WATER CONSERVATION PLAN

TONOPAH TEST RANGE

UNITED STATES DEPARTMENT OF ENERGY

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Prepared for:

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1.0 INTRODUCTION

This water conservation plan is a revised update of "Water Conservation Plan, Tonopah Test Range, Range 4809" dated May 19, 1992. This plan is for the United States Department of Energy (DOE) permitted premises portion of the Tonopah Test Range (TTR) and has been prepared in compliance with Nevada Revised Statues (NRS) §540.121 to §540.151. The plan follows guidelines outlined in the Nevada Department of Conversation and Natural Resources' Division of Water Resources document entitled "State of Nevada Water Conservation Planning Guide." This document has been prepared by Sandia National Laboratories (SNL) for the DOE.

2.0 GENERAL SITE DESCRIPTION

The TTR has been occupied by the DOE since the early 1950s as a weapons delivery test area. The DOE permitted premises encompasses approximately 280 square miles.

The TTR is surrounded on three sides by the United States Department of Defense's (DoD) Nellis Air Force Range. The land to the north of the TTR is controlled by the Bureau of Land Management and is used for cattle grazing. The TTR is located within Township 1 and 2 South, Range 45 through 51 East. The TTR is located in the northwestern section of the United States Air Force's (USAF) Nellis Air Force Base, in Nye County, Nevada. The TTR is situated approximately 150 air miles northwest of Las Vegas, Nevada, and approximately 35 air miles southeast of Tonopah, Nevada (see Figure 1).

