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# WILDFIRE DAMAGE ASSESSMENT REPORT

SEPTEMBER 24, 2020

**San Lorenzo Valley Water District**

13060 CA-9 Boulder Creek, CA 95006

Prepared by:  
Sandis Civil Engineers Surveyors Planners

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## EXECUTIVE SUMMARY

The CZU Lightning Complex Fires are currently burning in Santa Cruz and San Mateo Counties due to thunderstorms that produced thousands of lightning strikes throughout Northern California on August 16, 2020. As of September 11, 2020, 85% of the CZU Lightning Complex Fires are contained and over 86,000 acres have burned, leaving roads closed and 1,185 structures burned. All residents in the San Lorenzo Valley Water District (SLVWD) were evacuated, and although many safely returned, they confronted power outages and an uncertain tap water status.

As a result of the CZU Lightning Complex Fire, SLVWD facilities sustained significant facility and operational capacity losses. The water system's primary damage includes intakes and raw water pipelines from the Peavine; Foreman; Clear Creek 1, 2 and 3; and Sweetwater water intake locations. The Bennett Spring Overflow, Settling Tanks, related piping, and controls were also destroyed. The Lyon and Little Lyon tanks are contaminated with soot and other fire by-products and will likely require re-coating. Big Steel Water Tanks and the Water Treatment Plant, with its associated structures, were spared from significant damage but will require some minor repair before resuming full operation.

This Assessment Report provides an overview of SLVWD's water system and its current operational status including a detailed Water System Damage Report. To assist SLVWD in temporary restoration and repair of the system, and to begin long-term planning solutions, Sandis performed a field assessment of 7.5 miles of water pipeline and 7 intakes of the damaged waterlines. According to our preliminary damage assessment, more than 50% of the structures assessed were destroyed or majorly damaged, while other facilities have heat damage, smoke, or possible contamination. SLVWD is currently working on emergency repairs to bring the water system back to functioning condition. The next step in restoring the water supply will be the reconnection of the Little Lyon and Big Steel Tanks that were destroyed in the fire. Subsequent engineering and design will be needed to replace or reroute the rest of the system that has become non-operational.

As of the writing of this report, service has been restored to all customers; however, 419 customers are still affected by a Do Not Drink/Do Not Boil order.

*This assessment of the SLVWD Water System intends to be complete based on observations conducted by both SLVWD and Sandis staff. The extent and nature of the fire damage is such that some of the damage will be discovered later during the emergency repair operations. This report will be updated as new information is discovered and assessed.*



## 1. DEFINITIONS

In this report, the basis of damage assessment used a variant of the Federal Emergency Management Agency's (FEMA) damage-level rating system. The damage is assessed in a range from 0 (zero) to 4 (four), with 0 being used for facilities that were unaffected by the disaster, to 4 being used for facilities that were destroyed beyond repair by the disaster. The variation used in this report is specific to water system infrastructure and appurtenances. Please refer to Appendix A. Water System Damage Report for the full water system damage breakdown. Terms used in this report correspond to the numerical rating used during field assessment as follows:

- 0 – Unaffected
- 1 – Affected
- 2 – Minor Damage
- 3 – Major Damage
- 4 – Destroyed

## 2. DISTRICT WATER SYSTEM OVERVIEW

The San Lorenzo Valley Water District provides water from two separate drinking water systems: The San Lorenzo Valley Water District (surface flow, treated at the Lyon Plant) and The San Lorenzo Valley Water District-Felton (Bennett Spring and well water, treated at the Felton Plant). Each of these drinking water systems has its own independent source of drinking water supply. Fortunately, the SLVWD and SLVWD-Felton systems have an interconnection, which allows for the transfer of water between the two systems on an emergency basis. The SLVWD sustained damage, whereas fire-related damage to the SLVWD-Felton system was minimal.

