Water Resources Management Plan
Big Pine Indian Reservation

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Water is the basis for life and all things need water to be able to survive. As the population and consumption of water has grown on the Big Pine Indian Reservation, the Big Pine Tribal Council requested the Bureau of Indian Affairs for funds to create a document which would help the Tribe better manage the precious resource of water.

Water is a finite resource. It is renewable, but it has its limits. In 2007, U.S. headlines were declaring that 36 states would face water shortages within the next 5 years. In Tennessee, the town of Orme had to truck in water from Alabama because their water source dried up. The reservoir's in upstate New York have dropped to record lows. Georgia is experiencing a drought which affects millions. The Sierra Nevada snowpack which recharges the groundwater aquifer under the Big Pine Indian Reservation is melting faster every year.

Modern society has come to view water only as a resource that is there for the taking, rather than a living system that drives the workings of a natural world we depend on. The Big Pine Paiute Tribe of the Owens Valley sees the need to meet human needs with those of a healthy environment. The need to reduce water waste is greater now than ever before and as a result the Big Pine Tribe of the Owens Valley is enacting this water plan to be a better steward of it's water resources.

1.0 Overview of the Big Pine Indian Reservation

The Big Pine Indian Reservation is home to the federally recognized Big Pine Paiute Tribe of the Owens Valley (Tribe). The Big Pine Indian Reservation is home to 425 Tribal members and 155 Non-Indians, making the total population 580.

The Reservation itself is 299 acres (including a 20.5 acre parcel acquired from the Los Angeles Department of Water and Power for sewage treatment) which is contiguous to the town of Big Pine, California located in Inyo County. Land use consists of residential / agricultural, community facilities, commercial, and industrial zoning. US Highway 395 runs north and south through the Reservation. Bishop, Inyo County's only incorporated city, is located 15 miles north of Big Pine.

The Bureau of Indian Affairs through its Water Management, Planning, and Pre-Development Program has provided funding for the Tribe to develop a Comprehensive Water Management Plan for the Reservation. This Comprehensive Water Management Plan will assist the Tribe in better managing water resources on the Reservation.

1.1 Background

On April 20, 1937, the U.S. Congress authorized a land exchange between the City of Los Angeles and the Department of the Interior. This exchange was completed in 1939, and the United States Government exchanged 2,913.5 acres of land held in trust for the Owens Valley Paiute Indians for 1,391.48 acres of land owned by the Los Angeles Department of Water and Power. The exchange resulted in the creation of the Big Pine, Bishop and Lone Pine Indian Reservations. The Big Pine Indian Reservation was allocated 279.08 acres from the exchange.

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Included in the exchange was an agreement by the City of Los Angeles to supply four acre-feet of water per acre in perpetuity to the lands. Therefore, the water entitlement for the Big Pine Reservation is 1,116.32 acre feet per year. Water rights attached to the lands were not exchanged with the lands so that today the City of Los Angeles continues to hold the water rights beneath the Reservation and the federal government continues to hold the water rights of the exchanged lands.

In addition to the 279.08 acres associated with the 1939 land exchange, the Tribe acquired a 20.5 acre parcel of land from the Los Angeles Department of Water and Power for sewage treatment in 1989.

The Reservation includes a portion of Big Pine Creek as it flows in a northeasterly direction across the northwest corner of the Reservation. In addition to Big Pine Creek, there are two other surface water features in the vicinity of the Reservation. The Owens River flows in a southeasterly direction about 1 mile east of the Reservation and the Big Pine Canal lies adjacent to the eastern boundary of the Reservation.

1.2 Geography

The Reservation is located in the northern portion of Inyo County within the Owens Valley. The Owens Valley is bounded by the Sierra Nevada Mountains on the west and the White Mountains and Inyo Mountains on the east. As previously mentioned, U.S. Highway 395 bisects the Reservation and accommodates large volumes of north and south bound private and commercial traffic. The average elevation of the Reservation is 4,000 feet above sea level. The terrain of the Reservation is relatively flat and slopes easterly towards the Owens River at grades ranging from 1% to 4% (SCS Engineers Environmental Assessment Report for the Big Pine Indian Reservation; July 1999).

1.3 Climate

The Reservation is located in an arid region with cold winters and hot summers.

> The Sierra Nevada Mountains barrier influences the climate of the Owens Valley. Air moving up the west side of the mountains from the Pacific Ocean cools, and releases its accumulated moisture by the time it reaches the Sierra crest. Dry air descending the eastern side of the Sierras warms and evaporates moisture from the ground below, resulting in arid lower slopes and valleys.
>
> Spring is the region's most unpredictable season. A "false" spring occurs from mid-February to late march of most years. Maximum daily temperatures during that period are high enough to initiate bloom and fruit set of ornamentals and fruit trees while temperatures remain above freezing. In most years, this false spring is interrupted by periods of sub-freezing temperatures which damage or kill the flowers and fruit.
>
> Summer daily temperatures usually are in the range 90 degrees to 100 degrees in the early afternoon and dip into the 50's at night.

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> The sun shines during 90 percent of the day in the summer and about 70 percent of the day in the winter. Prevailing winds blow from the North or South at average speeds of 5 to 10 miles per hour. March, April and May tend to be the windiest months of the year.
>
> Average monthly air temperature and total precipitation are the two climatic variables that have the most significant impact on any agricultural water use determination. (NRCS, Water Rights Quantification; 1993)

The Reservation's annual precipitation is less than 5 inches and occurs primarily as rain in the winter months.

1.4 Community Profile

There are currently 210 housing units and 7 tribal operations/commercial units on the Reservation. The housing units are scattered throughout the Reservation except for one mobile home park which has 31 housing units located within a 5 acre area.

In addition to the housing units, there are 5 tribal operation units which includes the Tribal Offices, an elders building, a community center which holds the Tribe's Education department and a preschool, and Tribal Temporary Assistance to Needy Families (TANF) office. The various tribal operation units provide office space primarily, though the community center is also used by community groups for various functions.

There are also 2 units on the Reservation which were used as commercial facilities, but now operations at both facilities have been discontinued. Plans are now being developed by the Tribe's Economic Development Department to begin using those facilities in the future. One facility will be used as another tribal operation unit and will provide office space for Tribal programs within the next year. The Tribe's Economic Development Department is currently looking into a new economic endeavor for the Tribe to pursue in the other facility.

2.0 Domestic Water System

The Reservation operates a Community Water System which has 179 service connections. The majority of the service connections are for residential users. The original water supply system was constructed by the Bureau of Indian Affairs around 1960 and many upgrades to the system have been performed up until the present time.

The Community Water System has a total of 4 wells. Well No. 1 is located in the southwest corner of the Reservation. It was drilled in 1973 to a depth of 234 feet, 10 inches in diameter and is equipped with a 15 Hp submersible pump. It was discovered in 2002 that Well No. 1 now has a depth of 198 feet and the decreased depth is probably the result of sediment deposits. Well No. 1 is not fenced in.

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Well No. 2 is also located in the southwest corner of the Reservation. It was drilled in 1981 and is 235 feet deep, 8 inches in diameter and is equipped with a 10 Hp submersible pump. It is fenced in along with the pump house. The pump controls and treatment equipment for Wells No. 1 and 2 are located in a 12' x 12' block building located in the southwest corner of the Reservation. The pump house is fenced and locked.

Well No. 3 is located near Highway 395 south of the Tribal Administration building. It was drilled approximately 30 years ago and is 138 feet deep, 8 inches in diameter, lined with a 6 inch sleeve and is equipped with a 5 Hp submersible pump. Well No. 3 is not currently being used. The pump controls for Well No. 3 are located in a 6'x8' wooden building. The pump house and well are fenced and locked.

Table 1: Big Pine Domestic Water Well Data

Well ID	Depth	Diameter	Pump	Pump Rate	Voltage/Phase
Well #1	198 ft.	10 in.	15 hp	160 gpm	230/Three
Well #2	235 ft.	8 in.	10 hp	90 gpm	230/Three
Well #3	138 ft.	8 in. (6 in. sleeve)	5 hp	30 gpm	230/Single
Well #4	305 ft.	10 in.	40 hp	400 gpm	460/Three

Well No. 4 is located in the northeast corner of the Reservation. It was drilled in 2002 and is 305 feet deep, 10 inches diameter and is equipped with a 40 Hp submersible pump. The pump controls and treatment equipment for Well No. 4 are located in a 9'-4" x 20' block building. The pump house and well are fenced and locked.

The pump controls located in the pumphouses use automatic controls to fill the water storage tank. The function of the pump controls is to measure the water in the storage tank and turn on or off the water pumps as necessary to keep the storage tank level from getting too high resulting in overflow or getting too low resulting in inadequate system pressure and insufficient fire reserve.

Water storage is provided by a 250,000 gallon water storage tank which was constructed in June of 1980. The 250,000 gallon tank does not conform to AWWA D100-96 seismic zone 4 requirements. Currently, a new 348,000 gallon welded steel tank is being constructed. The new water storage tank will be placed within the footprint of the older tank. It will be located just west of the Reservation and should be completed in the summer of 2008.

