

DRAFT

Operation and Maintenance Manual

Greendale Water System

**Serving the Greendale, Firefighters Memorial, Deer
Run and Cedar Springs Campgrounds and the Cedar
Springs Marina**

Flaming Gorge National Recreation Area

Ashley National Forest

Daggett County, Utah

April 2010

Prepared By

Enterprise Technical Services



Greendale Water System

Operation and Maintenance Manual

Table of Contents

Section 0 – Emergency Contacts	1
Section 1 – Introduction	3
Section 2 - Permits and Standards	6
Section 3 – Safety	7
Section 4 - System Description, Operation, and Control	10
Section 5 – Sampling and Testing	13
Section 6 – Seasonal Startup and Shutdown	24
Section 7 – Maintenance	28
Section 8 - Condition Surveys & Sanitary Surveys	33
Section 9 – Utilities	35
Section 10 - Emergency Plans and Procedures	36
Section 11 - Records and Reports	37

Appendices

Appendix A – Site Plans, Drawings, and Schematics
Appendix B – Sampling & Operator Certification Information
Appendix C – Safety Information
Appendix D – Photos
Appendix E – Cross Connection Control Plan
Appendix F – Equipment Literature
Appendix G – Maintenance Records

SECTION 0 – EMERGENCY CONTACTS

This contact information should be routinely updated and readily available.

Title	Name	Office	Cellular	Home
Emergency Services		911		
System Operator	Barry Cain	435-885-3182	435-790-5976	435-885-3193
System Operator	Paulette Welder	435-781-5288	435-790-5975	435-784-3985
System Operator	Denny Maras	435-784-3445 435-781-5288	435-790-5970	435-784-3597
District Ranger	Marcia Pfleiderer	435-784-3445 435-781-5263	435-790-3677	435-784-3130
Forest Supervisor	Kevin Elliot	435-781-5101	435-790-7101	435-725-0028
Facility Manager	Alan Pulham	435-781-5269		435-885-3560
Forest Engineer	Lance Valentine	435-790-5988	435-790-5988	
State Drinking Water Contact	Division of Drinking Water - Utah	801-536-4200		
USFS LEO	Travis Hawkins	435-781-5243	435-790-5957	435-885-3081
Interagency Fire Center – USFS		435-789-7021		
Daggett Co. LEPC	Shirly Slaugh	435-784-3154 Ext. 200	435-880-7559	435-784-3389
Daggett Co. Sheriff	Rick Ellsworth	435-784-3255		
Utah Highway Patrol		435-789-3111 435-789-4222		

General Contacts	Phone Number	Notes
Moon Lake Electric	435-722-5400	
BHI Electrical Brandon	435-784-3483	
Chemtech-Ford, Inc	801-262-7299	Murray, UT
Utah State Department of Health Laboratory	801-584-8400	Salt Lake City, UT

Water System – Basic Information					
Site and System Name	Greendale Water System				
Region, Forest, District	R4, Ashley National Forest, Flaming Gorge Ranger District				
County, State	Daggett County, Utah				
Water Uses and Connections					
Site Type	4 Campgrounds and 1 marina				
State Classification	Public Transient Non-Community System				
Number of Sites	Varies by Campground. As little as nine sites at the Greendale Campgrounds, up to 94 sites at Firefighters Memorial Campground.				
Daily Flow Capacity (gpd)	28,400 gpd (calculation based on approx. spring flow of 19.7 gpm)				
Use Period	May – September				
Water System Source Type	INFRA ID	FS Class	Service Connections	Year Constructed	State Water System ID
Spring	0005017	TNC		1989	05017
Source	Greendale Spring Number 2, Greendale Number 1, and Lost Spring				
Source Water	Groundwater Under the Direct Influence of Surface Water (GWUDI)				
Collection System	Aggregate Filter Bed and perforated corrugated metal pipe				
Transport Piping	9 miles of HDPE piping, 1 to 4-inch diameter				
Treated Water Storage Tank	32,500-gallon Concrete Tank				
Package Treatment Plant	Filter Tech Systems, Inc. Grand Junction, CO				
Water Rights	Water User Claim Numbers 2791, 2792 & 604				
System Operators					
Barry Cain	435-885-3182				
Paulette Welder	435-781-5288				
Denny Maras	435-784-3445				

SECTION 1 - INTRODUCTION

A. General Description

The Greendale Water System is located in Daggett County, Utah in the Flaming Gorge National Recreational Area of the Ashley National Forest. The treatment plant is located in Section 32 of Township 2 North, Range 22 East of the Salt Lake Meridian.

The Greendale water treatment plant serves the Greendale single and family campgrounds, Firefighters Memorial campground, Deer Run campground, Cedar Springs campground, and the Cedar Springs marina.

The Water System ID is UTAH05017. The water system falls under the State of Utah Department of Environmental Quality (DEQ) Division of Drinking Water as a Public Transient Non-Community Water System (TNCWS). The system does not serve 25 of the same nonresident persons per day for more than six months per year. Examples of these types of system are RV parks, diners or convenience stores where the permanent nonresident staff number less than 25, but the number of people served exceeds 25.

The population served, as listed in the State of Utah water system database, is 800 persons. The operating season for the system is May through September. At other times, the system is closed down and drained to prevent damage from freezing.

B. Operator and Managerial Responsibility

This manual is a working document, and should be updated regularly to reflect physical and procedural changes to the water system. Also, it is intended that this manual be used as a training tool for new employees and as a guide for qualified substitute operators.

The operator of this water system is responsible for protecting public health and safety by ensuring that safe water is available to the users. Specific responsibilities include:

- Making sure water meets all safe drinking water requirements
- Ensuring all required testing is completed
- Performing annual start-up and shut-down tasks
- Informing managers of problems and potential problems
- Keeping current on procedures and permit requirements
- Maintaining any required state certification
- Performing regular inspections of all parts of the system and scheduling repairs/replacement as necessary
- Maintaining the records for the system – including sampling records, maintenance records, and updates to this O&M manual

The system operator should be knowledgeable in water quality requirements, testing procedures, maintenance and repair procedures, and equipment operation.

It is the responsibility of management to ensure that sufficient personnel and funds are supplied to keep the water system operating in a manner that will protect public health. Specific responsibilities include:

- Ensure that resources (qualified personnel and funding) are available for proper operation, maintenance and management of the system.
- Provide necessary training for the operator to maintain qualifications and any required state certifications.
- Respond to requests from the operator when notified of upcoming issues and budgetary items.

C. Manpower and Training

The operator of this water system must be able to properly start up the system at the beginning of the season, routinely operate the system throughout the season, and properly shut down the system at the end of the season. The operator must have a thorough knowledge of the system layout and equipment, be mechanically inclined, and be conscientious and careful. The operator must keep current on state requirements for testing, operations, and reporting. The job may at times require strenuous work, heavy lifting, responding at odd hours, and being available on-call to quickly respond to problems.

Routine operation requires equipment adjustments, responding to problems with equipment, power outages and other problems, and testing of the treated water.

D. Scheduling

This water system requires regular maintenance and observation to ensure that the system is operating correctly, to perform sampling, and to replenish chemicals. The operator must consider scheduling needs to ensure that the system will continue to operate when he or she will be away on leave, and must arrange for a back-up operator, when necessary (i.e. for sampling, chemical feed adjustment, start-up and shut-down procedures, available for emergency response, etc.).

E. Planning and Budget

The operator is responsible for timely budget requests and must let managers know when an expensive piece of equipment is likely to be wearing out and must be replaced. Regular condition surveys will help to document the condition of the system.

Annual budget items and approximate operating costs were provided by the system operator. These costs were in 2009 dollars and are as follows:

- Chemicals
 - Chlorine - \$1,500
 - Coagulant/Polymer - \$1,000
- Electricity - \$200
- Misc. Maintenance and Supplies - \$1,000
- Cleaning Supplies - \$500
- Small Tools - \$500

Long term costs such as chlorinator replacement, pump and pipe/tank replacements, etc. was expected to cost approximately \$3,000

SECTION 2 – PERMITS AND STANDARDS

The Federal Safe Drinking Water Act empowers the EPA to adopt and enforce rules which must be met by each public water system in the nation. By agreement with EPA, the Utah Department of Environmental Quality (DEQ) Division of Drinking Water has obtained primacy and administers the drinking water program within the state.

Standards: The regulations governing the construction and operation of drinking water systems in the state of Utah are listed under the Utah Administrative Code, Title 309 “Environmental Quality, Drinking Water”. An official copy of the rules can be obtained through the Utah Division of Administrative Rules. An electronic copy can be located on their website at:

<http://www.rules.utah.gov/publicat/code/r309/r309.htm>

Alternatively, the Department of Environmental Quality maintains formatted versions, along with guidance language on their website at:

<http://www.drinkingwater.utah.gov/rules.htm>

Required Permits from the Utah DEQ, Division of Drinking water for this system include:

Plan Approval: the drawings and specifications for construction of the water system must be reviewed and approved by DEQ. Any system modifications must also be approved (R309-500-6)

Operating Permit: an operating permit from the Division of Drinking Water is required for continued operation of the water system (R309-500-9).