The SLVWD system service area includes the communities of Boulder Creek; North of Boulder Creek, Brookdale; Ben Lomond; Quail Hollow; Glen Arbor; Zayante; Lompico; the Scotts Valley areas of Hidden Glenn, Lockwood Lane, Pasatiempo Pines, Whispering Pines, Manana Woods; and both Spring Lakes and Vista Del Lago Mobile Home Parks. The SLVWD system primarily utilizes surface water during the months of November to May. During periods of high streamflow, surface water can provide up to 100% of the drinking water in the SLVWD system. These surface sources are diversion structures located along streams in remote areas high within the District's protected watershed, away from human contamination.

The SLVWD-Felton system consists of 5 tank sites, water treatment plant, and distribution piping. This system draws water from three raw water sources: one spring and two creek diversions

Surface water diverted from these streams undergoes filtration at one of the District's conventional surface water treatment plants. To supplement supply during periods of low streamflow, the SLVWD blends surface water with groundwater from three separate wellfields: 1) the Quail Hollow wellfield, located in the Ben Lomond area; 2) the Olympia wellfield, located in the Zayante area; and 3) the Pasatiempo wellfield, located off Graham Hill Road in Scotts Valley which primarily serves the Scotts Valley and Manana Woods neighborhoods.

Water is also collected from the Bennet Ground Spring, located approximately one mile west of Felton. Structures associated with the spring include the Bennet Spring Overflow Box (concrete), Bull Spring settling Tank (1,000-gal, Poly), and the Bennet Spring Settling Tank (2,000-gal, concrete). The system includes 39 tank locations in total, their locations, construction material, and capacity are tabulated below:

**Table 1: System Tanks**

Tank Name	Capacity (gal)	Material	Location	Notes
Echo	75,000	Wood	Echo Lane, Boulder Creek	3 tanks @ 25,000 gal each
Riverside Grove	380,000	Steel	Pinecrest Drive, Boulder Creek	
Alder	700	Poly	Alder Road, Boulder Creek	
Blueridge	40,000	Redwood	Short Street, Boulder Creek	
Reader	150,000	Steel	Dolores Drive, Boulder Creek	
Eckley	350	Poly	Ridge Drive, Boulder Creek	
Big Steel	1,400,000	Steel	Madrone Drive, Boulder Creek	
Lyon	3,000,000	Steel	Madrone Drive, Boulder Creek	co-located with treatment plant
Little Lyon	250,000	Steel	Madrone Drive, Boulder Creek	co-located with treatment plant
Ralston	20,000	Poly	Ralston Ridge, Boulder Creek	2 tanks @ 10,000 gal each
Bear Creek	75,000	Steel	Forest Hill, Boulder Creek	
Huckleberry	125,000	Steel	Middleton Drive, Boulder Creek	
Blackstone	24,000	Poly	Blackstone Drive, Boulder Creek	2 tanks @ 12,000 gal. each
Highland	60,000	Redwood	Highland Drive, Boulder Creek	
Nina	134,000	Steel	Rebecca Drive, Boulder Creek	2 tanks @ 67,000 gal. each
South Reservoir	36,400	Poly	Sequoia Grove, Brookdale	4 tanks @ 9,100 gal each
Brookdale	721,000	Steel	River Road, Brookdale	co-located with Brookdale SCADA
Spring	65,000	Steel	Caledonia Avenue, Ben Lomond	
Swim	30,000	Redwood	Jackson Avenue, Ben Lomond	2 tanks @ 15,000 gal each
Quail #1	211,000	Steel	Quail terrace, Ben Lomond	co-located with Quail Wells and SCADA
Quail #2	240,000	Steel	Quail terrace, Ben Lomond	co-located with Quail Wells and SCADA

