor drains shown on **Figure 5**. The floor drains convey water to Outfall 002, where it is discharged to the Unnamed Tributary of the Flathead River.

The maximum discharge to Outfall 002 is anticipated to be 264 gallons per hour or 4.4 gpm. At the maximum, the bottling plant will operate 10-hours per day for a total discharge of 2,640 gallons per day, six days per week up for a total of 15,840 gallons per week, and 52 weeks per year for a total of 823,680 gallons per year. No water is anticipated to be discharged while the bottling plant is not in operation.


MONTANA ARTESIAN WATER COMPANY
PUBLIC WATER SUPPLY WELL
FACILITY WATER
BOTTLING
DOMESTIC (SEWERED) USES
NON-CONTACT HEATING WATER
BOTTLED
RINSE WATER
ON-SITE SEPTIC & DRAINFIELD
(~150-250 gal/day)
(~78,000 gal/year)
OUTFALL 001
(ave ~33,358 gal/day)
(~4,002,956 gal/year)
TRUCKED TO DISTRIBUTION
(~10,940 gal/day)
(~3,413,280 gal/year)
OUTFALL 002
(~2,640 gal/day)
(~823,680 gal/year)

Technical Memorandum **Applied Water Consulting**

TO: Montana Department of Environmental Quality – Water Protection Bureau

COPIES: Lew Weaver, Vice President / Montana Artesian Water Co.

FROM: Brad Bennett, Project Hydrogeologist / Applied Water Consulting

DATE: October 13, 2015

SUBJECT: **Montana Artesian Water Company – Montana Pollutant Discharge System (MPDES) Permit Mixing Zone**
AWC Project No. 693.14

INTRODUCTION

Applied Water Consulting (AWC) was retained by Montana Artesian Water Company, to prepare a Montana Pollutant Discharge Elimination System (MPDES) Permit application and evaluate the mixing zones associated with the propsed discharges at their bottling facility. This technical memorandum provides the general information obtained and modeling performed by AWC. A site vicinity map showing the location of the Montana Artesian Water Company bottling facility relative to the general features in the area is presented as **Figure 1**

RECEIVING WATERS

Montana Artesian Water Company plans to discharge: 1) non-contact heating water; and 2) rinse water, to a small Unnamed Tributary (UT) of the Flathead River. The receiving water is located approximately 130 feet east of their bottling facility. This area of the Flathead Valley is a large groundwater discharge area with abundant springs, wetlands, and many artesian wells. As shown in **Figure 2**, the Unnamed Tributary discharges water to the Flathead River to the west and Mill Creek (eventually the Flathead River) to the east. Overall, a minimal gradient is associated with this surface water body and it generally conveys water parallel with the topography at an elevation of 2900 to 2898 feet amsl. In essence, this water body acts to drain high groundwater and convey it to the Flathead River.

Water from the receiving waters is not utilized for human consumption or recreation. There are a few Statements of Claim for stock watering associated with the unnamed tributary. Only one of the water rights is located near the proposed outfalls. Statement of Claim 76LJ 9228 00, owned by Lew F Weaver, Vice President and part owner of Montana Artesian Water Company. Discharges associated with the bottling plant will not degrade water quality and the only anticipated impact is a slight variation in temperature.

A field survey of the unnamed tributary on July 19, 2014 and baseline water quality measurements collected on September 30, 2015 affirm the receiving water is comprised entirely of groundwater. Stream discharge was measured at 0.49 cfs on October 2, 2015. A portable flowmeter (March-McBirney Model 2000) and standard methodology were used to measure the

discharge of the receiving waters. A copy of the discharge measurement form is provided **Appendix A**. Given the source of the unnamed tributary is groundwater, there is very little seasonal variability in discharge. However, the spring and summer of 2015 have been exceptionally warm and dry with local streams at or near all-time seasonal low flows. The discharge measurement collected on October 2, 2015 represents baseflow conditions and will be utilized to model the anticipated mixing zone.

A set of water-quality field measurements including water temperature, pH, dissolved oxygen (DO), and specific conductivity (SC) were measured on September 30, 2015. The field instruments were calibrated with manufacturer's standards prior to use. AWC personnel collected baseline measurements at three locations as shown on **Figure 3**. A summary of the measurement value for each parameter is presented in **Table 1**. Measurements collected from the production well are provided for comparison.

Table 1
Field Water Quality Parameters

Site Description	Temperature (°F)	pH	Specific Conductivity (ms/cm)	Dissolved Oxygen (mg/L)
North - Upstream	47.3	7.92	0.333	7.60
Central – Outfall Location	46.04	7.90	0.320	8.09
South – upstream Flathead River	47.12	8.12	0.323	10.04
Groundwater – Production Well	52.3	7.92	0.343	3.50

Mixing Zone Parameters

The receiving waters are classified B-1 waters and as such, the quality is to be maintained. ARM 17.30.623 outlines the restrictions to water temperature associated with B-1 waters, as follows:

"A 1°F maximum increase above naturally occurring water temperature is allowed within the range of 32°F to 66°F... A 2°F maximum decrease below naturally occurring water temperature is allowed within the range of 55°F to 32°F..."

Mixing zone modeling was performed with ARM 17.30.623(e) as the guiding principle. Based upon the above rule, a mixing zone is required in the immediate vicinity of each outfall, wherein the water temperature is greater than 1°F above the naturally occurring temperature or 2°F lower than the naturally occurring water temperature. For the purposes of the following discussion, the term mixing zone is equivalent to the term "thermal plume".

SOURCE WATER

A new public water supply (PWS) well was recently drilled and constructed to serve the Montana Artesian Water Company's water bottling plant. The well design plans and specifications were approved by the Montana Department of Environmental Quality (DEQ). The

legal description of the PWS well site is the SE¼ SE¼ NW¼ SE¼ of Section 20, Township 28 North, Range 20 West, Flathead County, Montana. The location of the production well is illustrated in **Figures 1 and 3**.

Well Construction

A summary of well construction information is provided in **Table 2**. A copy of the well driller's log is provided in **Appendix B**.

Table 2 **Montana Artesian Water Co. – Production Well Details**	
Total Depth	222 feet
Static Water Level	30.7 feet ags
Grout Seal Depth	55 feet bgs
10-inch Well Casing	-2 to 203 feet bgs
Screened Interval	203 to 221 feet bgs

As shown on the well log (provided in **Appendix B**) the well flowed under artesian pressure at a rate of 175 gpm immediately after development. As such, a pump will not initially be required to divert water from the well to the bottling plant. Since that time, the wellhead has been capped and will remain capped until utilized for bottling water.

Water Quality

AWC collected water samples for a wide array of parameters required for the water bottling industry. Copies of the laboratory report for the water quality analysis are provided in **Appendix C**.