The community water system is currently being disinfected with chlorine using chemical feed pumps in each of the pump houses. Fluoridation equipment has been installed in the pump houses, but have not been in operation.

The water distribution system consists of 4" and 6" PVC water mains. There are 21,900 feet of 6-inch PVC main and 9,400 feet of 4-inch PVC main. There is 9400 feet of The 9,500 feet of 4-inch PVC main has been identified as insufficient to meet the fire flow needs of the Big Pine Volunteer Fire Department. The 4-inch PVC main is also old, has had numerous repairs and is undersized for the growing community of the Big Pine Tribe. In 2006, the tribal utility operator

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fixed 7 leaks along the 4-inch portion of the distribution system saving approximately 1 million gallons a month in water loss. The 4-inch PVC main runs along Crater Street, Hill Street, Callina Street, a portion of Bartell, along the west side of Highway 395 from Well #3 and across Highway 395 from Well #3.

A Fire Flow Analysis was conducted by the Indian Health Service in 2003 in order to determine if the water distribution system was capable of providing at least 1,000 gpm for fire flow. The 1,000 gpm rate was given by the Big Pine Volunteer Fire Department as the minimum flow to provide adequate fire protection to the Big Pine Indian Reservation. The Fire Flow Analysis determined that the existing water distribution system was not able to provide the 1,000 gpm rate needed for sufficient fire protection.

The model was changed by replacing the 4" piping along Crater Street with 8" piping and all other 4" piping (except the piping along Spratt Lane) with 6" piping. The results show that the replacement of piping would result in fire flows above 1,000 gpm on a peak day.

There are 61 fire hydrants located throughout the water distribution system. The average age of the hydrants located throughout the system is 28 years old and 93% of the existing hydrants are 30 years old. The age of the hydrants is a concern which should be handled through a hydrant replacement program.

Another concern is that the fire hydrants vary in size (1 - 2½", 25 - 4½" and 35 - 5¼"). The 2½" hydrant as well as the 25 - 4½" hydrants are in need of replacement due to parts being unavailable if a need to repair the hydrants was necessary.

Table 2: Hydrant Placement for Improved Fire Protection

Location	No. of New Hydrants	No. of Replacement Hydrants
US 395 crossing	2	0
Well #3 to Blake	0	1
Hill Street	1	1
Crater Street (south of Bartell)	2	5
Crater Street (north of Bartell)	2	3
Richards Street (south of Bartell)	2	4
Callina Street	0	3
Total	**9**	**14**

2.1 Leak Detection Survey

In June of 2003 a leak survey was conducted at each residence on the Big Pine Indian Reservation. This survey was conducted to locate plumbing leaks, determine the number of working and non-working smoke detectors, identify visible addresses for the Fire Department and install water conservation/safety devices (low flow showerheads, faucet aerators, and smoke detectors) for the hearing impaired and elderly.

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BP Fire Safe Council gaining momentum

July 23, 2012

By
Deb Murphy/Sports Editor
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An aerial view of the 2011 Center Fire shows the path and patchwork of wind-driven wildland fires in relation to the community of Big Pine. File photo

At Monday's fifth meeting of the Big Pine Fire Safe Council, residents learned just how close the bullet the community dodged on Saturday, July 7 actually came.

The large turnout, perhaps spurred on by two consecutive Saturdays of brush fires in or near the town, also began to come together with the first small steps in protecting themselves and their homes from the constant threat of wildland fires.

Eric Abrams, a CalFire and Big Pine Volunteer firefighter, briefed the residents on the details of the Fish Fire, the blaze that scorched 1,103 acres of brush south of the community. "It was a hard-charging fire," he said of the blaze that started just north of Fish Springs Road and was driven by gusting winds out of the south. "It was the quick action of the agencies that stopped it."

According to Abrams, the firefighters got ahead of the blaze and created a buffer zone between the fire and the south end of Big Pine.

A big factor was the air support. Abrams said the aircraft were called up by CalFire when it got the dispatch, before the crews and equipment left the station in Bishop. "The air support was already in orbit," said Abrams. "We were able to divert them from the west side of the mountains."

The picture Abrams drew was grim. Without the buffer and the air support, the fire would have followed the same path the Center Fire had taken 18 months earlier on its way to destroying 19 homes.

The first four meetings of the newly-formed council had been overwhelmed with issues of fuel reduction and larger issues of fire safety. Fourth District Supervisor Marty Fortney and council member Kent Schlick suggested the group take on simpler projects to start with, specifically putting up visible numbers on homes to help emergency responders locate residents.

Just that single goal illustrated the complexity of a community made up of two areas: one to the north and the older, original community of Big Pine straddling U.S. 395. The recommended

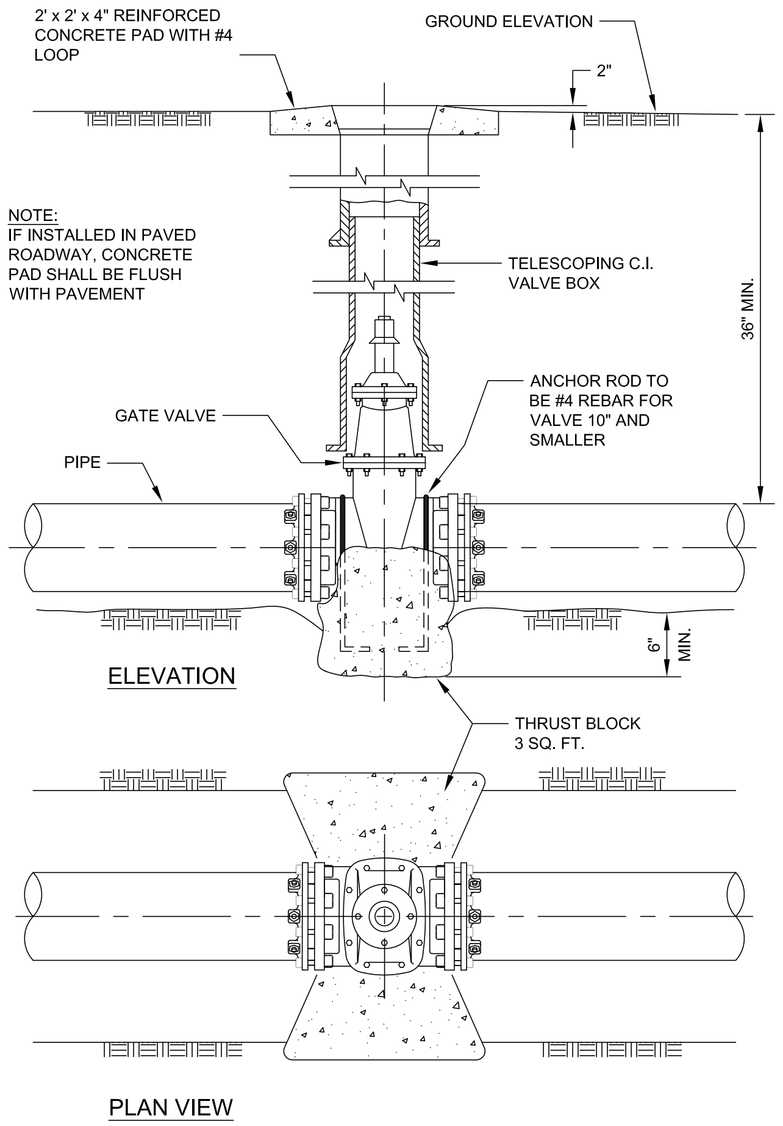
location for reflective address numbers is on the residence and on the curb. “Much of Big Pine doesn’t have curbs or sidewalks,” said Fortney.

Plans included a bulk mailing to residents with fire safe literature and information on the recommended reflective address numbers: no less than four inches in height on a contrasting background.

The bigger issues of fuel reduction on Los Angeles Department of Water and Power land and action against owners of abandoned homes that had degenerated into fire traps, a misdemeanor the Inyo County District Attorney will not prosecute, will be dealt with eventually. Schlick’s comment from the outset of the council meetings was that residents had to do what they could to protect their own homes before moving toward larger targets.