Tank Name	Capacity (gal)	Material	Location	Notes
University Reservoir	50,800	Concrete	Crown drive, Ben Lomond	
Ragain	500	Poly	Condor Avenue, Ben Lomond	
Upper El Solyo	10,000	Poly	El Solyo Heights, Felton	
Blair	255,000	Steel	Blair Street, Felton	
Clearwell	250,000	Steel	Kirby Street, Felton	co-located with treatment plant
McCloud	284,000	Steel	Orchard Road, Felton	.
Pine	18,000	Poly	Pine Drive, Felton	
Felton Acres	5,000	Poly	Madrona Avenue	
Lewis #1	40,000	Poly	West Drive, Lompico	5 tanks @ 8,000 gal each
Kaski	120,000	Redwood	Lake Boulevard, Lompico	2 tanks @ 60,000 gal each
Madrone	120,000	Poly	Madrone Avenue, Lompico	2 tanks @ 60,000 gal each
Probation	527,000	Steel	Graham Hill Road, Scotts Valley	
Upper Pasatiempo	100,000	Concrete	Spreading Oaks Drive, Scotts Valley	
Lower Pasatiempo	100,000	Concrete	Spreading Oaks Drive, Scotts Valley	
Blue	65,000	Steel	Miraflores Road, Scotts Valley	
Charlie	45,000	Steel	Miraflores Road, Scotts Valley	

The system also includes water treatment plants located on Madrone Drive in Boulder Creek, on Kirby Street in Felton, and King's Village Road in Scotts Valley. A system of six inter ties allows each treatment plant to serve the zones normally served by the other two plants. Inter tie #2 provides an emergency connection to infrastructure near Skypark, owned by the Scotts Valley Water District.

The water system is divided into thirty-seven (37) zones, and provided with a SCADA control system, which in conjunction with twenty-four (24) pump stations and the Mitchell hydro-pneumatic tanks, maintains pressures and flow values within the system. Bacteriological Sample Sites are provided throughout the system to allow for water quality testing, as are disinfectant and byproducts sampling stations.

### 3. STATUS OF WATER SYSTEM

Much of the water system west of Highway 9 and north of Alba Road was non-operational due to damage caused by the August 16th lightning strikes and subsequent wildfires but has been returned to service as of the date of this report. Facilities damaged in the fires include treatment systems, pumps, water quality monitoring equipment, intakes, and storage tanks. Water is being drawn from tanks located outside of this area to provide temporary service to the communities of Brookdale and Boulder Creek, which are normally served by the damaged Lyon Water Treatment Plant. The SLVWD system is currently operating with 49.5% of designed storage capacity, as Lyon, Little Lyon, and Big Steel tanks comprise 50.5% of system storage capacity.

The CZU Lightning Complex Fires have extensively damaged the District's intake and treatment system. The intake pipes, which traverse miles of steep grades and are inaccessible by traditional trenching equipment, were installed above grade. Due to exposure and rugged terrain, High-density polyethylene (HDPE) pipes were selected for the water system for its strength and ease of construction. Most of the intake piping was in the path of the fires and therefore melted, rendering the intake system inoperable. Many of the ductile iron fittings (including valves, unions, etc.) fared better than the HDPE pipe, but the internal rubber gaskets melted from the heat causing the fittings to be unusable. All non-metallic components of the pipeline were destroyed. The stream diversion structures are largely constructed of concrete and steel which was unaffected by the fire, but the wood planks used in the weirs were effectively destroyed, fittings were damaged, and the HDPE pipe outlets were burned or melted.

Despite the exterior of the storage tanks appearing to be intact, the tanks should undergo additional evaluation by the District and professional consultants to verify that they are safe to operate as intended. Water should be tested to verify its safety, or it should be discarded. Potential contaminants for this water include chemicals from the off gassing of the heated metal, burning of paint or other coatings, or other sources of contamination. The exterior of the Lyon Water Treatment Plant also appears to be undamaged but should be evaluated before resuming full operation. Additionally, the District's trailer-mounted generator was destroyed, and the trailer-mounted air compressor unit was damaged by heat and smoke. The generator and compressor unit should also be either repaired or replaced before use.

An overview of the District's facilities damaged by the wildfire is presented in Figure 1 below (damaged facilities are highlighted in red). The damaged facilities have also been broken into three areas (Area A, Area B, and Area C) for display purposes; see Figures 2-4 below for the Wildfire Zonal Detail exhibits.