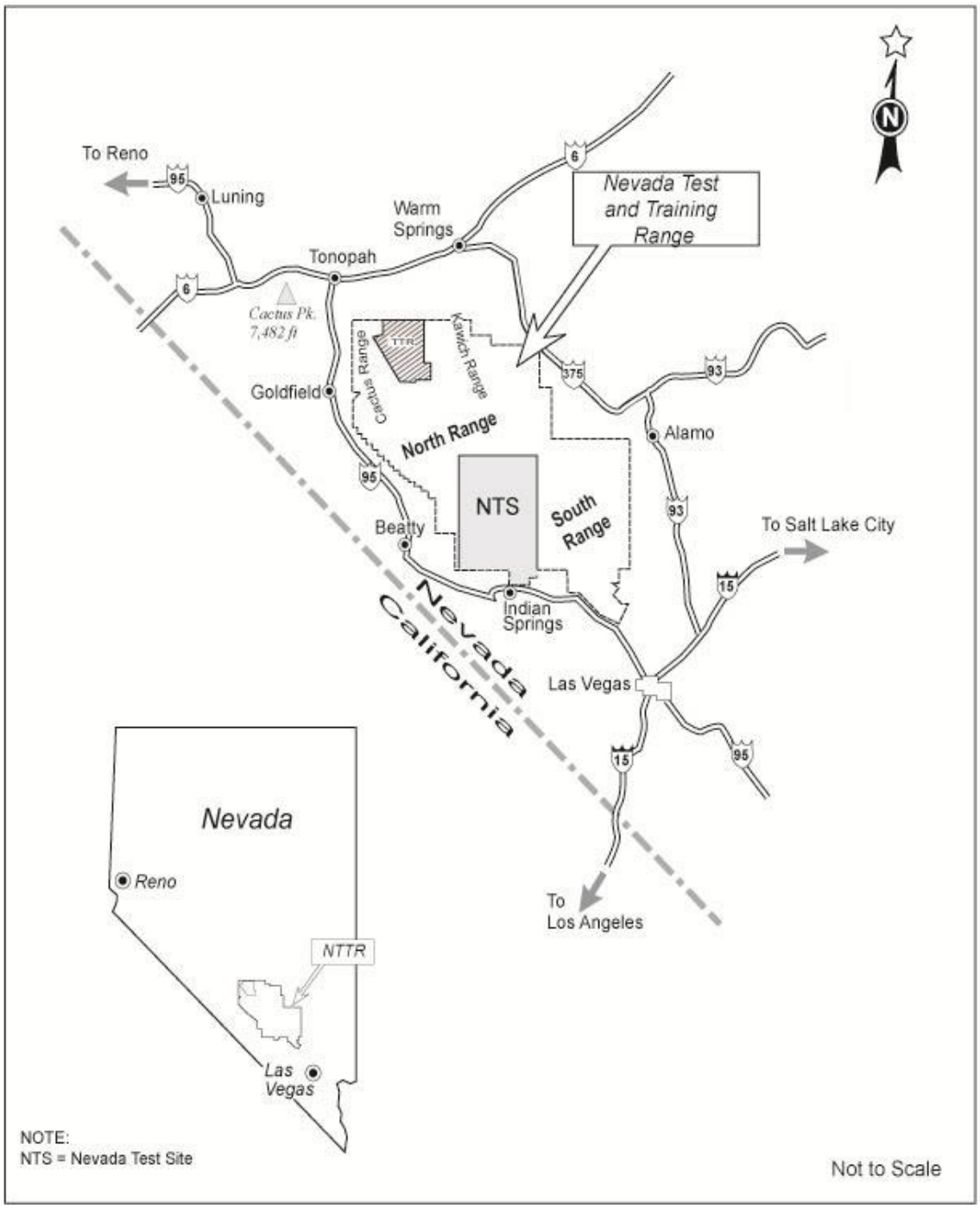

Figure 1. Map of Nevada with TTR Location

Note: Area identified as TTR on the Figure is the DOE's TTR Permitted Premises.

2.1 TENANTS OF THE TTR

This facility is considered an isolated rural location by the agencies that manage and operate the TTR. Due to the type of research and

development operations conducted on the TTR, it is a controlled access area for safety and security reasons. The TTR is primarily used by the DoD and DOE. SNL and the USAF have been occupants on the TTR since the early 1950s. The USAF controls housing quarters and dining facilities for the work force. Workers commute to the TTR from Las Vegas and nearby surrounding regions on a daily or weekly basis by air or by vehicle.

2.2 GEOLOGY OF THE TTR

The TTR is situated in a high desert consisting of broad valleys surrounded by north- / south-trending mountain ranges. The Cactus Flat area constitutes the basic working area of the TTR. The TTR is an alluvial fan surrounded by the Cactus Mountain Range to the west and the Kawich Mountains to the east. The terrain around the facility is generally flat with an average terrain variation of 15 feet over approximately 20 miles.

The TTR is in the western part of the Basin-and-Range Phisographic Province. This area is characterized by sharp, rugged mountain ranges surrounding low alluvial filled valleys. Both the Cactus and Kawich Mountain Ranges have numerous fault lines and inferred fault lines associated with them. The Cactus Range was a major volcanic center over six million years ago. Several extinct volcanic caldera extend in a southerly direction from the TTR.

There are three basic geological terrains associated with the site: areas of deep alluvial cover, areas of Tertiary volcanic or sedimentary rock near volcanic or intrusive craters, and areas of Paleozoic carbonate rock near igneous intrusions, and regional thrust and detachment faults.

2.3 CLIMATOLOGY OF THE TTR

The climate is mild and usually dry, as is typical of high deserts, and it is subject to large diurnal and seasonal changes in temperature. These temperatures can vary from record high of 102 degrees Fahrenheit to a record low of -24 degrees Fahrenheit. Clear, sunny days with light to moderate winds are usual. The average rainfall precipitation is approximately 5 inches per year in the valley with most of the precipitation occurring in August. Dust storms are common in the spring and dust devils during the summer months.

2.4 HYDROLOGY OF THE TTR

The dominant hydrologic unit in the region is a thick layer of unconsolidated alluvial material that partially fills the basins. Most of the groundwater at the TTR originates as precipitation in the mountains and runs off through the alluvium, and migrates toward the center of the basin. The sediments in these areas are composed of gravels, sands, silts, and clays but no continuous confining layers.

There are two separate groundwater systems that make up the source of water used on the TTR (see Figure 2). The systems are known as the Cactus Flat and Stonewall Flat. The groundwater depth varies greatly in the alluvial valleys, with groundwater being encountered from approximately 50 feet to greater than 500 feet below ground surface (bgs). The regional groundwater discharge from both of these systems is believed to be toward Sarcobatus Flat.