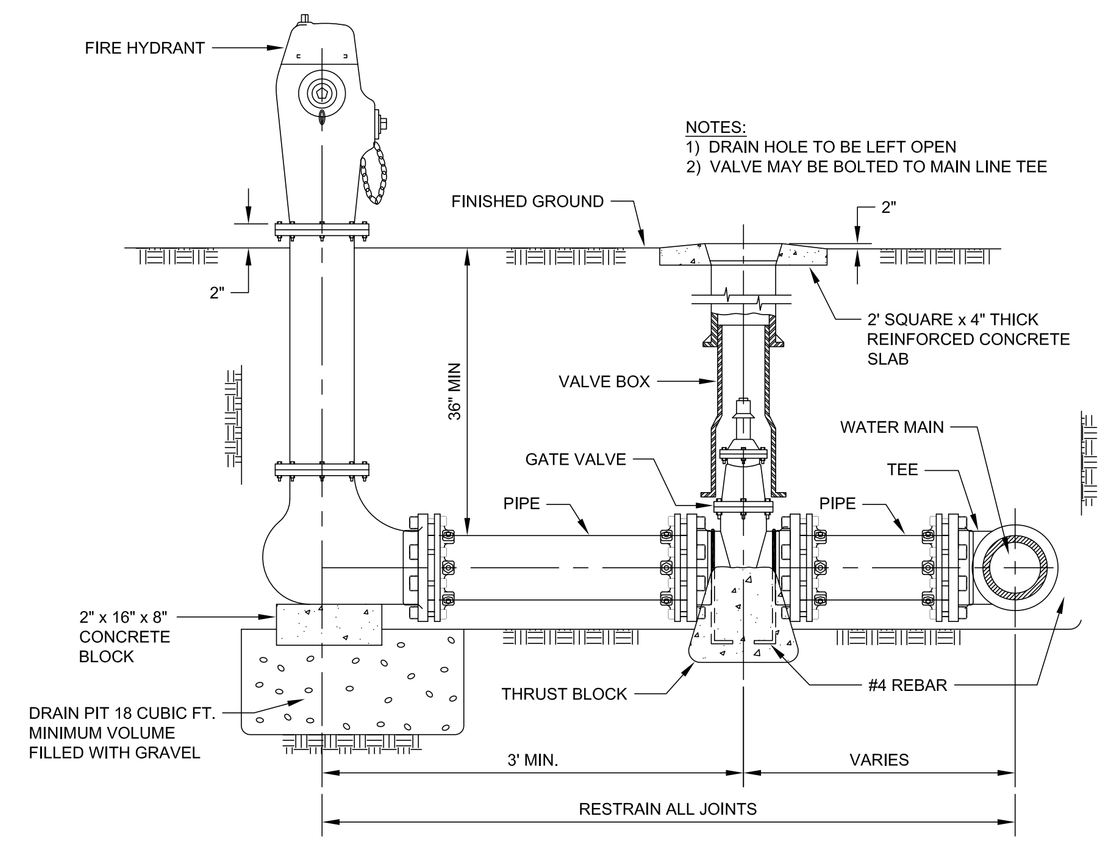
According to Fortney, the issues of abandoned fire traps was being transferred to the Inyo County Counsel’s Office with the hope of some action.

The next meeting of the Big Pine Fire Safe Council is 7 p.m. Monday, Aug. 20, at the Town Hall on Dewey Street.



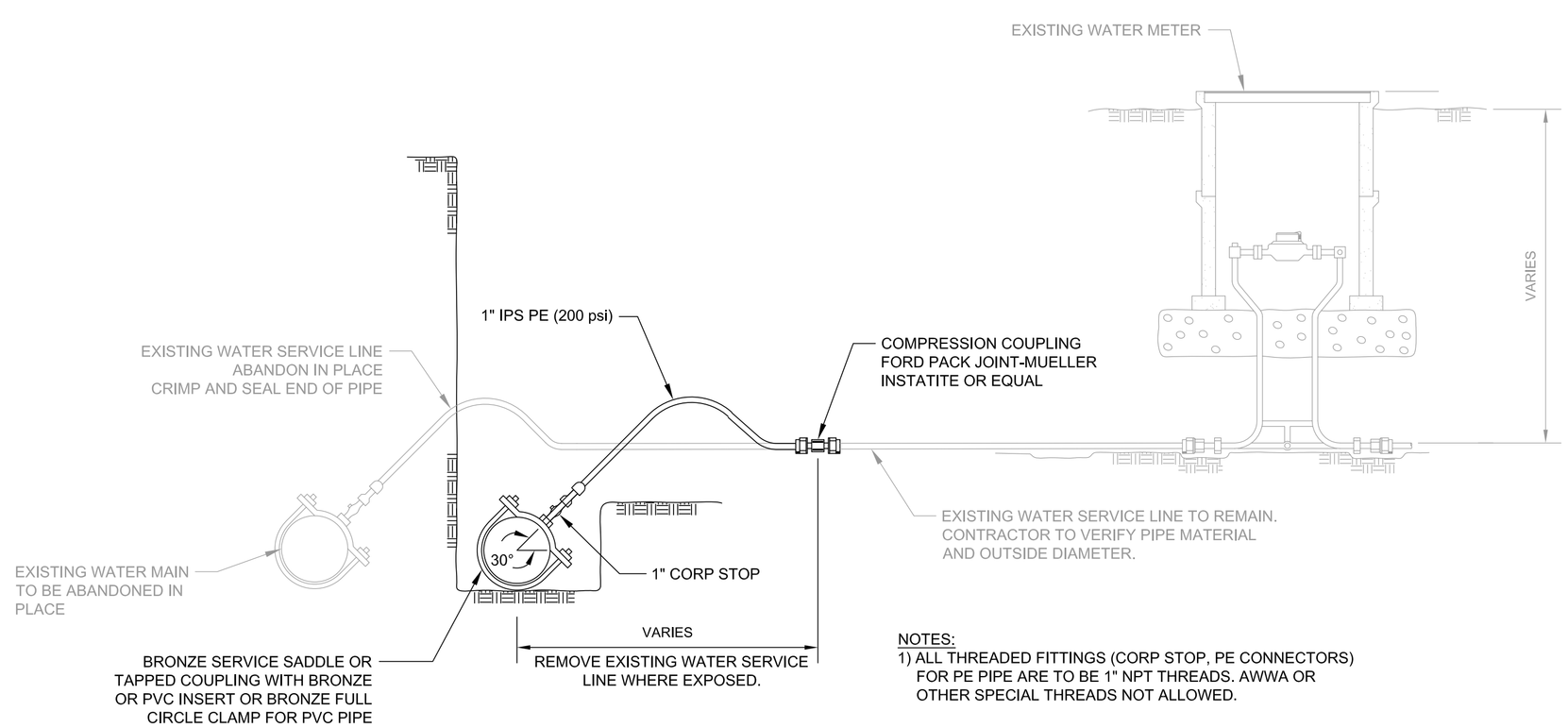
4 RESILIENT WEDGE GATE VALVE, BOX & COVER

Scale: N.T.S.



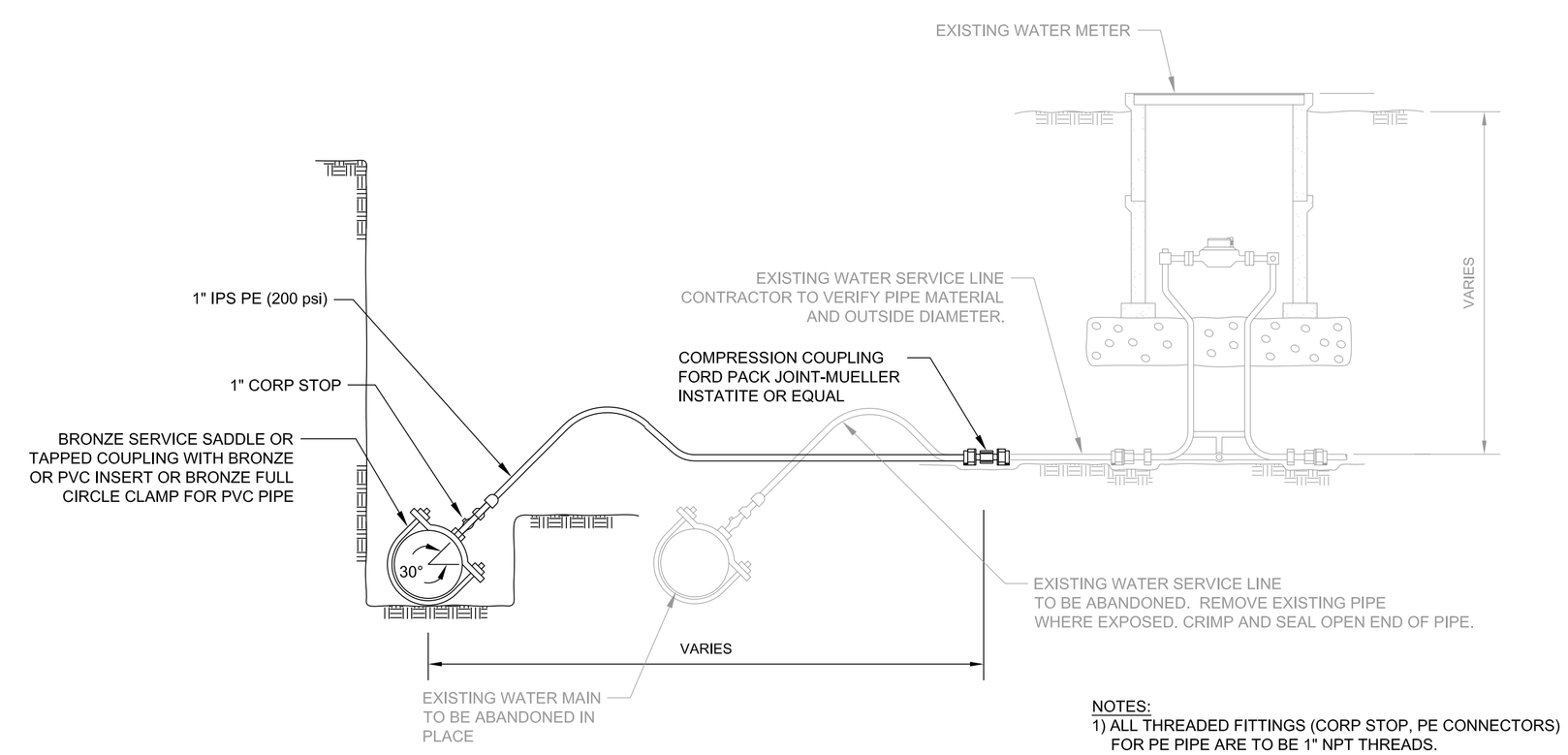
3 NEW FIRE HYDRANT DETAIL

Scale: N.T.S.