Figure 1: System Fire Damage Overview

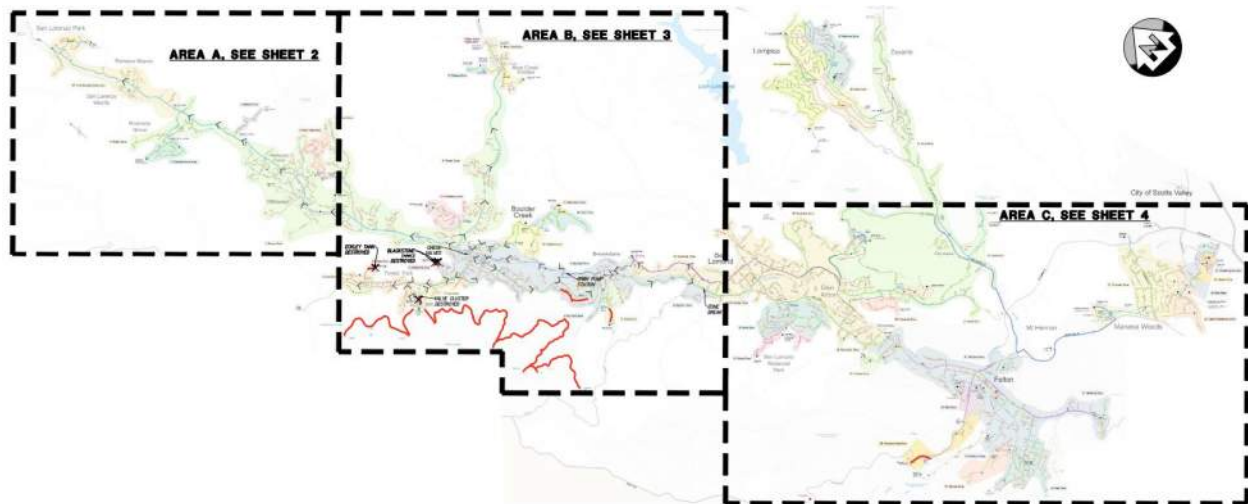


Figure 2: Wildfire Zonal