The laboratory results from the production well indicate the groundwater is a calcium-magnesium – bicarbonate type, which is typical of the deep artesian aquifer in the Flathead Valley. The specific conductivity is reported as 331 µmohs/cm. The nitrate concentration was reported as 0.11 mg/L, which is representative of background conditions. Sulfate was detected at a concentration of 2.7 mg/L and fluoride was detected at a concentration of 0.13 mg/L. No volatile organic chemicals (VOCs), semi-volatile organic chemicals (SVOCs), pesticides, or herbicides were detected in the analyses.

OUTFALL 001

Outfall 001 will receive discharge water from a non-contact heating system utilized to heat the bottling facility.

Heat Pump Design and Specifications

An open-loop geothermal water source heating system shall be utilized to heat the bottling plant. Two Bosch Model TW-122 10-ton water source heat pumps are to be utilized to heat the facility (specifications are provided in **Appendix D**). The heat pumps will draw a maximum demand of

3.0 gpm / ton from the groundwater for a total peak demand of 60 gpm. Water flow to the heat pump will be variable depending upon the heating needs at a given time. Automated valves within the heat pump control the flow of water through the unit. When the heat pump receives demand, the valves open and water flows through the unit. After the heat is taken from the groundwater, it is returned to the unnamed tributary through Outfall 001 located approximately 160 feet east of the well. Water is provided to the heat pump between 52 and 53 °F and will be returned at a minimum temperature of 44.1 to 45.1 °F.

Water flow to the heat pumps will be variable depending upon the heating needs at a given time. Based on the annual heating load for the bottling facility (211,000 BTU/hr) and the typical heating requirements for the Kalispell area, the total volume of water diverted to the geothermal heating system is estimated to be 4,002,956 gallons. Water flow to the heat pumps is controlled by the temperature in the facility. When a call for heat is made, an automated valve within the unit opens and water flows through the unit.

Outfall Design

The outfall shall consist of approximately 140 feet of buried 3-inch inner diameter (ID) PVC to convey water from the boiler room to the receiving waters. A final 10 foot section of 6-inch id PVC will be utilized to reduce the velocity of the discharge water before it reaches the outfall and begins mixing with the receiving waters. The 6-inch ID outlet will be placed at approximately 0.8 feet below the water surface and will be discharged horizontally and perpendicular to the channel. As shown on the attached schematic provided as **Figure 4**.

OUTFALL 002

Outfall 002 will receive water that has been used to rinse water bottles prior to them being filled and sealed. Rinse water is collected in floor drains located beneath the rinse station. Water collected in the drains shall flow directly to the outfall.

Bottling System and Rinse Station

Water will be diverted from the wellhead under artesian pressure via a 6-inch nipple welded to the side of the casing. Water is conveyed to a 2,000 gallon stainless steel storage tank. As shown in **Figure 5**, water is routed from the storage tank through a series of paper filters and an ultra-violet disinfection system before entering the bottling line. System operating pressure is controlled by a booster pump located ahead of the disinfection system. Montana Artesian Water Company will bottle water with a filling station capable of filling at a rate of 7,000 – 20 ounce bottles per hour. The bottling plant is a Monobloc model RFC 18-18-6 rotary rinser-filler-capper. Water bottles are rinsed, filled, and capped in the bottling plant. From there the bottles are conveyed to the labeling and wrapping machines where the bottles are labeled, sorted, and cased before being stacked on pallets. The pallets are stored on shelving at the plant until they are picked up by the distributor and trucked to distributing markets.

The bottles are rinsed prior to being filled. The Monobloc model RFC rinser utilizes 700 to 1,000 liters or 185 to 264 gallons per hour. The rinse water is discharged on the floor of the

bottling plant and conveyed to the trench floor drains shown on **Figure 3**. The floor drains convey water to Outfall 002, where it is discharged to the Unnamed Tributary of the Flathead River.

The maximum discharge to Outfall 002 is anticipated to be 264 gallons per hour or 4.4 gpm. At maximum the bottling plant will operate 10-hours per day for a total discharge of 2,640 gallons per day, six days per week up for a total of 15,840 gallons per week, and 52 weeks per year for a total of 823,680 gallons per year. No water is anticipated to be discharged while the bottling plant is not in operation.

Outfall Design

The outfall shall consist of approximately 125 feet of buried 3-inch ID PVC to convey water from the floor drains below the rinser to the receiving waters. The 3-inch ID outlet will be placed at approximately 0.8 feet below the water surface and will be discharged perpendicular to the channel. As shown on the attached schematic provided as **Figure 4**.

MIXING ZONE MODELING

Thermal dispersion modeling was conducted for effluent discharges using the United States Environmental Protection Agency (EPA) Visual Plumes modeling software. Visual Plumes is a public domain software published by the EPA and maintained by the Center for Exposure Assessment Modeling (CEAM). The software simulates single and merging submerged plumes in stratified ambient flow and buoyant surface discharges. Within the Visual Plumes user interface, the UM3 model was selected to simulate effluent discharge at the Montana Artesian Water Company site. Additional information regarding the modeling software can be found at the EPA website at the following link: *http://www.epa.gov/ceampubl/swater/vplume/index.html*.

Model inputs were derived from information obtained from site visits. The size and location of the discharge port(s) utilized in the models, including the depth and angle where obtained from the applicant. Effluent discharge is representative of the maximum potential discharge for Outfall 001 of 60 gpm (0.134 cfs) and Outfall 002 of 5 gpm (0.011 cfs). Additional effluent temperatures are based on information obtained from representatives of Bosch, the manufacturer of the heat pump unit. The ambient groundwater temperature is utilized for the bottle rinse water sent to Outfall 002. Ambient temperature conditions are based on the three temperature measurements discussed above. The ambient current was estimated to be 0.05 ft/second, based on the discharge measurement collected on October 2, 2015. Model inputs and outputs, can be found in **Appendix E**. Graphical results of the modeling, directly from the Visual Plumes program are also provided in **Appendix E**.

It should be noted that the mixing zone model assumes continuous discharge of effluent, which is not anticipated nor proposed. Modeling in this manner, may provide a slightly larger mixing zone estimate.

DISCUSSION OF RESULTS

Outfall 001

As expected, Outfall 001 yields the larger thermal plume of the two discharges. However, the thermal plume remains relatively small. **Table 3** describes the size, shape, and temperature of the thermal plumes for each outfall. It should be noted that the plume temperature presented is at the center of the plume. Temperatures along the margins of the plume will be closer to the ambient conditions.