The TTR has no continuously flowing streams or rivers. There are some intermittent streams in and near the TTR. These intermittent streams end in closed basins. The streams are identified as Cactus, Antelope, and Silverbow Springs.

2.5 SNL TTR PWS

At the TTR, the DOE's National Nuclear Security Administration (NNSA) is the registered owner of the SNL Public Water System (PWS). SNL, as the operator of the TTR PWS, is responsible for pumping, treating, and distributing potable water in compliance with all federal and state of Nevada Division of Environmental Protection (NDEP) regulations. SNL's Operating and Management (O&M) Contractor employs certified water operator personnel who ensure compliance with water quality standards.

A PWS provides the drinking water for TTR personnel supplied entirely with groundwater pumped from a well designated as Well 6. Depth to groundwater is approximately 450 feet below ground surface. The distribution system supplies water to the Area 3 complex where most personnel are located. The well water is chlorinated, the pH is adjusted utilizing carbon dioxide, and treated for arsenic before water is stored in a 200,000-gallon elevated storage tank constructed in 2005. TTR treats potable water for arsenic to meet primary drinking water standards. TTR supplies bottled water for sites located outside of Area 3.

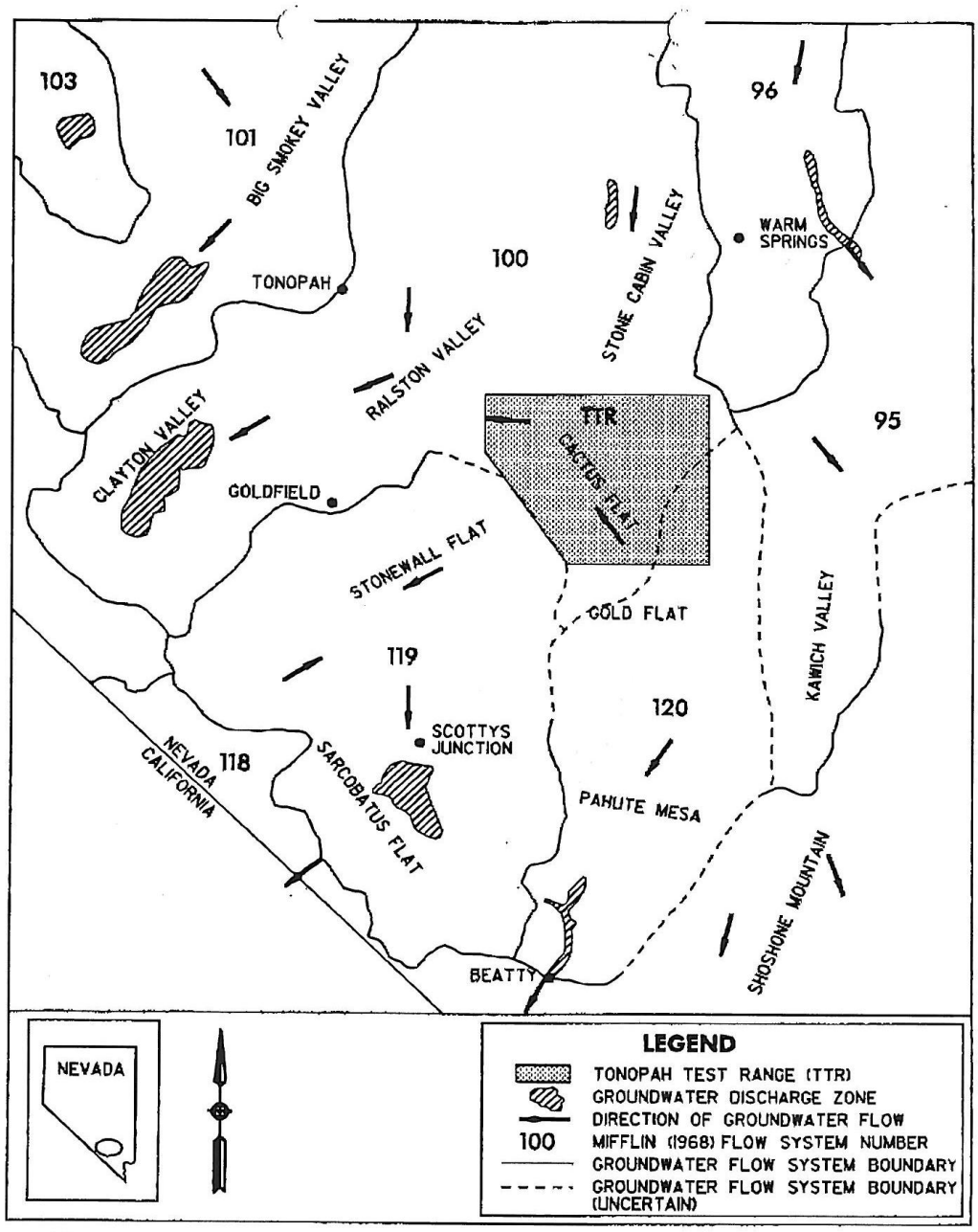

Figure 2. Groundwater Flow Systems near TTR

The water system is classified as a non-transient non-community (NTNC) PWS under the State of Nevada Safe Drinking Water Regulations (NAC445A.591). The permit, NY-3014-12NTNC, is renewed annually with the NDEP's Bureau of Safe Drinking Water (BSDW). The system is operated and maintained under an O&M contract that is administered by SNL. The O&M contractor is responsible for providing appropriately certified Water Distribution and Treatment Operators for the TTR PWS. The O&M contractor will operate and maintain the system consistent with NDEP

regulations and the Operating Procedures (OP) established and maintained by TTR. The OP currently in effect includes the following: E&SH OP, *Safe Drinking Water Program at TTR* (SNL 2008). All compliance reports are provided to the NNSA's Sandia Site Office for submittal to the BSDW. The TTR also holds a Permit to Operate a Treatment Plant, Permit # NY-3014-TP11-12NTNC, which is also renewed annually.

3.0 WATER CONSERVATION PLAN

The types of activities on the TTR direct the type of elements that will be included in the water conservation plan. From NRS §540.141, the following provisions are to be included:

1. "A plan or joint plan of water conservation submitted to the Section for review must include provisions relating to:
   a. Methods of public education to:
      (1) Increase public awareness of the limited supply of water in Nevada and the need to conserve water.
      (2) Encourage reduction in the size of lawns and encourage the use of plants that are adapted to arid and semiarid climates.
   b. Specific conservation measures required to meet the needs of the service area, including, but not limited to, any conservation measures required by law.
   c. The management of water to:
      (1) Identify and reduce leakage in water supplies, inaccuracies in water meters, and high pressure in water supplies; and
      (2) Where applicable, increase the reuse of effluent.
   d. A contingency plan for drought conditions that ensures a supply of potable water.
   e. A schedule for carrying out the plan or joint plan.
   f. Measures to evaluate the effectiveness of the plan or joint plan.
   g. For each conservation measure specified in the plan or joint plan, an estimate of the amount of water that will be conserved each year as a result of the adoption of the plan or joint plan, stated in terms of gallons of water per person per day."
2. "A plan or joint plan submitted for review must be accompanied by an analysis of:
   a. The feasibility of charging variable rates for the use of water to encourage the conservation of water.
   b. How the rates that are proposed to be charged for the use of water in the plan or joint plan will maximize water conservation, including, without

limitation, an estimate of the manner in which the rates will affect consumption of water."

As a government-operated PWS, there are no fees collected or charges for water usage; therefore, the following conservation measures do not include an estimate of or the feasibility of charging variable rates for the use of water to encourage the conservation of water.

3.1 METHODS OF PUBLIC EDUCATION

As the TTR draws its water from deep groundwater systems, it is very important to use this restricted resource in moderation. It is essential to educate the people at the TTR in water conservation methods. Water Operator personnel will institute a site-wide water conservation education plan to increase the public awareness of limited water supply and water conservation techniques that can be used in the workplace as well as in their own residence. TTR does not have any landscaping to water.