Area A Enlarged

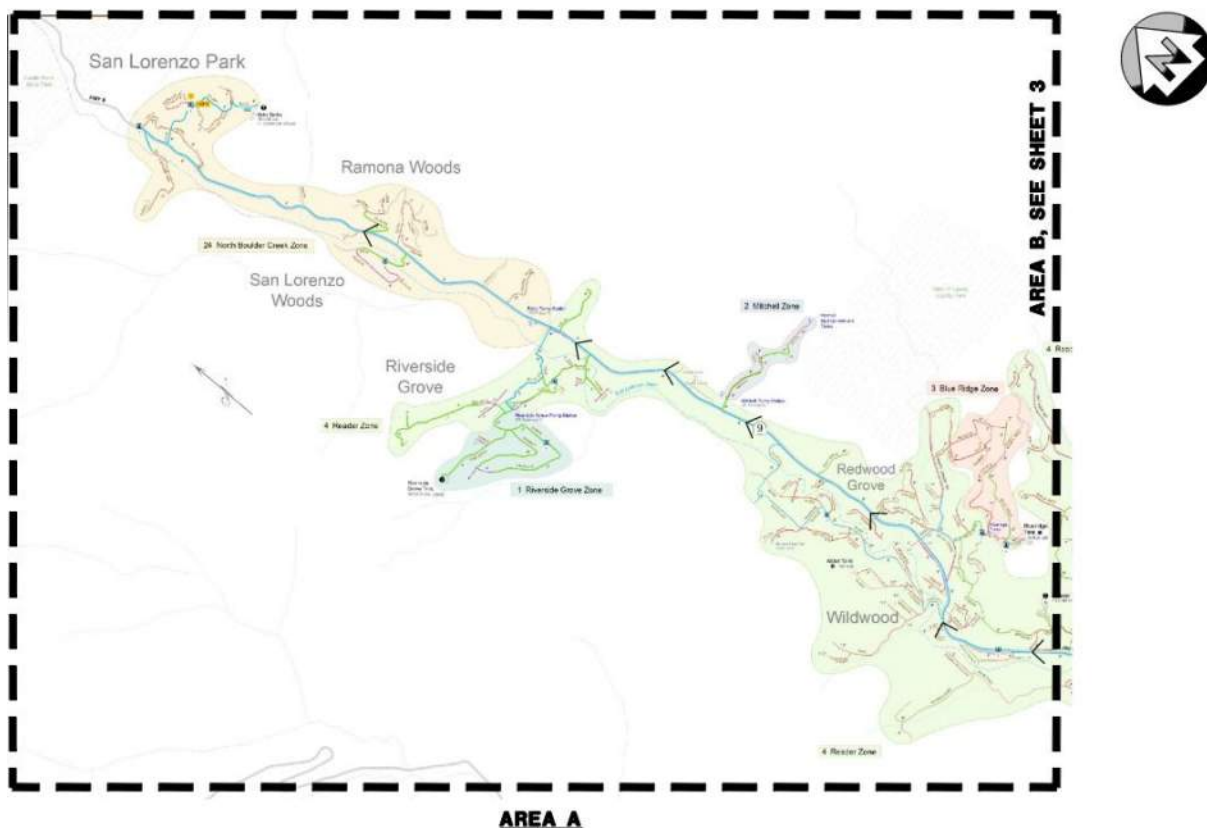
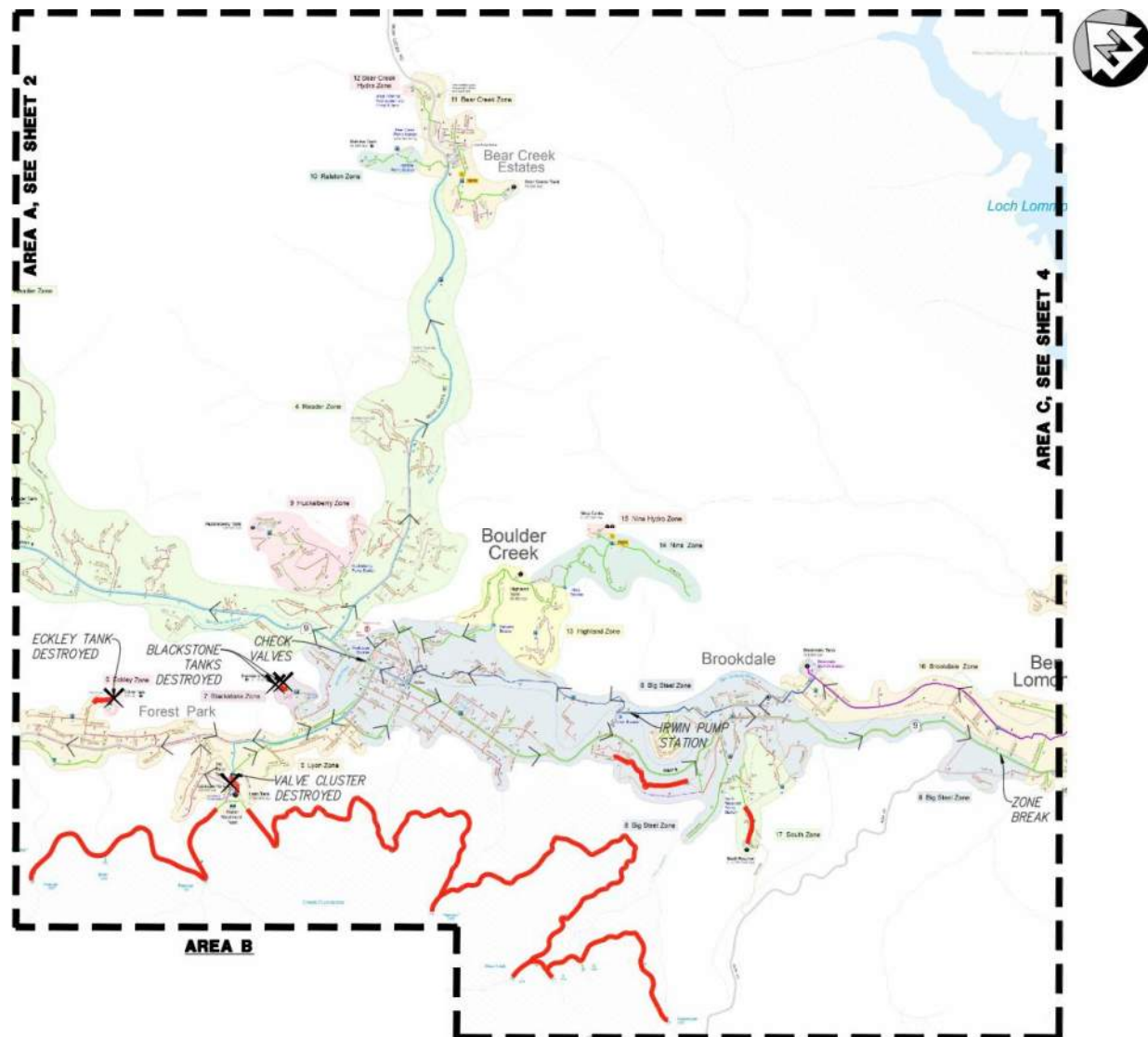