Table 3
Size and Position of Thermal Plume

Modeled Condition	Plume Centerline Distance Outfall		Relative Depth	Plume Diameter	Effluent Temp	Plume Temp	Ambient Temp
	X (ft)	Y (ft)	(ft)	(ft)	(°F)	(°F)	(°F)
Outfall 001	0.083	2.607	0.852	1.721	44.1	45.81	47.30
Outfall 002	0.421	0.913	0.624	1.316	53	47.05	46.04

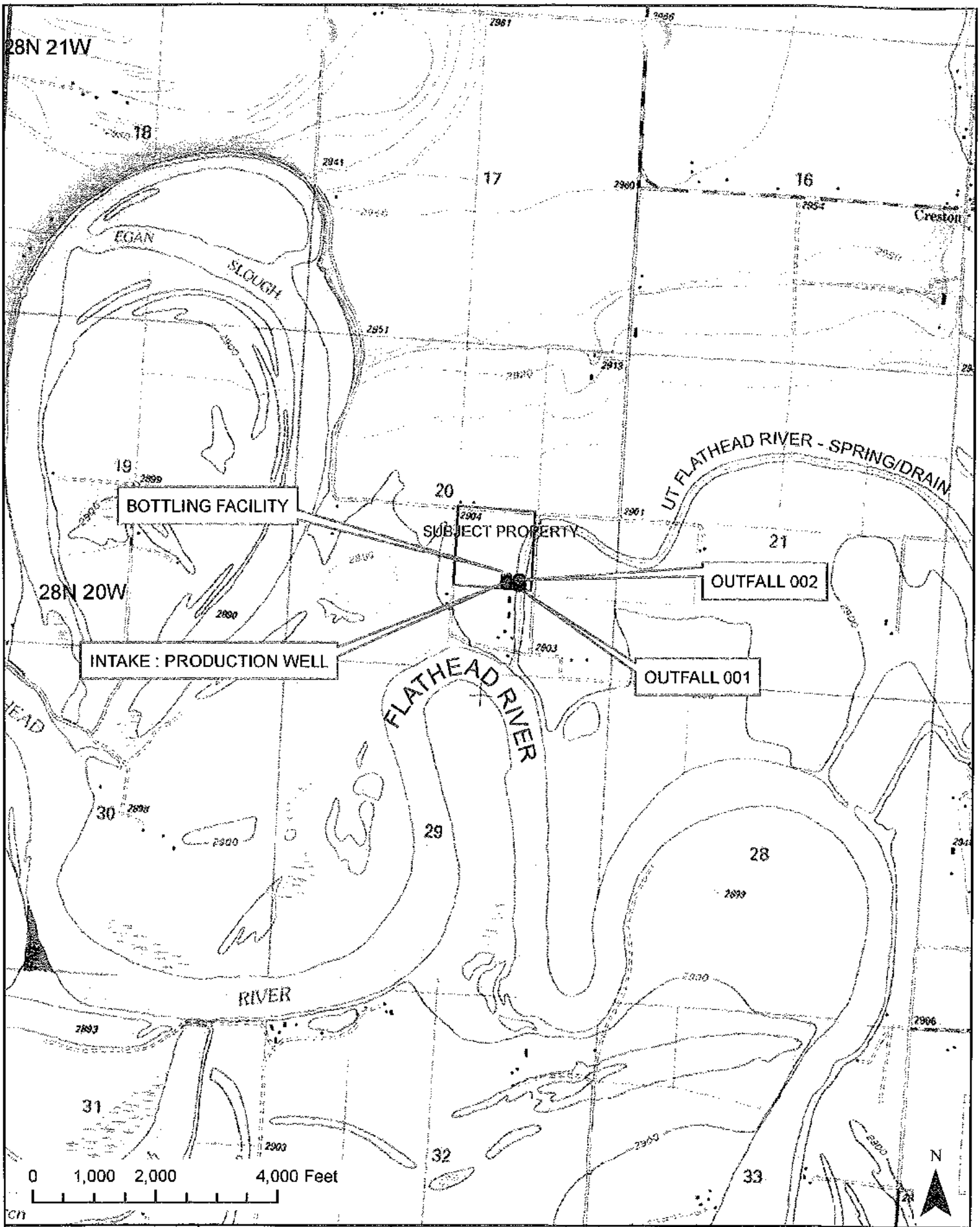
Effluent discharge for non-contact heating of the bottling facility was simulated at a temperature of 44.1°F. Effluent is discharged perpendicular to the channel into slightly warmer water, estimated to be 47.3°F. The warmest temperature measured at the site on September 30, 2015 was utilized to represent a more conservative approximation of the mixing zone. **Figure 6** illustrates the shape of the plume in cross section. The 44.1°F effluent is discharged at a depth of 0.8 feet below water surface and as can be seen, the plume travels slightly downward to a depth of 0.582 feet over a horizontal distance of approximately 2.6 feet (0.08x, 2.61y). This is attributed to the buoyant forces of the cooler water. As shown in plan view (**Figure 7**), the plume generally follows the momentum of the discharge velocity perpendicular to the channel. By the time the plume has traveled approximately 2.6 horizontal feet (0.08x, 2.61y) from the discharge point, it has warmed to within 1°F of the ambient temperature. At that time the thermal plume has a diameter of 1.72 feet.

Outfall 002

Effluent discharged to Outfall 002 yields a relatively small thermal plume. **Table 3** describes the size, shape, and temperature of the thermal plumes (mixing zones). It should be noted that the plume temperature presented is at the center of the plume. Temperatures along the margins of the plume will be closer to the ambient conditions.