1 WATER SERVICE CONNECTION (TYPE 1)

Scale: N.T.S.



2 WATER SERVICE CONNECTION (TYPE 2)

Scale: N.T.S.

DATE	REVISIONS	INIT.

INDIAN HEALTH SERVICE
OFFICE OF ENVIRONMENTAL HEALTH & ENGINEERING

RENO DISTRICT OFFICE
1395 GREG STREET, SUITE 101
SPARKS, NV 89431
(775) 784-5327

INDIAN HEALTH SERVICE 1955

THE BIG PINE PAIUTE TRIBE

BIG PINE – INYO COUNTY, NEVADA
BIG PINE WATER SYSTEM IMPROVEMENTS
DETAILS – 2
PH09-T59

RN NUMBER: N/A
DRAWN BY: BLB
CHECKED BY: GDP
SCALE: 1" = 1'
DATE: ----
DATE: JULY 2012
FILE NAME: RENO-C-DTWATR
LAYOUT NAME: C-502
PROJ ENG: BRANDON L. BECKMAN, PE

C-502

SHEET 10 OF---

Fire destroys 19 homes in Big Pine

March 21, 2011

By
Mike Gervais/Register Staff
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An ariel view of Big Pine (l) Saturday shows the path of the Center Fire and damage to various homes throughout the community. Photo courtesy Kiana Wyatt. Solemn residents and firefighters gather next to what was once a home (r), now reduced to smoldering ash and a lone chimney. The county has declared a State of Emergency and if approved, money and resources will follow to help the victims and the community. Photo by Mike Bodine

While many residents were able to return to their homes in Big Pine Saturday morning, the homecoming was bittersweet as some found they had no homes to return to, their residences and worldly possessions destroyed during the night by the 800-acre Center Fire.

A total of 19 homes were destroyed in the fire, which broke out at about 3:30 p.m. Friday near the Bernasconi Center west of town. The cause of the fire is under investigation.

Preliminary estimates put the cost of damages from the fire at $4.5 million.

A number of fundraisers and relief efforts have been established to assist those rendered homeless by the blaze or otherwise impacted by the fire (see accompanying story on pg. 1).

Due to high winds, the fire spread rapidly, driven north-east into Big Pine. Local law enforcement officers from the Inyo County Sheriff's Department and California Highway Patrol began the first of a series of mandatory evacuations at about 5 p.m.

Sheriff Bill Lutze said that the execution of evacuation orders went smoothly, considering the speed of the blaze and danger to homes.

"I thought all and all the evacuations went well, everyone was cooperative and Health and Human Services did a great job of opening evacuation centers," Lutze said.

Displaced residents were sent to the Big Pine High School Auditorium, Eastern Sierra Tri-County Fairgrounds in Bishop or Lone Pine High School.

The mandatory evacuation order was lifted at about midnight Friday, allowing most residents to return to their homes.

During the evacuation and throughout much of the night, U.S. 395 was closed to traffic from Bishop to Independence. Many residents who were evacuated were required to travel to

Independence for shelter as the fire threatened to jump the highway.
At the fire's peek, more than 250 firefighters from across the state, including volunteer firefighters from local communities from Lone Pine to Mammoth.
The blaze spread quickly, moving from Bernasconi northeast, hitting first the westernmost areas of town including the Glacier View Mobile Home Park and the area near Rossi Road.
Big Pine resident Jarrett Coons, who lives in the Glacier View Mobile Home Park, said he was fishing on the canal around 4 p.m. when he noticed the fire and began to see ash blowing into town. When he returned home he received the mandatory evacuation order from local sheriff's deputies.
"Everybody got out – the sheriff's did a great job considering how fast everything happened," he said, "but we didn't have time to really get anything out of the house."
Coons said volunteer firefighters remained at the park to protect homes, despite the fire's progression, and managed to save about half of the dwellings there.
Coons was able to return to Big Pine at about 7 a.m. Saturday, and was relieved to see that his was one of the homes in the park that was spared.
"We were relieved that our house is still here, the guys did an awesome job saving what they could, but we have a lot of friends in the park who lost everything. There were parts of homes that were just vaporized," Coons said.
In addition to the number of trailers burned at Glacier View, portions of the 100-plus-year-old Rossi homestead sustained major and/or complete damage, however the extent could not be confirmed. At least one home was completely lost.
From the trailer park, spot fires hit east of Baker Creek Campground, burning livestock fields near County Road and School Street and prompting the evacuation of dozens of horses from the Big Pine Saddle Club and approximately 15 cats and dogs from the Inyo County Animal Shelter on County Road.
Inyo County Animal Shelter Manager Julie Sutton said county animal control staff evacuated the shelter at about 4:30 p.m. Friday, taking the animals to Bishop Veterinary Hospital.
No animals were inured during the fire, and the shelter was not damaged.
The animals were returned Sunday afternoon.
At the Big Pine Saddle Club, residents scrambled to load up their horses and transport them to the Tri-County Fairgrounds in Bishop, where free stables were provided and Dr. Ken and Nancy Gilliland and Peter Stickles of Zack Ranch provided hay to the refugee equines.
Also, Lee Roeser of Independence made his way to Big Pine early Friday evening with a large stock trailer to help get horses from the fields near School Street to safety as the blaze made its way there.
CalFire Public Information Officer Julie Hutchinsen said firefighters were able to get a handle on the fire by 9 p.m. Friday evening because the high winds began to die down. Later in the evening, firefighters got another break in the form of light precipitation that helped quell the blaze.
Saturday saw more relief for local volunteers, many of whom had been on the fire all night.
"Everyone worked so well together, the local fire agencies really deserve some recognition. The first responders had to wait four hours for back-up from down south, and they just did a phenomenal job," Hutchinsen said.
The fire was almost fully contained Saturday evening, and any hot spots that may have persisted throughout the weekend were completely exitinguished Sunday, when Big Pine experienced heavy rain.

Over the course of the weekend many rumors about the blaze circulated through communities of the Eastern Sierra, claiming that Bernasconi, Palisade Glacier High School, the Big Pine Animal Shelter, Big Pine Saddle Club and the Roosevelt Tree at the intersection of U.S. 395 and State Route 168 had been destroyed. Despite close calls at each of those locations, none were claimed by the fire.

Other rumors have persisted claiming that several local youth were arrested in connection to the blaze. Sheriff Lutze said that no arrests have been made, adding that CalFire investigators continue to look into the source of the blaze.

No deaths have been reported in relation to the fire, but Hutchinsen said one Inyo County sheriff's deputy was injured by flying debris Friday night. That injury, she added, was caused by wind, not fire.

Sheriff Lutze said the officer suffered injuries to his chest after a sign struck him as he helped with the evacuation effort. He was treated for his injuries and will be off work for the next few days, but is expected to make a full recovery.

County leaders will hold a special meeting today at 3 p.m. at the One Stop Center on Main Street in Bishop to ratify a Declaration of a State of Emergency due to the fire and hear a request from Inyo County Integrated Waste to waive all gate and disposal fees associated with debris from the fire.

WATER DISTRIBUTION IMPROVEMENTS TO IMPROVE FIRE FLOW ON THE BIG PINE INDIAN RESERVATION

Prepared by Douglas E. Marx, P.E., September, 2003

INTRODUCTION

The Big Pine Paiute Tribe (the Tribe) wants their water system to be capable of providing a fire flow of at least 1,000 gpm throughout the distribution system. They asked the Indian Health Service (IHS) to analyze their existing water distribution system to determine if it was capable of doing so, and if not, to suggest improvements that could be made to meet their objective. The following report describes the preparation of a model of the water system that was used to analyze the system and the recommended changes that could be made to meet their objective. The report does not discuss other issues affecting fire suppression, including water storage.