Operator Certification: the Utah Division of Drinking Water rules state that “All community and non-transient non-community water systems or any public system that employs treatment techniques for surface water or ground water under the direct influence of surface water shall have an appropriately certified operator. Refer to Section 309-300, Certification Rules for Water Supply Operators, for specific requirements.” The water source for this system is considered ground water under the direct influence of surface water. Therefore, a certified operator is required to operate the Greendale water system.

Operators of the Greendale Water System are required to be **Class 1** certified in the Treatment discipline and **Class 1** certified in the Distribution discipline. Please see Appendix B for a summary of Rule 309-300, provided by the Utah Division of Drinking Water.

SECTION 3 - SAFETY

It is your responsibility to consider the safety of yourself and others at all times when operating and maintaining this system. It is impossible to cover every safety precaution in this manual. Please contact the system operator or safety coordinator for your unit if you are unsure of any situation, or have safety concerns.

- Emergency telephone numbers are located in this manual in **Section 0 – Emergency Contacts**. Review the numbers periodically and make any corrections as necessary.
- Hazards that may be encountered in the operation of this system include, but are not limited to:
 - General Safety Concerns – walking on uneven terrain, poor footing, falling, cuts from sharp objects, lifting heavy objects, encounters with animals, animal droppings, venomous insects, etc.
 - Confined Spaces – tanks, lift stations and manholes are considered confined spaces and should be labeled as confined spaces on the access manhole or lid. They may be subject to oxygen deficiency and noxious gases. These types of spaces shall be entered only by following the confined space plan requirements (see confined space procedures FSH 6709.11, ch. 30). Specific Greendale Water System confined spaces include the buried water storage tanks, lift stations, and deep valve boxes.
 - Spider and Insect Bites – keep your eyes open for spiders and insects, particularly when entering a valve box. Poisonous spiders do reside in Utah, so it may be a good idea to familiarize yourself with the features of the black widow, brown recluse, and hobo spider. If you believe you may have been bitten by a poisonous spider, wash the wound with soap and water and apply an antibiotic ointment. If the area becomes infected, or you develop muscle cramps, nausea, fever, a rash, etc., seek medical attention.¹
 - Electrical Hazards – be on the lookout for frayed or exposed wires, rusted or broken electrical boxes, missing covers or plates, electrical cords or other equipment in poor condition, and similar electrical hazards. Report hazardous situations to system operator, or supervisor immediately, and contact a certified and/or licensed electrician to perform electrical repairs.
 - Chlorine and other Hazardous Chemicals – follow Federal, local, and Agency requirements including FSH 6709.11, chapter 30. Review MSDS sheets located in Appendix C.

¹California Poison Control System, 2008: <http://www.calpoison.org/public/spiders.html>

- Explosion and Fire Hazards - do not allow accumulation of flammable materials at the site. Ensure that recently tested and approved fire extinguishers are available in well marked locations.
- Defense against safety hazards
 - The best defense against hazards related to general safety is for the operator to be careful and alert.
 - Operator should have sufficient first aid training.
 - Use circuit breakers to turn off pumps or other items before working on equipment.
 - Any work done on the electrical system shall be done by a licensed electrician.
 - A Lock out/tag out program shall be used when performing electrical repairs.
 - Refer to MSDS information in Appendix C of this manual when working with any disinfecting chemicals.
- Duties requiring two or more persons: confined space entry, lifting or moving items that are too heavy or awkward for one person.
- Safety Equipment Requirements – Use of Personal Protective Equipment as listed in FSH 6709.11, chapter 20 is required. Make certain that the required equipment is available and in good condition.
 - First Aid Kits
 - Fire Extinguishers
 - Protective Clothing, gloves face shield
 - Eye Protection
 - Confined Space entry equipment
- Accident Reporting – refer to the requirements listed in FSH 6709.12, chapter 30.

Chemicals, Hazardous Materials, MSDS

The only chemical used in this system is a sodium hypochlorite solution, otherwise known as household bleach. This product is used to disinfect the water source and is also used for disinfection of the drinking water system during the season, should it test positive for coliform.

Sodium hypochlorite solution slowly decomposes on contact with air. Exposure to sunlight accelerates decomposition. Sodium hypochlorite solution is not considered to be a fire or explosion hazard. It will release oxygen when heated, which may increase the severity of an existing fire. Sodium hypochlorite solution should be stored in a tightly closed container, in a cool, dry, ventilated area, away from incompatible substances, including but not limited to ammonia, amines, ammonium salts, methanol, soaps and bi-sulfates.

Sodium hypochlorite solution may cause irritation or burns if contacted with the skin. Inhalation can cause severe irritation or burns to the respiratory tract. Symptoms may include coughing and sore throat. Ingestion may cause nausea and vomiting, and can result in extensive burns to the gastrointestinal tract.

Review the MSDS located in Appendix C before handling sodium hypochlorite.

SECTION 4 – SYSTEM DESCRIPTION

A. Water Source

Water for the Greendale system comes from three spring areas: Greendale Spring Number 2, Greendale Number 1, and Lost Spring. These springs are located southeast of the junction of Highway 44 (U.S. 191) and Highway 260 (U.S. 191) in Section 32 of Township 2 North, Range 22 East, and Sections 5 and 6 of Township 1 North, Range 22 East of the Salt Lake Meridian.

Greendale Spring Number 2 is the main spring area, made up of three collection points. The collection system for each of the three Greendale Number 2 springs is the same. It includes a section of perforated corrugated metal pipe (CMP) laid behind a concrete headwall. The CMP lies on a four-inch thick layer of 2 to 3-inch diameter gravel. The gravel continues to a depth of 6 inches over the top of the pipe, and becomes finer towards the top of the layer. A sheet of polyethylene plastic is located on top of the gravel, and a six-inch layer of sand was placed over the plastic sheet. A second layer of polyethylene plastic lies on top of the sand, and a few feet of earth fill completes the development. The two springs on the east feed into a 4'x 4'x 5' concrete head box. The bottom, walls and top of the head box are 4-inch thick concrete, and the access lid is made of sheet metal. The line from the spring to the west ties into the line leaving the head box approximately two hundred feet below the head box.

The two springs located to the south of Greendale Number 2 spring have very simple collection systems consisting of merely a collection box.

A combination of 1.5-inch diameter and 3-inch diameter polyethylene pipe carries water north from the source, approximately one mile to the treatment plant. Pressure reducing valves have been placed in this line because of the large elevation difference between the sites.

B. Treatment

The spring water is considered ground water under the direct influence (GWUDI) of surface water. Therefore, Utah Division of Drinking Water rules require that the water receive the same treatment and testing as surface water.

Water is treated in a package plant manufactured by Filter Tech Systems, Inc. from Grand Junction, Colorado. Upon entry to the water treatment plant, a polymer is added to the spring water. Alum is also added to aid flocculation of the suspended solids. The polymer feed rate is manually adjusted by the operator. Higher turbidity levels, such as those often seen after a storm event, require the operator to increase the chemical feed. The water is mixed and run through settling tubes. After the settling tubes, the water is filtered through a mixed media filter. The filter is composed of:

- Nine inches of ¾" to ½" gravel

- Three inches of ½” to ¾ inch gravel
- Three inches of ¼” to ⅛” gravel
- Ten inches of 2 to 3 mm gravel
- Ten inches of 0.45 to 0.55 mm gravel
- Twenty inches of 1.0 to 1.1 mm Aquakol Anthracite

The filtered water is then chlorinated with liquid chlorine, allowed contact time in the chlorine contact tank, then stored in a 10,000 gallon storage tank before being discharged into the distribution system.

C. Distribution

The Greendale water distribution system is a complex system serving four campgrounds, one group site, one marina, one sewer lagoon, and one sanitary dump station. The system includes approximately 9 miles of main water line.

Approximately 8,500 linear feet of 3-inch diameter, polyethylene (PE) pipe rated at 160 pounds per square inch (psi) transports the treated water from the water treatment plant to a 32,500 gallon concrete storage tank. Prior to discharge into the storage tank, a 1½ inch PE pipe diverts water from a point just above the now unused Greendale Junction Box and runs westward to the Greendale Campground.

The 32,500-gallon storage tank is physically located near the Greendale Group Campground. This tank is made up of 4-inch thick concrete. Tank access is provided through a sheet metal cover at one end and through a manhole at the other end. The storage tank supplies Firefighters Memorial Campground, Greendale Group Site, Deer Run Campground, Cedar Springs Sewage Lagoons, Cedar Springs Sanitation Station, the Cedar Springs Marina, and the Cedar Springs Campground.

Water from the storage tank is discharged through one of three supply lines. The supply line for the Greendale Group site is located half way up the tank wall. The group site will not receive water if the water level drops due to high demand or a leak in the system. The other two 3-inch supply lines run approximately 4,000 linear feet from the large storage tank to the Firefighters Memorial diversion point, located adjacent to Loop C in the Firefighters Memorial Campground. Valve boxes at the diversion point separate water off for the three loops of the Firefighters Memorial Campground. A third 3-inch diameter HDPE waterline continues on toward Deer Run and Cedar Springs Campgrounds.