Figure 3: Wildfire Zonal Area B Enlarged



[illegible]

## 4. WATER SYSTEM DAMAGE REPORT

A tabular summary of all inspected facilities is presented below. This summary includes date of observation and level of damage.

**Table 2: System Damage**  
**San Lorenzo Valley Water District**  
*Wildfire Damage Assessment*  
 CZU August Lightening Complex Wildfire

Facility	Type	Zone	Date Observed	Damage Level	Notes
Lyon Tank	Storage Tank	5	8/27/2020	1	heat, smoke, and possible contamination
Little Lyon Tank	Storage Tank	5	8/27/2020	1	heat, smoke, and possible contamination
Lyon WTP Accessory Bldg	Plant	5	8/27/2020	1	heat, smoke, and possible contamination
Trailer-mounted Gen-Set	Plant	5	8/27/2020	4	
Trailer-mounted Air Comp (2)	Plant	5	8/27/2020	2	heat and smoke
Lyon Water Treatment Plant	Plant	5	8/27/2020	1	heat, smoke, and possible contamination
Big Steel	Storage Tank	5	8/27/2020	1	heat, smoke, and possible contamination
Peavine Creek Diversion	Intake			4	
Peavine Pipeline	Pipe			4	~7,000 LF 8" HDPE
Foreman Creek Diversion	Intake		8/27/2020	4	
Foreman Box & Turbidity Meter	Tank		8/27/2020	4	
Foreman Pipeline	Pipe		8/27/2020	4	~3,400 LF 8" HDPE
Clear Crk1 Creek Diversion	Intake		9/3/2020	4	
Clear Crk1 Pipeline	Pipe		9/3/2020	4	~250 LF 8" HDPE
Clear Crk2 Creek Diversion	Intake		9/3/2020	4	
Clear Crk2 Pipeline	Pipe		9/3/2020	4	~350 LF 8" HDPE
Clear Crk3 Creek Diversion	Intake		9/3/2020	4	
Clear Crk3 Pipeline	Pipe		9/3/2020	4	~3.5 MI. 8" HDPE
Sweetwater Creek Diversion	Intake		9/3/2020	4	
Sweetwater Pipeline	Pipe		9/3/2020	4	~1.5 MI. 8" HDPE
Pine Tanks	Storage Tank	33	9/1/2020	1	~30 LF 2" HDPE damaged by Cal Fire Dozer
Felton Acres Pressure Tank	Storage Tank	33	9/1/2020	0	no visible damage
Felton Acres Pump	Pump	33	9/1/2020	0	no visible damage
Bennett Spring Box	Intake	29	9/1/2020	1	wood roof fire damage, replace

