Piute Fire

CA-SQF-001356

State Emergency Assessment Team (SEAT) Report

DRAFT

Affecting Watersheds in Kern County California

October 14, 2008

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DISCLAIMER

The scope of the assessment and the information contained in this report should not be construed to be either comprehensive or conclusive, or to address all possible impacts that might be ascribed to the fire effect. Post fire effects in each area are unique and subject to a variety of physical and climatic factors which cannot be accurately predicted. The information in this report was developed from cursory field examination by licensed resource professionals and should be viewed in conjunction with other relevant sources of information. Neither the State of California nor any Agency or Department participating as a member of the State Emergency Assessment Team (SEAT) makes any warranty, express or implied, nor assume any legal liability for the information disclosed herein.

EXECUTIVE SUMMARY

The Piute fire began on June 28, 2008 and was contained on July 25, 2008. It burned approximately 37,026 acres in the Piute Mountains approximately 10 miles southeast of Lake Isabella, California. The fire consumed approximately 32,923 acres of U.S. Forest Service (USFS), 2,613 acres of Bureau of Land Management (BLM), and 1,490 acres of private property. The fire burned within 14 hydrologic areas. Five of the 14 hydrologic areas were burned more than 50%. A series of thunderstorms equivalent to the 25 year storm event (BAER July 2008) occurred during the end of the fire suppression activities and revealed the consequences of the Piute fire burn. Flood damage was observed throughout the Piute Mountain region with major erosion and debris flow taking place along Erskin Creek, Thompson Creek, and Kelso Creek. There are approximately 22 miles of perennial streams directly affected by the Piute Fire and approximately 130 miles of intermittent streams that have been directly affected by the Piute Fire (BAER July 2008).

Topography in the burned area ranges from gentle slopes to extremely steep slopes. Elevations in the burned area range from 4,000 to 8,417 feet, and precipitation occurs mostly as rain with snowfall in the upper watersheds. The burn area is predominantly composed of Mesozoic granitic rocks and locally overlain by pre-Cretaceous metavolcanic rocks, metasedimentary rocks, and carbonate rocks. Quaternary alluvium is limited to two locations near Claraville and near Dry Meadow Creek within the burn area. The community of Lake Isabella is on a low gradient alluvial fan at the mouth of Erskine Creek. A description of the bedrock units within the Piute Fire area is included in the explanation to the Geologic Index Map (Appendix A). Primary plant communities are Jeffery Pine Forest, Pinyon-Juniper Woodland, Mixed Fir Forest, Live Oak Forest, Chaparral and Montane Chaparral, and Desert Shrub.

Land uses in areas affected by the fire are residential, mining, livestock grazing, recreation, and watershed. Roads in and adjacent to the fire included Piute Mountain Road, local access roads, and unpaved roads used for recreation and management on private, BLM and USFS lands.

Runoff and sediment from the fire area is expected to be greatly increased, with a potential for debris flows or torrents from upstream channels. Improved access to the burned area could lead to additional disturbance from off-highway vehicles and grazing. Values at risk include life, safety, property, transportation systems and access, water supply and water quality, wildlife habitat, and threatened, endangered and sensitive plants.

Proposed mitigation measures include:

Public awareness is crucial in preventing loss of life or destruction of property due to flooding, hyperconcentrated flows or debris torrents that can be caused by the aftermath from the Piute Fire. Initially county, city, and community organizations need to be identified. In return these entities should notify the potentially effected public of the life threatening values at risk as stated above. Items listed below are some suggested ways that local officials can inform the public that the dangers from the fire are not over.

- Prior to the first typically expected rain event, notify residents in the life threatening areas that are designated in this report (i.e. Erskine Creek, Thompson Creek).
- Prior to the first typically expected rain, post warning notices in public places about the flood hazards and possible drinking water contamination.
- Mail warning/notification letters to residents in the FEMA determined flood zones affected by Erskine and Thompson creeks, as well as areas along these creeks that have not yet been determined by FEMA.
- Post temporary warning signs, such as, "Warning Potential Flood Hazard" on Lake Isabella Blvd. where Erskine Creek crosses during rainfall events.

Local governments are strongly encouraged to develop an evacuation plan, if one is not already in place, for residents that may be stranded due to a possible road failure, or where residents' driveways may be washed out. Although it is recommended that a precipitation gage be installed in the upper watersheds of Erskine Creek and Thompson Creek be used to evaluate a rainfall threshold value that can cause land slides and subsequent debris torrents that would aid appropriate officials to quickly execute an evacuation plan. This study should be performed by a licensed professional civil engineer who specializes in soil mechanics and hydrology.

Prior to the first typically expected rainfall, all culverts should be inspected, cleaned, and "trash racks" installed where notable debris exists

ACKNOWLEDGEMENTS

List of Team Members

- Don Braun, Engineering Geology
  California Geological Survey, Eureka

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- Dane Liebel, Landowner, Erskine Creek Road

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- Rick Aguayo, District Conservationist, NRCS-Victorville

- Bill Voss, Disaster Assistance Specialist, State OES

- Jose Robledo, Assoc. Sanitary Engineer, California Department of Public Health

- Jill Walsh, Sanitary Engineer, Regional Water Quality Control Board, Central Valley Region

SETTING AND CONDITIONS

The Piute Fire began on June 28, 2008, was contained on July 25, 2008. As shown in Figure 1. The burned area was centered on the Piute Mountains approximately 10 miles southeast of Lake Isabella.

The Piute Fire area is within the Piute Mountains with approximately 89% (32,923 ac.) of the fire area confined to the Sequoia National Forest south of Lake Isabella in Kern County, California. Approximately 7% (2,613 ac.) of the fire area occurred on Bureau of Land Management property. Approximately 4% (1,490 ac.) of the fire area occurred on private property. A simplified model of the topography of the vicinity of the Piute Fire area is that of a plateau with average elevations in the 4,000 to over 8,000-foot elevation range. Very steep to precipitous slopes form the lateral margins of the plateau. Several major watercourses and tributaries extend into the plateau area. These watercourses include the Erskine Creek Watershed, the Thompson Creek Watershed, and the western portion of the Kelso Creek Watershed. The Erskine Creek Watershed consists of the main channel, East, Middle, and South Forks of Erskine Creek, and Bear Trap Canyon. The Thompson Creek watershed includes Bear Trap Creek and the main channel and several un-named forks of Thompson Creek. The Kelso Creek Watershed includes Bob Rabbit Canyon, Woolstaff Creek, and Cortez Canyon.

The fire area is predominantly composed of Mesozoic granitic rocks and locally overlain by pre-Cretaceous metavolcanic rocks, metasedimentary rocks, and carbonate rocks, and Mesozoic basic intrusive rocks. Quaternary alluvium is also present in low-lying areas adjacent to major watercourses, fans created at the mouth of larger watercourses, and in broad basins. Down slope of the fire area alluvial fan deposits underlie the communities of Lake Isabella and Bodfish. Erskine Creek flows across the alluvial fan of Lake Isabella where it enters the Kern River. Thompson Creek flows into Basin Creek, which flows across Walker Basin, and eventually into Caliente Creek. The major watercourses from the eastern portions of the Piute Burn area drain into Kelso Creek.

Soils are generally Ortents and Xerepts with prominent rock outcrop features through out the fire area. Fine sandy loam and loamy textures of granitic parent materials dominant across the fire area. Several areas of metamorphic soil parent material do exist in the project area.

The fire perimeter encompassed a total of 37,026 acres within 14 hydrologic areas (see Figure 2). Five of the 14 hydrologic areas were burned more than 50%. A series of thunderstorms equivalent to the 25 year storm event (BAER July 2008) occurred during the end of the fire suppression activities and revealed the consequences of the Piute fire burn. Flood damage was observed throughout the Piute Mountain region with major erosion and debris flow taking place along Erskine Creek, Thompson Creek, and Kelso Creek. There are approximately 22 miles of perennial streams directly affected by the Piute Fire and approximately 130 miles of intermittent streams that have been directly affected by the Piute Fire (BAER July 2008).

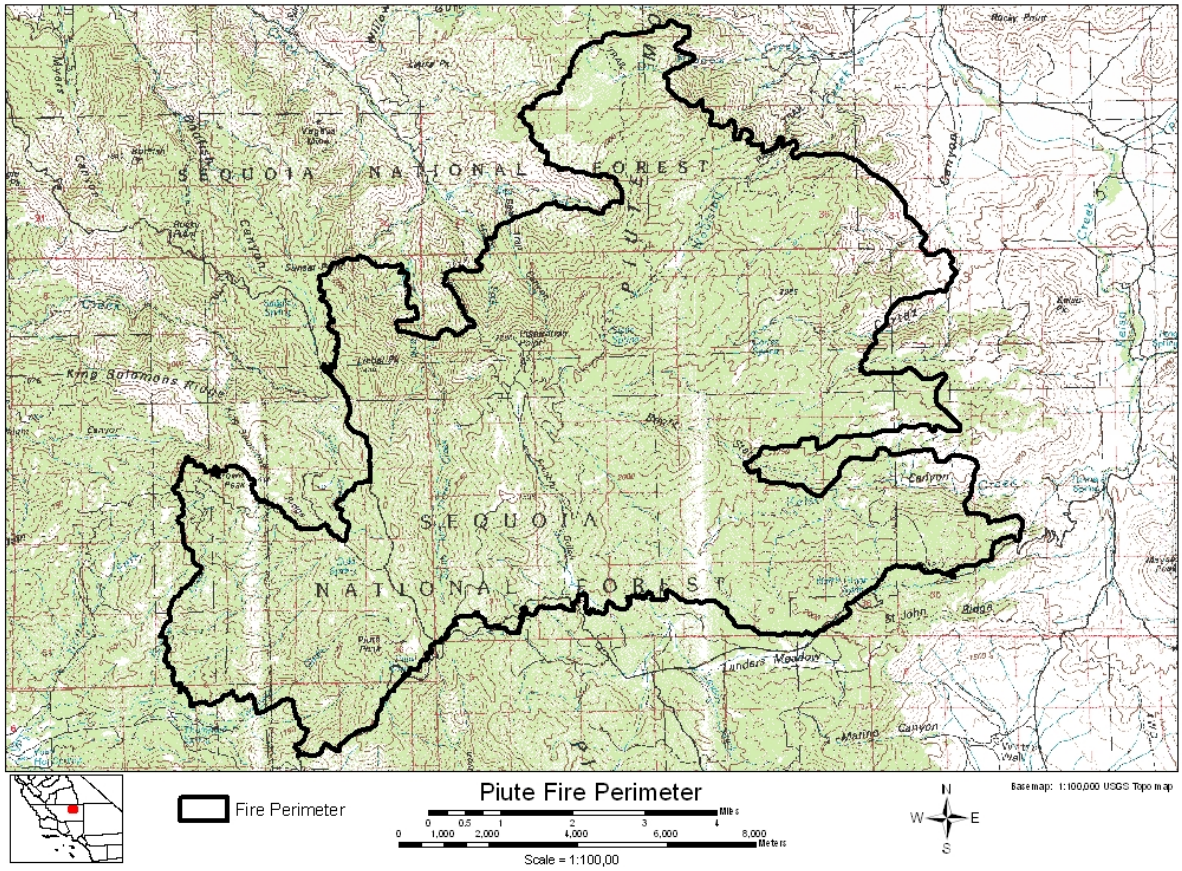

Figure 1: Fire Boundary and Topography Map

Elevations in the burned area range from approximately 4,000 feet above mean sea level to over 8,000 feet. Taking into account the orographic features of the Piute Fire area, examining nearby precipitation gages that have historic data, and examining the United States Geological Service California Average Annual Rainfall map, the annual average rainfall for the Lake Isabella area is approximately 10.5 inches while the mountain regions of Piute Peak receive approximately 25 to 30 inches annually. Additional information about runoff and stream flow is contained in the attached Hydrology and Water Quality specialist report.

Primary plant communities within the Piute Fire include Jeffery Pine Forest, Pinyon-Juniper Woodland, Mixed Fir Forest, Live Oak Forest, Chaparral and Montane Chaparral, and Desert Shrub. Because the Forest Service lands within the fire boundary have more forest and woodlands, the vegetation distribution of the Bureau of Land Management public lands are even more heavily weighted to Pinyon-Juniper Woodland and Desert Shrub, while private lands in the fire included much of the Live Oak Forest, Chaparral and Montane Chaparral vegetation, with some pines on north facing slopes and in stream corridors.

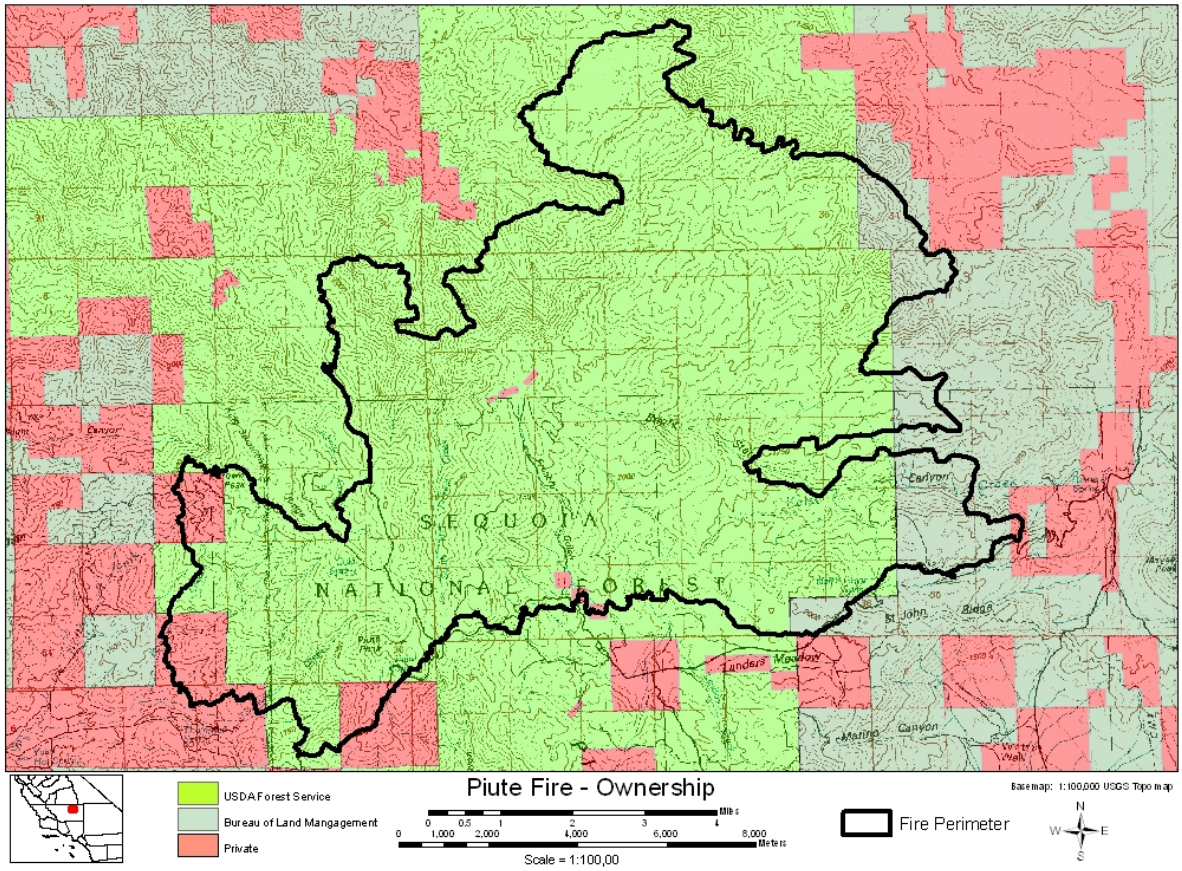

Figure 2: Fire Area Ownership Map

SEAT field review found that water repellent soils were present in most burned areas. Hydrophobic conditions were generally seen as very thin layers at the contact between the soil surface and ash or litter layers. However, thicker layers located a half inch or deeper in the soil were found in areas where more severe burning conditions were indicated by nearly complete consumption of brushfields or the presence of charcoal from heavier fuel loadings. These results are generally consistent with findings described in the BLM BAER report.

A burned area reflectance characterization (BARC) map covering the fire area was provided by the US Forest Service (USFS) to rate differences in soil burn severity. This map was modified

by the BLM BAER Team based on observed post-fire vegetation and water repellency conditions (Figure 3). The SEAT field review generally confirmed the BLM findings, and no modifications to the revised BARC map are proposed in this report. The resulting, overall, burn severity estimates for the fire area are 9 percent low, 70 percent moderate, and 3 percent high. In addition, 9 percent of the area within the fire boundary was found to be unburned.

Erosion hazard ratings (EHRs) for soils in the burned area were calculated using the California Soil Survey Committee method (CSSC 1989). In general, soils on more gently sloping areas that were rated as having a low pre-fire EHR remained in the low EHR category or moved into moderate, while areas with moderate pre-fire EHR generally moved into either high or very high EHR categories as a result of the fire. Soils that were rated as having a high EHR before the fire invariably moved into the very high category. No soils were rated as having a very high EHR prior to the fire. Additional information about EHR determinations is included in the Soils Specialist report.