Water is gravity fed under US 191 and to the Deer Run Campground, approximately 5,400 linear feet. Prior to reaching the Deer Run campground, diversion valves divert water to Cedar Springs Campground and to the Cedar Springs Sanitation Station/Upper Lift Station. Water then flows south through a 2 ½-inch diameter line to the Cedar Springs sewage lagoons (approximately

2,000 linear feet), and north via a 4-inch diameter line to the Cedar Springs Marina (approximately 2,600 linear feet).

D. Connections

Cedar Springs Marina

Water is supplied to a fish cleaning station and restroom facility with six flush toilets which are maintained by the Forest Service. Water is also supplied to floating restrooms and a full service marina, which are operated and maintained by concessionaires.

Cedar Springs Campground

Cedar Springs Campground includes two host units with water and sewer, 16 single unit campsites, five double unit campsites that can accommodate up to 16 people each, and six water hydrants. This facility is served by vault toilets.

Deer Run Campground

Deer run Campground includes two host units with water and sewer, seven water hydrants, 15 single unit campsites, four double unit campsites, one restroom/shower house with six flush toilets and six showers, and three vault restrooms.

Cedar Springs Sanitation Station

Cedar Springs Sanitation Station includes four water taps for rinsing down RV waste.

Cedar Springs Lagoon

Cedar Springs Lagoon includes two water hydrants for clean-up and testing.

Firefighters Memorial Campground

Firefighters Memorial Campground includes two host sites with water and sewer, Three loops with a total of 94 single unit campsites, one sanitation station with water tap for flushing rinsing RV waste, 28 water hydrants, one contact station, two restrooms with six flush toilets and four sinks each, two restrooms with four flush toilets and four sinks each, and one restroom with two flush toilets and two sinks.

Greendale Campground

Greendale campground includes seven single unit campsites, three water hydrants and one vault toilet.

Greendale Group Campground

The Greendale Group Campground includes two group areas that can accommodate between 15 and 40 people each, five water hydrants and two vault toilets.

Photographs of this water system are included in Appendix D. Site Plans and Aerial Photographs are included in Appendix A.

SECTION 5 – SAMPLING AND TESTING

Sampling and testing are used for both monitoring the quality of treated water and to aid in control and operation of the plant. Operating personnel must understand the relationship between laboratory test results and the proper operation of treatment units and process. A copy of the Utah DEQ Division of Drinking Water Public Water System Master Report is included in Appendix B. This report includes monitoring requirements imposed by the State of Utah as of the date of this manual.

Monthly monitoring reports must be submitted to the Department of Environmental Quality, Division of Drinking Water within ten days after the end of each month that the system serves water to the public. Keep records of all tests performed. State required retention times are noted in Section 11.

Tests Analyzed by the Operator

1. Chlorine Residual

a. Frequency:

- Daily or continuously as finished water leaves the plant, and
- Same frequency as bacteriological sampling at the final use throughout the distribution system.

- b. Free chlorine residual, measured at the points of final use, should be between 0.2 and 2.0 mg/L. Chlorine levels less than 0.2 mg/L indicate that not enough free chlorine is left to ensure safe water. Chlorine levels over 4.0 mg/L are a violation of the State of Utah drinking water standards.

2. Turbidity

- a. Location: turbidity monitoring must be conducted at the treatment plant's clear well outlet.
- b. Frequency: Continuous monitoring is required by the state (a minimum of once every 15 minutes). If the system utilizes sand filtration and has received permission from the Division of Drinking Water in writing, this monitoring may be reduced to once per day. (R309-215-9(1)).
- c. Re-sampling: If the turbidity limit has been exceeded, the sampling and measurement shall be confirmed by re-sampling as soon as practicable, preferably within one hour. If the repeat sample confirms that the turbidity limit has been exceeded, the operator shall report it to the Department of Drinking Water no later than 24 hours after the exceedance is known. If the result of the re-sampling confirms that the turbidity limit has been exceeded, one bacteriologic sample shall be taken near the first service connection from the source within 24 hours. (R309-215-9(2)).
- d. Turbidity can indicate surface water influence, and its removal indicates how well the flocculation and filtration system is operating. Bacteria, cryptosporidium, and

giardia can be protected by the particles in turbid water, which can inhibit the disinfection process.

- e. The drinking water standard for turbidity in GWUDI water is 0.3 NTU in 95% of the samples for the month, with a single sample maximum (not to exceed) 1 NTU (R309-200-5(5)(a)). If the system exceeds 5 NTU, the operator must notify DEQ within 24 hours of discovering the exceedance.
3. Additional information:
 - a. Frequency: daily (R309-215-8)
 - Daily flow
 - pH (measured near chlorine residual monitoring location)
 - Temperature (measured near chlorine residual monitoring location)
 - Influent turbidity
 - Weather (high/low temp & precipitation)
 - Results of any jar tests
 - Amount of chemicals used
 - Rate that water is applied to each filter (gpm/ft²)
 - Head loss across each filter (psi or ft. H₂O)
 - Length of backwash, if performed
 - Hours of operation since backwash was performed

Tests Analyzed by a Certified Laboratory

1. Sulfate
 - a. Frequency: The Forest Service has obtained a waiver from the Division of Drinking Water under 309-205-5(3)(b)&(c). Sulfate sampling is required once every nine years.
 - b. The drinking water standard for sulfate is 1,000 mg/L (R309-200-5(1)(c)).
2. Nitrate/Nitrites Sampling
 - a. Frequency: The system must be sampled annually for nitrates (R309-205-5(4)(d)). The system must be sampled for nitrites as specified by the Executive Secretary (R309-205-5(5)(a&b)).
 - b. The drinking water standard for Nitrate-N is 10 mg/L, the standard for Nitrite-N is 1 mg/L, and the standard for Nitrate-N + Nitrite-N is 10 mg/L (R309-200-5(1)(b)).

3. Coliform Bacteria

- a. Coliform Bacteria samples are collected monthly at the locations indicated in the Greendale Sampling Plan. It is recommended to sample early in the month to allow time for repeat samples, if necessary.
- b. Please refer to the Utah Bacteriologic Sampling Information Sheet in Appendix B for more information.
- c. Samples should be taken according to the following guidelines (FSH 7409.11, Chapter 20):
 - i. Samples should be collected in sterile, plastic or glass containers with a leak-proof lid. Sampling bottles and forms should be obtained from the approved laboratory.
 - ii. Individuals should wash their hands before collecting samples, and wear latex gloves if possible.
 - iii. Water taps used for sampling should be free of aerators, bubblers, strainers, hose attachments, mixing type faucets, vacuum breakers, and purification devices. The flow of the water out of the tap should be adjusted so the water will not splash out when the sample is collected. The tap should be cleaned and flushed.
 - iv. If tap cleanliness is questionable, sampling port can be sanitized by applying a solution of 1 tsp bleach to 1 quart of water to the end of the spout.
 - v. Allow water to run for 2-3 minutes prior to collecting sample to clear service line.
 - vi. While filling the sample bottle, ensure that your fingers do not touch the inside of the bottle, or the inside of the lid. Do not set lid down; hold it by the outside surface while you fill the bottle.
 - vii. Use a small stream of water while filling the container so it doesn't splash or overflow. Leave at least 1" headspace at the top to facilitate mixing of the sample by shaking prior to analysis. Immediately replace lid and tighten.
 - viii. All samples taken should be recorded on a sample collection form, which should be available from the approved laboratory. Fill out the sample bottle label. Keep copy of collection form for your records and send the original to the laboratory.
 - ix. Samples should be kept upright and refrigerated or kept on ice, and should arrive at the lab within 30 hours after being collected.
- d. Repeat Sampling (Utah R309-210-5(2))
 - i. If a routine sample is total coliform positive, the operator must collect a set of four (4) repeat samples within 24 hours of being notified of the

positive result. The samples must be collected from specific locations. Please refer to the Utah Bacteriological Sampling Information Sheet, located in Appendix B for specific instructions.

- ii. If operator determines that the water system has exceeded the MCL for total coliform, as specified in R309-200-5(6), the operator must report the violation to the Utah DEQ no later than the end of the next business day after learning of the violation, and notify the public in accordance with R309-220.

Public Notification

If the water system exceeds state standards and the water is unsafe to drink, public notification is required. The state of Utah has provided public notification templates for your use at:

http://www.drinkingwater.utah.gov/public_notification_templates.htm

A copy of the public notification template for fecal coliform and nitrate exceedances in non-community water systems has been included in Appendix B.