ESTIMATES OF FUTURE WATER DEMANDS

It is necessary to estimate future water system demands to evaluate changes to the water distribution system. These demands are important because the water system must continue to deliver domestic demands concurrent with delivering 1000 gpm to fight a fire. Demands are usually calculated based on the consumption of water per person or per residential equivalent (one single family residence). Typical figures for water systems that are similar to the one on the Big Pine Reservation can be used. However, it is better to estimate future demands using actual water usage figures.

Between November 2, 1998 and October 29, 1999, the two well pumps produced an average of 227,000 gpd (157 gpm). The Feasibility Study for the Improvements to the Big Pine Water Storage Tank, November 2001 stated that the Reservation population was 595 people. By comparison, the 2000 United States Census data indicates there are 462 people on the Reservation. The Feasibility Study also indicates a 1.0% population growth rate. Using the figures in the feasibility study, the population in 1999 is estimated to be 583, so the per capita usage in that year was 389 gallons per day (gpd). This is significantly higher than the average annual residential use in Nevada which is 200 gallons per capita per day (Nevada Water Facts, 1992).

During the summer months usage increases, primarily due to increased outdoor watering. Each summer from 1998 to 2001, the highest monthly usage averaged around 400,000 gpd (278 gpm). The percentage increase in usage is consistent with other water systems serving mostly residences. On any given day, the usage is not constant but varies from around 50% to 150% of the average usage on that day. For the purposes of estimating future demands in the water system, it will be assumed that the population in 1999 was 583, the growth rate is 1.0% per year, the per capita usage is 389 gpd, the peak day is 1.8 times the average day, and the peak demand on any day is 150% of the average demand on that day. Relevant demands are calculated from these assumptions and are shown in the table on the next page. The year 2054 was chosen based on a 50 year life for any proposed distribution pipe.

Another approach to designing the water distribution system is to determine the demands once no more development can take place. It may be assumed that this will occur when every existing lot on the Reservation contains one single family residence. The plat map of the Reservation contains 487 individual lots on 21 different blocks that are separated by streets. Since the Reservation contains 279 acres, each lot is about 0.5 acres in size. The Feasibility Study indicates there are 155 service connections. For comparison, the 2000 United States Census data indicates there are 160 housing units with an additional 21 housing units being vacant. If it is assumed that each connection serves one home, the average occupancy is 3.84 people per home. If this average is assumed to continue indefinitely, the population once all 487 lots are developed will be 1,869. Using the same 1.0% population growth rate, this will occur in the year 2116. The demands for that year are included in the table below.

DEMAND ESTIMATES	1999	2054	Build Out (2116)
Population	583	1,008	1,869
Average Usage (gpd)	227,000	392,000	727,000
Average Usage (gpm)	157	272	505
Peak Day (Avg. x 1.8)	283	490	909
Peak Hour (Peak Day x 1.5)	425	735	1,363

WATER DISTRIBUTION MODEL

A model of the existing water distribution system was prepared to determine what piping changes should be considered. The primary source of information to model the existing piping was a composite drawing of the distribution system that was prepared by the IHS in 1999. The map shows the approximate location of each pipe (4" and larger) and notes its nominal size. All piping is believed to be PVC. The only addition to the distribution system since 1999 was the construction of a 6" water line along Bowers Street north of Bartell Street.

Nominal pipe sizes were used instead of actual pipe inside diameter. A Hazen-Williams coefficient of 150 was used for PVC. Junction elevations were estimated from a topo map that was prepared from an aerial survey that was completed in the late seventies. The map shows contours at 4' intervals. The two graphs in the appendix illustrate the model. The first graph shows the existing pipe sizes and street names. The second graph shows the labels assigned to each pipe and each junction (or node).

The number of lots in the vicinity of each junction were counted. In this way, any system demand is spread evenly throughout the Reservation. No attempt was made to spread the demand by locating existing structures or predicting where future growth would occur, except for the demand from the existing trailer park. The park contains approximately 33 trailers located on 12 lots. The additional demand from these trailers was distributed to the adjacent junctions. The number of lots in the vicinity of each junction is shown on Graph 1.

The existing 250,000 gallon water storage tank was built in 1980. A right-of-way map (IHS drawing #383-02, Sheet 3) indicates the tank is about 1175 feet west of School Street. Pressure gauge readings in the treatment building at the corner of West Sepsey Lane and School Street (elevation 4050') show a maximum pressure of 36 psi, indicating the high water level in the tank has an elevation of 4133'. The tank is 32' tall, so assuming a maximum depth of 30', the ground below the tank has an elevation of 4103'. This is within a few feet of the elevation determined from a recent survey or estimated from a USGS topo map.

The model prepared for Big Pine is based only on information available in the IHS office in Reno. This data is believed to be sufficient to evaluate the distribution system and determine the outcome of any changes. However, flow test data should be collected and compared to output from the model to confirm its accuracy.

ANALYSIS USING DOMESTIC DEMANDS

The pressure range in the distribution system is primarily determined by the water level in the storage tank and the elevation of each home. With 30' of water in the tank, the pressure at the lowest lot (Block 1, Lot 30) is 75.3 psi. The pressure at the highest lot (Block 18, Lot 11) is 36.4 psi. The model was used to evaluate the effects of future domestic demands. The results are shown in the table below. The hydraulic grade line (HGL) at any junction indicates the amount of pressure loss due to pipe friction.

YEAR	Static	1999	2054	BUILD OUT
Peak Hour Demand	0 gpm	425 gpm	735 gpm	1,363 gpm
Minimum Pressure	38.1 psi	36.6 psi	34.0 psi	22.8 psi
Minimum HGL (J-13)	4130.0	4122.3	4108.5	4062.9
Maximum HGL (J-33)	4130.0	4126.7	4120.7	4100.9

The model shows that even at build out, the distribution system can maintain a residual pressure greater than 20 psi. This is generally considered an acceptable pressure. The minimum pressure occurs below the tank at either node J-33 or J-34 as a result of the head loss in the 8" pipe that connects the tank to the system (P-53). The head loss in that pipe accounts for 43% of the head loss occurring at Node J-13. Node J-13 is served by 4" pipe and is far from the tank, so the maximum drop in pressure occurs there.

Table 1 in the appendix lists each pipe by headloss gradient during peak hour demand in the year 2054. Since all water demands must flow from the tank through the pipes near the tank, the highest flows are seen in those pipes. Consequently, these pipes have the highest headloss gradients. Although the headlosses do not result in excessive friction losses, the table shows which pipes should be replaced first to maintain the hydraulic grade line and thereby minimize pressure losses throughout the system.

FIRE FLOW ANALYSIS

The model of the existing distribution system was also used to determine the available fire flow at each junction. The Nevada Administrative Code (Section 232) indicates that the system should maintain a residual of at least 20 psi during maximum day demand and fire flow. Throughout an entire year, the actual demands are estimated to exceed the maximum demands approximately 3% of the time (Figure 5 in Water Supply Engineering). These two conditions were applied to the current system. The results are shown in Table 2. A fire flow of greater than 1,000 gpm can be provided at all nodes except those that are not connected to the distribution system by a 6" or 8" pipe. The 8 nodes on 4" pipes have fire flow capacities between 690 gpm and 890 gpm. If the head loss from Pipe P-53 is eliminated, the available flow at these 8 nodes increases by about 100 gpm. The existing system therefore does not provide the fire flow desired by the Tribe.

ALTERNATIVES

The model was first used to determine whether a water storage tank constructed at Node J-12 would provide the required fire flows. Peak day demand was increased to 490 gpm so that any solution would accommodate assumed growth through the year 2054. The minimum zone pressure was allowed to drop below 20 psi. The results are shown in Table 3. Five of the 8 nodes on the 4" pipe now can provide more than 1,000 gpm. However, three cannot. Therefore, this alternative alone is not acceptable.

It was assumed from the start of this exercise that the 4" piping would not support fire flows of 1,000 gpm. The model was changed to replace the 4" piping along Carter Street with 8" piping and all other 4" piping (except the piece on Spratt Lane) with 6" piping. The results are shown in Table 4. All nodes except J-34 can now provide fire flows above 1,000 gpm on peak day in the year 2054.