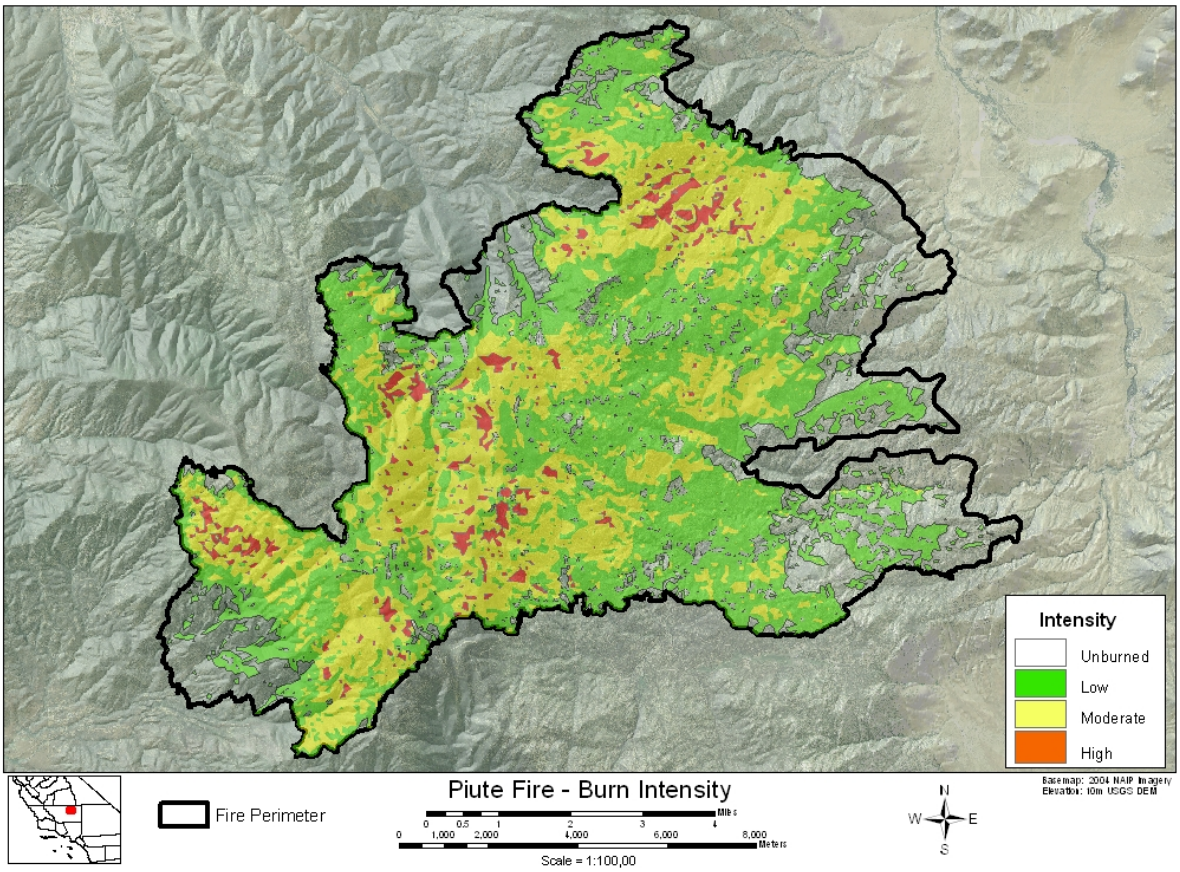

Figure 3: Burn Severity Map

SPECIALIST REPORTS FINDINGS SUMMARY

Geology

I. Resource Condition Assessment

A. Resource Setting

The Piute Fire comprised an approximately 37,000-acre burn area located in the southern portion of the Sierra Nevada geomorphic province. The general vicinity of the burn area is predominantly composed of Mesozoic granitic rocks and locally overlain by pre-Cretaceous metavolcanic rocks, metasedimentary rocks, and carbonate rocks. Quaternary alluvium is limited to two locations near Claraville and near Dry Meadow Creek within the burn area. The community of Lake Isabella is on a low gradient alluvial fan at the mouth of Erskine Creek. Outcrops of granitic and metamorphic bedrock are common and are estimated to represent up to 40% of the burn area. A description of the bedrock units within the Piute Fire area is included in the explanation to the Geologic Index Map (Appendix A).

A simplified topographic model of the vicinity of the burn area is that of an irregular plateau with average elevations in the 600 to 8000-foot range. Very steep to precipitous slopes form the perimeter of this plateau. Several major watercourses and tributaries extend into the center of the plateau.

B. Findings

While the fire was actively burning a series of thunderstorms occurred over the Piute Pear area and near the headwaters of the Erskine Creek and Thompson Creek watersheds. The thunderstorm resulted in numerous flashflood events, some of which developed into hyperconcentrated floods and debris torrents. The two largest hyperconcentrated flood/debris torrent events occurred in the South and East Forks and main channel of Erskine Creek (which adversely impacted the Community of Lake Isabella and the Kern River) and in the main channel and several unnamed tributary channels of Thompson Creek (which adversely impacted several County roads and private roads, and eventually terminating in the community of Lamont approximately 20 miles downstream). Other smaller flash flood and/or debris flow events occurred in the Clear Creek, Woolstaff Creek, French Meadow, and Dry Meadow Creek.

The principal concern with the Piute Fire is the resulting increase in the potential for in-channel floods, hyperconcentrated floods, debris torrents, and debris flows. The primary mechanisms for this are the increase in runoff resulting from reductions in interception and infiltration, from the simplification of surficial runoff patterns, and from the loss of mechanical support along stream channels where riparian vegetation was burned. Where fires burned hot, such as in portions of upper Thompson Creek and Erskine Creek watersheds the reduction in interception may be affected by the development of hydrophobic soils where waxy substances released by plant materials during hot fires follow thermal gradients into the soil and congeal as continuous surfaces in areas of moderate to high soil burn severity.

The community of Lake Isabella, scattered residences in the lower Thompson Creek watershed, and several isolated residences in the Woolstaff, Kelso Creek, and Erskine Creek watersheds as well as several County and private roads are downstream from portions of the Piute Fire burn area. Residential structures and roads constructed on the low gradient alluvial fan within the community of Lake Isabella have been and will continue to be subjected to flash flood and debris flow events. Because of the lack of vegetation and highly hydrophobic soils within portions of the burn area runoff from thunderstorms and rapidly melting snow (such as rain-on-snow events) will result in an increased risk of flash flood, hyperconcentrated floods and debris torrents within stream channels and steep swales downslope of the burn area.

II. Emergency Determination

The values at risk considered in this assessment include the possible loss of life and property due to landsliding, debris flow, rock fall, debris torrents, and hyperconcentrated flooding from increased surface water runoff. In general, the risk from flash floods and debris torrents are possible where roads, residences or other development are located within and/or adjacent to canyon stream channels or on alluvial fans, colluvial footslopes and debris flow deposits.

It should be noted that these hazards are part of the natural processes in this environment, and that these risks were present under per-fire conditions. Many of the residential structures and County and private roads downstream of the burn area have been, and will be at risk from these hazards.

Off-site locations along Erskine Creek and Thompson Creek that are in the flood zones designated by FEMA are now at a higher risk to flooding because of the fire. Because much of the steeper watercourse channels in the upper portions of the Erskine Creek and Thompson Creek watersheds appear to have been scoured down to bedrock as a result of the July thunderstorm events, runoff velocity in the scoured channels will be significantly higher than the pre-July thunderstorm condition. However, additional debris torrents involving mobilization or entrainment of in-channel cobbles and boulders are unlikely to be as substantial as those that occurred during July 2008.

III. Treatments/Recommendations

A. The specific and general observations and recommendations included in the Technical Specialist Geology review should be considered in any emergency response plan developed by emergency agencies. The Kern County Fire and Public Works Departments, Sheriff's Department, Office of Emergency Services, the Natural Resources Conservation District, and any other responsible party should be made aware of the potential hazard to lives and property in and downstream from the fire area, especially in the downstream portions of the Erskine Creek and Thompson Creek watersheds. Emergency response plans, including early warning systems and evacuation plans, should be developed by responsible agencies. The new flood rate insurance maps prepared by FEMA should be reviewed. Warning signs should be placed at locations defined by the limits of the July 2008 flooding or at the edge of the 100-year flood zone as determined by FEMA.

B. The existing County road drainage systems should be inspected by the appropriate controlling agency to evaluate impacts from floods, hyperconcentrated floods, debris torrents, debris flows, and sedimentation resulting from seasonal thunderstorms and winter rains and snow. It is understood that significant portions of Erskine Creek Road and Thompson Canyon Road, as well as Cal-Bodfish Road, Kelso Valley Road, and Piute Mountain Road are controlled by Kern County.

Discussion:

There are two main risks to lives from a geologic perspective:

1. Possible loss of life resulting from catastrophic debris torrents and hyperconcentrated floods onto the alluvial fan within the community of Lake Isabella and use of the Erskine Creek Road upstream of the Lake Isabella alluvial fan

2. Catastrophic flooding onto the broad gently inclined portions of the Thompson Creek watershed. Risks to property and infrastructure include county roads, State Highways, private roads, water and septic systems, and residential and ranch property. The primary recommendation to mitigate these risks is to inform and educate the individual homeowners, affected communities, local emergency agencies (Kern County), and policy makers of the risks at hand. Mitigations such as evacuation procedures, early warning systems, and site-specific mitigations can then be developed and implemented.

References – See attached Geology Tech. Report

Hydrology and Water Quality

Discussion/Recommendations

The Piute Fire began June 28, 2008 and was contained July 24, 2008. The fire burned a total of 37,026 acres within 14 hydrologic areas. Five of the 14 hydrologic areas were burned more than 50%. A series of thunderstorms equivalent to the 25 year storm event

(BAER July 2008) occurred during the end of the fire suppression activities and revealed the consequences of the Piute fire burn. Flood damage was observed throughout the Piute Mountain region with major erosion and debris flow taking place along Erskin Creek, Thompson Creek, and Kelso Creek. There are approximately 22 miles of perennial streams directly affected by the Piute Fire and approximately 130 miles of intermittent streams that have been directly affected by the Piute Fire (BAER July 2008).

For the 2009-2010 rain season, higher than normal flows should be expected. Although higher flows will occur due to increased runoff from burn areas, most of the flood damage has already occurred. Water courses have been altered and the channel carrying capacity of the tributaries has greatly increased. Therefore, it is anticipated that excessive erosion is not likely to occur. The hydrologic effect of the burned area is expected to diminish over 5 to 7 years. Studies within the Kern River watershed during the McNally Fire, 2002, discovered high severity burn areas had a five to seven year recovery (Kaplan-Henry, 2007). The recovery rate is only accounting for increased runoff as a result of the Piute Fire.

Higher than normal flows within Kelso Creek, Thompson Creek, and Erskine Creek may impact property at the base of the hydrologic areas. Residents within this region should be aware that during a mountain rain event, the possibility of flash floods may be more likely due to reduced vegetation from the Piute Fire and increased scouring within the stream channel. Emergency evacuation plans should be implemented for the community of Lake Isabella during significant rainfall events. Emergency evacuation plans should be implemented for the community of Lake Isabella during significant rainfall events.

It should be noted that ash produced as a result of the fire will be suspended in the stormwater runoff and downstream turbidity may increase. Two downstream surface water treatment plants utilize the Kern River as a source of capacity. The two treatment plants are operated by Cal Water Service and the Kern County Water Agency. Both agencies may want to take precautionary actions prior to the high turbidity water reaching the intakes of the plants.

All county, private, state roads and trails should be safely monitored during and after future rain events. Of particular importance, are access roads that are maintained by the US Forest Service and the County of Kern. The SEAT team observed culvert road crossings that appeared to be inadequately cleared and constructed to be able to handle future rain events. Specific locations have been previously noted in this report.

Cultural Resources

Resource Setting

The Piute Fire burned approximately 37,000 acres southeast of Lake Isabella, primarily on lands managed by the Federal Government. Following the Piute Fire incident, a 25-year flood event causing large scale flash flooding occurred. The regions affected by the fire and floods contain dozens of known cultural heritage sites.

Recommendations

No sites assessed on SRA lands were recommended for treatment. Therefore, general management recommendations follow:

1. All ground disturbing activities (e.g., culvert replacement, delta and berm repair, etc.) taken in response to fire or flood damage mitigation and repair will require archaeological review prior to implementation;
2. The region where the Piute Fire burned contains numerous historic and active mines. Due to erosion and loss of organic structural material, these mines may become more unstable and collapse. Mines should be assessed for stability, and closures, erecting exclosures, or posting signage should be implemented as necessary. An archaeologist should be involved if mines will be impacted by stabilization procedures;
3. The region where the Piute Fire and Flood events occurred has a long historic record ranging from using steep, high elevation slopes for mining, high elevation peaks and plateaus for temporary encampments, and lower elevation riparian areas for more permanent habitation. Much of the Piute incident region remains un-surveyed. Taking advantage of improved ground visibility and cleared vegetation is recommended to identify any other heritage resources either impacted by the Piute incident, or to future flood events;

A. Survey Method

Between October 1st and October 10th, 2008, a CAL FIRE archaeologist assessed previously recorded sites located within State Responsibility Areas of the burn perimeter as well as those located in watershed regions potentially affected by post-fire flooding. Additionally, areas exhibiting potential to disclose previously unidentified sites were surveyed; binocular reconnaissance was employed on previously un-surveyed lands located in steep and difficult to access terrain.

B. Resource Condition after Fire

Condition assessments noting impacts and treatment recommendations were made on numerous sites. Typically, one of the most impending threats in a fire event such as this would be erosion and land slides; however, flash flood rain events that immediately followed the fire allowed no time for identification and implementation of damage mitigation recommendations. Therefore, the impact of most notable concern is damage due to increased visitor usage (e.g., looting, off-highway vehicle damage); erosion and displacement due to slides remains a potential threat to sites located within the focus area.

Emergency Determination:

Cultural heritage sites are at risk from both direct and indirect fire effects, including: erosion, vandalism, soil deflation, fire suppression damage and sooting, spalling and combustion. No previously recorded cultural heritage sites were determined to be at risk from fire effects.

Treatments to Mitigate the Emergency

Treatments include inventory, public safety precautions and monitoring.

Treatment Objectives

Treatments aim to improve the effects of fire damage on sites, mitigate further damage and identify other resources potentially affected or at risk.

VALUES AT RISK SUMMARY

The values at risk considered in this assessment include the possible loss of life and property due to landslides, debris flow, rock fall, debris torrents, and hyperconcentrated flooding from increased surface water runoff. In general, the risk from flash floods and debris torrents are possible where roads, residences or other development are located within and/or adjacent to canyon stream channels or on alluvial fans, colluvial footslopes and debris flow deposits.

It should be noted that these hazards are part of the natural processes in this environment, and that these risks were present under per-fire conditions. Many of the residential structures and County and private roads downstream of the burn area have been, and will be at risk from these hazards.

Off-site locations along Erskine Creek and Thompson Creek that are in the flood zones designated by FEMA are now at a higher risk to flooding because of the fire. Because much of the steeper watercourse channels in the upper portions of the Erskine Creek and Thompson Creek watersheds appear to have been scoured down to bedrock as a result of the July thunderstorm events, runoff velocity in the scoured channels will be significantly higher than the pre-July thunderstorm condition. However, additional debris torrents involving mobilization or entrainment of in-channel cobbles and boulders are unlikely to be as substantial as those that occurred during July 2008.

REFERENCES: See individual Specialist Reports

APPENDIX A: Geology Technical Specialist Report

DRAFT TECHNICAL SPECIALIST'S REPORT

STATE EMERGENCY ASSESSMENT TEAM (SEAT) Emergency Report

Resource: Geology

Fire Name: Piute Fire CA-SQF-001356 **Month/Year** October 2008

Author Name: Don Braun, Certified Engineering Geologist
California Geological Survey
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Eureka, CA. 95547
Office (707) 441-5745

I. Resource Condition Assessment

A. Resource Setting

The Piute Fire comprised an approximately 37,000-acre burn area located in the southern portion of the Sierra Nevada geomorphic province. This area is predominantly composed of Mesozoic age (>65 million year old) granitic rocks and locally overlain by pre-Cretaceous age (>65 million year old) metavolcanic rocks, metasedimentary rocks, and carbonate rocks. Quaternary age (< 1 million year old) alluvium is also present in low-lying areas adjacent to major watercourses, fans created at the mouth of larger watercourses, and in broad basins. Numerous mines are present within and adjacent to the Piute burn area. The majority of the mines appear to be situated near the contact zone between the granitic rocks and the overlying metamorphic rocks. A general description of the bedrock units within and adjacent to the Piute Fire area is included in the explanation of the Geologic Index Map (Appendix A). We estimate that outcrops of granitic and metamorphic rock might represent as much as 40% of the burn area. Decomposed granite (DG) is common throughout the areas underlain by the granitic bedrock. Within the burn area the DG soils are typically thin and averaging about 1 to 2 feet deep. DG soils are known to be easily eroded by surface runoff.

Down slope of the fire area alluvial fan deposits underlie the community of Lake Isabella. Erskine Creek flows across the alluvial fan of Lake Isabella where it enters the Kern River. Thompson Creek flows into Basin Creek, which flows across Walker Basin, and eventually into Caliente Creek. The major watercourses from the eastern portions of the Piute burn area drain into Kelso Creek. Alluvial fans are present along each of these creeks at the base of the mountain slope.