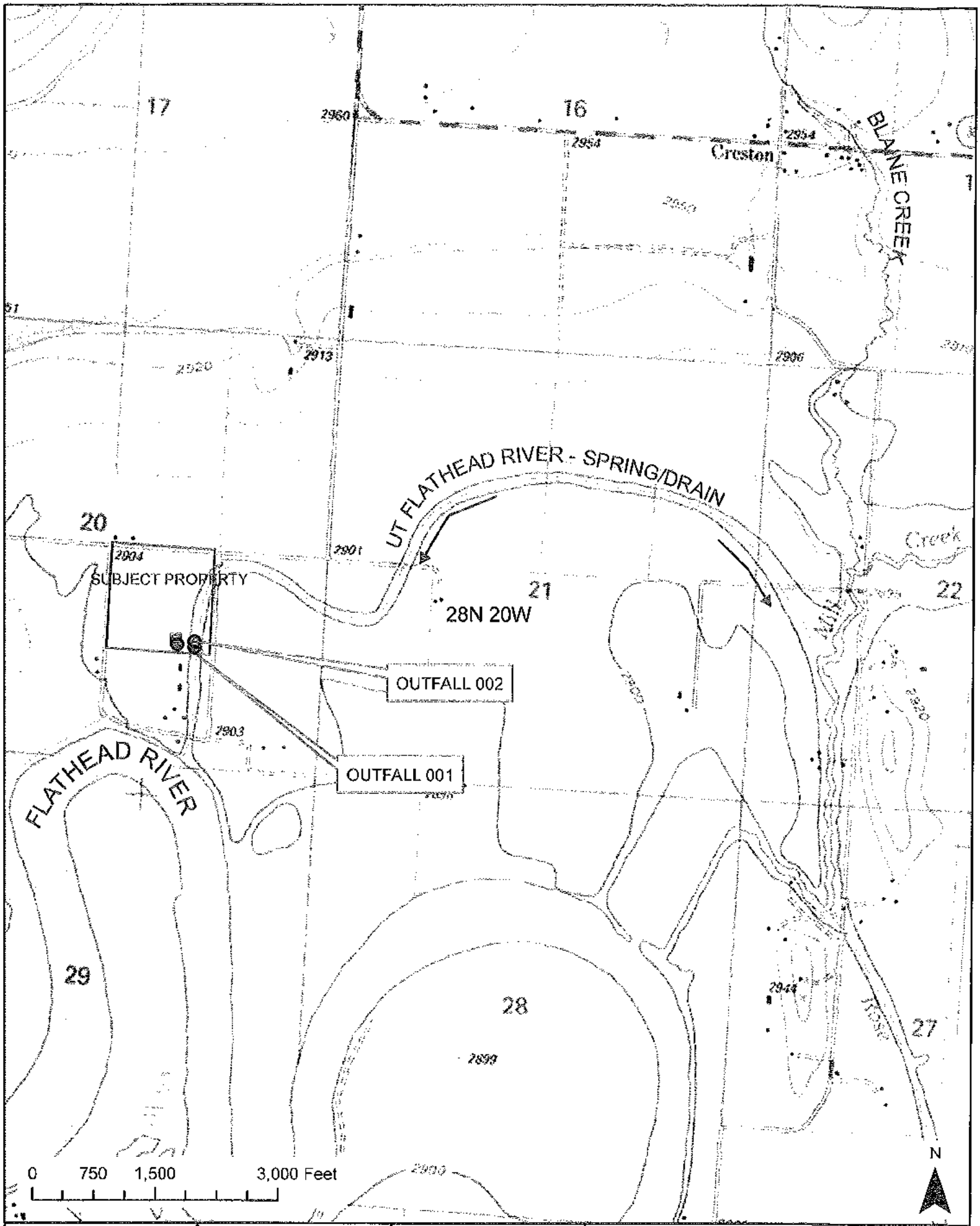
Effluent discharge of rinse water from the bottling facility was simulated at a temperature of 53°F. Effluent is discharged perpendicular to the channel into slightly cooler water, estimated to be 46.04°F. The coolest temperature measured at the site was on September 30, 2015 utilized to represent a more conservative approximation of the mixing zone. **Figure 8** illustrates the shape of the plume in cross section. The 53°F effluent is discharged at a depth of 0.8 feet below water surface and as can be seen, the plume travels slightly upward to a depth of 0.624 feet over a horizontal distance of approximately 1.0 feet (0.42x, 0.91y). This is attributed to the buoyant forces of the warmer water. As shown in plan view (**Figure 9**), the plume generally follows the

momentum of the discharge velocity perpendicular to the channel, but is being pushed slightly downstream. By the time the plume has traveled approximately 1.0 foot (0.42x, 0.91y) from the discharge point, it has cooled to within 2°F of the ambient temperature. At that time the thermal plume has a diameter of 1.32 feet.

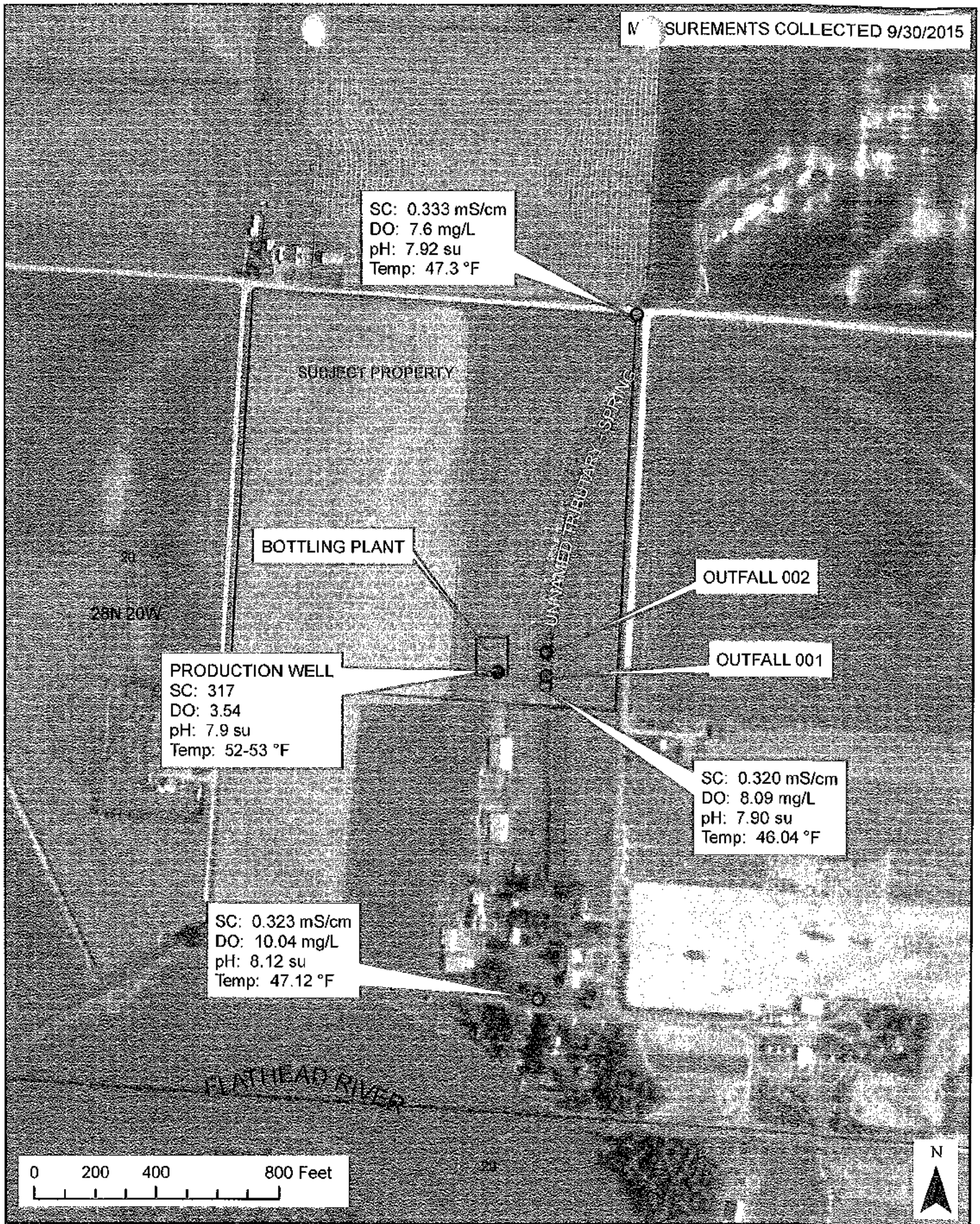


Applied Water CONSULTING LLC	Proj. No: 693-14	Drawn: BJB	MONTANA ARTESIAN WATER CO
	Location: CRESTON, MT	Proj. Mgr: B.Bennett	
	Scale: 1 inch = 2,000 feet	Checked:	BASELINE WATER QUALITY
	File Name: MAWC-DP	Date: OCT/2/2015	