COST ESTIMATE

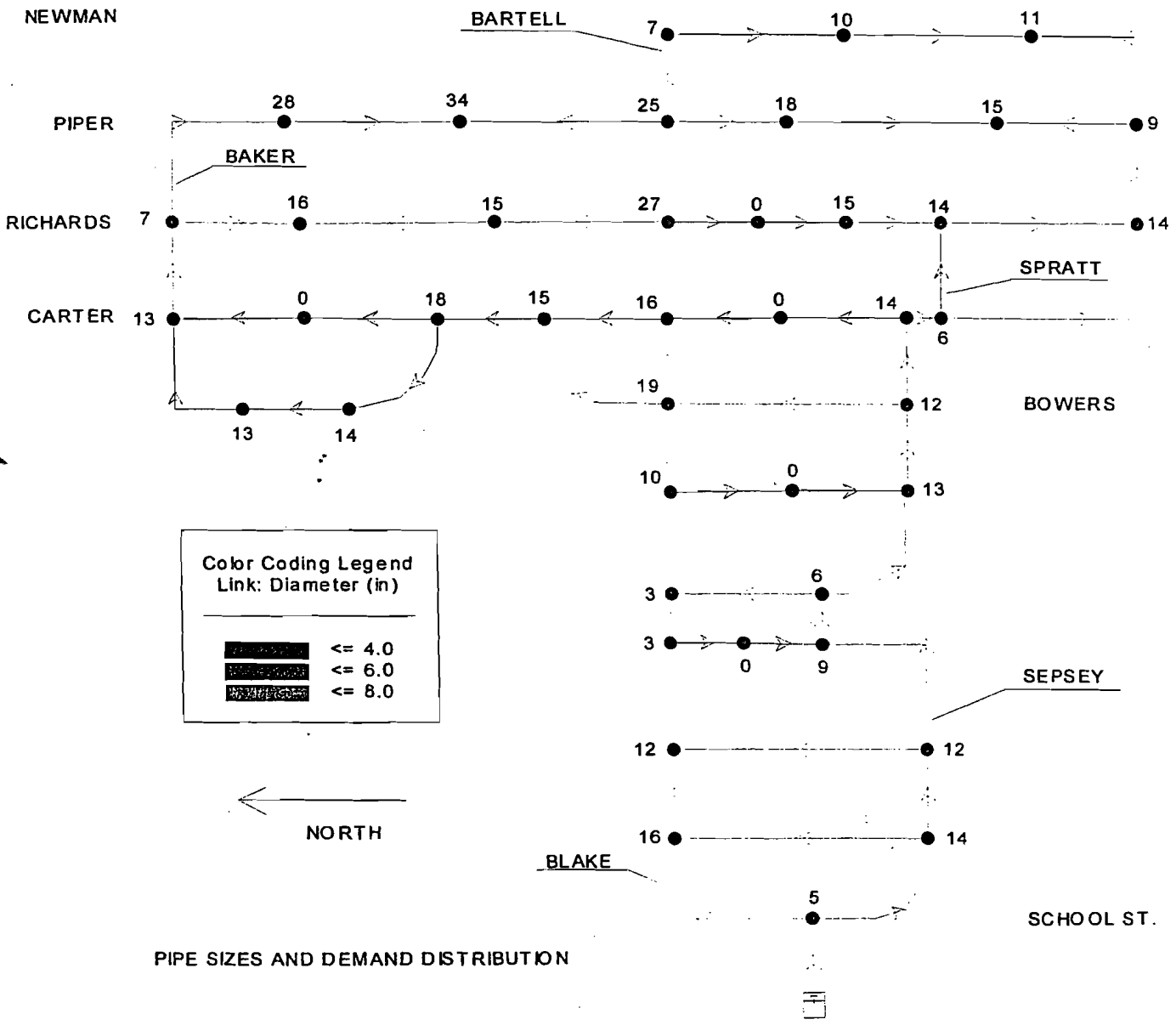
A total of 9,000 feet of 6" and 8" piping is needed to provide fire flows along the existing 4" piping. There is no need to abandon the existing 4" diameter pipe. The proposed pipes can be installed parallel with the existing pipes and should be connected to the 6" and 8" mains at either end. Hydrants should be installed on the new water mains to provide protection for existing and future construction. Hydrant spacing should be determined by the local authority.

Every lot on the Reservation is adjacent to an existing water main except those on Newman Road north of Bartell Road. These lots are not adequately protected by the water main on Piper Street. A 6" water main should be constructed along this road and on Baker Lane to provide fire protection to this area. This line will be about 3,080 feet long.

APPENDIX

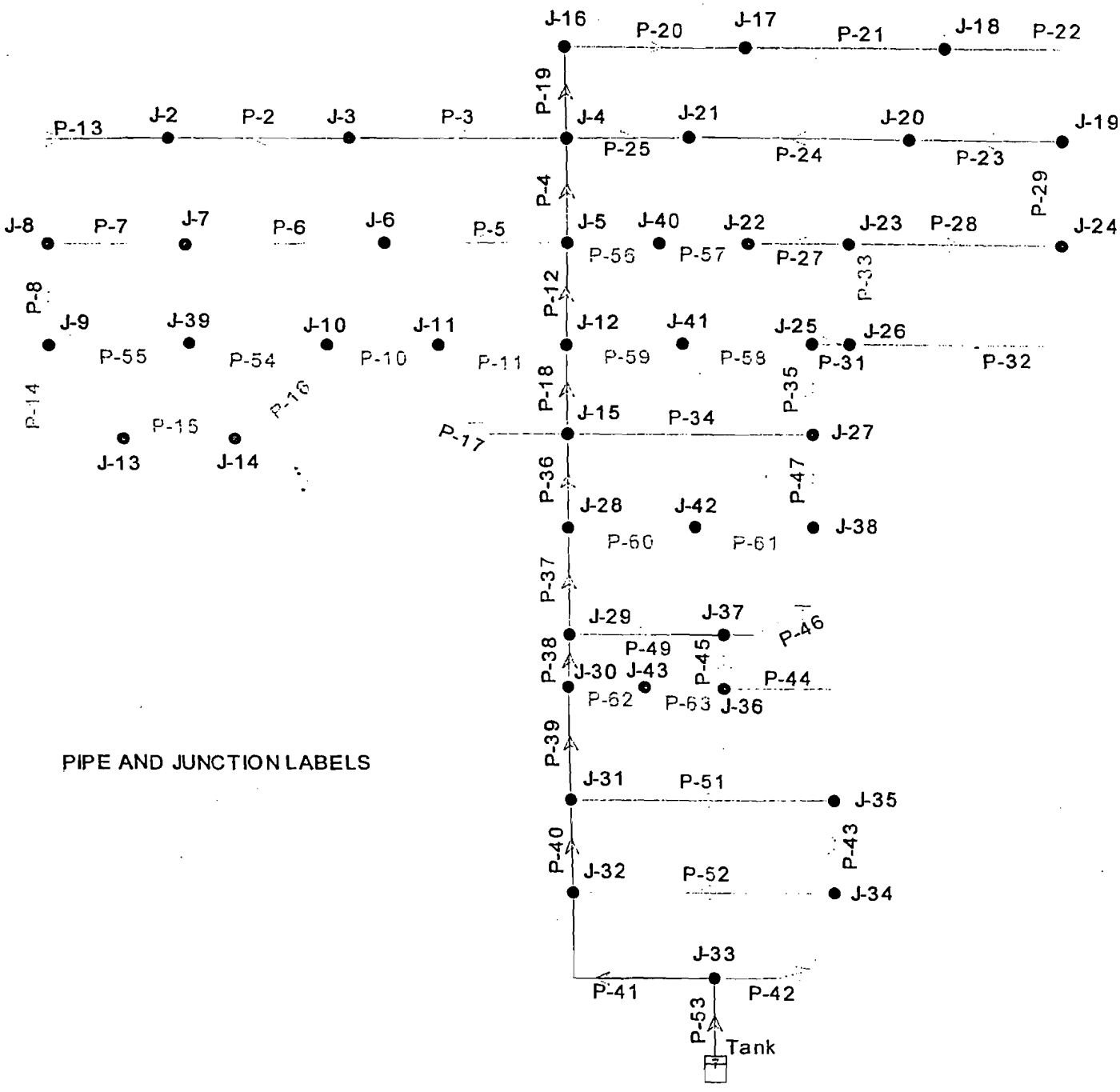
Graph 1: Pipe Sizes and Demand Distribution
Graph 2: Pipe and Junction Labels
Table 1: Headloss Gradients in Existing Piping
Table 2: Fire Flow Analysis of Existing Piping
Table 3: Fire Flow Analysis of Tank at Node 12
Table 4: Fire Flow Analysis of Installation of 6" and 8" piping