The Piute Fire is within the Piute Mountains with approximately 89% of the Fire area confined to the Sequoia National Forest south of Lake Isabella in Kern County, California. Approximately 4% of the fire area occurred on private property with the remainder occurring on Bureau of Land Management property. A simplified model of the topography of the vicinity of the Piute Fire area is that of a plateau with average elevations ranging in elevation between 6,000 and 8,000 feet. Very steep to precipitous slopes form the lateral margins of the plateau. Several major watercourses and tributaries extend into the plateau area. These watercourses include the Erskine Creek Watershed, the Thompson Creek Watershed, and the western portion of the Kelso Creek Watershed. The Erskine Creek Watershed consists of the main channel, East, Middle, and South Forks of Erskine Creek, and Bear Trap Canyon. The Thompson Creek watershed includes Bear Trap Creek and the main channel and several un-named forks of Thompson Creek. The Kelso Creek watershed includes Dry Meadow Creek (Bob Rabbit Canyon), Woolstaff Creek, French Gulch, and Cortez Canyon. Figures 1 and 2 show the locations of the predominant watercourses draining the Piute Fire burn area.

B. Survey Methods

An initial field survey via County roads of portions of the burn area and down slope areas was conducted on September 30, 2008. A helicopter reconnaissance of the burn area and portions of downstream watersheds was conducted on October 2, 2008. The purpose of the flight was to identify potential areas within the burn area that might be source areas for erosion of surface sediments and debris flows that affected downslope and offsite known impacted areas, and additional sites of high value that were potentially at risk due to the effects of the fire. High value areas are defined as locations that are at risk for possible loss of life and property due to in-channel floods, hyperconcentrated floods, debris torrents, and debris flows, slope generated landslides, rock fall, and associated slope movement. Areas that contained concentrations of homes, businesses, and public infrastructure received the greatest attention. Following the initial field reconnaissance and helicopter overview, site specific road and foot inspections were conducted within the watersheds where flash flood/debris flow source areas occurred during the intense rain storms of July 2008 and where points of interest were noted during earlier reconnaissance. Field surveys were conducted within the main channel of Erskine Creek and near the confluence with the East, Middle, and South Forks of Erskine Creek and in the main channel of Thompson Creek both downstream and within the Piute burn area. Field surveys were also conducted at the general vicinity of the Jeanette Grant and Lone Star mines and at Inspiration Point within the burn area. Other survey methods included interviews with eyewitnesses to the flood events (Milton Davis of Thompson Canyon Road, and Keith Miller and Dane Liebel of Erskine Creek Road) and interviews with various county agencies (Andrew Richter, Engineering Manager with Kern County Roads Department; Zach Smith of the Kern County Water Agency; and Richard Lloyd of County of Kern Water Agency), and a USFS Piute Fire Baer Team member (Alan Gallegos).

II. Review of Specific Piute Fire BAER Team Reports

To aid in our evaluation of downstream impacts from the Piute Fire we were provided with the USFS BAER Team draft summary report dated August 15, 2008 and specialist assessment reports dated July 25, 2008. Specific specialist reports reviewed included the Geology and Slope Stability Assessment (Gallegos, 2008), the Soil Report (Jimenez, 2008), and the Hydrology Report (Courter and Stewart, 2008). While we generally concur with the observations and conclusions presented in these reports there are some specific instances where our observations and/or interpretations are not in complete agreement with conclusions presented in the BAER Team reports. Relevant points of agreement and disagreement are briefly discussed below.

Agreement: The BAER Hydrology Report suggests that accelerated runoff is expected to return to normal conditions within 5 to 7 years as supported by studies conducted for the McNally Fire of 2002 within the Kern River watershed north of Lake Isabella.

The BAER Geology Report states that the tributary channels to Thompson Creek and the South Fork of Erskine Creek have been scoured down to bedrock or to a boulder/rock substrate with evidence of debris flow levees and other depositional features. The Geology Report also states that the likelihood of additional debris flows in a watershed that has recently had a sequence of significant flooding and debris flow activity is lower than in a watershed that has not had debris flow activity following fire. However, the Geology Report still concludes that the potential for debris flows still exists in the fire area and there is an emergency from potential flooding and debris flows within and downstream of the fire area.

Based on the results of our limited assessment we concur with the above observations and/or conclusions in the Baer Team reports.

Disagreement: The BAER Hydrology Report states that flooding and debris flows also occurred outside of the Piute Fire burn area and suggests the fire only contributed to the extent of the debris flows. During our reconnaissance we did not observe any evidence of debris flows or debris torrents occurring in stream channels or swales outside of the Piute Fire burn area. We discussed the offsite occurrence of debris flows (via a phone conversation) with the Baer Team geologist (Alan Gallegos). We were informed that the debris flows discussed were the flows that occurred in the Erskine Creek main channel and in the Thompson Creek main channel and that debris flows were not observed within tributary channels to these watercourses outside of the burn area. We note that we did observe evidence of flashfloods in numerous channels or swales outside of the burn area. It is our opinion that the flash flood and debris torrent events likely would have occurred regardless of the fire; however, the fire clearly had a significant contribution to the extent of the July flooding (see general observation section below).

The Geology and Soil Reports state that they found very little soil repellency in the fire area and that most areas tested for water repellency resulted in rapid infiltration of water. (We do not completely agree with the conclusion of the lack of water repellency. Several locations within high to moderate-high burn intensity areas were tested for evidence of hydrophobic soils. The soil at the surface and the base of gullies or rills greater than 6 inches deep was found to have rapid infiltration in about 1 to 2 seconds. However, at a

depth of about 1-inch (outside of rills and gullies) the soil was determined to have a high degree of water repellency or strong to very strong development of hydrophobic soils, exceeding 60 seconds).

We are also not in agreement with recommendations regarding remediation for the Jeanette Grant mine tailings (see specific observation and recommendation sections below).

III. General Observations

The principal concern with the Piute Fire is the resulting increase in the potential for in-channel floods, hyperconcentrated floods, debris torrents, and debris flows. The primary mechanisms for this are:

- Increases in runoff resulting from the loss of live vegetation,
- Reductions in infiltration due to the removal of duff and the dehydration of the soil,
- The simplification of surficial runoff patterns, and
- The loss of mechanical support to hillslope materials that was provided by vegetation and vegetative litter along stream channels.

Where fires burned hot, such as in portions of Thompson Creek and Erskine Creek watersheds hydrophobic soils have developed (waxy substances released by plant materials during hot fires which have congealed with the soils as continuous surfaces). Dry ravel (downslope mobilization of loose bedrock, spoils, and sediment wedges accumulated behind vegetation consumed by the fire) and numerous areas of rill development within loose surficial soils were observed on steep to moderate slopes at numerous locations within burnt slopes within the Erskine Creek and Thompson Creek watersheds. This loose material may become mobilized into sediment-laden masses during heavy rains (debris flows and debris torrents) that may flow downstream from the watershed headwater source areas and hillsides in the burn area above the watercourse channels. The magnitude of additional post fire damage will ultimately be determined by the intensity and duration of storms that impact the burn area, particularly during the winter of 2008-2009 and during thunderstorm events in the summer of 2009.

A. July Thunderstorm Event

While the Piute Fire was actively burning, a series of thunderstorms occurred over the Piute Fire area. These thunderstorms appeared to be concentrated over Piute Peak and near the headwaters of the South Fork and East Fork of Erskine Creek and Thompson Creek. Information in the Piute BAER Team specialist reports suggests that 3.5 inches of rain fell within a 2-hour interval on July 13th. This is reported to be a 25-year rainfall event (Courter and Stewart, 2008). The overall rainfall event in the Piute Peak area was a total of 5.16 inches over a 46.5-hour period beginning at 5:15 pm on July 12th (see SEAT Hydrology report). The thunderstorm resulted in numerous flash flood events, some of which developed into hyperconcentrated floods and debris torrents. The two largest

hyperconcentrated flood/debris torrent events occurred in the South and East Forks and main channel of Erskine Creek (which adversely impacted the Community of Lake Isabella and the Kern River) and in the main channel and several unnamed tributary channels of Thompson Creek (which adversely impacted several county and private roads and one residence) eventually terminating in the community of Lamont approximately 20 miles downstream. Within the lower Thompson Creek watershed several private landholding were adversely impacted including damage to one structure and burial of grazing land and a stock/fire suppression pond with cobbles and boulders. Within the Erskine Creek Watershed, Erskine Creek Road, property adjacent to the channel, one travel trailer, portions of the Community of Lake Isabella, and the Kern River were adversely impacted. Other smaller flash flood and/or debris flows occurred in the Clear Creek Watershed and in the Woolstaff Creek, Dry Meadow Creek (Bob Rabbit Canyon), and French Gulch sub-Watersheds of Kelso Creek. The flood event within Clear Creek overtopped the Caliente-Bodfish Road (County Road 483) but did not appear to create any damage. The relevant results of our observations of portions of the Piute Fire area and impacted downstream watersheds are presented below.

B. Downstream Impacts (flooding, sedimentation, debris torrents)

The community of Lake Isabella including the Borel Canal (Southern California Edison Company) and the adjacent Erskine Creek Road in the Erskine Creek Watershed, the general vicinity of Thompson Canyon Road and scattered residences in the Thompson Creek Watershed, and scattered residences in tributaries to Kelso Creek are all located down gradient from the Piute Fire area. While damage has occurred to specific areas as a result of the Piute Fire and the July thunderstorm events we present our findings per a watershed basis. The extent of damage and flooding from the July thunderstorms is considered an important marker for future flood events; however, areas inside as well as outside of the July flooding event remain at risk from future flooding and debris torrents, particularly until the vegetation in the Piute Fire area recovers over the next few years.

1. Thompson Creek Watershed

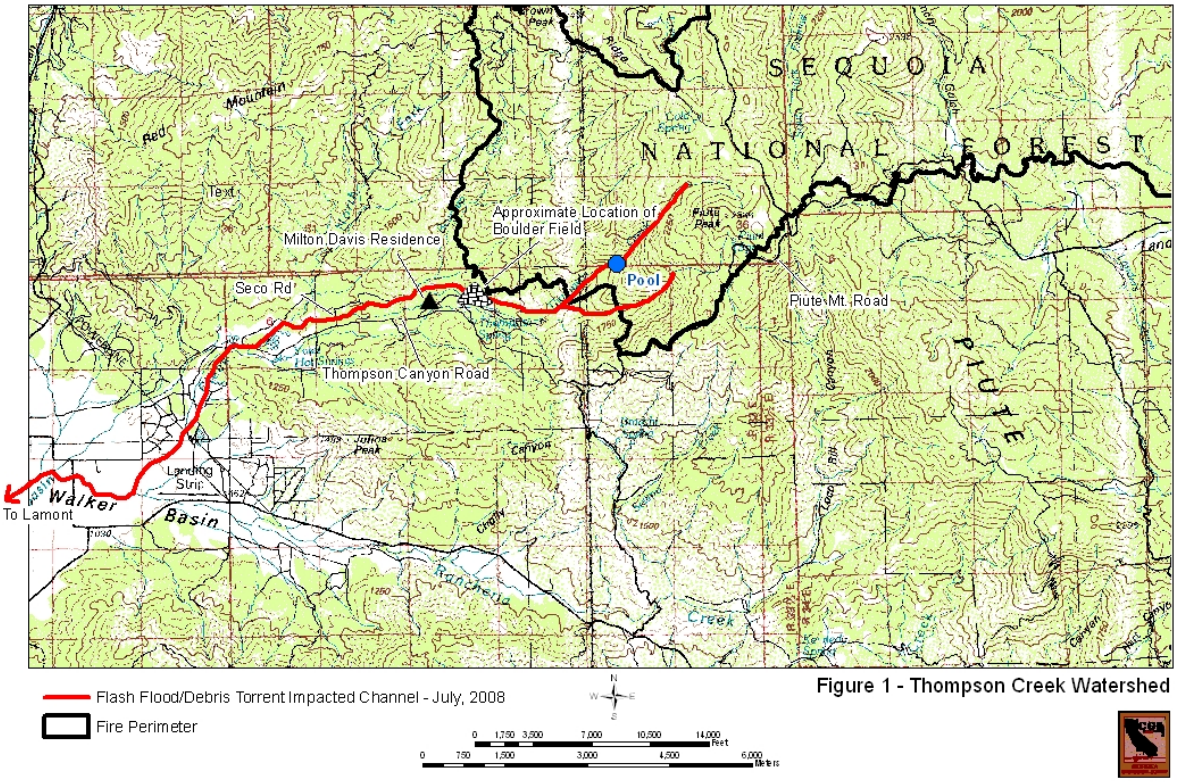

Figure 1 - Thompson Creek Watershed

a. July 2008 Flash Flood/Debris Torrent:

The flash flood/debris torrent event within Thompson Creek Watershed also occurred on July 13th similar to the timing of the flooding in the Erskine Creek Watershed. The debris torrent developed within portions of the Piute Fire area and resulted in the deposition of a very large boulder field in low gradient portions of the watershed below the burn area. Boulders within the boulder field are commonly in the range of 2- to 5-foot diameter. We estimate the boulder field at approximately 465 feet wide at its greatest width by 600 to 800 feet long (see Figure 1). The debris torrent and deposition of the boulder field reportedly occurred within approximately 15 minutes after the storm hit the lower portions of Thompson Creek and lasted for approximately 2 hours (see interview with Milton Davis below). A stock pond that was about 15 feet deep and an adjacent grass field were both reportedly buried with sand, cobbles, and boulders just below the larger boulder field. Near the site of the buried pond we observed an area of gully erosion within a grassland area that is covered with fresh cobbles and boulders from the July flooding. The scoured area exposes an approximately 18-inch thick buried soil horizon at a depth of about 3 to 4 feet below the former surface. The soil horizon is overlain by an approximate 18-inch thick layer of granitic cobbles which is inturn overlain by a silty coarse sand. Cobbles and boulders up to 5-foot diameter underlie the buried soil horizon. This exposure suggests that 2 or 3 flood/debris torrent events have covered soil horizon

since its development and a large debris torrent event occurred prior to the development of this buried soil horizon.

The channel of the main branch of Thompson Creek and an unnamed tributary channel above the boulder field were locally scoured down to granitic bedrock within and below the fire area. The BAER Team reports also state that the channel of Thompson Creek was scoured down to bedrock. The scoured banks of the channel expose cobbles and boulders within colluvium. Boulders were commonly 2 to 5-foot diameter. The scoured channel, where observed, is typically in the range of 5 to 10 feet wide with 5-foot high, near-vertical banks. The results of our evaluation suggest that a debris torrent eroded all entrenched sediment within the channel of Thompson Creek down to the lower gradients of the watershed.

We estimate that the large boulder field is greater than 4,000 feet below the downslope perimeter of the Piute Fire burn area. Fine grained sediment from the July debris torrent and flash flood event reached the community of Lamont located at least 20 miles downstream from the mouth of Thompson Creek where it enters Basin Creek and Walker Basin.

Photo A: Channel of Thompson Creek just below perimeter of the burn area (note large diameter boulders and woody debris) October 5, 2008.

Above the main channel of Thompson Creek and just inside the perimeter of the Piute Fire burn area we observed an approximate 40-acre sized area of high intensity burn. Within this area we observed abundant rills leading directly to Thompson Creek. The rills were commonly 1 to 2 inches deep and with spacing commonly varying between 6 inches to 2 feet. We tested the hydrophobic properties of the soil in the burn area and determined it to be strong to very strong. At a depth of approximately 1-inch water remained beaded and did not infiltrate into the soil after 60 seconds.

Photo B: High intensity burn near perimeter of Piute Fire burn area. Hydrophobic properties of soil are strong to very strong. This area drains directly to Thompson Creek. Note common rill development.

b. Impacts to Thompson Canyon Road and Adjacent Roads

All the road crossings over Thompson Creek extending down to the mouth of the creek where it enters Walker Basin appear to have been destroyed by the July flooding and debris torrent event. Most of the crossing had been reconstructed by the time of our field assessment. The remainder of the crossings were in the process of being reconstructed. Almost all of the crossings are either fords or concrete low water crossings with the exception of two crossings where culverts were installed. It appears that private parties including a local homeowners association conducted all

repair maintenance. It is not clear how much of the Thompson Canyon Road is controlled or maintained by Kern County.

c. Areas Not Assessed

Much of the Piute Burn area on Federal land is inaccessible either due to road closures implemented by the USFS, the lack of trails or roads to various headwater areas of impacted watersheds and locally very steep to precipitous slopes. Much of the areas downslope of the burn area are ranches and are also relatively inaccessible because of the lack of roads and trails.