FIGURE 1

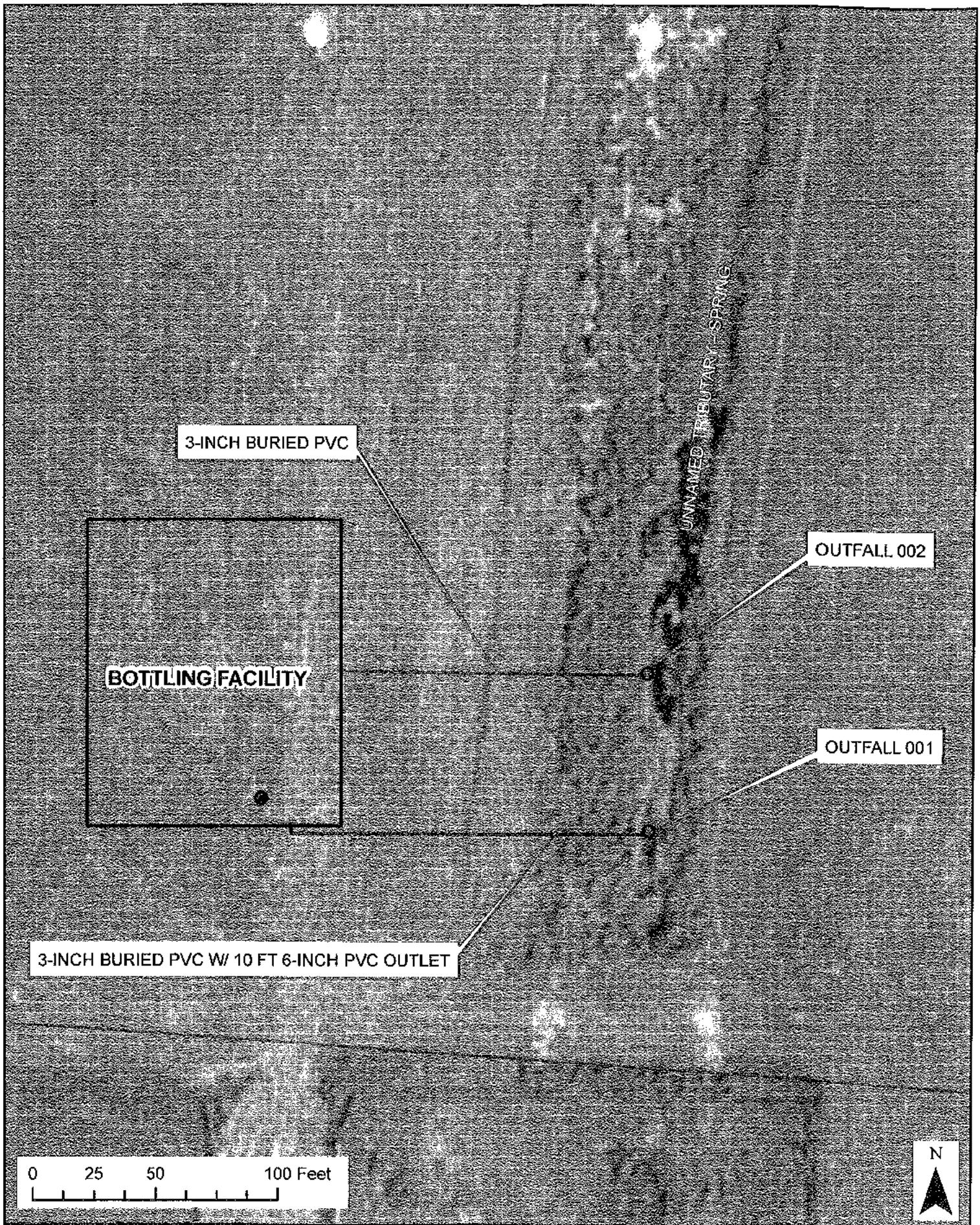


Applied Water CONSULTING LLC	Proj. No: 693-14	Drawn: BJB	MONTANA ARTESIAN WATER CO	FIGURE 2
	Location: CRESTON, MT	Proj. Mgr: B.Bennett		
	Scale: 1 inch = 1,500 feet	Checked:	UNNAMED TRIBUTARY	
	File Name: MAWC-DP	Date: OCT/2/2015		



Applied Water CONSULTING LLC	Proj. No: 693-14	Drawn: BJB	MONTANA ARTESIAN WATER CO
	Location: CRESTON, MT	Proj. Mgr: B.Bennett	
	Scale: 1 inch = 400 feet	Checked:	BASELINE WATER QUALITY
	File Name: MAWC-DP	Date: OCT/1/2015	

FIGURE 3



Applied Water CONSULTING LLC	Proj. No: 693-14	Drawn: BJB	MONTANA ARTESIAN WATER CO	FIGURE 4
	Location: CRESTON, MT	Proj. Mgr: B.Bennett		
	Scale: 1 inch = 50 feet	Checked:	OUTFALL SCHEMATIC	
	File Name: MAWC-DP	Date: OCT/7/2015		