SAMPLE SITE PLAN

WATER SYSTEM: GREENDALE SYSTEM NO.: 05017

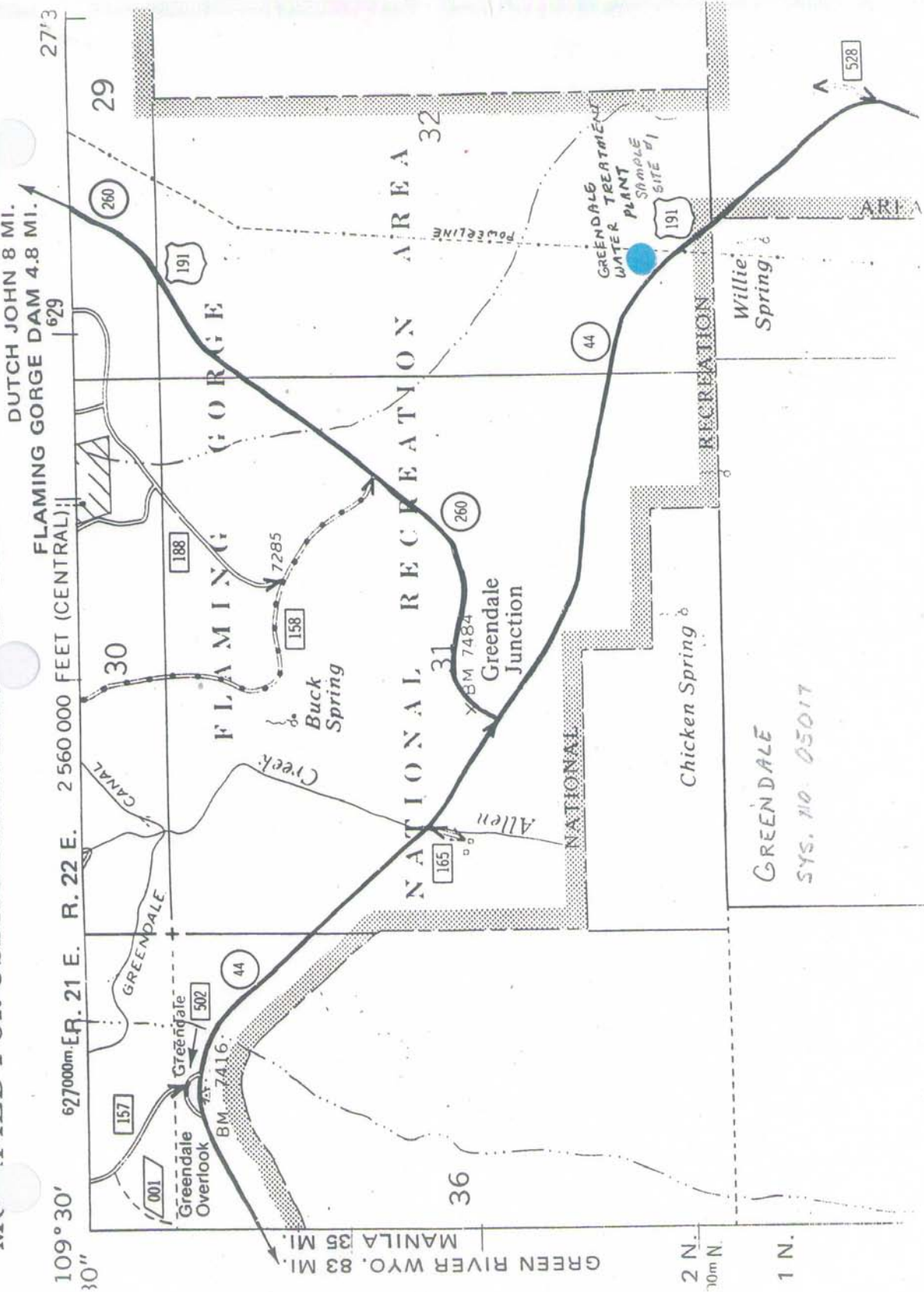
JANUARY Closed
FEBRUARY Closed
MARCH Closed
APRIL site #1
MAY site #2
JUNE site #3
JULY site #4
AUGUST site #5
SEPTEMBER site #6
OCTOBER Closed
NOVEMBER Closed
DECEMBER Closed