The education program will consists of the following practices:

1. O&M Water Operator personnel will distribute water conservation reminders to Site personnel, to be posted at water use areas such as sinks, wash racks, etc.
2. O&M Water Operator personnel will periodically send articles by E-mail to TTR personnel reminding users of water conservation practices.
3. All TTR personnel will be encouraged to report leaking faucets, toilets, and / or water pipes as soon as possible.

For these education conservation measures, an estimate of the amount of water that may be conserved each year as a result of the adoption of the plan is approximately 22,630 gallons based on about one (1) gallon of water per person per day.

3.2 INDOOR-OUTDOOR WATER CONSERVATION MEASURES

Indoor-Outdoor water conservation can be practiced by individual users and further encouraged by organizations. Average water consumers can save thousands of gallons of water per year by being aware of water conservation practices. Some of the practices to be implemented are as follows:

1. Instituting a reoccurring maintenance program on the water distribution systems to include water saving replacement parts. This can

include faucets with water saving aerators, low flow devices, and water displacement devices in toilets.
2. Conscious effort to use less water in the workplace, or in temporary residence quarters. This includes turning off water when performing tasks in the workplace, such as cleaning and checking equipment, performing any personal hygiene function, washing full loads of laundry, etc.
3. Conscious effort by all individuals in the workplace to report all leaks to maintenance.

3.2.1 Construction

A large portion of the water used on the TTR occurs during construction projects and dust suppression on unpaved roadways. TTR's Area 3 wastewater effluent discharges to the USAF lagoon and is not available for reuse.

Closure of the Well 6's construction pond has occurred and now the pond will only be used to flush the well when necessary. The pond had been filled with water for dust suppression, and this closure action saves several hundred thousand gallons of water per year (3,406,500 gallons were pumped to the pond from 2003 to 2008).

3.2.2 Engineering

Primary organizations are responsible for the design of new facilities at the TTR. These organizations will be responsible for assuring that all new facilities conform to the minimum standards for plumbing fixtures. In addition, it will be the primary organizations' responsibility to assess additional design modifications to facility buildings in an effort to conserve water.

3.2.3 Outdoor / Agriculture

No lawns exist with sprinkler systems on the TTR; therefore, watering of lawns is not a contributor to water usage. Water is also not used for agricultural purposes at the TTR. There are several developed ponds or springs on the TTR that naturally provide the wildlife population with water. These sources of water may go dry during drought conditions. If directed by DOE, supplemental water sources may also be provided for wildlife during drought conditions.

For these indoor-outdoor conservation measures, an estimate of the amount of water that may be conserved each year as a result of the adoption of the plan is approximately 45,260 gallons based on about two (2) gallons of water per person per day.

3.3 SUPPLY MANAGEMENT

Supply management entails the accounting and verification that the user is receiving water from the source of the supply through the water distribution system. The management of this system from the source to the user assists in the detection of problems as well as establishes a proactive approach to resolving problems.

All water systems lose water due to leaks. The reoccurring maintenance programs for the water distribution systems assist in keeping the leaks to a minimum. It is a recognized fact that undetected leaks in a water distribution system can cause damage to the bedding of the pipes, thus causing large breaks with greater costs to repair.

3.3.1 Leak Detection Program

TTR's Area 3 Water Distribution System is small enough, usage is constant enough, and it is engineered in such a way that leak detection is incorporated into the daily operation of the SNL PWS. Water usage within the Area 3 compound is fairly constant and is logged daily. Flow meters in the water treatment facility show distribution system usage in real time. If the water flows constantly without zeroing out after a few minutes, operators know that something has been left on, is stuck, or is leaking. Whenever there is an unexpected increase in the daily or weekly usage within the Area 3 distribution system, a possible leak within the distribution system is expected. Several leaks within the system have been identified using this method over the last few years.

When leaks are suspected, the next aspect will involve "pinpointing" the leaks through visual inspection and sonic detection techniques. Once a leak location is identified, it is repaired in a timely manner.