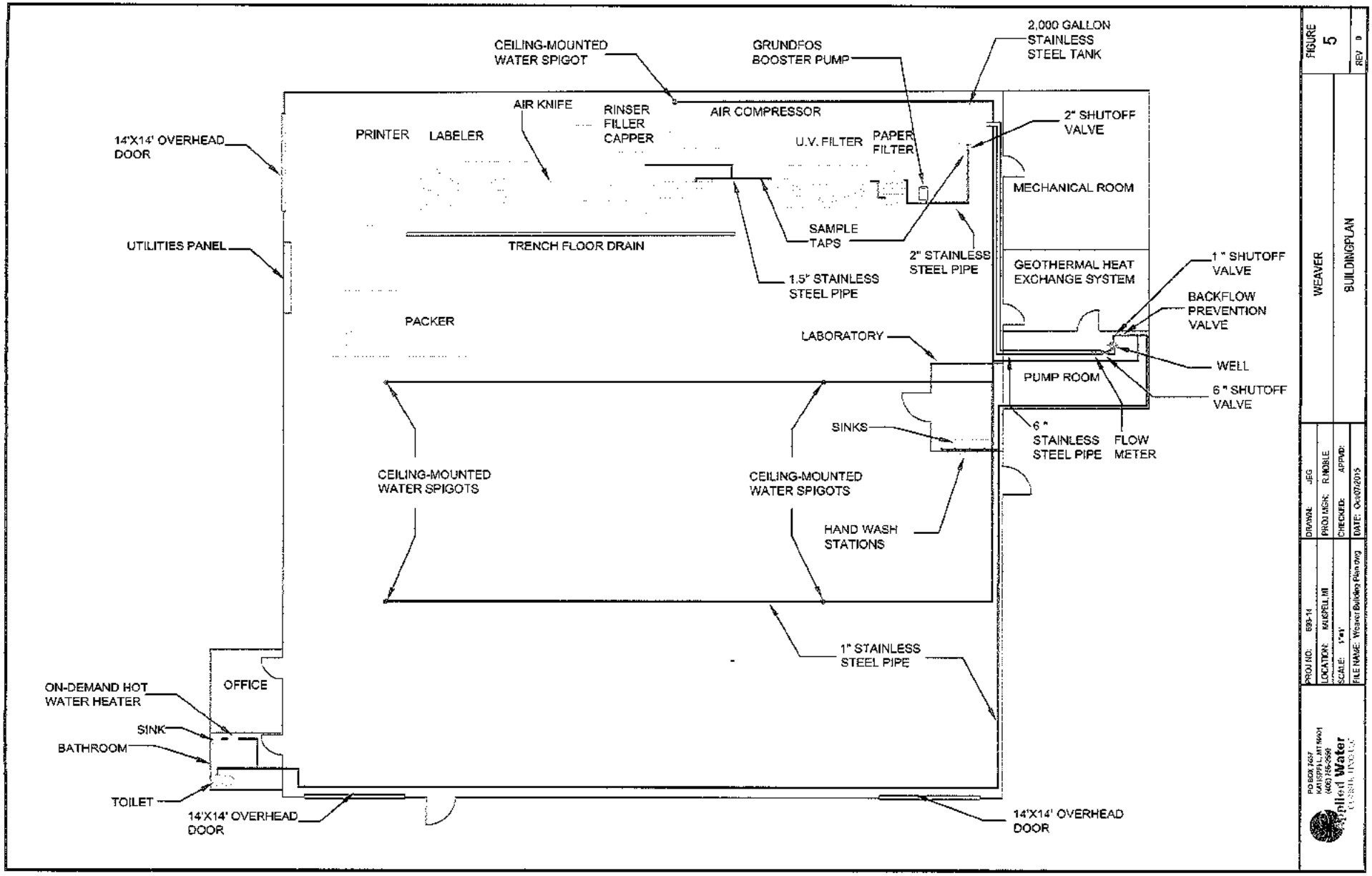

CEILING-MOUNTED WATER SPIGOT
GRUNDFOS BOOSTER PUMP
2,000 GALLON STAINLESS STEEL TANK
AIR KNIFE
RINSER FILLER CAPPER
AIR COMPRESSOR
PRINTER
LABELER
U.V. FILTER
PAPER FILTER
2" SHUTOFF VALVE
14'X14' OVERHEAD DOOR
MECHANICAL ROOM
SAMPLE TAPS
TRENCH FLOOR DRAIN
2" STAINLESS STEEL PIPE
UTILITIES PANEL
GEOTHERMAL HEAT EXCHANGE SYSTEM
1 " SHUTOFF VALVE
1.5" STAINLESS STEEL PIPE
BACKFLOW PREVENTION VALVE
PACKER
LABORATORY
WELL
PUMP ROOM
6 " SHUTOFF VALVE
SINKS
6 " STAINLESS STEEL PIPE
FLOW METER
CEILING-MOUNTED WATER SPIGOTS
CEILING-MOUNTED WATER SPIGOTS
HAND WASH STATIONS
1" STAINLESS STEEL PIPE
OFFICE
ON-DEMAND HOT WATER HEATER
SINK
BATHROOM
TOILET
14'X14' OVERHEAD DOOR
14'X14' OVERHEAD DOOR
FIGURE 5
REV 0
WEAVER
BUILDING PLAN
PROJ NO: 693-14
LOCATION: KALISPELL MT
SCALE: 1"=1'
FILE NAME: Weaver Building Plan.dwg
DRAWN: JEG
PROJ MGR: R.MOBLE
CHECKED: APPVD:
DATE: Oct/07/2015
Applied Water