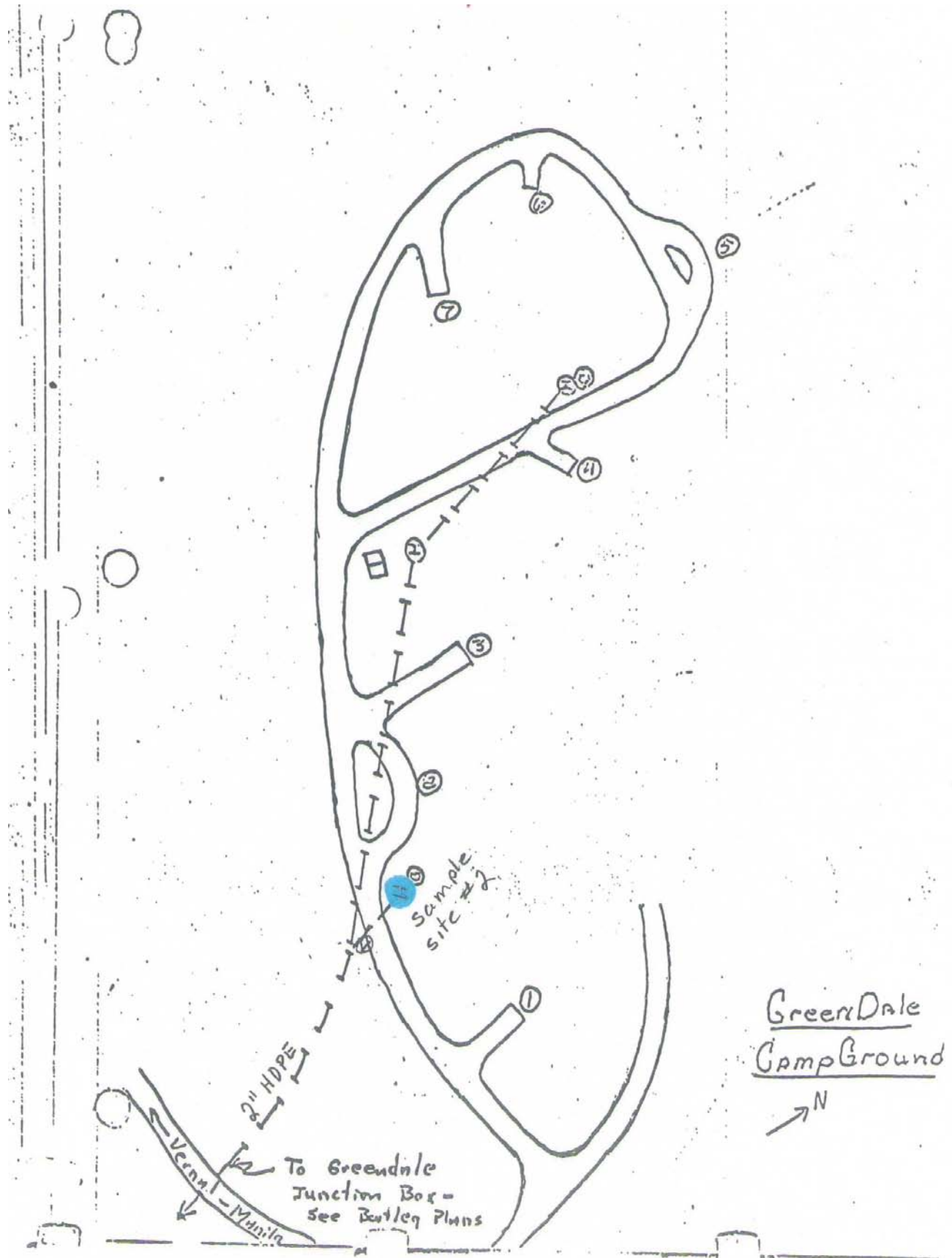
Site Description

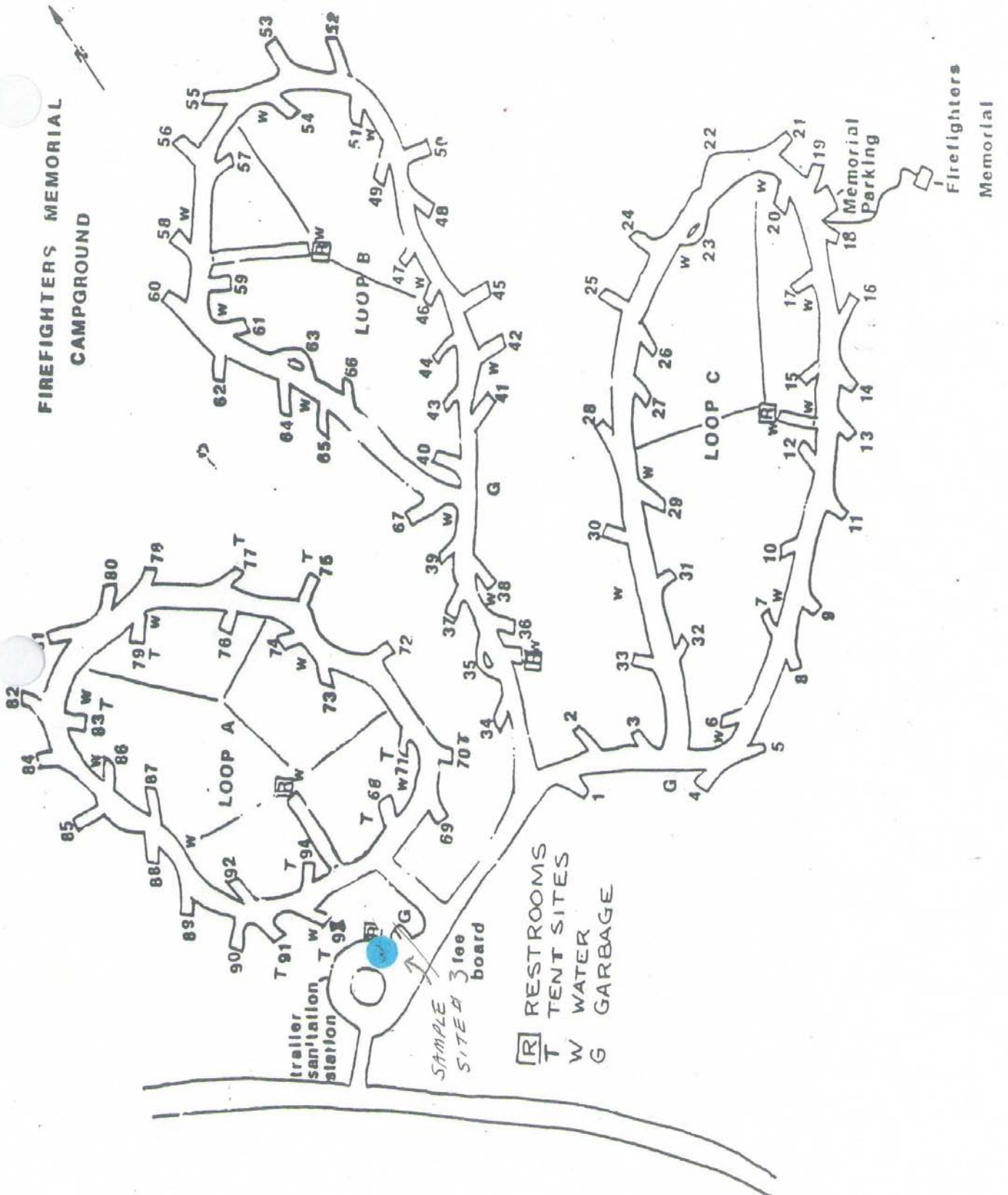
SITE #1 Water Treatment Plant
SITE #2 Greendale C.G.
SITE #3 Firefighters C.G.
SITE #4 Deer Run C.G.
SITE #5 Cedar Spring C.G.
SITE #6 Cedar Spring Ramp Restroom
SITE #7 _____

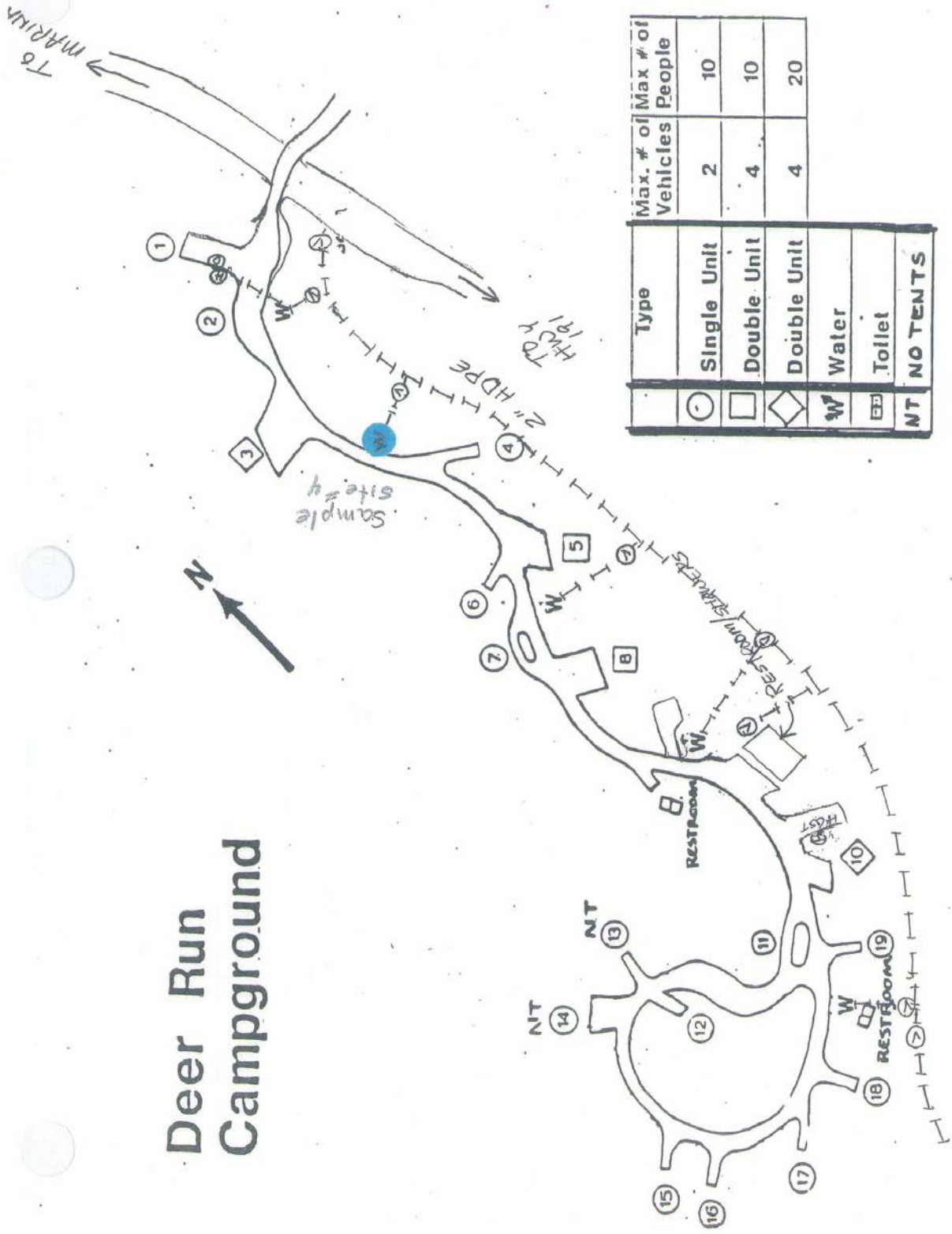
Sample area #1 will be used to sample the spring in case of an unsafe sample result. If temperature conditions do not allow water introduction into recreation facilities, the water samples will be taken at other sample areas.