2. Erskine Creek Watershed

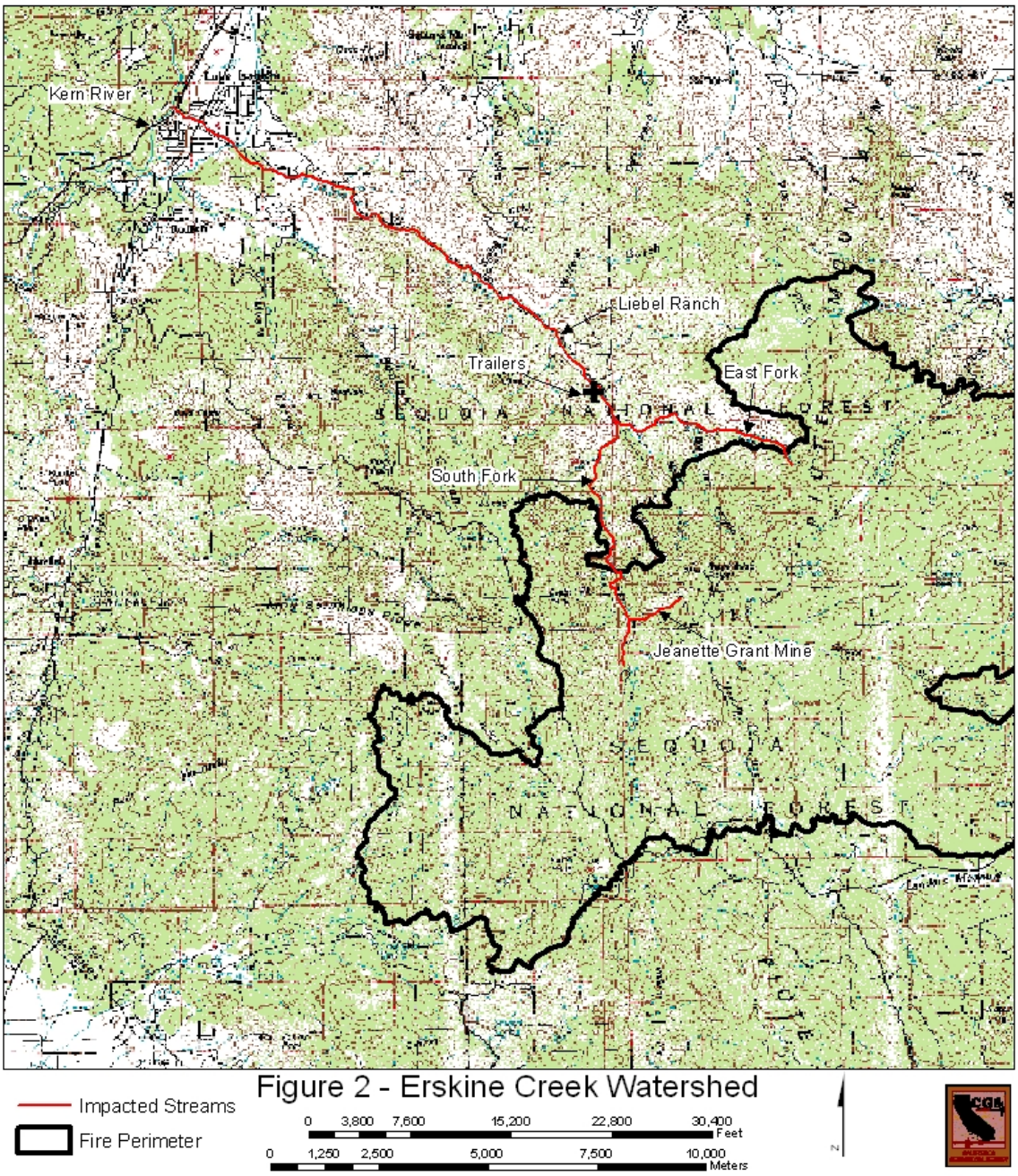

Figure 2 - Erskine Creek Watershed

a. July 2008 Flash Flood/Debris Torrent:

The approximate common intersection of the South Fork, Middle Fork, and East Forks of Erskine Creek and Bear Trap Canyon is at the southeastern end of Erskine Creek Road. Together, these watercourses form the main channel of Erskine Creek.

The head of each of these drainages is within the Piute Fire burn area. Debris torrents occurred within the East Fork and South Fork of Erskine Creek on July 13th (see interview with Keith Miller below). Just below the common intersection of these drainages deposits and scouring from the debris torrent is estimated to range in width from between 100 to 150 feet. Boulders and cobbles were mobilized from entrained sediments within the stream channels up gradient from the end of the Erskine Creek Road. The majority of the cobbles and boulders dropped out of the torrent near the Liebel Ranch approximately 6,000 feet downstream from the end of the road. The approximate head of South Fork Erskine Creek is approximately 6 miles above Liebel Ranch. These boulders were generally less than 4 feet diameter and commonly in the 1 to 2-foot diameter range. The debris torrent produced a mud splash approximately 10 feet above the base of the channel near the point where the watercourse enters the alluvial fan just above the community of Lake Isabella.

Additional evidence of flash flooding and debris torrents were observed in a tributary watercourse to the South Fork Erskine Creek at the Jeanette Grant Mine (within the burn area), approximately 1,600 feet south and up gradient of the common intersection with the four main branches of Erskine Creek.

Several travel trailers were observed near the common intersection of the four main tributaries to Erskine Creek (South, Middle, and East Forks, and Bear Trap Canyon). All but one of the trailers appeared to be un-damaged from the flood event. One trailer was damaged where approximately 2 feet of sediment and woody debris was deposited against the trailer.

Photo C – South Fork of Erskine Creek near end of Erskine Creek Road.
July 6, 2008

3. Impacts to the Community of Lake Isabella

The community of Lake Isabella is predominantly constructed on a relatively low gradient alluvial fan. The fan is over 2 miles long and terminates at the Kern River. Erskine Creek currently flows over the southern portions of the fan. Numerous residential structures and two schools have been constructed on the alluvial fan. The July 2008 thunderstorm events over Piute Peak resulted in flooding and overtopping of the stream channel within the fan. Sediment laden floodwater crossed under the flume portion of the Borel Canal (which carries Lake Isabella water to a Southern California Edison Company power plant), crossed over Lake Isabella Boulevard and into a box culvert below State Highway 178 where it entered the Kern River. At and immediately downstream of the intersection of Erskine Creek with the Kern River we observed a sediment plume composed of clay, silt, and sand near the mouth of Erskine Creek with cobbles and boulders extending approximately 200 feet downstream. The floodwater deposit we observed on the alluvial fan is predominantly fine-grained material with only a small fraction of cobbles and small boulders. This suggests that the cobbles and boulders we observed in the Kern River just downstream of the mouth of Erskine Creek were deposited from an earlier flash flood/debris torrent event(s). We observed several residential structures that had been impacted by sediment-laden water during the flood, predominantly between Lake Isabella Boulevard and the flume. We have been informed that the

Kern County Fire Department personnel rescued several residents during the flooding event of July. We observed a warning sign for flooding hazard on the fan and while other warning signs may be present they were not observed.

4. Impacts to Southern California Edison Company Canal and Flume

The Borel Canal is generally constructed on fill placed on the surface of the alluvial fan with the top of the canal estimated at 8 feet above the ground surface. A portion of the canal is constructed as an elevated flume over the current channel of Erskine Creek with approximately 4 to 5 feet clearance above the ground surface. The foundation support for the flume appears to be substantial and is composed of steel beams and concrete footings. We did not observe any damage to the flume or foundation. Mud stains on the lower portions of the flume suggest the flood debris was approximately 5 to 6 feet deep at this location.

5. Impacts to Erskine Creek Road

Erskine creek road between the community of Lake Isabella and the approximate end of the road to the southeast crosses Erskine Creek approximately 20 times. One of the crossings is a typical culvert with the remainder either consisting of non-rocked fords or concrete low water crossings with small diameter culverts. At the time of our evaluation the road had been reconstructed from the flood damage. As far as we can tell Erskine Creek Road sustained only minor damage and was quickly re-established after the July 2008 flood event. The use of concrete low water crossings and fords appears reasonable for streams with a high sediment load.

IV. Interviews with Specific Individuals

Milton Davis – Thompson Canyon Road

Mr. Davis owners two 40 acre parcels within a generally low-lying region of the Thompson Creek Watershed roughly ½ mile downstream from the burn area. Mr. Davis reports that he was present during the entire July thunderstorm event. On July 13th at approximately 2:00 pm the debris torrent from upper areas of the Thompson Creek watershed passed through his property. He stated that the noise of the boulders banging together "sounded like a herd of Godzillas". He also reports that the debris torrent occurred approximately 15 minutes after it started raining at his property and last for approximately 2 hours. As a result of the debris torrent a stock/water supply pond up to 15 feet deep and an approximate 2-acre grass field were buried.

Keith Miller - Erskine Creek Road area

Mr. Miller has a residence near the confluence of East Fork, Middle Fork, and South Forks of Erskine Creek. He was present during the July thunderstorm events. He reports that flash floods occurred within all three forks of Erskine Creek on the 1st and 3rd days of the thunderstorm event. He also reports that debris flows and boulders were delivered down the South Fork and East Fork of Erskine Creek on day 2 (July 13th) of the thunderstorm event. Our observations confirm that boulders up to 5-foot diameter have been deposited within and adjacent to the channels of both the East and South Forks of Erskine Creek.

V. Specific Observations

Houses, canals, roads, and other high-value sites down slope from the burned area were assessed to evaluate potential risks from debris torrents, flash floods, and other geologic hazards. Structures and infrastructure (roads, highways, canals) downstream of large watersheds appear to be in positions where they may be affected by significant in-channel floods, hyperconcentrated floods, debris torrents, and debris flows. Areas with the Erskine Creek and Thompson Creek watersheds are addressed in the General Observation section.

Piute Mountain Road

This non-paved road crosses through the Sequoia National Forest and within portions of the Piute Burn area between Kelso Valley to the east and a paved County road that leads to Walker Basin to the west. The SEAT Team leader informed us that this road is generally closed during the winter period and reopened by the county in the spring using a grader.

The July thunderstorm events resulted in locally substantial damage to the road where ditch relief culverts and watercourse crossing culverts were blocked by sediment eroded from the Piute Fire burn area. Runoff was diverted as a result of this local blockage and appeared to create some gully erosion of the road surface. At the time of our field assessment the road had been regraded and the various culverts generally cleared of debris. The majority of damage appeared to be concentrated between French Meadow within the National Forest and an area south of Piute Peak where a watercourse channel is in close proximity to the road. The majority of the road appears to be poorly drained. The spacing of ditch relief culverts was not measured but appears to be excessive. At the inlet of most of the ditch relief culverts we observed relatively deep (3 to 6 feet) and very steep (>100% to near vertical) excavations. The excavations generally expose loose soil materials including decomposed granite (DG) that appear to be easily eroded and relatively unstable. We did not observe any critical dips over any of the watercourse crossings. A berm (generally 1 to 3 feet high) was observed along the majority of the outboard edge of the road. The berm has been locally breached to allow drainage; however, the openings through the berm appear to be widely spaced. Overall, the Piute Mountain Road is considered to be poorly drained and the Piute Fire has resulted in additional runoff onto the road surface.

Jeanette Grant Mine Tailings

The Jeanette Grant Mine is located on USFS land, and was reportedly a gold mine, which was apparently abandoned sometime in the early 1980's. The tailings from the Jeanette Grant Mine were dumped directly above a steep and incised watercourse channel. This watercourse drains directly into the South Fork of Erskine Creek (located approximately 1,800 feet to the southwest), which eventually flows through the community of Lake Isabella. The old access road to this mine was constructed within portions of the watercourse channel and sometimes just above the left bank of the channel. The old mine road crosses over the tailing pile to the north side of this channel. We observed evidence that a flash flood/debris torrent event from the July thunderstorms adversely impacted the watercourse channel. The old road to the mine was washed out upslope of the mine and tailing pile. A pickup truck and two diesel generators and other equipment were observed to be partially buried in debris deposited from the torrent. Another pickup (noted by SEAT Team Leader David Shy) was located approximately 800 feet up gradient from its previous location just prior to the July thunderstorms. The debris torrent/hyperconcentrated flood of July moved this truck downgradient. The truck is now crushed and wrapped around a tree. The outboard edge of the tailing pile is severely eroded as a result of the flooding/debris torrent event. The eroded portions of the tailing file are estimated to be up to 20 feet high by 50 feet wide. Water was observed flowing within the channel at the toe of the tailing pile and from the mine tunnel immediately south of and level with the tailing pile. The SEAT Team water quality engineer (Anthony Toto) collected a water sample from the channel below the tailing pile.

Page 6 of the draft Baer Team Burned-Area summary report, recommended installation of erosion control measures at Jeanette Grant Mine. This section of the Report states that a 175 cubic yard tailings pile is located near the mill site and adjacent to the channel. To prevent erosion the report is recommending covering the tailings pile with filter fabric in combination with wattles to prevent off-site migration of this material.

It appears that the July flash flood/debris torrent event has already resulted in substantial erosion of the tailing pile and therefore the recommended mitigation of placing filter fabric with wattles on the tailing pile will likely be ineffective in preventing additional erosion of the tailing pile during future high intensity rainfall or a flash flood/debris torrent event.

Photo D: Overview of Jeanette Grant Mine and eroded tailings from old mine road to west. Seat team members for scale, October 7, 2008.

VI. Emergency Determination

The values at risk considered in this assessment include the possible loss of life and property due to landsliding, debris flow, rock fall, debris torrents, and hyperconcentrated flooding from increased surface water runoff. In general, the risk from flash floods and debris flows are possible where roads, residences or other development are located within and/or adjacent to canyon stream channels or on alluvial fans, colluvial footslopes and debris flow deposits.

Because vegetative soil cover has been reduced and hydrophobic soils have been developed by the Piute Fire, increased run-off is expected. Subsequent rainfall and the pattern in which it is delivered will determine the amount of damage due to flooding, hyperconcentrated flows or debris torrents at any specific time. If light rainfall events occur evenly over time, above average run-off will result and therefore increase the average stream flows. If above average rainfall events occur evenly over time, widespread debris flows, flooding and debris torrents are likely. If a record rainfall event occurs, debris torrents and hyperconcentrated flooding is expected.

It should be noted that these hazards are part of the natural processes in this environment, and that these risks were present under per-fire conditions. The existing risks are elevated as a result of the upslope fire. Many of the residential structures and county and private roads

downstream of the burn area have been, and will be at risk from these hazards. The potential for these processes to be exacerbated by the fire is primarily dependent upon burn severity and slope steepness, both of which are highly variable in the Piute burn area. In general, where the burn severity is moderate to high and the slopes are steep, the potential for increased hazard is greatest. The potential for increased hazard from flooding is also present in the downstream portions of the largest watersheds (Erskine Creek, Thompson Creek, and Kelso Creek).

Due to the limited access to most of the burned areas and off-site downstream areas, most of the specific values at risk are stated in terms of general areas. Areas of moderate to high potential risks to life and property from flooding and debris torrents exist elsewhere downstream of the Piute Fire, but the assessment of sites that were not affected by the fire is beyond the scope of this evaluation.

Off-site locations along Erskine Creek and Thompson Creek that are in flood zones designated by FEMA are now at a higher risk to flooding because of the fire. Because much of the steeper watercourse channels in the upper watersheds of Erskine Creek and Thompson Creek appear to have been scoured down to bedrock from the July thunderstorm events, runoff velocity in the scoured channels will be significantly higher than pre-July thunderstorm condition. Additional debris torrents involving mobilization or entrainment of in-channel cobbles and boulders are unlikely to be as substantial as those that occurred during July 2008. However, debris torrents in channels that have not been recently scoured will remain at risk.

VII. General Recommendations

A. County Roads

Piute Mountain Road

The extensive areas of the berm along the outside edge of the road should be removed and/or breached at 50 to 100-foot segments to reduce the potential for concentrated runoff. The excavated areas adjacent to inlets of ditch relief culverts should be stabilized to minimize the risk of culvert blockage, runoff diversion, and erosion. Reducing the gradients of the excavated slopes above the culvert inlet along with rock armoring of the excavation is considered an appropriate mitigation. Culverts at watercourse crossings should be removed and replaced as rocked fords where feasible. At a minimum, critical dips should be constructed just down gradient from the crossing to prevent diverted runoff caused by blocked culverts from flowing down the road and causing erosion and possible washouts. The critical dip is intended to re-direct stream flow back into the channel and not allow diversion down the road. Warning signs, such as ‘Warning Potential Flood Hazard’ should also be placed adjacent to all watercourse crossings.

Erskine Creek Road

All crossings with culverts should be removed and replaced with rocked ford crossings or concrete low water crossings (locally referred to as Arizona crossings). Warning signs,

such as 'Warning Potential Flood Hazard' should also be placed adjacent to all watercourse crossings.

Thompson Canyon Road and Adjacent Roads

All crossings with culverts should be removed and replaced with rocked ford crossings or concrete low water crossings (locally referred to as Arizona crossings). Warning signs, such as 'Warning Potential Flood Hazard' should also be placed adjacent to all watercourse crossings.

B. Downstream Impacts (flooding, sedimentation, debris flow)

Community of Lake Isabella

All residents living on the alluvial fan of Erskine Creek should be notified of the increased risk of flash floods and debris torrents flowing within existing channels, creating new channels, and flowing across areas of the fan that had not been recently adversely impacted by previous historical floods. The FEMA (2008) Flood Insurance Rate Map, effective date of September 26, 2008, might have been prepared after the July thunderstorm events. Therefore the FEMA flood maps would be useful in determining the minimum area where residents should be notified and where temporary warning signs should be posted. The warning signs, such as "warning potential flood hazard" should be posted at the perimeter of the July flooding or at the perimeter of the 100-year flood zone identified in the FEMA map, whichever is greater.