Facility	Type	Zone	Date Observed	Damage Level	Notes
Bennett Spring Chlor Station	System	29	9/1/2020	0	no visible damage
Bennett Spring to Chlor Sta	Pipe	29	9/1/2020	4	
Kirby Water Treatment Plant	Plant	31	9/1/2020	0	no visible damage
Kirby Storage Tank	Storage Tank	31	9/1/2020	0	no visible damage
South Reservoir	Storage Tank	17	9/1/2020	2	heat, smoke, and possible contamination
South Res. Piping	Pipe	17	9/1/2020	4	~4,000 LF 2" HDPE
Alta Via Pipeline	Pipe	8	9/1/2020	4	~3,000 LF 4" HDPE
South Res Booster Pump	Pump	8	9/1/2020	0	no visible damage
Eckley Tank	Storage Tank	6	9/1/2020	4	7500 gal. poly tank
Eckley Pipeline	Pipe	6	9/1/2020	4	750 LF 2" HDPE
Riverside Grove Tank	Storage Tank	1	9/1/2020	1	heat, smoke, and possible contamination
Riverside Grove Booster	Pump	1	9/1/2020	1	heat and smoke
Riverside SCADA & Power	Storage Tank	1	9/1/2020	4	
Blackstone Tanks	Storage Tank	7	8/27/2020	3	heat, smoke, and possible contamination
Blackstone Pipeline	Pipe	7	8/27/2020	3	~150 LF

## Legend

0	Unaffected
1	Affected
2	Minor Damage
3	Major Damage
4	Destroyed



## 5. WATERSHED DAMAGE

The SLVWD watershed sustained extensive damage during the wildfires, both directly and indirectly. Direct damage includes destruction of trees and brush by fire; indirect damage includes contamination of surface waters by ash and debris, increased erosion potential due to destruction of vegetation on slopes, and potential future damage caused by toppling of trees damaged but not burned outright by the fires. Tree damage and destruction near the water treatment plant and Lyon/Big Steel tank complex was extensive, with approximately 400 trees determined to be safety hazards to personnel and/or critical structures if left standing. The destruction of anchoring vegetation also increases the risk of slides, either rock or (during the rainy season) mud.

Surface waters within the fire zone have been contaminated directly by ash and debris falling into the creeks and streams in the area. Of note is the destruction of the District's creek diversion structures, which sit directly in the stream bed in each location and continue to release contaminants. These creeks and streams will be impacted further as ash, burned vegetation, and other debris is washed downslope and into surface waters by runoff or wind.

## 6. NEXT STEPS

SLVWD is currently working on emergency repairs to bring the water system back to a functioning condition. The first step in restoring the water supply will be reconnecting the Little Lyon and Big Steel Tanks piping destroyed in the fire. These tanks can be fed through construction of a new pipeline connecting from the Foremen Intake to the Little Lyon/Big Steel Tanks. The water system can also back-feed the tanks from the water sources in Felton to aid in refilling the tanks with potable water. SLVWD will then coordinate with the engineering consultants to design a plan to replace or reroute the rest of the system that is non-operational.

District infrastructure within the burn zone, and at the water treatment plant and tank complex, has suffered contamination by ash, soot, and other fire byproducts. Release of volatile oxidizing compounds (VOCs) by the plastics, coatings, and other materials used in the SLVWD system is suspected. SANDIS has taken samples from both Lyon tanks for analysis. The District has taken samples from the water treatment plant and from sampling points located throughout the system, also submitted for analysis. Water quality sampling and testing is ongoing as emergency repairs are made to the system. Contamination extents and levels, with associated test data will be presented under separate cover, together with recommendations to address the specific contaminants identified.