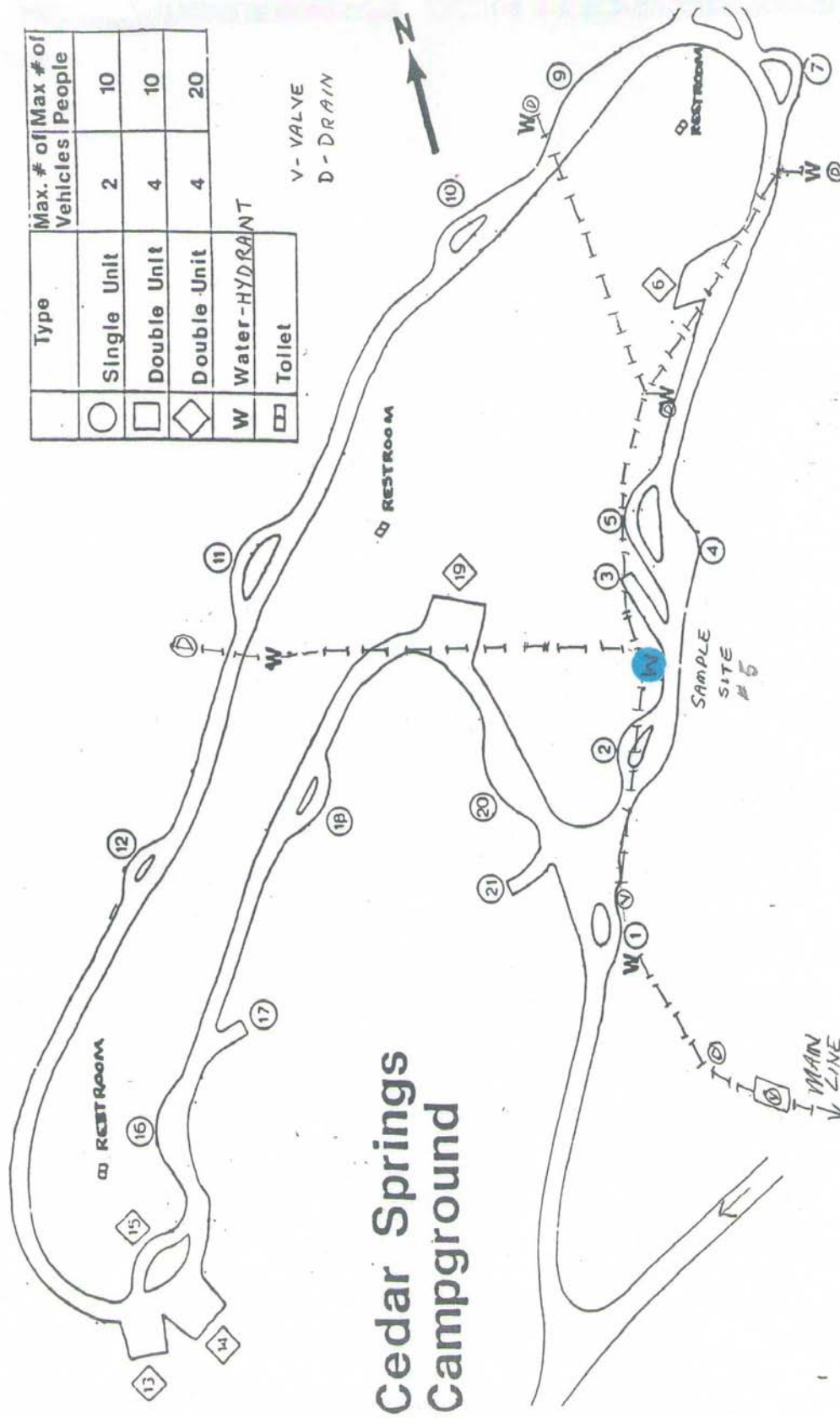
MODIFIED FOR USDA FOREST SERVICE USE

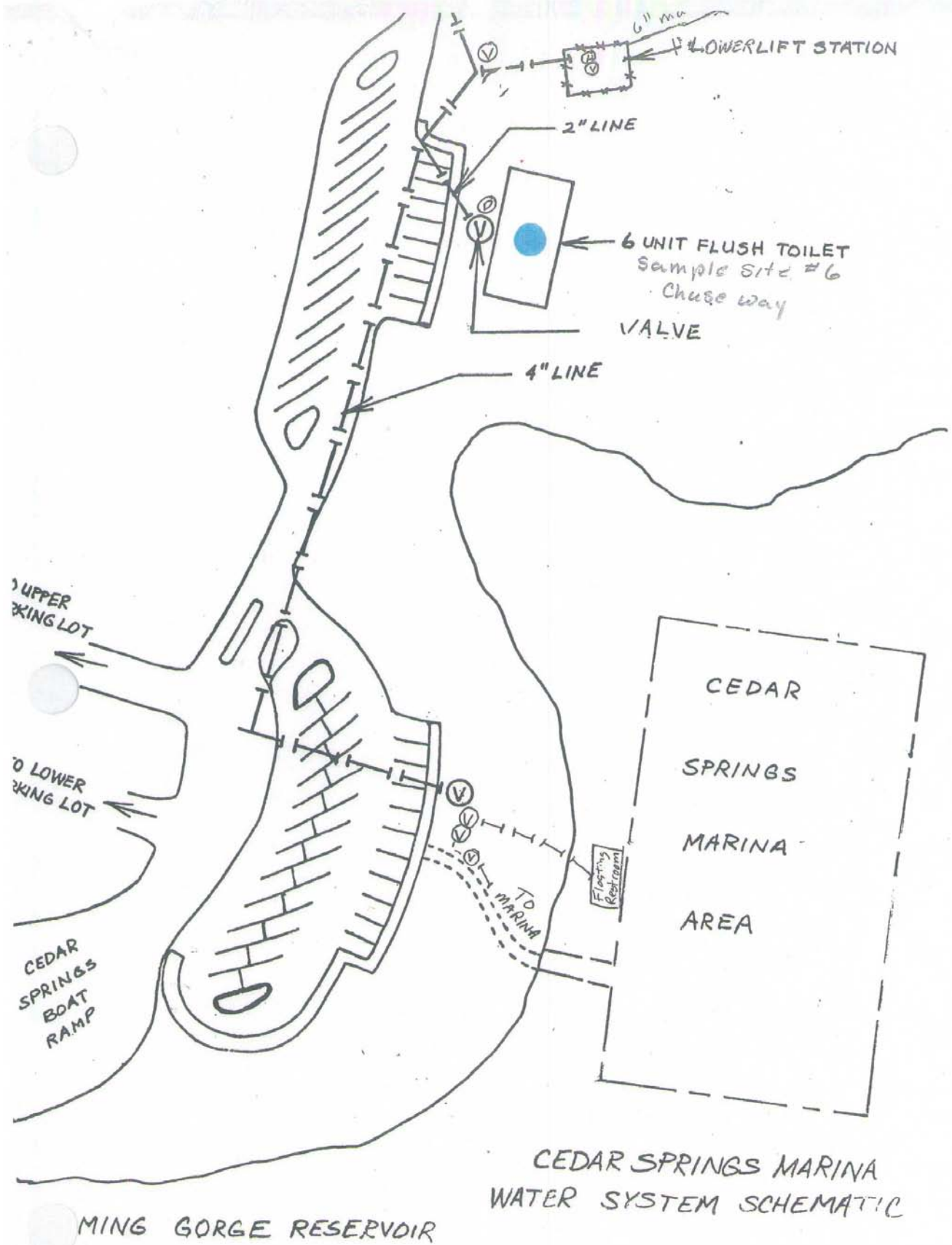












SECTION 6 – SEASONAL START-UP AND SHUT-DOWN PROCEDURES

The Utah Division of Drinking Water rules (R309-105-10(6)) require seasonally operated water systems to be disinfected and flushed according to the techniques given in AWWA Standard C651-92 and C652-92 prior to each season's use. The rules also require a satisfactory bacteriologic sample to be achieved prior to use.

The following start-up and shut-down procedures have been provided by the system operator:

A. System Start-Up Procedures

1. Close all faucets connected to the pressure-reducing valves and drain from the Greendale Treatment Plant to the main storage tank. Close the supply valve for the Greendale Campground.
2. Close drain valve and main line supply valve at the main storage tank. Add enough chorine to produce a 2 ppm residual.
3. Open the supply line valve located in the valve box north of the 10,000 gallon tank at the water treatment plant. The main storage tank, 10,000 gallon tank and connecting water line will now fill.
4. Close supply valve for Greendale group area.
5. Close valves for all loops of Firefighters Memorial campground.
6. Close drain valves and valves on west side water line located in upper valve box.
7. Close faucets in pressure reducing valve box and the drain valve and fire hydrant in C loop lift station enclosure.
8. Close supply valve for Deer Run campground and close the faucets in pressure reducing valve box.
9. Close faucets in pressure reducing valve boxes located between Highway 191 and Cedar Springs campground.
10. Close supply valves for Cedar Springs campground and old water line.
11. Close main line valve near the lower Cedar Springs lift station.
12. Return to main storage tank and open the "new" water supply valve.
13. Close drain valves between main storage tank and Firefighters Memorial Campground. Close drain valves located above and below Highway 191 below Firefighters Memorial Campground.
14. Close drain valve at lower Cedar Springs lift station after the water clears.

15. Close supply valves for Cedar Springs flush restroom and Cedar Springs Marina. Close supply valves for Deer Run campground, Deer Run trailer dump station, and drain valves and faucets at Cedar Springs Sewage Lagoons.
16. Open main line valve at lower Cedar Springs lift Station and fill main line.
17. Open supply valve to Deer Run campground and close valve at the top of the campground. Close the valve to the flush restroom/shower house. Close drain valve and faucets.
18. Open supply line to Deer Run trailer dump station and close valves at sump station water towers.
19. Open supply valve to C loop in Firefighters Memorial Campground. Close petcock on C loop water meter. Close valve for C loop restroom. Close drain valves and faucets.
20. Close supply valves for B loop restrooms, A loop restrooms, and restroom by trailer dump station. Close small drain valve near red water tower.
21. Open main line valve supplying A and B loops. Proceed through B loop, closing the drain valves and faucets.
22. Close A loop drain valve and faucets.
23. Close all faucets at host site and trailer dump station area.
24. Open main supply valve for Greendale campground. Close drain valves and faucets. Proceed back to main valve and open faucet to expel air out of the high point of the water line.
25. Open main valve supplying water for the Greendale group area. Close drain valves and faucets.

B. Water Treatment Plant Shut-Down Procedures

1. Empty out polymer and alum tanks.
2. Pour contents of chlorine tank into an empty 5 gallon jug.
3. Fill the chemical tanks with 5-10 gallons of water and pump for 5-10 minutes to clean chemicals from chemical pumps.
4. Disconnect and remove the chemical pumps and put them in a storage container.
5. Empty all the water from the chemical tanks and clean them.
6. Remove “bath tub ring” from the water level line of the interior surfaces of the plant tank walls.
7. Open drain valves of all but the filtration tank and dump out all water and sludge.
8. Using a hose, wash all remaining sediment from tanks.
9. Backwash the filter bed for about 10 minutes.
10. Drain the 10,000 gallon tank outside at the plant building.