Emergency response plans, including early warning systems and evacuation plans, should be developed by responsible agencies. Real time monitoring of rainfall within the burned area in the Piute Mountains could serve as an early warning system to determine when to implement the evacuation plan.

C. Areas Not Assessed

Assessment of all properties within and downslope of the burn area is beyond the scope of this review. Emergency response agencies and/or community groups should visit any properties not included in this report in an effort to provide further assessment and advise those property owners.

VIII. Specific Recommendations

Jeanette Grant Mine Tailings

We recommend that the USFS is contacted and provided copies of this report and the Water Quality and Hydrology SEAT reports. The recommended mitigation of installing filter fabric and wattles is considered ineffective in preventing further erosion of the tailing pile. We recommend that the USFS re-evaluate this location and propose

alternative or additional mitigations to minimize the risk of erosion from the mine tailings and potential contamination to drinking water supplies to residents in the upper portions of Erskine Creek road and the Community of Lake Isabella.

Community of Lake Isabella

Site-specific recommendations are not provided. Please refer to the General Recommendation section above.

County Roads within Erskine Creek and Thompson Creek Watersheds

Site-specific recommendations are not provided. Please refer to the General Recommendation section above.

Piute Mountain Road

Site-specific recommendations are not provided. Please refer to the General Recommendation section above.

IX. References

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APPENDIX B: Hydrology/Water Quality Technical Specialist Report

DRAFT TECHNICAL SPECIALIST'S REPORT

STATE EMERGENCY ASSESSMENT TEAM (SEAT) Emergency Report

Fire Name: Piute Fire CA-SQF-001356 **Month/Year** October 2008

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I. Potential Values at Risk

The values at risk identified in this assessment are the possible loss of life and property that may occur due to future storm events. Additionally, roads, culverts, and water supply may also be at risk due to increased flow in the creeks and potential clogging of culverts drainage structures by debris.

II. Resource Condition Assessment

A. Resource Setting

The 37,026-acre Piute Fire started on June 28, 2008 and was contained on July 24, 2008. A series of thunderstorms occurred before initial BAER surveys were completed and revealed the consequences of the Piute fire burn. Flood damage was observed throughout the Piute Mountain region. The region consists of mild to very steep slopes with annual rainfall variability averaging 10 inches per year in the community of Lake Isabella and approximately 20 to 25 inches of rainfall in the Piute Mountain region.

Initial concerns for hydrology within the Piute Fire are as follows:

- Increased erosion along the road systems
- Potential threat to water quality
- Increased water yield within all affected watersheds

Figure 1 presents the hydrologic boundaries within the region.

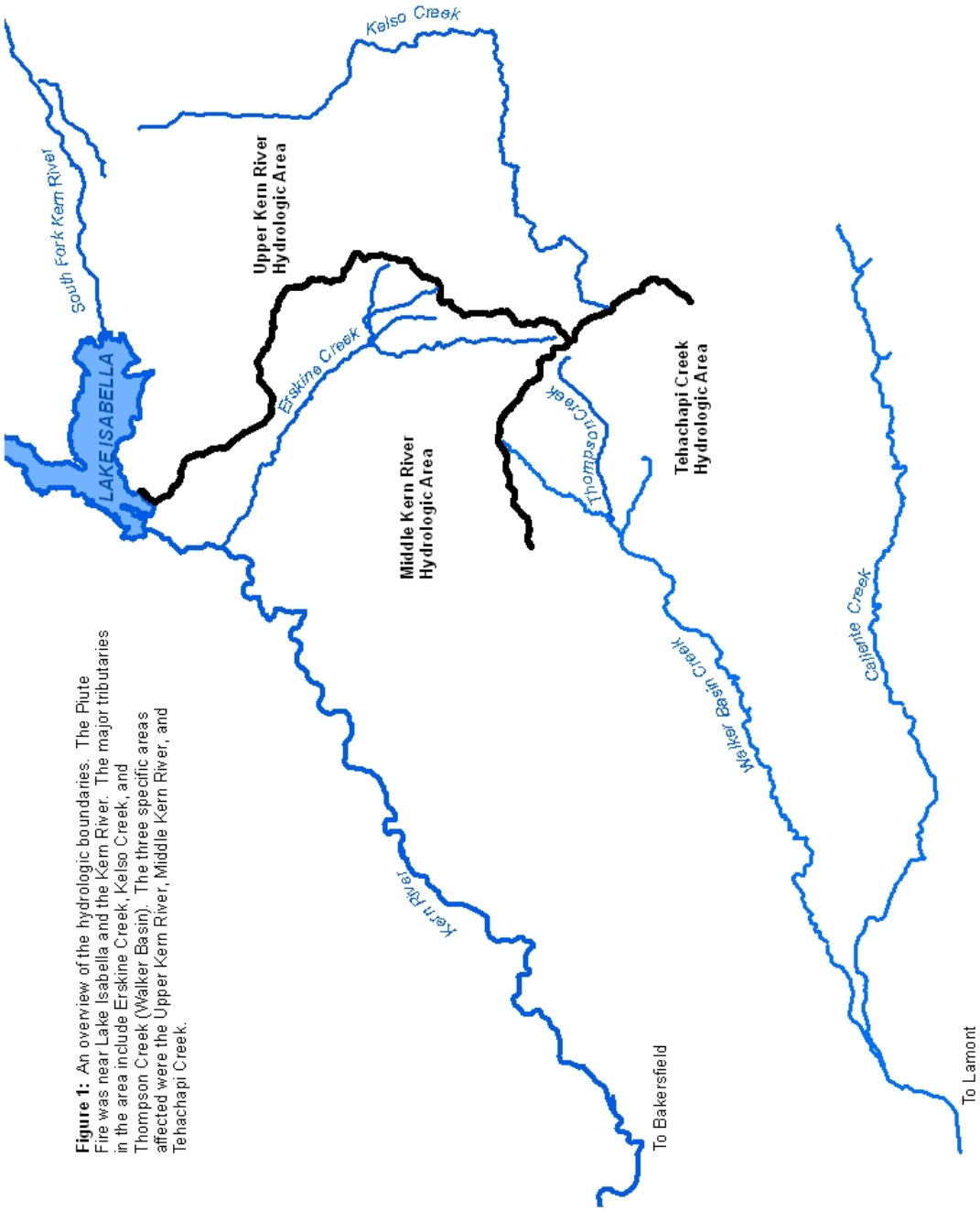


Figure 1: An overview of the hydrologic boundaries. The Piute Fire was near Lake Isabella and the Kern River. The major tributaries in the area include Erskine Creek, Kelso Creek, and Thompson Creek (Walker Basin). The three specific areas affected were the Upper Kern River, Middle Kern River, and Tehachapi Creek.

The burn area impacted 14 hydrologic areas within the region. Figure 2 (next page) presents the extent of the Piute Fire and the three hydrologic areas affected.

The fourteen planning watersheds within the Piute Fire are tributary to the Kern River, west side streams, and valley floor waters. The Middle Kern River Hydrologic Area is below Lake Isabella (No. 554.10) and the Upper Kern River Hydrologic Area is above Lake Isabella (No. 554.22). The Tehachapi Creek Hydrologic Area starts as a west side stream and continues to valley floor waters. The Water Quality Control Plan for the Tulare Lake Basin, Second Edition, Revised January 2004 describes and designates beneficial uses. The reach of the Kern River below Southern California Edison Kern River Powerhouse No. 1 (KR-1) is below the affected watersheds.

The Bodfish Canyon, Upper Clear Creek, Haight Canyon, Willow Gulch, and Bear Trap Canyon planning watersheds are within the Middle Kern River Hydrologic Area (No. 554.10). The main tributary to the Kern River is Erskine Creek. The beneficial uses designated for the Kern River below Lake Isabella are as follows: hydropower generation (POW); water contact recreation, including canoeing and rafting (REC-1); non-contact water recreation, including aesthetic enjoyment (REC-2); warm freshwater habitat (WARM); cold freshwater habitat (COLD); wildlife habitat (WILD); and rare, threatened, or endangered (RARE).

The Dry Canyon, Dry Meadow Creek, Cortez Canyon, Bright Star Canyon, Burning Moscow Spring, and Landers Creek are within the Upper Kern River Hydrologic Area (No. 554.22). The main tributary to the Kern River is Kelso Creek. The beneficial uses designated for the Kern River above Lake Isabella are as follows: municipal and domestic supply (MUN); hydropower generation (POW); water contact recreation, including canoeing and rafting (REC-1); non-contact water recreation, including aesthetic enjoyment (REC-2); warm freshwater habitat (WARM); cold freshwater habitat (COLD); wildlife habitat (WILD); rare, threatened, or endangered (RARE), spawning, reproduction, and/or early development (SPWN); and freshwater replenishment (FRSH).

The North Fork Walker Basin Creek, Thompson Creek, and Loco Canyon planning watersheds are within Tehachapi Creek Hydrologic Area (No. 556.10). The planning watersheds flow to Walker Basin Creek, which merges into Caliente Creek. Water flows from Caliente Creek and terminates near Lamont (approximately 30 miles downstream of Piute Peak). The beneficial uses of West Side Streams and Valley Floor Waters are as follows: agricultural supply (AGR); industrial service supply (IND); industrial process supply (PRO); water contact recreation (REC-1); and non-contact water recreation (REC-2); warm freshwater habitat (WARM); wildlife habitat (WILD); rare, threatened, or endangered (RARE); ground water recharge (GWR).

The beneficial uses of the Kern River below KR-1 are as follows: municipal and domestic supply (MUN); agricultural supply (AGR), industrial service supply (IND), industrial process supply (PRO), hydropower generation (POW); water contact recreation (REC-1); and non-contact water recreation (REC-2); warm freshwater habitat (WARM); wildlife habitat (WILD); rare, threatened, or endangered (RARE); ground water recharge (GWR).

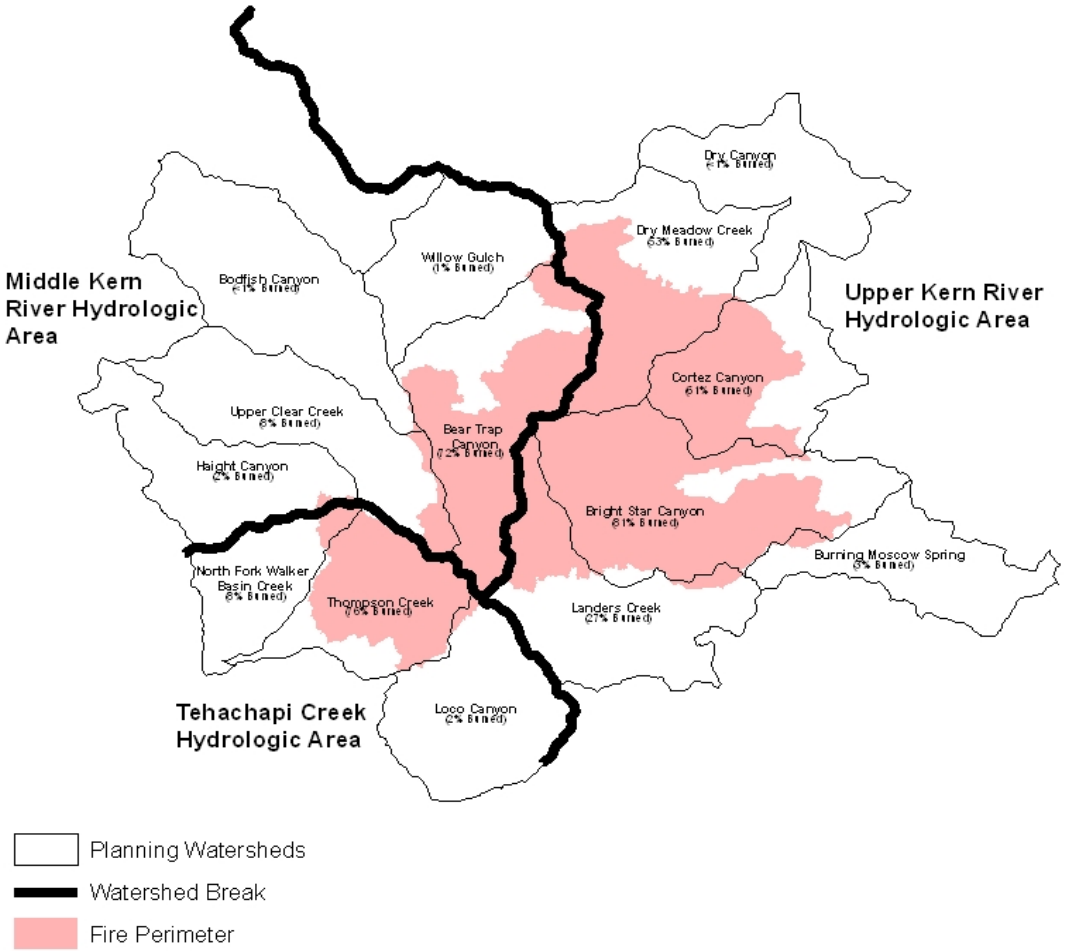


Figure 2: The Piute Fire was within 3 Hydrologic Areas: Upper Kern River, Middle Kern River, and Tehachapi Creek (CALWATER 2.2). The fire burned more than 50% of 5 planning watersheds: Thompson Creek, Bear Trap, Dry Meadow Creek, Cortez Canyon and Bright Star Canyon. The figure shows planning watersheds in relation to the fire perimeter with percent burned

Listed below are the three Hydrologic areas affected by the fire and the associated burned areas for each planning watershed.

Middle Kern River Hydrologic Area

Planning Watershed	CALWATER 2.2	In Burn Perimeter (acres)	Watershed (acres)	% Burned
Bodfish Canyon	554.100201	29	10601	0%
Haight Canyon	554.100301	116	6719	2%
Upper Clear Creek	554.100304	723	8931	8%
Willow Gulch	554.100101	58	6562	1%
Bear Trap Canyon	554.100103	7528	10506	72%

Upper Kern River Hydrologic Area

Planning Watershed	CALWATER 2.2	In Burn Perimeter (acres)	Watershed (acres)	% Burned
Burning Moscow Spring	554.220402	183	6146	3%
Landers Creek	554.220407	2521	9388	27%
Cortez Canyon	554.220405	4616	7536	61%
Bright Star Canyon	554.220401	10564	13011	81%
Dry Canyon	554.220507	11	7260	0%
Dry Meadow Creek	554.220501	5210	9818	53%

Tehachapi Creek Hydrologic Area

Planning Watershed	CALWATER 2.2	In Burn Perimeter (acres)	Watershed (acres)	% Burned
Loco Canyon	556.100608	170	7915	2%
North Fork Walker Basin Creek	556.100603	362	4627	8%
Thompson Creek	556.100602	5061	6694	76%

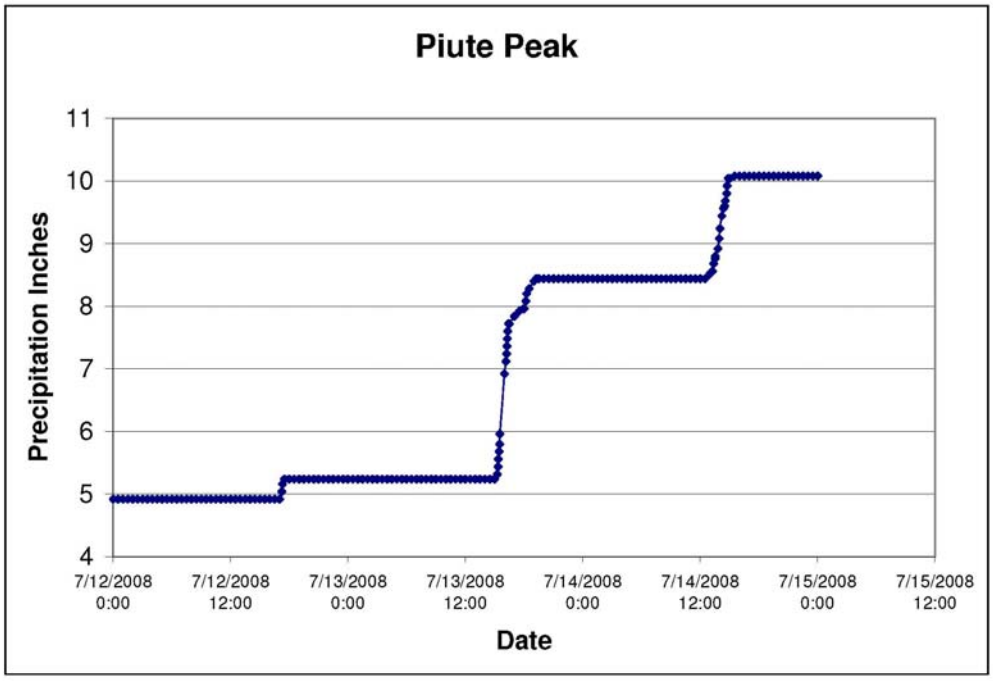
Precipitation and floods

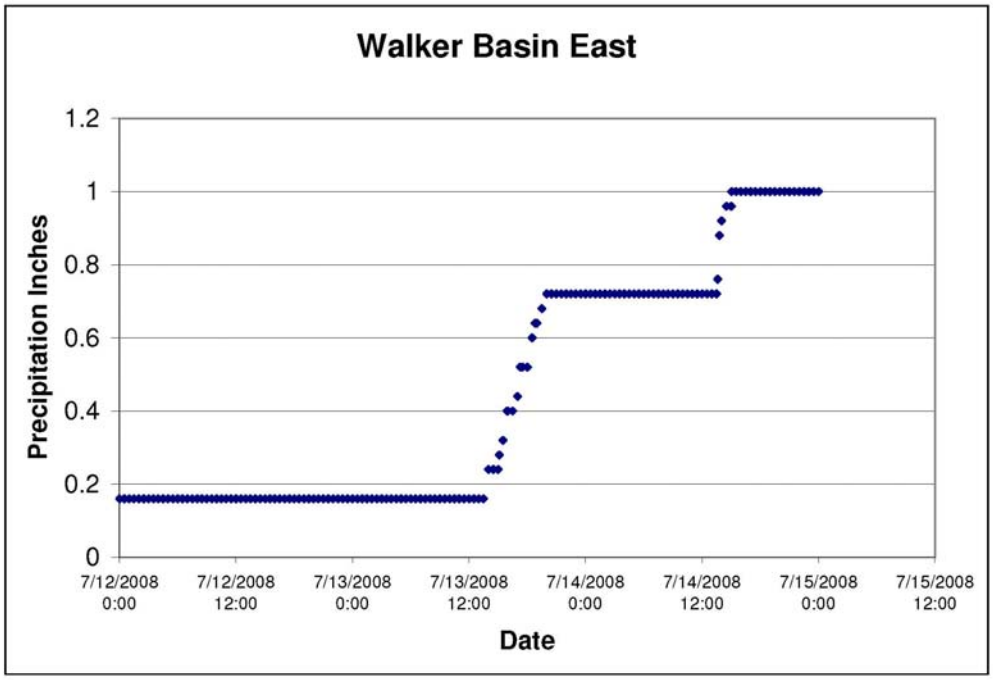
Elevations in the burned area range from approximately 4,000 feet above mean sea level to over 8,000 feet. Taking into account the orographic features of the Piute Fire area, examining nearby precipitation gages that have historic data, and examining the United States Geological Service California Average Annual Rainfall map, the annual average rainfall for the Lake Isabella area is approximately 10.5 inches while the mountain regions of Piute Peak receive approximately 25 to 30 inches annually.