Figure 6

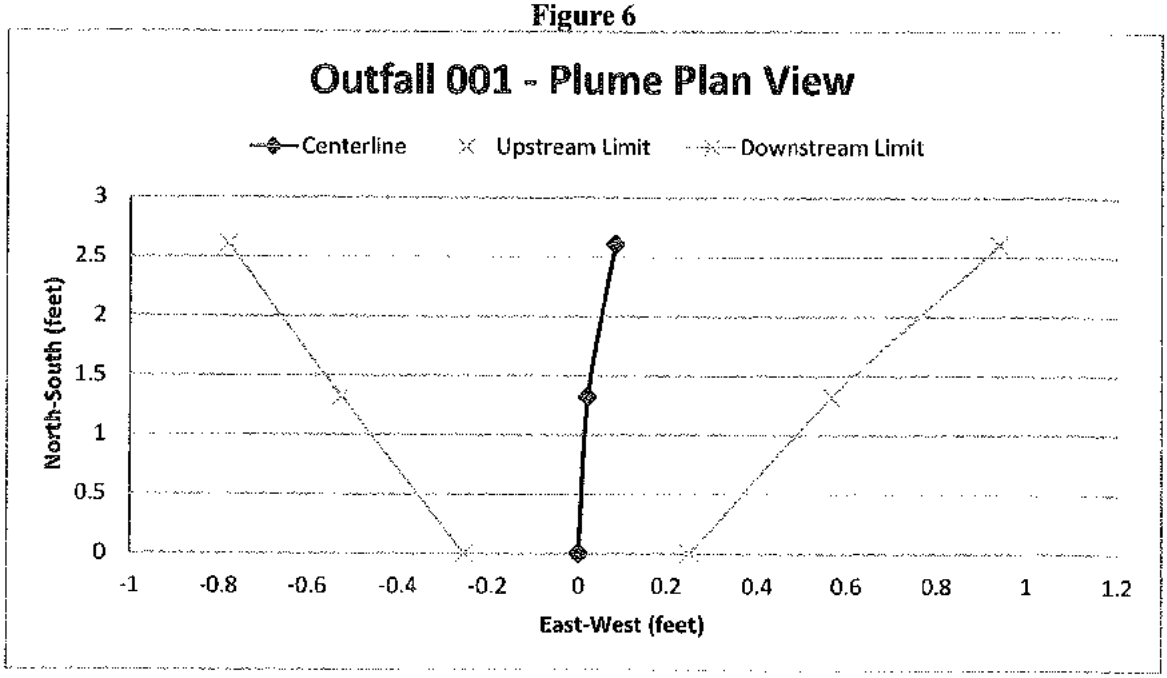


Figure 7

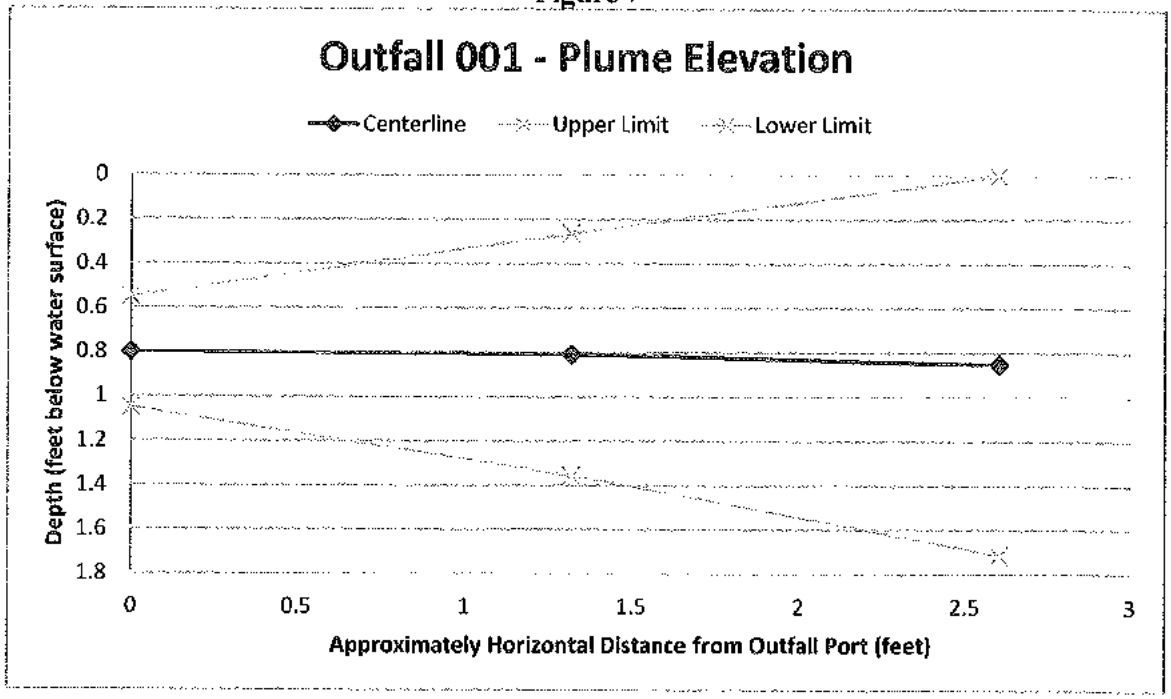


Figure 8

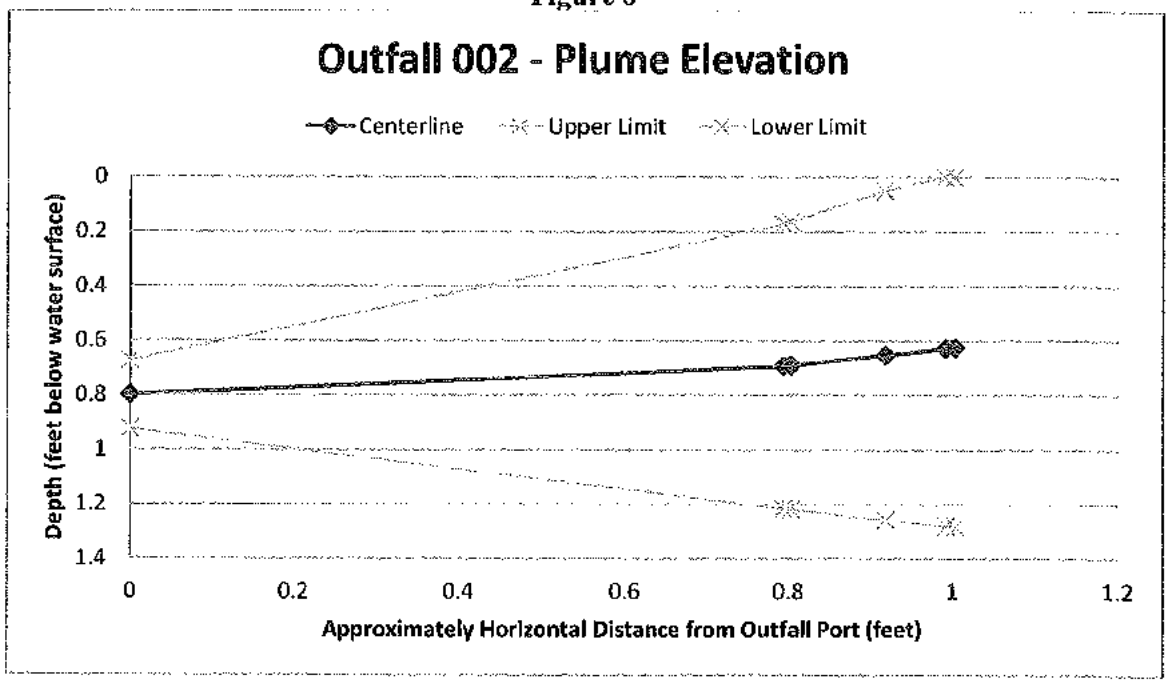
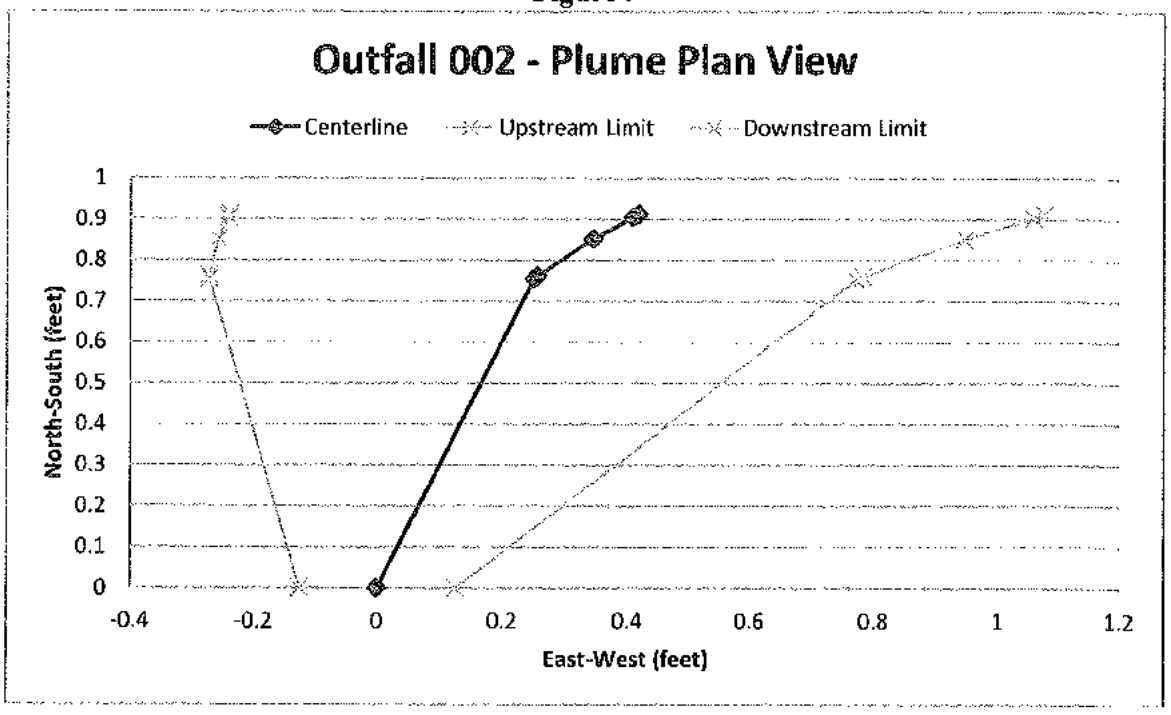