11. Pump down filter bed with effluent pump. Be sure to keep float valve “up” during this process.
12. Listen to the flow through the effluent pump. When air is heard in the pump, shut the pump off.
13. Remove the galvanized plug at the base of the filter bed tank to finish draining the filter bed tank.
14. Turn on pressure tank to pump water out of the tank. Open all faucets, petcocks, and remove plugs from pumps.
15. Remove the lowest plug from the effluent and backwash pumps.
16. Loosen bolts of flow meter on raw water line going into the rapid mix tank.
17. Remove plug from balancing valve, remove water over the diaphragm and replace plug.
18. Disconnect lines from the tops of all the diaphragm valves. Remove fittings. Remove as much water as possible from the tops of diaphragms and fill with RV antifreeze.
19. Reattach the fittings and blow air through the lines to these fittings.
20. Reattach the lines to the diaphragm valves.
21. Blow out the line from the chlorine tank.
22. Disconnect line leading to the turbidimeter from the finish water tank, drain and blow air through. Add RV antifreeze and blow through the line. Reattach the line.
23. Disconnect lines beneath the differential pressure gauge, drain and blow out. Reconnect lines.
24. Disconnect small lines beneath the differential pressure gauge, drain and blow out. Reconnect lines.
25. If using the upper springs, close the diversion valve on the Lost Spring line and open the valve at the first upper spring to direct flow to drain.
26. Close valve on main line near highway 191 and open valve to direct flow to the stream.
27. Open drain valve situated in the buried trash can.
28. Open valves in the valve box situated south of the plant on the water line coming from the upper spring.
29. Open the butterfly valve on raw water inlet in the plant.
30. Disconnect water line leading to the sink.
31. Pour RV antifreeze into sink trap and floor drain.
32. Shut off all power switches.

C. System Shut-Down Procedures

1. At the valve box located north of the 10,000 gallon tank located behind the Greendale water treatment plant, close the valve supplying water for the main storage tank.
2. Go to the main storage tank and open the drain valve. Open the drain valve located to the west of the storage tank.
3. After the main line has drained from the treatment plant to the main storage, start at the highest pressure regulator and open the valves located at each pressure regulator.
4. Open faucets located in the Greendale campground valve box.
5. Open drain valves and faucets in Greendale campground.
6. Open drain valve located at lower Cedar Springs lift station.
7. Open drain valves and faucets at Greendale group area.
8. Open main line drain valves between main storage tank and Firefighters Memorial campground.
9. Open drain valves and faucets at Firefighters Memorial campground.
10. Open valves on water towers at Firefighters Memorial trailer dump station.
11. Open drain valve and fire hydrant at old sewage lift station. Open faucets located in pressure regulator box nearest to the lift station.
12. Open faucet located in pressure regulator box next to Deer Run upper shut-off valve.
13. Open main line drain valves located above and below Highway 191.
14. Open main line drain valves in the pressure regulator boxes between Highway 191 and Cedar Springs campground.
15. Open valve for old Cedar Springs campground.
16. Open drain valves and faucets at Cedar Springs campground and host sites.
17. Open valve for Cedar Springs Marina, if already closed.
18. Open drain valve and faucets in Deer Run campground.
19. Open all valves on water towers at Deer Run trailer dump station.
20. Open drain valves and faucets at Cedar Springs sewage lagoons.
21. Open drain valve and faucets located in the pressure regulator boxes.
22. Use an air compressor to blow water out of water line running between host sites at the Cedar Springs campground.

SECTION 7 - MAINTENANCE

A. Maintenance

Operation of this system includes routine tasks. Below is a list of items to consider:

1. General Operation

- Maintain a supply of commonly needed maintenance and repair parts.
- Keep a log book of all maintenance tasks performed.
- Ensure that updated manufacturer's literature is filed in this manual (Appendix F) when components are added or replaced.
- Sanitary Surveys are to be performed in accordance with applicable State regulations. See Section 8 of this manual.
- Condition Surveys should be performed annually. Perform and document as per FSM 7421.13. See Section 8 of this manual. Correct any deficiencies identified in the Annual Condition Survey.
- Buildings should be inspected annually to identify potential cross connections. Backflow prevention assemblies shall be tested annually (FSH 7421.11). Follow the Ashley Cross Connection Control Plan. Any corrections should be recorded, and maintained in this manual and in the appropriate official files.
- Update Water System Files as necessary:
 - Update this Operation and Maintenance Plan and the official water system file when samples are taken or sample results are received, after any maintenance procedures or equipment replacement, condition surveys, sanitary surveys, etc.
 - Update Water System INFRA database as required
- Check www.epa.gov/enviro/html/sdwis/sdwis_query.html for any outstanding violations.

2. Raw Water - Spring Collection Area and Transport Piping

- Ensure adequate protection of the spring source. Inspect for signs of burrowing rodents. Check springs to ensure that the general public is not disturbing the source by digging, dumping oil or hazardous materials onto the ground, etc.
- Periodically clear deep rooted vegetation from the spring collection area to prevent root growth from clogging collection lines. Encourage the growth of grasses and other shallow rooted vegetation for erosion control and to inhibit the growth of detrimental flora.
- Do not apply pesticides or herbicides onto the spring collection area.

- Maintain any valve or collection boxes to preserve sanitary conditions. Access ports for collection boxes should have a sealed lid to keep rainwater, insects and animals out of the box. The lid should be securely locked.
- Be alert to lush green grass over or around pipeline locations, or surfacing water, indicating a probable leak. Typically, leaks occur where pipes interconnect; such as elbows, bends, tees and fittings. Pipes can also break due to soil movement, freezing, corrosion, root intrusion, or improper installation.

3. Water Treatment Plant

- Maintain the filter unit, including cleaning, back-flushing, replacement of media, replacement of malfunctioning parts, as necessary.
- Maintain the chemical feeders, including replenishing chemicals, cleaning and maintaining the feed pumps and lines, and replacement of the diaphragms and seals, as necessary. The alum solution should be mixed at ½ pound of alum per gallon of water. Polymer should be mixed at ¼ gallon per 10 gallons of water.
- Adjust the controls as needed to provide quality finished water with fluctuating raw conditions. The alum feed rate averages about 0.045 gallons of alum solution per hour. The polymer feed rate will vary with the turbidity of the water. Raw water with a higher turbidity will require a higher feed rate. During 2009, the feed rate varied between 0.099 gal/hr and 0.269 gal/hr. Turbidity can become elevated within 2 hours of a storm event. Check the turbidity and adjust the polymer to compensate. Consulting the previous year's records can help provide a guide for feed rates.
- Maintain the pumps, controls, electrical system, and piping
- Ensure that the building is clean, secure, and in good repair.
- Open the plant drain valves for 3-5 minutes weekly or as needed to flush out the sludge
- Backflow preventer valves should be checked annually for proper operation by a certified inspector.
- Consult the manual provided by Filter Tech Systems, Inc. for detailed operation and maintenance needs of this system. Copies of the manual are located at the treatment plant, and in the water system files located in the Manila office.
- The turbidimeter requires regular maintenance. Refer to the turbidimeter section of the Filter Tech Systems manual. Normal turbidimeter maintenance includes:
 - Standardization checks should be performed on a monthly basis, as described in Section 3.3 of the manual.
 - Calibration should be performed at least every 4 months, and after any significant maintenance or repair, by one of the methods described in Sections 3.3 and 6.4 of the manual.

- Occasional cleaning of the photocell window will be required. Inspect photocell window before each standardization or calibration checks and clean as needed.
- Clean turbidimeter body of sediment semi-annually or as needed.
- Replace the photocell and lamp, as needed.

4. Water Storage Tanks

- Inspect tank periodically. Make sure the lids are sanitary and secure.
- Maintain the valves, piping and vents. Inspect and maintain screens over vents.
- Make sure that the float is working adequately.
- Check inside of tank for sediment buildup, insects, corrosion, cracks and leaks.
- Inspect discharge pipe for proper air gap to prevent back-siphoning of storm water.

5. Water Distribution System

- Maintain the valves, piping and vents. Exercise the valves as noted below.
- Automatic combination air-vacuum valves ordinarily require no scheduled lubrication or maintenance. Periodically inspect them for leakage, tampering, freeze damage, or flooding of the vault.
- Check to ensure that a minimum water pressure of 20 psi is maintained at all points in the system.
- Be alert to lush green grass over or around pipeline locations, or surfacing water, indicating a possible leak. Typically, leaks occur where pipes interconnect; such as elbows, bends, tees and fittings. Pipes can also break due to soil movement, freezing, corrosion, root intrusion, or improper installation.
- Flush water piping during seasonal start-up to remove any accumulated sediments or other impurities.
- Disinfect piping at the start of the season and after opening the piping system for maintenance or repairs.
- Valves should always be opened and closed slowly. When water in a system is immediately stopped due to a valve or hydrant being closed too quickly, moving water can create a force which can cause considerable damage.
- Sample system monthly as described in the sampling plan and Section 5 of this manual. Update the INFRA Water Sampling Module.

B. Common Operating Problems

The most common problems for this system are a lack of water due to low snow levels, and difficulties predicting and adjusting the amount of polymer necessary for settling of the

suspended solids during high turbidity events. See Number 3, above, for tips on adjusting the chemical feed rates.

If water levels are low, make efforts to inform the public and reduce the water consumption. This can be done by posting signs and informing the camp hosts. The hosts can help spread the word to the water campers.