Rainfall that occurred in July 2008 produced some of the largest flood flows that many of the local residents had ever witnessed. Significant floods occurred on July 12-14, 2008 and affected Erskine Creek, Thompson Creek, Kelso Creek, and the Kern River. Flow records on all of the Creeks are not known due to the lack of flow recording stations.

Flow into the Kern River from Erskine Creek was reported to be 1,500 cubic feet per second (cfs) during the July rain event but can not be confirmed.

Data from two tipping stations in the Piute Mountain region were used to evaluate the significance of the July rain event. The two precipitation stations were Piute Peak (PPK) at an elevation of 6,650 feet and Walker Basin East (WBE) at an elevation of 4,220 feet. The graphs below present the three rainfall events that took place between July 12, 2008 and July 14, 2008. As can be seen in the graphs, all three events were significant however the second day (13th of July) was the most significant. According to the collected data at PPK, 3.2 inches of precipitation fell within 4 hours 14 minutes. The precipitation event started at 3:00 p.m. and ended at 7:14 p.m. According to the BAER report, the Piute Mountains experienced a 25 year rainfall event in two hours. Even though the rainfall event that was experienced was 25 year return storm, the actual flood event may have been one that is only experienced every one or two centuries (SEAT report – Geology). This assumption is based on the visual geology that was left behind after significant erosion that took place in Thompson Creek.





Peak Flow Analyses

Research in Southern California indicates that post-fire peak flows can produce as much as 10 to 30 fold increases for low magnitude storms and 2 to 3 fold increases for larger magnitude storms (Rowe, et al. 1949, 1954). Post-fire flows were estimated based on the following assumptions recently used by USFS hydrologists for the Angora Fire in the Lake Tahoe Basin in 2007 (USFS 2007): Burned areas that have a high runoff response rating as a result of the fire (i.e. forested environments with high burn severity) will experience 5-fold increase in the Q2 (or a flood with a recurrence interval of 2 years), a 3-fold increase in the Q5, and a 2-fold increase on the Q10.

Burned areas that have a moderate runoff response rating as a result of the fire (i.e. forested environments with moderate burn severity) will experience 2.5-fold increase in the Q2, a 1.75-fold increase in the Q5, and a no increase on the Q10. Areas of low burn severity, rock, and unburned have a low runoff response and it is assumed for these calculations that they will not experience increases in post-fire runoff. It is assumed that runoff response classes are evenly distributed throughout the watershed. Also, there is no channel routing or sediment bulking factor used in this analysis.
Table Hydrology - 1 shows the acreage burned, acres on the whole watershed, unburned acres, acres of low severity burn, acres of moderate severity burn, and acres of high severity burn. These numbers were used to calculate the values in Table Hydrology- 2.

Table Hydrology- 2 calculates the percent of pre-fire peak flow we are likely to see for each watershed during the first winter for the following sizes of storms: a two-year return-interval storm (Q2), a five-year return interval storm (Q5), and a ten-year interval

storm (Q10). For example, a Q2 flow in the Bear Trap planning watershed is expected to be 160% larger in the post-fire condition as in the pre-fire condition (100%).

Table Hydrology - 2 shows how the longer the return interval (or in other words the larger the size of the storm), the smaller the effect of the fire on increasing the peak flow resulting from that storm.

Table Hydrology – 1: Acres of watershed burned and acres of severity.

Middle Kern River Hydrologic Area

Planning Watershed	In Burn Perimeter	Watershed	UNBURNED	LOW	MODERATE	HIGH
Bodfish Canyon	29	10601	0	11	18	0
Haight Canyon	116	6719	42	48	25	0
Upper Clear Creek	723	8931	64	412	243	2
Willow Gulch	58	6562	37	21	1	0
Bear Trap Canyon	7528	10506	1262	2822	2934	484

Upper Kern River Hydrologic Area

Planning Watershed	In Burn Perimeter	Watershed	UNBURNED	LOW	MODERATE	HIGH
Burning Moscow Spring	183	6146	147	35	0	0
Landers Creek	2521	9388	186	1058	1080	188
Cortez Canyon	4616	7536	2017	1940	636	5
Bright Star Canyon	10564	13011	2981	5267	2203	74
Dry Canyon	11	7260	0	11	0	0
Dry Meadow Creek	5210	9818	740	2133	1922	398

Tehachapi Creek Hydrologic Area

Planning Watershed	In Burn Perimeter	Watershed	UNBURNED	LOW	MODERATE	HIGH
Loco Canyon	170	7915	26	73	63	7
North Fork Walker Basin Creek	362	4627	49	109	158	45
Thompson Creek	5061	6694	1300	1698	1823	222

Table Hydrology – 2: Predicted 1st year post-fire peak flow percent changes for 2, 5, and 10 year events.

Middle Kern River Hydrologic Area

Planning Watershed	Peak Flow 2nd Year	Peak Flow 5th Year	Peak Flow 10th Year
Bodfish Canyon	100%	100%	100%
Haight Canyon	101%	100%	100%
Upper Clear Creek	104%	102%	100%
Willow Gulch	100%	100%	100%
Bear Trap Canyon	160%	130%	105%

Upper Kern River Hydrologic Area

Planning Watershed	Peak Flow 2nd Year	Peak Flow 5th Year	Peak Flow 10th Year
Burning Moscow Spring	100%	100%	100%
Landers Creek	125%	113%	102%
Cortez Canyon	113%	106%	100%
Bright Star Canyon	128%	114%	101%
Dry Canyon	100%	100%	100%
Dry Meadow Creek	146%	123%	104%

Tehachapi Creek Hydrologic Area

Planning Watershed	Peak Flow 2nd Year	Peak Flow 5th Year	Peak Flow 10th Year
Loco Canyon	102%	101%	100%
North Fork Walker Basin Creek	109%	105%	101%
Thompson Creek	154%	127%	103%

B. Survey Method

To begin to identify the values at risk, reconnaissance was conducted from September 30, 2008 through October 8, 2008. Our field investigations focused on areas identified by flood damage that occurred during the July 2008 rainfall event, knowledge of people familiar with the relative areas in question, and information along with specialized maps that were developed. Areas of particular concern included inhabited areas along Erskine Creek, Thompson Creek, and Kelso Creek. Additionally, we evaluated both public and private access roads throughout the burn area paying particular attention to culverts and other road drainage features.

Access was by four-wheel drive vehicle, foot, and helicopter. Visual observations were recorded in field notebooks. Slopes were measured with a clinometer (Geologist). Distances were measured with vehicle odometer, hip chain, or by pacing. Culvert sizes were measured with a measuring tape. Simple soil hydrophobicity tests were made by pouring water from a bottle and timed with a watch. GPS was used to take waypoints and digital camera for pictures. Two way radios were utilized to communicate in the field.

We used historical information from local residents, the County of Kern personnel, and various websites. We also conducted phone interviews, including Cal Water Service, Erskine Creek Water Co., California Department of Public Health, Kern County Public Health, Bureau Land Management, Regional Water Quality Control Board, and United States Forest Service.

Waypoints were taken at the following field site visits:

- Piute Mountain Road (WP No. 90 to WP No. 98)

- Erskine Creek evaluation of crossings (WP No. 99 to WP No. 120)
- Helicopter Reconnaissance (WP No. 121 to WP No. 134)
- Thompson Creek – Tehachapi Creek (WP No. 135 to WP No. 142)
- Inspiration Pt./Walker Basin/Lamont (WP No. 144 to WP No. 146)
- Confluence of Walker Basin Creek/Caliente Creek (WP No. 147 to WP No. 152)
- Milt's house – Thompson Creek (WP No. 153 and WP MltDvs)
- Hiked Thompson Creek/Hydrophobic soils (WP No. 154 to WP No. 161)
- Headwaters of Erskine Creek (WP No. 162, WP LblRnc, WP Trlrs)
- Janette Mine (WP No. 164 to WP No. 165 and WP BRGHTS)

Attachment A presents a waypoint table that includes: Waypoint number, Comment, Latitude, Longitude, Date, Time, and Map Reference.

III. Findings of the On-The-Ground Survey (Observations)

A. Identify Values at Risk

The type of burn severity at the Piute Fire ranges from low to high. Of the 37,026-acre burn perimeter; 4% has high severity, 30% has moderate severity, 42% has low severity, and 24% of the burn perimeter was unburned. Debris flows from the July 2008 storm event extended into Lake Isabella from Erskine Creek and into the Walker Basin from Thompson Creek. However, the Piute Fire is not solely responsible for this event. Outside the Piute Fire boundary flooding and debris flows also occurred suggesting the fire only contributed to the debris flows. A significant amount of stream bed and road erosion was observed along Erskine Creek, Thompson Creek, and over Piute Mountain Road. Many access roads were repaired by public and private entities by the time the Piute SEAT team was deployed. New growth was common in the low to medium burn severity areas while very little new growth was noted in the high burn areas above Thompson Creek and Inspiration Point.

As SEAT began its fieldwork, the principal post-Piute Fire hydrologic concerns were:

- Potential effects of burned-area runoff on downstream water quality, including the Kern River and local water supplies.
- Potential effects of burned-area runoff keeping the roads along Erskine Creek, Thompson Creek, and Piute Mountain open and serviceable.
- Potential effects of flash flooding, in-channel flooding, hyper-concentration of slope runoff, debris torrents, and debris flows, which have the potential to put either life or property at risk.

These concerns were evaluated to indentify values-at-risk resulting from wildfire-caused hydrologic changes. The potential changes may include increased storm runoff, increased erosion, increased streamflows and peakflows during storms, and increased turbidity and sediment transport.

Areas with the high soil burn severity produce the greatest changes. High soil burn severity maps as mapped by the BLM within the Piute Fire area exhibit hydrophobicity, a condition of water repellency created by the extreme heat of the fire essentially cooks the soil and volatizes the organic matter. Areas with moderate soil burn severity produce much less change. Areas with low soil burn severity moderate soil burn severity produce very little change and unburned areas produce no change. The effects are most severe during the first storm event which took place in July 2008.

B. Describe Conditions of Values at Risk

Water Quality

Kern River

There was concern expressed about the potential effects of sediment-ladened burned-area runoff on the Kern River. Two downstream surface water treatment plants utilize the Kern River as a source of supply for drinking water needs for the community of Bakersfield and its surrounding communities. The two treatment plants are operated independently by Cal Water Service and the Kern County Water Agency. Both agencies may want to take precautionary actions prior to the high turbidity water reaching the intakes of the plants. During the July flood event these two water treatment plants had to shut down due to the high turbidity water fouling the plants. There is likely to be a continued impact on water quality in this system, particularly during the first rainstorms of 2008-09. Depending on the intensity of these first storms over the burned area there may be noticeable increase in stormwater turbidity and bedload loads particularly in Erskine Creek which discharges directly into the Kern River.

The hydrologic effect of the burned area is expected to diminish rapidly over the first five years following the fire and with nearly full recovery in about seven years. Studies within the Kern River watershed during the McNally Fire, 2002, discovered high severity burn areas had a 5 to 7 year recovery and lower degrees of burn severity were sooner (Kaplan-Henry, 2007). The recovery rate is only accounting for increased runoff as a result of the Piute Fire. Agricultural water supplies are not likely to be impacted from direct discharge into the Kern River.

Erskine Creek Water Company

The potential for the burned area to affect Lake Isabella's water supply was briefly investigated. The Erskine Creek Water Company (Water Company) serves water to 238 customers in a mobile home development near Erskine Creek and Lake Isabella Blvd. The water company also supplies water for the downtown Lake Isabella. The

source of drinking water is groundwater from two wells that are located in the Erskine Creek stream channel approximately ½ mile upstream of the discharge point into the Kern River. Although there is evidence of debris flow, a representative from the Water Company indicated that no damage was done to the wells. However, there was evidence of debris buildup around the storage tank and booster pump facilities that supply drinking water to downtown Lake Isabella. Even though there was debris built up, the system was never disrupted. The area around the booster pump station has been cleaned up since the flood event.

Waste Water Treatment Plant

A small wastewater treatment plant is located near Erskine Creek Water Company. The wastewater treatment plant (WWTP) serves a small mobile home park across the street. The WWTP did not appear to have debris within its property boundaries. The WWTP has waste discharge requirements that were issued by the Regional Water Quality Control Board in 1984.

Access Roads

Generally, roads and culverts within the burn perimeter were not directly impacted by the fire. The damage occurred as a result of the July flood event and has been repaired since that time.

Erskine Creek Road

Field surveys along Erskine Creek Road revealed at least nineteen watercoarse crossings. This road is maintained by the County of Kern up to Liebel Ranch. The road terminates at the convergence of the Eastern, Middle, and South Fork tributaries above Liebel Ranch. The road crossings consist of concrete apron fords, culverts, "Arizona Crossings," also known as vented fords. During high flows steam water will flow over the top of the crossing but still leaving the crossing intact when water recedes. During low flow water passes through the culvert.

At Waypoint No. 99 (low water crossing at Erskine Creek Road), flood waters reached an approximate height of twenty feet. This was evident by mud marks on trees and creek sidewalls. Significant erosion has occurred throughout this watershed.

Thompson Canyon Road

Field surveys along Thompson Canyon Road revealed that access roads and crossings were severely damaged. For example, what was once a meadow crossing is now a 465 foot wide boulder field that extends approximately 150 to 200 yards in length. This road is a private road maintained by the County of Kern. The County put a temporary culvert in place (which was not designed for 100 year flow event), the culvert is beginning to fill with sediment on the upstream side. The upstream side is not tapered to streambed, the abrupt change could cause down cutting of the stream and sediment plugging of the culvert. The downstream side of the culvert had steep

slopes and was cutting a deepened channel. A readily available source of gravel, cobbles, and boulders can be used on site to construct a rocked ford. A rocked ford would require less maintenance than a culvert crossing. The remote access and constant maintenance requirement may warrant the installation of a rocked ford instead of a culvert crossing.

The culvert crossing on Seco Road (Waypoint No. 135) was washed out from the July flood event. The installation of a new "Arizona" crossing is underway. A trash rack consisting of four 3-inch pipes should mitigate debris flow and the four culverts should allow passage of water and protect the road base. The concrete apron is protected by cemented boulders on both the upstream and downstream side of the road. The replacement is a much needed improvement of the previous watercourse crossing.

Piute Mountain Road

Field surveys revealed that most drainage crossings on the east side of Piute Mountain consist of culverts. The west side of Piute Mountain Road consists primarily of downstream "punch-outs" on a regular interval to allow for drainage along the road rather than culverts. The damage along the road was not as severe as Erskine Creek or Thompson Creek road ways. The repair of the upstream side of several culverts consists of deep hole rather than tapered slopes. The deep hole could be for the placement of a corrugated metal riser. The Piute Mountain Road will require vigilant maintenance to remain open.