Figure 9



Appendix A

RECEIVING WATER DISCHARGE MEASUREMENT

Montana Artesian Water Company MPDES Permit
Kalispell, Montana

Discharge Measurement

Start Time: 12:30 PM
End Time: 1:18 PM
Discharge: 0.489 cfs

Party: B. Bennett Air Temp: 68°F H_2O Temp: 47°F

Stream: Unnamed Tributary of Flathead River

Station Description: Weaver Property - downstream from discharge

Distance	Width	Depth	Velocity at point	Mean Velocity in vertical	Area	Discharge
1.3	0.38	-	-		-	-
2.0	0.63	0.68	0.01		0.43	0.004
2.5	0.50	0.72	0.01		0.36	0.004
3.0	0.50	0.72	0.02		0.36	0.007
3.5	0.50	1.10	0.01		0.55	0.006
4.0	0.50	1.20	0.05		0.60	0.030
4.5	0.50	0.90	0.06		0.45	0.027
5.0	0.50	0.90	0.15		0.45	0.068
5.5	0.50	1.05	0.09		0.53	0.047
6.0	0.50	1.10	0.08		0.55	0.044
6.5	0.50	1.10	0.10		0.55	0.055
7.0	0.50	1.40	0.05		0.70	0.035
7.5	0.50	1.15	0.14		0.58	0.081
8.0	0.50	1.15	0.05		0.58	0.029
8.5	0.50	1.15	0.06		0.58	0.035
9.0	0.50	1.10	0.01		0.55	0.006
9.5	0.75	0.98	0.01		0.74	0.007
10.5	1.25	0.50	0.01		0.63	0.006
12.0	0.75	-	-		-	-
				Total Discharge =		0.489

Attachment B

WELL DRILLER'S LOG – MBMG 281779

Montana Artesian Water Company MPDES Permit
Kalispell, Montana

MONTANA WELL LOG REPORT

This well log reports the activities of a licensed Montana well driller, serves as the official record of work done within the borehole and casing, and describes the amount of water encountered. This report is compiled electronically from the contents of the Ground Water Information Center (GWIC) database for this site. Acquiring water rights is the well owner's responsibility and is NOT accomplished by the filing of this report.

Other Options

Return to menu
Plot this site in State Library Digital Atlas
Plot this site in Google Maps

Site Name: WEAVER ENTITIES
GWIC Id: 281779

Section 1: Well Owner(s)
1) WEAVER ENTITIES (MAIL)
405 PEDERSON ROAD
KALISPELL MT 59901 [02/18/2015]

Section 2: Location

Township	Range	Section	Quarter Sections
28N	20W	20	SE¼ NW¼ SE¼

County: FLATHEAD
Geocode:

Latitude	Longitude	Geomethod	Datum
48.171639	114.167361	SUR-GPS	WGS84

Ground Surface Altitude	Method	Datum	Date
2907	LIDAR	NAVD88	8/12/2015

Addition: Block: Lot:

Section 3: Proposed Use of Water
PUBLIC WATER SUPPLY (1)

Section 4: Type of Work
Drilling Method: ROTARY
Status: NEW WELL

Section 5: Well Completion Date
Date well completed: Wednesday, February 18, 2015

Section 6: Well Construction Details

Borehole dimensions

From	To	Diameter
0	55	18
55	222	10

Casing

From	To	Diameter	Wall Thickness	Pressure Rating	Joint	Type
-2	63	14	0.375		WELDED	A53B STEEL
-2	203	10	0.322		WELDED	A53B STEEL

Completion (Perf/Screen)

From	To	Diameter	# of Openings	Size of Openings	Description
203	221	10		.100	SCREEN-CONTINUOUS-STAINLESS

Annular Space (Seal/Grout/Packer)

From	To	Description	Cont. Fed?
0	55	CASING SEAL	Y

Section 7: Well Test Data

Total Depth: 222
Static Water Level:
Water Temperature:

Air Test *

400 gpm with drill stem set at 180 feet for 4 hours.
Time of recovery 0.33 hours.
Recovery water level _ feet.
Pumping water level _ feet.

Artesian/Flow Test *

175 gpm for 24 hours.
Flow controlled by Valve on wellhead .

** During the well test the discharge rate shall be as uniform as possible. This rate may or may not be the sustainable yield of the well. Sustainable yield does not include the reservoir of the well casing.*

Section 8: Remarks

Section 9: Well Log
Geologic Source
Unassigned

From	To	Description
0	1	SILTY CLAY LOAM
1	12	MEDIUM-FINE SAND-DARK BROWN
12	21	CLAYEY SILT (SATURATED)-GRAY BROWN
21	41	SILTY FINE SAND WITH MINOR CLAY (SATURATED) -GRAY BROWN
41	111	SILTY CLAY WITH MINOR FINE SANDS-GRAY BROWN
111	149	SILTY FINE SAND WITH ORGANICS-GRAY
149	179.5	SILTY CLAY (DENSE AND STIFF)-BROWN
179.5	195	GRAVELS IN SILTY SAND MATRIX -TAN- 5 GPM
195	222	GRAVELS IN POORLY SORTED SAND MATRIX TAN- 200 GPM

Driller Certification
All work performed and reported in this well log is in compliance with the Montana well construction standards. This report is true to the best of my knowledge.

Name: LARRY GAGNON
Company: O'KEEFE DRILLING
License No: WWD-126
Date Completed: 2/18/2015

Attachment C

WATER QUALITY DATA

Montana Artesian Water Company MPDES Permit
Kalispell, Montana