C. Cross Connection Control and Backflow Prevention

The Ashley National Forest maintains a Cross Connection Control Plan. A copy of this plan is attached in Appendix E. Cross connection control and backflow prevention are operational programs which a public water system and its customers must implement to prevent contaminants and non-potable water (wastewater, storm water, process water) from being drawn into their drinking water system. Cross connections are physical, piped connections between potable water and an unsafe or polluted water source. Backflow is a reverse flow of water from the customer or service connection into the water distribution system. Backflow typically occurs when distribution system pressure drops due to a water main break or other reason. Cross connection control programs consist of building codes and other regulations which prohibit cross connections and require backflow prevention devices on particularly high risk service connections. Education, inspection and enforcement are also necessary to ensure compliance with the building code regulations.

D. Valve Exercising

Water valves are subject to corrosion and build-up of dirt and debris. This restricts water flow through the valve and greatly increases the torque required to open or close that valve. A proper valve maintenance program includes inspection of all of the valves in a water distribution system. The inspection not only includes observing the condition of each valve, but also turning the valve stem of each valve to a fully closed position and a fully open position. Keep a record of the ease with which a given valve stem turns and number of stem revolutions to open and close the valve. All system valves should be inspected at least every 2 to 3 years. Schedule the repair of malfunctioning valves.

E. Water Line Repairs

Water pressure is reduced during a water line repair, creating the opportunity for contamination. The following steps protect customers during a repair:

- Notify affected customers of the repair and shut down the water system
- Make the repair.
- Re-establish pressure after the repair.

- Disinfect the repaired line by adding high levels of chlorine, operate valves to distribute chlorine throughout the system, and allow time for chlorine to act.
- Flush the line to remove excess chlorine and debris.
- Test water to ensure safety.
- Send test results to Utah Division of Drinking Water.

SECTION 8 – CONDITION AND SANITARY SURVEYS

A. Condition Survey

Condition surveys are performed to collect and document current condition and maintenance tasks for a water system. Condition surveys must be conducted by qualified personnel.

Qualified personnel shall conduct condition surveys in accordance with FSH 7409.11, Chapter 70, whenever:

- A system violates the MCL standard for coliform
- A closed seasonal system is opened for service
- There is a significant change in conditions that may affect the system operation and or water quality

Copies of the surveys are kept in the water system files located in the USFS Manila office.

B. Sanitary Survey

Utah State regulations (R309-100-7) require that a sanitary survey be conducted at least every three years on all public water systems. The Division of Drinking Water Executive Secretary may reduce this frequency to once every five years based on outstanding performance on prior sanitary surveys.

According to Utah regulations, sanitary surveys may be conducted by Division of Drinking Water personnel, Utah Department of Environmental Quality District Engineers, local health officials, Forest Service engineers, or other qualified individuals authorized in writing by the Executive Secretary. Surveyors are required by Utah DEQ to use the Desktop Electronic Sanitary Survey (ESS) software developed by the Drinking Water Academy. Sanitary surveys for the Greendale water system are conducted by the State of Utah Division of Drinking Water personnel.

Upon receiving a sanitary survey report from the state agency, staff shall prepare a corrective action plan to correct deficiencies and submit it to the line officer for approval (FSM 7420.43) prior to submission to the primacy agency. Corrective actions for significant deficiencies for public water systems must be completed within timeframes required by the State primacy agency.

Copies of the surveys are kept in the water system files located at the USFS Manila office.

C. Cross Connection Assessments

Conduct assessments for Cross Connection hazards in accordance with the Ashley National Forest Cross Connection Control Plan (Appendix E). A certified backflow technician must inspect and test backflow preventer devices annually.

D. Records

Condition and sanitary survey records are kept in the water system files, located at the USFS Manila office. They are the primary documents for planning, programming, and implementing necessary replacement, repair, and corrective action.

SECTION 9 - UTILITIES

The relationship between drinking water systems and other utilities plays a significant role in the performance of the system. In many cases, operation of the system is totally dependent on a utility and a break in service may be critical, if not catastrophic.

The water treatment plant relies on electricity to operate. Electricity is provided by Moon Lake Electric Company. A large portion of the water main for this system runs parallel to overhead power lines operated by Moon Lake Electric Company. Contact information for the electric company can be found in Section 0 of this document.

Firefighters Memorial Campground, Deer Run Campground, Cedar Springs Campground, Cedar Springs Marina, and the RV dump stations are served by sewage lagoons.

SECTION 10 – EMERGENCY PLANS AND PROCEDURES

During an emergency situation, please refer to the **Ashley National Forest Flaming Gorge Ranger District Drinking Water Systems Emergency Response Plan**, located in Appendix C of this document. This plan contains excellent information on alternate power and water sources, telephone locations, etc. For ease of use during an emergency, this plan has been reproduced on colored paper in Appendix C.

During most emergencies, it will be necessary to quickly notify a variety of parties both internal and external to the agency. Refer to Section 0 of this manual for contact information.

Potential Emergency Situations

Potential emergency situations include natural disasters, vandalism and terrorism, hazardous materials accidents, and other man-caused disasters.

Wildland Fire – The threat of fires for people using the Flaming Gorge Recreation Area is real, and can be devastating. After a fire, a condition survey must be completed to evaluate the system and determine what damage has been done and what components must be repaired or replaced prior to reopening of the system.

Flood – Flooding does not appear to be a major concern for this system. If a flood occurs, check the system for any evidence of infiltration.

Drought – Dry years may cause the source spring to produce low flows. Use available water wisely. Check for leaks and repair quickly. Educate the public about water conservation.

Vandalism and Terrorism Acts – The most vulnerable points in this system are the treatment plant, storage tanks, and lift stations. The access ports for the storage tanks and lift stations should be checked regularly to make sure that they are bolted down properly. The treatment plant should be locked and secured. Public health is the primary concern for public drinking water systems. If you discover that the system has been tampered with, and suspect that the drinking water system may be in jeopardy, close the system and post signs for the public, warning them not to use the water. Flush the system. Sample the water prior to re-opening the system.

Hazardous Chemical Spill – A spill of chemicals or petroleum products can contaminate the drinking water supply. The likelihood of a hazardous chemical spill is low. However, notify the District Ranger immediately if you suspect a hazardous chemical or oil spill near the spring collection area, diversion box, water storage tank, chlorination port, or near public access areas (drinking fountains or restrooms).

SECTION 11 – RECORDS AND REPORTS

Records and reports are a guide for system operation and control and serve as historical record of the performance of a system. Reports and forms can be standardized, but must be adapted to each individual system and operation. Summarizing recorded data in graphical form for visual display can facilitate analysis and system operation.

Records and reports can be kept in the water system file or in this Operation and Maintenance Manual. Space has been provided in the appendices of this manual to place copies of important reports, such as sanitary and condition surveys, maintenance records, and testing results.

Types of records that may be included in the file for this system are:

1. Reports to/from State or Federal Agencies - include any notice of violations, modification approvals, sanitary surveys performed by the state, monthly monitoring reports, etc. The state of Utah (R309-105-17) requires the following retention time for reports and records:
 - a. Action to correct violation of primary drinking water regulations – 3 years
 - b. Copies of public notices – 3 years
 - c. Reports, sanitary surveys, etc. – 10 years
2. Forms – include annual condition surveys, INFRA condition surveys for maintenance, etc.
3. Process Control and Daily Operating Log – this is a day-to-day log of the operation of the system. A form can be prepared to facilitate this activity. It is important that operating logs be developed to suit the particular needs and operational requirements of each system and are not just records being kept. Operating logs should be kept in a bound notebook. The state of Utah (R309-105-17) requires a detention time of 5 years for backflow prevention test records.
4. Laboratory Records and Reports - laboratory worksheets and sample results should be maintained. The state of Utah (R309-105-17) requires the following retention time for laboratory records:
 - a. Microbial test results – 5 years
 - b. Chemical test results – 10 years
 - c. Backflow prevention tests – 5 years
5. Operating Costs and Records – maintain adequate operation and maintenance cost records for budgeting purposes. These costs may include:
 - a. Labor
 - b. Chemicals
 - c. Supplies
 - d. Maintenance Items
 - e. Equipment Replacement

Appendix A

Site Plans, Drawings and Schematics

Vicinity Map

Aerial Photographs with Approximate Line Locations

Site Plan

Greendale Water System Drawings

Appendix B

Sampling & Operator Certification Information

Utah DEQ Public Water System Master Report for Greendale
State of Utah Bacteriologic Sampling Information
Operator Certification Documentation
Utah Public Notice Templates – Bacteria and Nitrates

Appendix C

Safety Information

Sodium Hypochlorite Material Safety Data Sheet (MSDS)
Ashley National Forest Drinking Water Emergency Response Plan

Appendix D

System Photographs

Appendix E

Ashley National Forest Cross Connection Control Plan

Appendix F

Equipment Literature

Turbidimeter Manual

*Please also see: Greendale Filter Tech System Manual, located in the water system files at the USFS Manila office

Appendix G

Maintenance Records

Greendale Infra System Inventory Data
Insert Maintenance Records in this Section