Tributary Concerns

Erskine Creek, Thompson Creek, and Kelso Creek

The planning watersheds containing Erskine Creek (Bear Trap Canyon), Thompson Creek (Thompson Creek) and Kelso Creek (Bright Star Canyon and Cortez Canyon) are at risk for future flash flooding, in-channel flooding, hyper-concentration of slope runoff, debris torrents, and debris flows. This damage could have the potential to put either life or property at risk.

IV. Emergency Determination

The road system within the Piute Fire consisting of the Piute Mountain Road, Erskine Creek Road and roads within the Thompson Creek drainage. These roads need overside drains, culverts functioning, rocked fords, vented fords and improvements on watercourse crossings. Non-functioning culverts can create further resource damage by not allowing water to flow down the hillside. The water and debris could clog and back up on the upstream side of the culvert. The water could flow over the road and erode back towards the upstream side of the culvert. This can create gullies and rills increasing resource damage within the watershed. Functioning overside drains will remove water from the road and help prevent the runoff from concentrating along the road. The increased erosion in the form of rilling or gullying can create both short term and long term

resource damage. It will also allow for sediment to accumulate and be transported down a gully into a channel.

The uncontrolled runoff and debris flows which were witnessed in mid July are typical of seasonal rainfall in the area. High intensity short duration rainfall events cause runoff and debris flows. The fire exasperated the runoff causing fine sediment to be transported as much as 30 miles away. The transport of sediment can have an adverse affect on water filtration systems and alternate water supply should be evaluated.

V. Treatments

Public awareness is crucial in preventing loss of life or destruction of property due to flooding, hyperconcentrated flows or debris torrents that can be caused by the aftermath from the Piute Fire. Initially county, city, and community organizations need to be identified. In return these entities should notify the potentially effected public of the life threatening values at risk as stated above. Items listed below are some suggested ways that local officials can inform the public that the dangers from the fire are not over.

- Prior to the first typically expected rain event, notify residents in the life threatening areas that are designated in this report (i.e. Erskine Creek, Thompson Creek).
- Prior to the first typically expected rain, post warning notices in public places about the flood hazards and possible drinking water contamination.
- Mail warning/notification letters to residents in the FEMA determined flood zones affected by Erskine and Thompson creeks, as well as areas along these creeks that have not yet been determined by FEMA.
- Post temporary warning signs, such as, “Warning Potential Flood Hazard” on Lake Isabella Blvd. where Erskine Creek crosses during rainfall events.

Local governments are strongly encouraged to develop an evacuation plan, if one is not already in place, for residents that may be stranded due to a possible road failure, or where residents’ driveways may be washed out. Although it is recommended that a precipitation gage be installed in the upper watersheds of Erskine Creek and Thompson Creek be used to evaluate a rainfall threshold value that can cause land slides and subsequent debris torrents that would aid appropriate officials to quickly execute an evacuation plan. This study should be performed by a licensed professional civil engineer who specializes in soil mechanics and hydrology.

Prior to the first typically expected rainfall, all culverts should be inspected, cleaned, and “trash racks” installed where notable debris exists. These areas are displayed on Figures in Attachment A.

VI. Discussion/Recommendations

The Piute Fire began June 28, 2008 and was contained July 24, 2008. The fire burned a total of 37,026 acres within 14 hydrologic areas. Five of the 14 hydrologic areas were burned more than 50%. A series of thunderstorms equivalent to the 25 year storm event

(BAER July 2008) occurred during the end of the fire suppression activities and revealed the consequences of the Piute fire burn. Flood damage was observed throughout the Piute Mountain region with major erosion and debris flow taking place along Erskin Creek, Thompson Creek, and Kelso Creek. There are approximately 22 miles of perennial streams directly affected by the Piute Fire and approximately 130 miles of intermittent streams that have been directly affected by the Piute Fire (BAER July 2008).

For the 2009-2010 rain season, higher than normal flows should be expected. Although higher flows will occur due to increased runoff from burn areas, most of the flood damage has already occurred. Water courses have been altered and the channel carrying capacity of the tributaries has greatly increased. Therefore, it is anticipated that excessive erosion within the existing stream beds is not likely to occur. The hydrologic effect of the burned area is expected to diminish over 5 to 7 years. Studies within the Kern River watershed during the McNally Fire, 2002, discovered high severity burn areas had a five to seven year recovery (Kaplan-Henry, 2007). The recovery rate is only accounting for increased runoff as a result of the Piute Fire.

Higher than normal flows within Kelso Creek, Thompson Creek, and Erskine Creek may impact property at the base of the hydrologic areas. Residents within this region should be aware that during a mountain rain event, the possibility of flash floods may be more likely due to reduced vegetation from the Piute Fire and increased scouring within the stream channel. Emergency evacuation plans should be implemented for the community of Lake Isabella during significant rainfall events. Emergency evacuation plans should be implemented for the community of Lake Isabella during significant rainfall events.

It should be noted that ash produced as a result of the fire will be suspended in the storm water runoff and downstream turbidity may increase. Two downstream surface water treatment plants utilize the Kern River as a source of capacity. The two treatment plants are operated by Cal Water Service and the Kern County Water Agency. Both agencies may want to take precautionary actions prior to the high turbidity water reaching the intakes of the plants.

All county, private, state roads, and trails should be safely monitored during and after future rain events. Of particular importance, are access roads that are maintained by the US Forest Service and the County of Kern. The SEAT team observed culvert road crossings that appeared to be inadequately cleared and constructed to be able to handle future rain events. Specific locations have been previously noted in this report.

VII. References

California Department of Public Health
Jose Robledo
Associate Sanitary Engineer
265 W. Bullard Ave., Suite 101
Fresno, CA 93704

California Department of Water Resources
California Data Exchange Center
http://cdec.water.ca.gov/

County of Kern
Andrew Richter
Engineering Manager Maintenance
2700 M Street, Suite 400
Bakersfield, CA 93301

DWR Rainfall Duration Frequency
ftp://ftp.water.ca.gov/users/dfmhydro/

Erskine Creek Water Company
Company Reference
(760) 379-8309

Kaplan-Henry, Terry. 2007. "McNally Postfire Discharge and the Relationship of Sierra Nevada-Wide Flood Frequency Curves and Local Kern River Discharge Curves." In *Advancing the Fundamental Sciences. Proceedings of the Forest Service National Earth Sciences Conference, Sand Diego, CA, 18 – 22 October 2004*. Ed. Furniss, Michael J., Catherine F., Ronnenberg, Kathryn L., 2007. U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, PNW-GTR-689 Volume 1.

Keith Miller
Personal Reference
Erskine Creek Area

Milton Davis
Personal Communication
Thompson Creek Area

Regional Water Quality Control Board, Central Valley Region
Jill Walsh
Sanitary Engineer
1685 E Street
Fresno, CA 93706

Second Edition of the Water Quality Control Plan for the Tulare Lake Basin
http://www.waterboards.ca.gov.centralvalley/water_issues/basin_plans/tlbp.pdf

United States Geological Society
Geography, Geology, Hazards and Natural History Information
http://water.usgs.gov/waterwatch/?m=flood&r=ca&w=map

United States Geological Society
Water Watch
http://education.usgs.gov/california/maps/california_precipitation2.htm

Western Regional Climate Center
http://www.wrcc.fri.edu

Appendix C:

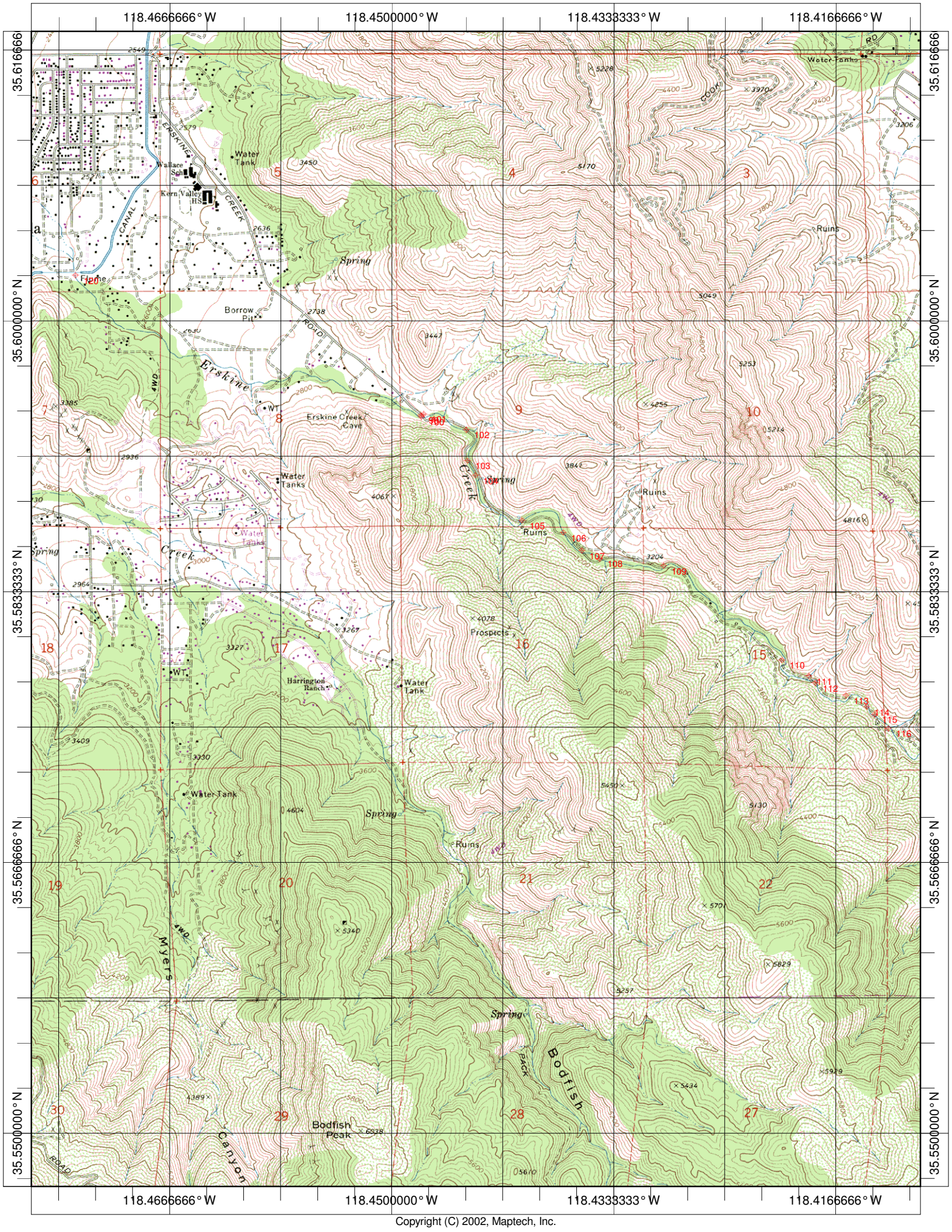
Attention

The following appendix and information is required to by law to be kept confidential and is not for public viewing:

Archaeology (Gov. Code 6254.10) & 14 CCR 969.1(a)(2))

Page 88 through page 103

Attachment A
Waypoints/Maps



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Markers

Name: 99

Short Name: 10/1/2008

Coordinates: 035.5941764° N, 118.4477111° W

Comment: Low water crossing on Erskine Creek

Name: 100

Short Name: 10/1/2008

Coordinates: 035.5940634° N, 118.4476771° W

Comment: Tree Mudd High Water Mark at WP 99

Name: 101

Short Name: 10/1/2008

Coordinates: 035.5942484° N, 118.4475261° W

Comment: Rockmud High Water Mark at WP 99

Name: 102

Short Name: 10/1/2008

Coordinates: 035.5932913° N, 118.4443422° W

Comment: Erskine Creek crossing No 3

Name: 103

Short Name: 10/1/2008

Coordinates: 035.5913893° N, 118.4442522° W

Comment: Erskine Creek crossing No 4

Name: 104

Short Name: 10/1/2008

Coordinates: 035.5904563° N, 118.4435922° W

Comment: Erskine Creek Crossdrain

Name: 105

Short Name: 10/1/2008

Coordinates: 035.5877122° N, 118.4401003° W

Comment: Erskine Creek crossing No 5

Name: 106

Short Name: 10/1/2008

Coordinates: 035.5869252° N, 118.4370085° W

Comment: Erskine Creek crossing No 6

Name: 107

Short Name: 10/1/2008

Coordinates: 035.5858412° N, 118.4356195° W

Comment: Erskine Creek crossing No 7

Name: 108

Short Name: 10/1/2008

Coordinates: 035.5853631° N, 118.4342866° W

Comment: Erskine Creek crossing No 8

Name: 109

Short Name: 10/1/2008

Coordinates: 035.5848871° N, 118.4294897° W
Comment: Erskine Creek crossing No 9
Name: 110
Short Name: 10/1/2008
Coordinates: 035.5790619° N, 118.4205980° W
Comment: Erskine Creek crossing No 10
Name: 111
Short Name: 10/1/2008
Coordinates: 035.5780609° N, 118.4185781° W
Comment: Erskine Creek crossing No 11
Name: 112
Short Name: 10/1/2008
Coordinates: 035.5776569° N, 118.4181101° W
Comment: Erskine Creek crossing No 12
Name: 113
Short Name: 10/1/2008
Coordinates: 035.5769099° N, 118.4158172° W
Comment: Erskine Creek crossing No 14
Name: 114
Short Name: 10/1/2008
Coordinates: 035.5761859° N, 118.4142393° W
Comment: Erskine Creek crossing No 15 Large Culvert
Name: 115
Short Name: 10/1/2008
Coordinates: 035.5757348° N, 118.4136723° W
Comment: Erskine Creek crossing No 16
Name: 116
Short Name: 10/1/2008
Coordinates: 035.5748618° N, 118.4126193° W
Comment: Erskine Creek crossing No 17
Name: 117
Short Name: 10/1/2008
Coordinates: 035.5725418° N, 118.4092534° W
Comment: Erskine Creek crossing No 18
Name: 118
Short Name: 10/1/2008
Coordinates: 035.5716357° N, 118.4078255° W
Comment: Erskine Creek crossing No 19
Name: 119
Short Name: 10/1/2008
Coordinates: 035.5704707° N, 118.4055766° W
Comment: Erskine Creek crossing No 20
Name: 120
Short Name: 10/1/2008
Coordinates: 035.6027817° N, 118.4736582° W