Scenario: Existing Piping



PIPE SIZES AND DEMAND DISTRIBUTION

Scenario: Existing Piping



PIPE AND JUNCTION LABELS

Scenario: Existing Piping
Steady State Analysis
Pipe Report

PEAK HOUR 2054

LOOK AT HEAD LOSSES IN PIPING

SORTED BY

Label	Length (ft)	Diameter (in)	Material	Discharge (gpm)	Headloss Gradient (ft/1000ft)	Calculated Friction Headloss (ft)	Velocity (ft/s)	Open?
P-53	1,170	8.0	PVC	737	7.96	9.3	4.70	true
P-42	800	6.0	PVC	266	4.88	3.9	3.01	true
P-39	380	8.0	PVC	492	3.77	1.4	3.14	true
P-40	440	8.0	PVC	471	3.47	1.5	3.00	true
P-38	120	8.0	PVC	470	3.45	0.4	3.00	true
P-41	1,190	8.0	PVC	464	3.38	4.0	2.96	true
P-43	440	6.0	PVC	215	3.31	1.5	2.44	true
P-37	380	8.0	PVC	457	3.28	1.2	2.91	true
P-10	450	4.0	PVC	69	2.90	1.3	1.76	true
P-36	440	8.0	PVC	423	2.84	1.3	2.70	true
P-47	440	6.0	PVC	165	2.01	0.9	1.87	true
P-46	800	6.0	PVC	164	2.00	1.6	1.86	true
P-45	120	6.0	PVC	164	2.00	0.2	1.86	true
P-44	950	6.0	PVC	159	1.89	1.8	1.81	true
P-18	440	8.0	PVC	313	1.63	0.7	2.00	true
P-35	440	6.0	PVC	142	1.52	0.7	1.61	true
P-12	440	8.0	PVC	293	1.45	0.6	1.87	true
P-33	440	4.0	PVC	42	1.18	0.5	1.08	true
P-31	250	6.0	PVC	115	1.03	0.3	1.30	true
P-17	1,150	6.0	PVC	88	0.63	0.7	1.00	true
P-16	350	4.0	PVC	30	0.60	0.2	0.75	true
P-3	1,050	6.0	PVC	81	0.54	0.6	0.91	true
P-5	940	6.0	PVC	80	0.52	0.5	0.90	true
P-4	440	8.0	PVC	164	0.49	0.2	1.05	true
P-32	1,530	6.0	PVC	64	0.35	0.5	0.72	true
P-6	1,000	6.0	PVC	58	0.29	0.3	0.66	true
P-48	1,320	4.0	PVC	19	0.27	0.4	0.49	true
P-29	440	6.0	PVC	54	0.25	0.1	0.61	true
P-50	750	4.0	PVC	18	0.24	0.2	0.46	true
P-51	1,320	6.0	PVC	39	0.14	0.2	0.44	true
P-9	1,440	4.0	PVC	13	0.14	0.2	0.34	true
P-7	700	6.0	PVC	35	0.11	0.1	0.39	true
P-2	1,000	6.0	PVC	31	0.09	0.1	0.35	true
P-52	1,320	6.0	PVC	30	0.09	0.1	0.34	true
P-26	1,120	4.0	PVC	10	0.08	0.1	0.26	true
P-14	790	4.0	PVC	10	0.08	0.1	0.25	true
P-15	700	4.0	PVC	9	0.07	4.9e-2	0.24	true
P-23	850	6.0	PVC	24	0.06	4.8e-2	0.27	true
P-25	790	6.0	PVC	24	0.06	4.5e-2	0.27	true
P-30	1,320	4.0	PVC	7	0.04	0.1	0.17	true
P-22	1,030	6.0	PVC	17	0.03	3.1e-2	0.19	true
P-8	440	6.0	PVC	15	0.02	1.1e-2	0.17	true
P-20	1,050	6.0	PVC	14	0.02	2.1e-2	0.15	true
P-19	440	8.0	PVC	24	0.01	6.3e-3	0.15	true
P-27	450	6.0	PVC	12	0.01	6.3e-3	0.13	true
P-28	1,090	6.0	PVC	11	0.01	1.4e-2	0.12	true
P-13	1,030	6.0	PVC	9	0.01	1.0e-2	0.11	true
P-49	750	6.0	PVC	9	0.01	6.3e-3	0.10	true
P-11	750	4.0	PVC	3	0.01	5.9e-3	0.07	true
P-34	1,320	6.0	PVC	5	3.7e-3	4.9e-3	0.06	true
P-24	1,000	6.0	PVC	2	4.88e-4	4.9e-4	0.02	true

TANK OUTLET

T-1-1 - 1 - Headloss Gradients in Existing Piping

Scenario: Existing Piping
Fire Flow Analysis
Fire Flow Report

ELIMINATE HEAD LOSS IN 8" LINE TO TANK

MIN 20 PSI AT ALL NODES

Q = 283 (PEAK DAY, 1999)

Only nodes not achieving 1000 gpm are those that are not served by a 6" or 8" pipe.

J-34 is near the tank

	Zone	Label	Available Fire Flow (gpm)	Total Flow Available (gpm)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction
gpm)	Zone-1	J-2	1,118.0	1,133.6	20.0	21.8	J-34
	Zone-1	J-3	1,140.5	1,159.4	20.0	21.3	J-34
	Zone-1	J-4	1,189.6	1,203.5	30.5	20.0	J-34
	Zone-1	J-5	1,189.6	1,204.6	29.7	20.0	J-34
	Zone-1	J-6	1,141.0	1,149.3	20.0	21.2	J-34
	Zone-1	J-7	1,119.2	1,128.1	20.0	21.8	J-34
	Zone-1	J-8	1,156.6	1,160.5	20.8	20.0	J-9
	Zone-1	J-9	1,070.9	1,078.1	20.0	20.7	J-13
914	Zone-1	J-10	880.1	890.1	20.0	21.9	J-14
	Zone-1	J-11	1,160.3	1,168.6	20.0	20.8	J-34
	Zone-1	J-12	1,189.6	1,198.5	29.2	20.0	J-34
759	Zone-1	J-13	692.2	699.4	20.0	31.0	J-34
792	Zone-1	J-14	715.6	723.4	20.0	30.6	J-34
	Zone-1	J-15	1,189.6	1,200.2	28.8	20.0	J-34
	Zone-1	J-16	1,189.6	1,193.5	31.0	20.0	J-34
	Zone-1	J-17	1,168.2	1,173.7	20.0	20.6	J-34
	Zone-1	J-18	1,164.4	1,170.5	20.0	20.7	J-34
	Zone-1	J-19	1,189.6	1,194.6	21.5	20.0	J-34
	Zone-1	J-20	1,144.7	1,153.1	20.0	21.2	J-34
	Zone-1	J-21	1,189.6	1,199.6	20.1	20.0	J-34
	Zone-1	J-22	1,025.2	1,033.6	20.0	24.1	J-34
	Zone-1	J-23	1,103.2	1,111.0	20.0	21.1	J-22
	Zone-1	J-24	1,168.3	1,176.0	20.0	20.6	J-34
	Zone-1	J-25	1,189.5	1,197.3	22.8	20.0	J-34
	Zone-1	J-26	1,184.7	1,188.0	20.0	20.1	J-34
	Zone-1	J-27	1,189.4	1,196.1	23.1	20.0	J-34
	Zone-1	J-28	1,189.7	1,195.3	27.9	20.0	J-34
	Zone-1	J-29	1,190.1	1,191.8	28.1	20.0	J-34
	Zone-1	J-30	1,191.0	1,192.7	26.7	20.0	J-34
	Zone-1	J-31	1,197.6	1,204.2	26.0	20.0	J-34
	Zone-1	J-32	1,225.6	1,234.5	24.3	20.0	J-34
	Zone-1	J-33	1,374.0	1,376.7	20.0	22.3	J-34
	Zone-1	J-34	1,112.2	1,120.0	20.0	24.9	J-33
	Zone-1	J-35	1,173.2	1,179.8	20.5	20.0	J-34
	Zone-1	J-36	1,187.0	1,192.0	22.3	20.0	J-34
	Zone-1	J-37	1,187.3	1,190.7	23.2	20.0	J-34
	Zone-1	J-38	1,177.5	1,184.7	20.0	20.3	J-34
328	Zone-1	J-39	749.9	749.9	20.0	30.0	J-34
585	Zone-1	J-40	865.9	865.9	20.0	27.6	J-34
942	Zone-1	J-41	827.7	827.7	20.0	28.4	J-34
998	Zone-1	J-42	771.7	771.7	20.0	29.5	J-34
1092	Zone-1	J-43	891.2	891.2	20.0	27.1	J-34

Table 2: Fire Flow Analysis of Existing Piping

IF TANK IS PLACED AT NODE J-12

Scenario: Existing Piping
Fire Flow Analysis
Fire Flow Report

MIN 10 PSI IN SYSTEM
MIN 20 PSI AT FIRE NODE
Q = 490 (PEAK DAY, 2054)

CIRCLED NODES ON 4" PIPE
6 NODES NOW DROP BELOW 1000 GPM (490 GPM MIN.)