## 6. DATA SOURCES

1. Cal Fire CZU Lightening Complex website
2. San Lorenzo Valley Water District website
3. Rick Rogers, District Manager – Observations
4. James Furtado, District Operations Manager – Observations
5. Sandis Civil Engineering – Observations

# Photolog

**Instructions:** This form should be used to document the status of the utility's systems and facilities immediately after a disaster event. Please include photos from various angles so that as much damage as possible is shown. For each photo, include a caption.

Date: September 15, 2020

Time:

Facility Name:

San Lorenzo Valley Water District

Address or Location:

Person Making Report:

SANDIS Civil Engineers



Caption: Typical Creek Diversion Structure



Caption: Typical Creek Diversion Structure



Caption: Typical Creek Diversion Structure



Caption: Typical Creek Diversion Structure

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**Instructions:** This form should be used to document the status of the utility's systems and facilities immediately after a disaster event. Please include photos from various angles so that as much damage as possible is shown. For each photo, include a caption.

Date: September 15, 2020

Time:

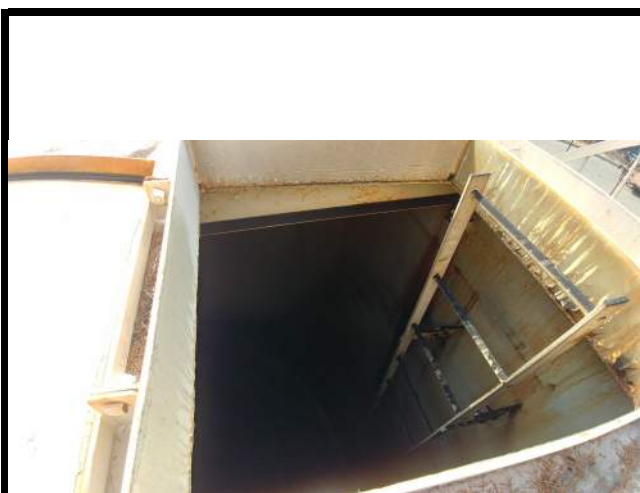
Facility Name:

San Lorenzo Valley Water District

Address or Location:

Person Making Report:

SANDIS Civil Engineers



Caption: Typical Little Lyon/Lyon Tank Interior



Caption: Lyon Tank



Caption: Little Lyon Tank



Caption: Typical Tank Exterior



# Photolog

**Instructions:** This form should be used to document the status of the utility's systems and facilities immediately after a disaster event. Please include photos from various angles so that as much damage as possible is shown. For each photo, include a caption.

Date: September 15, 2020

Time:

Facility Name:

San Lorenzo Valley Water District

Address or Location:

Person Making Report:

SANDIS Civil Engineers



Caption: Damaged Trailer Equipment



Caption: Damaged Equipment Water at Water Treatment Plant



Caption: Typical Above Ground Pipe Fittings



Caption: Typical Above Ground Pipe Fittings



# Photolog

**Instructions:** This form should be used to document the status of the utility's systems and facilities immediately after a disaster event. Please include photos from various angles so that as much damage as possible is shown. For each photo, include a caption.

Date: September 15, 2020

Time:

Facility Name: San Lorenzo Valley Water District

Address or Location:

Person Making Report: SANDIS Civil Engineers



Caption: Melted HDPE Pipe



Caption: Existing Pipe Destroyed Around Pipe Fittings



Caption: Existing Pipe Destroyed Around Pipe Fittings



Caption: Destroyed Pipe Installed on Steep Incline

# Photolog

**Instructions:** This form should be used to document the status of the utility's systems and facilities immediately after a disaster event. Please include photos from various angles so that as much damage as possible is shown. For each photo, include a caption.



Date: September 15, 2020

Time:

Facility Name:

San Lorenzo Valley Water District

Address or Location:

Person Making Report:

SANDIS Civil Engineers



Caption: Temporary Storage Tanks



Caption: Temporary Storage Tank Location



Caption: Contaminated Little Lyon Tank Interior



Caption: Contaminated Little Lyon Tank Interior