3.3.2 Leak Prioritization

Leaks will be prioritized as follows in Table 1:

Table 1: Leak Prioritization

CATEGORY	PRIORITY	DESCRIPTION
CLASS 1	HIGH	A LEAK THAT WILL CAUSE DAMAGE, LEAK OVER 10 GALLONS PER MINUTE
CLASS 2	MODERATE	A LEAK WITH MODERATE LOSS OR POSSIBLE DAMAGE, LEAK OF 2-10 GALLONS PER MINUTE
CLASS 3	LOW	A LEAK POSING NO HAZARD OR LEAK LESS THAN 2 GALLONS PER MINUTE

3.3.3 Pressure Reduction Program

Pressure reduction is proven to be a successful means of physically suppressing water usage. This practice has the potential to reduce both the average and peak water use on a long-term basis.

Excessive pressure may damage seals between pipes and joints or the pipe itself at locations where the pipe has been weakened by corrosion. Pressure regulation has the added value of reducing leakage and maintenance requirements. Pressure is maintained at an optimal level throughout the Area 3 distribution system.

For these supply management conservation measures, an estimate of the amount of water that may be conserved each year as a result of the adoption of the plan is approximately 1,051,200 gallons based on about forty-six (46) gallons of water per person per day from a Class 3 leak.

3.4 IMPLEMENTATION SCHEDULE

All of the plan elements listed are currently in place. The plan is to be reviewed every five years, and updated as system needs change.

3.5 PLAN EFFECTIVENESS METRICS

Historical well production logs will be compared to estimated employee population each year to determine the gallons per capita per day (gpcpd) consumption. During 2009, Well 6 produced 833,000 gallons of water that was chlorinated and sent to the elevated water storage tank. For 2009, the well production divided by the estimated employee population of 62 is approximately 13,435 gallons per capita or about 37 gpcpd. When average annual consumption is significantly greater than 37 gpcpd, plan revisions will be considered to include additional

conservation measures. When a plan element is activated, such as declaring a drought stage or new facilities conforming to the minimum standards for plumbing fixtures in an effort to conserve water, production in terms of gpcpd will be compared to same time historical data to estimate effectiveness.

4.0 DROUGHT CONTINGENCY PLAN

Water at the TTR is taken from deep aquifers. As the length of time to recharge these aquifers is considerable, drought conditions are rarely observed. Well monitoring data has been collected on the TTR over a period of years by the United States Geologic Survey (USGS) for the DOE. The USGS data indicates the depth of groundwater varies only a matter of feet for the duration of the monitoring activities at each of the wells.

Drought condition determination will be based on departure from the observed normal trends and will be determined on a well by well basis. The long term climatic conditions (past, present, and projected future) will be evaluated when making the drought determination. Drought condition determination will be issued by the DOE or an organization that is representing the DOE on the TTR at the time.

4.1 DROUGHT WARNING STAGE

A drought warning stage will be issued when well monitoring activities indicate a minor drop in the static water level. This drop will be determined to be a departure from the normal trends of the well being measured including the surrounding wells in the area. An extensive water conservation media campaign will be implemented at this time. This campaign will urge compliance with water conservation guidelines outlined in the TTR plan.

4.2 SEVERE DROUGHT STAGE

A severe drought stage will be declared by the DOE when well monitoring activities indicate a drop in static water that is determined to be a moderate departure from normal trends. The following reduction of use of water will be implemented by all organizations on the TTR.

1. Require the use of reclaimed water (effluent) for construction purposes.

2. Restrict the use of vehicle washing to two (2) days per week.

4.3 EMERGENCY DROUGHT STAGE

An Emergency Drought stage will be declared when well monitoring activities indicate a drop in the static water level to be a significant departure from normal trends as well as long term climatic conditions indicate that there will be minimum precipitation in the area during the "wet season".

Upon the declaration of an Emergency Drought Condition, the following usage of water will be either eliminated or severely restricted by all organizations.

1. Eliminate the use of water for all recreational activities.
2. Eliminate the use of the car wash and any vehicle wash area.
3. Close selected areas that are limited in use.
4. Severely restrict the use of water for construction purposes.

5.0 REFERENCES

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