	Zone	Label	Available Fire Flow (gpm)	Total Flow Available (gpm)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction
	Zone-1	J-2	989.8	1,016.8	20.0	19.8	J-34
	Zone-1	J-3	1,005.3	1,038.1	20.0	19.4	J-34
	Zone-1	J-4	1,209.0	1,233.1	20.0	13.7	J-34
	Zone-1	J-5	1,197.0	1,223.0	20.0	14.1	J-34
	Zone-1	J-6	1,003.6	1,018.0	20.0	19.5	J-34
	Zone-1	J-7	988.5	1,003.9	20.0	19.9	J-34
	Zone-1	J-8	1,030.1	1,036.9	20.0	18.4	J-13
	Zone-1	J-9	947.0	959.5	20.0	19.8	J-13
24	Zone-1	J-10	781.2	798.6	20.0	21.2	J-14
	Zone-1	J-11	1,020.1	1,034.6	20.0	19.0	J-34
	Zone-1	J-12	1,194.3	1,209.7	20.0	14.2	J-34
244	Zone-1	J-13	624.3	636.9	20.0	28.3	J-34
097	Zone-1	J-14	640.4	653.9	20.0	28.0	J-34
	Zone-1	J-15	1,193.9	1,212.2	20.0	14.2	J-34
	Zone-1	J-16	1,215.6	1,222.3	20.0	13.5	J-34
	Zone-1	J-17	1,038.5	1,048.2	20.0	18.5	J-34
	Zone-1	J-18	1,036.5	1,047.1	20.0	18.6	J-34
	Zone-1	J-19	1,061.4	1,070.1	20.0	17.9	J-34
	Zone-1	J-20	1,010.4	1,024.8	20.0	19.3	J-34
	Zone-1	J-21	1,051.7	1,069.0	20.0	18.2	J-34
	Zone-1	J-22	907.1	921.6	20.0	21.9	J-34
	Zone-1	J-23	969.0	982.5	20.0	20.4	J-34
	Zone-1	J-24	1,014.3	1,027.8	20.0	19.2	J-34
	Zone-1	J-25	1,078.8	1,092.3	20.0	17.4	J-34
	Zone-1	J-26	1,026.5	1,032.3	20.0	18.9	J-34
	Zone-1	J-27	1,080.5	1,092.1	20.0	17.4	J-34
	Zone-1	J-28	1,188.6	1,198.2	20.0	14.3	J-34
	Zone-1	J-29	1,210.0	1,212.9	20.0	13.7	J-34
	Zone-1	J-30	1,178.1	1,181.0	20.0	14.7	J-34
	Zone-1	J-31	1,181.3	1,192.8	20.0	14.8	J-34
	Zone-1	J-32	1,169.3	1,184.7	20.0	16.0	J-34
	Zone-1	J-33	1,167.1	1,171.9	20.0	21.8	J-34
	Zone-1	J-34	925.1	938.6	20.0	24.6	J-33
	Zone-1	J-35	1,006.1	1,017.7	20.0	19.1	J-34
	Zone-1	J-36	1,065.9	1,074.6	20.0	17.7	J-34
	Zone-1	J-37	1,085.8	1,091.6	20.0	17.2	J-34
	Zone-1	J-38	1,007.6	1,020.2	20.0	19.3	J-34
942	Zone-1	J-39	678.8	678.8	20.0	27.2	J-34
195	Zone-1	J-40	780.1	780.1	20.0	25.0	J-34
140	Zone-1	J-41	746.5	746.5	20.0	25.7	J-34
022	Zone-1	J-42	693.2	693.2	20.0	26.9	J-34
261	Zone-1	J-43	791.5	791.5	20.0	24.7	J-34

Table 3: Fire Flow Analysis of Tank at Node 12

Scenario: Existing Piping
Fire Flow Analysis
Fire Flow Report

SORTED BY

Zone	Label	Available Fire Flow (gpm)	Total Flow Available (gpm)	Calculated Residual Pressure (psi)	Calculated Minimum Zone Pressure (psi)	Minimum Zone Junction
Zone-1	J-34	926.3	939.8	20.0	24.6	J-33
Zone-1	J-35	1,009.7	1,021.3	20.0	19.0	J-34
Zone-1	J-20	1,020.9	1,035.4	20.0	19.0	J-34
Zone-1	J-42	1,028.0	1,028.0	20.0	18.8	J-34
Zone-1	J-22	1,036.1	1,050.6	20.0	18.6	J-34
Zone-1	J-24	1,042.1	1,055.6	20.0	18.4	J-34
Zone-1	J-3	1,043.6	1,076.4	20.0	18.4	J-34
Zone-1	J-14	1,045.5	1,059.0	20.0	18.4	J-34
Zone-1	J-6	1,046.5	1,061.0	20.0	18.3	J-34
Zone-1	J-18	1,046.7	1,057.3	20.0	18.3	J-34
Zone-1	J-38	1,047.5	1,060.0	20.0	18.3	J-34
Zone-1	J-17	1,048.5	1,058.1	20.0	18.3	J-34
Zone-1	J-13	1,049.9	1,062.4	20.0	18.2	J-34
Zone-1	J-23	1,050.3	1,063.8	20.0	18.2	J-34
Zone-1	J-2	1,059.1	1,086.1	20.0	18.0	J-34
Zone-1	J-21	1,062.4	1,079.8	20.0	17.9	J-34
Zone-1	J-26	1,069.0	1,074.8	20.0	17.7	J-34
Zone-1	J-43	1,071.3	1,071.3	20.0	17.6	J-34
Zone-1	J-7	1,073.5	1,089.0	20.0	17.6	J-34
Zone-1	J-40	1,076.5	1,076.5	20.0	17.5	J-34
Zone-1	J-19	1,078.2	1,086.8	20.0	17.5	J-34
Zone-1	J-36	1,097.2	1,105.8	20.0	16.9	J-34
Zone-1	J-37	1,104.8	1,110.6	20.0	16.7	J-34
Zone-1	J-27	1,105.3	1,116.9	20.0	16.7	J-34
Zone-1	J-25	1,146.8	1,160.3	20.0	15.5	J-34
Zone-1	J-10	1,153.9	1,171.2	20.0	15.3	J-34
Zone-1	J-41	1,160.9	1,160.9	20.0	15.1	J-34
Zone-1	J-39	1,167.0	1,167.0	20.0	15.0	J-34
Zone-1	J-33	1,167.1	1,171.9	20.0	21.8	J-34
Zone-1	J-32	1,169.4	1,184.8	20.0	15.9	J-34
Zone-1	J-30	1,180.3	1,183.2	20.0	14.6	J-34
Zone-1	J-31	1,181.8	1,193.3	20.0	14.8	J-34
Zone-1	J-11	1,185.0	1,199.5	20.0	14.4	J-34
Zone-1	J-8	1,189.5	1,196.2	20.0	14.3	J-34
Zone-1	J-28	1,192.3	1,201.9	20.0	14.2	J-34
Zone-1	J-15	1,196.6	1,214.9	20.0	14.1	J-34
Zone-1	J-9	1,197.9	1,210.4	20.0	14.1	J-34
Zone-1	J-12	1,209.2	1,224.6	20.0	13.7	J-34
Zone-1	J-29	1,210.3	1,213.2	20.0	13.7	J-34
Zone-1	J-5	1,215.6	1,241.6	20.0	13.6	J-34
Zone-1	J-4	1,226.4	1,250.5	20.0	13.2	J-34
Zone-1	J-16	1,231.1	1,237.8	20.0	13.1	J-34

MIN 10 PSI IN SYSTEM

MIN 20 PSI AT FIRE NODE

Q = 490 gpm

Change 4" pipe on Carter Street to 8". Change other 4" pipe to 6".

Table 4: Fire Flow Analysis of Installation of 6" and 8" piping

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Home lost, but lives saved

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BYREGISTER STAFF
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A Big Pine resident is being hailed as a hero after noticing smoke coming from a neighbor's house and breaking down the door to wake the sleeping occupants.

According to the Inyo County Sheriff's Department, Galen and Veronica Moore, of 994 Bowers St. in Big Pine, saw black smoke rising from their neighbor's home at 994 Hill St. Saturday morning.

"As Galen ran up to the residence he could see flames on the east side of the residence," the press release states. "Galen attempted to open the front door but the door handle was too hot."

He then grabbed a metal pipe nearby and hit the door handle until it broke off.

"Galen kicked in the front door and flames shot out of the house as it opened," the press release states. "The heat was so intense Galen could only go into the entryway."

With flames fully engulfing the kitchen and ceiling, Moore began yelling and hitting the door, walls and glass around him to wake up the residents.

Members of the Big Pine Volunteer Fire Department were called out to 994 Hill St. in Big Pine Saturday morning for a house fully engulfed by fire. A neighbor reported the fire to authorities, before breaking into the home to wake two sleeping residents, possibly saving their lives. Photos by Angie Calloway

It took about a minute, but the two residents, Harold and Daniel Pierce, woke up and escaped the fire.

"Those guys would have been (dead) if that guy wasn't there," Inyo County Sheriff's Deputy Joshua Nicholson said of Moore's efforts to rouse Harold and Daniel Pierce.

Nicholson said that by the time law enforcement and the Big Pine Volunteer Fire Department arrived at the scene, the house was fully engulfed in flames.

He went on to say that both Harold and Daniel lost all their possessions to the fire.

The first call to authorities regarding the fire came in at 10 a.m. Saturday morning. The fire burned for about two hours, with law enforcement leaving the scene at noon, as firefighters remained to ensure that no hot spots re-ignited the fire.

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