Comment: SCE Flume

Name: 122

Short Name: 10/2/2008

Coordinates: 035.5715347° N, 118.4055326° W

Comment: Helicopter WP 122

Name: 123

Short Name: 10/2/2008

Coordinates: 035.5531072° N, 118.3821085° W

Comment: Helicopter WP 123

Name: 124

Short Name: 10/2/2008

Coordinates: 035.5212667° N, 118.3821577° W

Comment: Helicopter WP 124

Name: 125

Short Name: 10/2/2008

Coordinates: 035.5147396° N, 118.3846147° W

Comment: Helicopter WP 125

Name: 126

Short Name: 10/2/2008

Coordinates: 035.5001612° N, 118.3745561° W

Comment: Helicopter WP 126

Name: 134

Short Name: 10/2/2008

Coordinates: 035.5046056° N, 118.4058831° W

Comment: Helicopter WP 134

Name: 162

Short Name: 10/6/2008

Coordinates: 035.5442781° N, 118.3785017° W

Comment: Erskine Creek Confluence of South, Middle and East

Name: LblRnc

Short Name: 10/6/2008

Coordinates: 035.5573164° N, 118.3902712° W

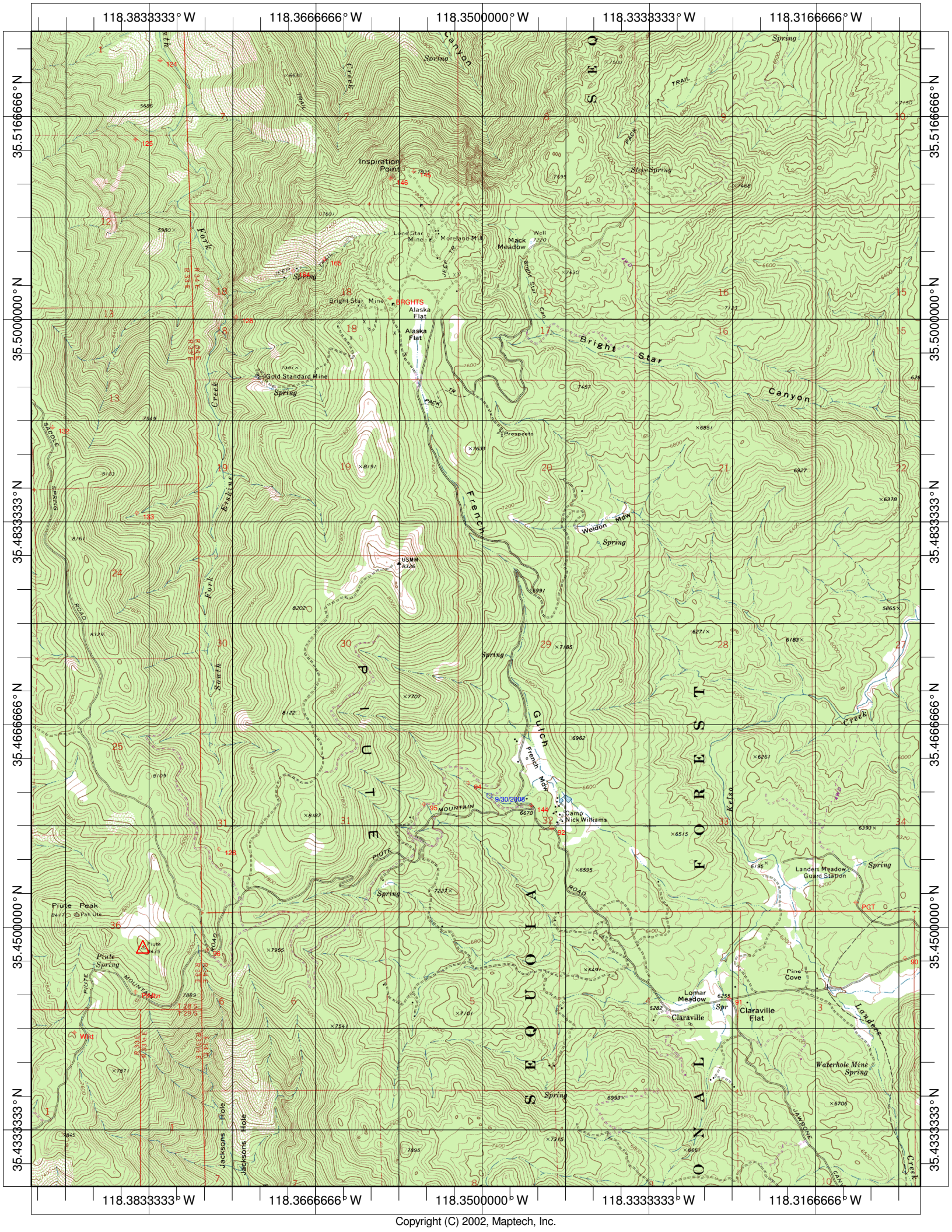
Comment: Liebel Ranch

Name: Trlrs

Short Name: 10/6/2008

Coordinates: 035.5437271° N, 118.3787966° W

Comment: Trailers



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  - Coordinates: 035.4580761° N, 118.3429670° W
  - Comment: Camp Nick Williams
- Name: 9/30/2008
  - Short Name: Culvert at French Meadow Gulch
  - Coordinates: 035.4608282° N, 118.3492337° W
  - Comment: ff
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  - Comment: Can Dump upstream of WP 93
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Short Name: 10/2/2008
Coordinates: 035.4354364° N, 118.4690515° W
Comment: Seco Road Low Water Crossing
Name: 136
Short Name: 10/2/2008
Coordinates: 035.4334235° N, 118.4818791° W
Comment: Thompson Creek
Name: 137
Short Name: 10/2/2008
Coordinates: 035.4308825° N, 118.4859359° W
Comment: Thompson Creek crossing
Name: 138
Short Name: 10/2/2008
Coordinates: 035.4374663° N, 118.4350207° W
Comment: Dual Culverts
Name: 139
Short Name: 10/2/2008
Coordinates: 035.4368152° N, 118.4324518° W
Comment: Thompson Creek Cross Section Right
Name: 140
Short Name: 10/2/2008
Coordinates: 035.4369082° N, 118.4323748° W
Comment: Thompson Creek Cross Section Left
Name: 141
Short Name: 10/2/2008
Coordinates: 035.4388533° N, 118.4414055° W
Comment: 465 foot Bolder Field
Name: 142
Short Name: 10/2/2008
Coordinates: 035.4398094° N, 118.4413445° W

Comment: Culvert near Bolder Field

Name: 153

Short Name: 10/4/2008

Coordinates: 035.4401094° N, 118.4461954° W

Comment: Milt Davis Stock Pond

Name: MltDvs

Short Name: 10/4/2008

Coordinates: 035.4387924° N, 118.4448974° W

Comment: Milt Davis Home

Name: 154

Short Name: 10/5/2008

Coordinates: 035.4362692° N, 118.4229291° W

Comment: Thompson Creek Flat Parking Spot

Name: 155

Short Name: 10/5/2008

Coordinates: 035.4367032° N, 118.4238541° W

Comment: Thompson Creek 1st Y

Name: 156

Short Name: 10/5/2008

Coordinates: 035.4382452° N, 118.4216542° W

Comment: Thompson Creek Debris Dam

Name: 157

Short Name: 10/5/2008

Coordinates: 035.4399032° N, 118.4199443° W

Comment: Thompson Creek 2nd Y

Name: 158

Short Name: 10/5/2008

Coordinates: 035.4418692° N, 118.4170454° W

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Coordinates: 035.4429032° N, 118.4146135° W

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Comment: Thompson Creek Pool Area Blocks Path

Name: 161

Short Name: 10/5/2008

Coordinates: 035.4417812° N, 118.4162594° W

Comment: Thompson Creek emphemeral stream

Name: PtMtvr

Short Name: 10/7/2008

Coordinates: 035.4446411° N, 118.3845975° W

Comment: Piute Mt Overlook

Name: Wlkt
Short Name: 10/7/2008
Coordinates: 035.4412741° N, 118.3906983° W
Comment: piute rd meeting poinr after w
Name: PPK
Short Name:
Coordinates: 035.4270428° N, 118.4080836° W
Comment: Piute Peak RAW tipping bucket
Name: WBE
Short Name:
Coordinates: 035.3840419° N, 118.4110832° W
Comment: Walker Basin East RAW tipping bucket
Name: 99
Short Name: 10/1/2008
Coordinates: 035.5941764° N, 118.4477111° W
Comment: Low water crossing on Erskine Creek
Name: 100
Short Name: 10/1/2008
Coordinates: 035.5940634° N, 118.4476771° W
Comment: Tree Mudd High Water Mark at WP 99
Name: 101
Short Name: 10/1/2008
Coordinates: 035.5942484° N, 118.4475261° W
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Short Name: 10/1/2008
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Short Name: 10/1/2008

Coordinates: 035.5716357° N, 118.4078255° W
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Short Name: 10/1/2008
Coordinates: 035.5704707° N, 118.4055766° W
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Short Name: 10/6/2008
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Comment: Erskine Creek Confluence of South, Middle and East
Name: LblRnc
Short Name: 10/6/2008
Coordinates: 035.5573164° N, 118.3902712° W
Comment: Liebel Ranch
Name: Trlrs
Short Name: 10/6/2008
Coordinates: 035.5437271° N, 118.3787966° W

Comment: Trailers

Name: 145

Short Name: 10/3/2008

Coordinates: 035.5121803° N, 118.3567646° W

Comment: Inspiration Point

Name: 146

Short Name: 10/3/2008

Coordinates: 035.5115333° N, 118.3590845° W

Comment: Picture Looking down Inspiration Point

Name: 164

Short Name: 10/7/2008

Coordinates: 035.5039683° N, 118.3688823° W

Comment: Janette Mine Entrance

Name: 165

Short Name: 10/7/2008

Coordinates: 035.5049483° N, 118.3657534° W

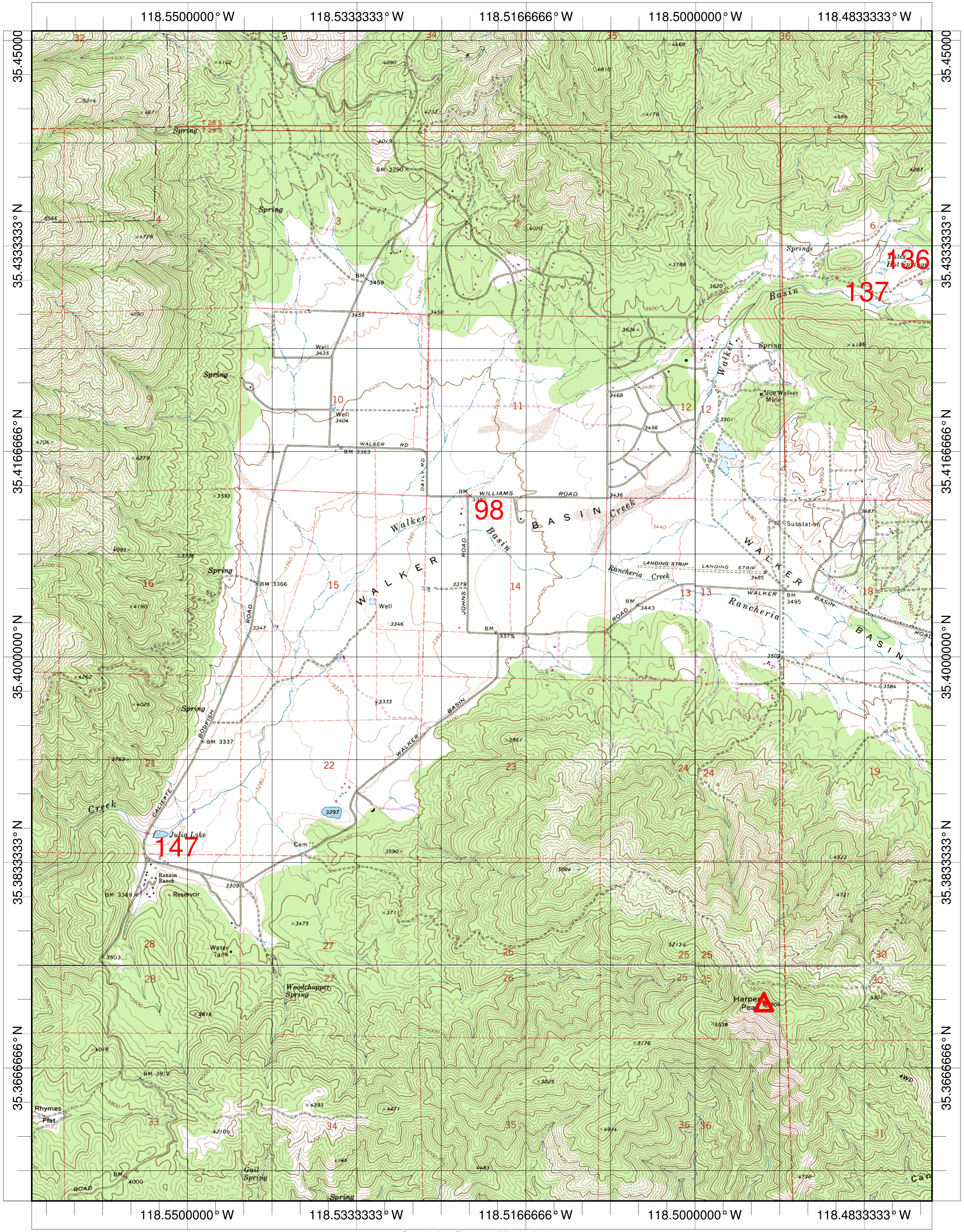
Comment: Red Pick up truck starting point

Name: BRGHTS

Short Name: 10/7/2008

Coordinates: 035.5017412° N, 118.3591876° W

Comment: Bright Star Mine



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Markers

Name: 96

Short Name: 9/30/2008

Coordinates: 035.4480911° N, 118.3774498° W

Comment: USFS Road 27S02 2801

Name: 97

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Coordinates: 035.3827059° N, 118.4106482° W

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Name: 127

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Coordinates: 035.4564013° N, 118.3762518° W

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Short Name: 10/2/2008

Coordinates: 035.4368152° N, 118.4324518° W
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Coordinates: 035.4369082° N, 118.4323748° W
Comment: Thompson Creek Cross Section Left
Name: 141
Short Name: 10/2/2008
Coordinates: 035.4388533° N, 118.4414055° W
Comment: 465 foot Bolder Field
Name: 142
Short Name: 10/2/2008
Coordinates: 035.4398094° N, 118.4413445° W
Comment: Culvert near Bolder Field
Name: 153
Short Name: 10/4/2008
Coordinates: 035.4401094° N, 118.4461954° W
Comment: Milt Davis Stock Pond
Name: MltDvs
Short Name: 10/4/2008
Coordinates: 035.4387924° N, 118.4448974° W
Comment: Milt Davis Home
Name: 154
Short Name: 10/5/2008
Coordinates: 035.4362692° N, 118.4229291° W
Comment: Thompson Creek Flat Parking Spot
Name: 155
Short Name: 10/5/2008
Coordinates: 035.4367032° N, 118.4238541° W
Comment: Thompson Creek 1st Y
Name: 156
Short Name: 10/5/2008
Coordinates: 035.4382452° N, 118.4216542° W
Comment: Thompson Creek Debris Dam
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Coordinates: 035.4399032° N, 118.4199443° W
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Comment: Walker Basin East RAW tipping bucket

Name: 98

Short Name: 9/30/2008

Coordinates: 035.4130841° N, 118.5224858° W

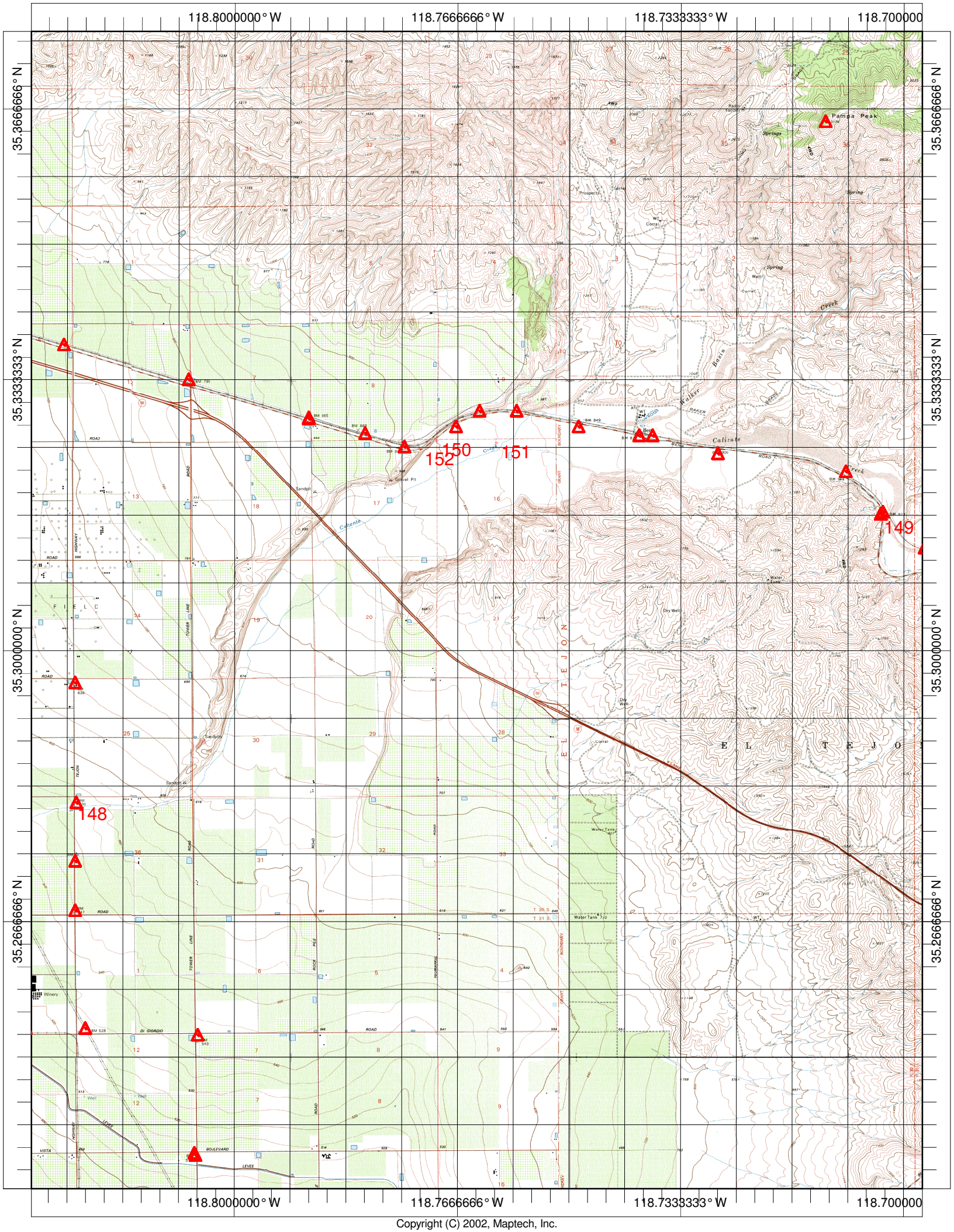
Comment: Williams Road and Johns Road to Walker Basin

Name: 147

Short Name: 10/3/2008

Coordinates: 035.3856913° N, 118.5540848° W

Comment: Culvert on Bodfish Road



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Markers

Name: 148

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Coordinates: 035.2809095° N, 118.8241496° W

Comment: Mountain View and Tejon Freeway

Name: 150

Short Name: 10/4/2008

Coordinates: 035.3258905° N, 118.7696911° W

Comment: Star Sod Farm near confluence of Walker Basin/Caliente Creek"

Name: 151

Short Name: 10/4/2008

Coordinates: 035.3255526° N, 118.7606794° W

Comment: Confluence of Walker Basin/Caliente Creek

Name: 152

Short Name: 10/4/2008

Coordinates: 035.3248095° N, 118.7722570° W

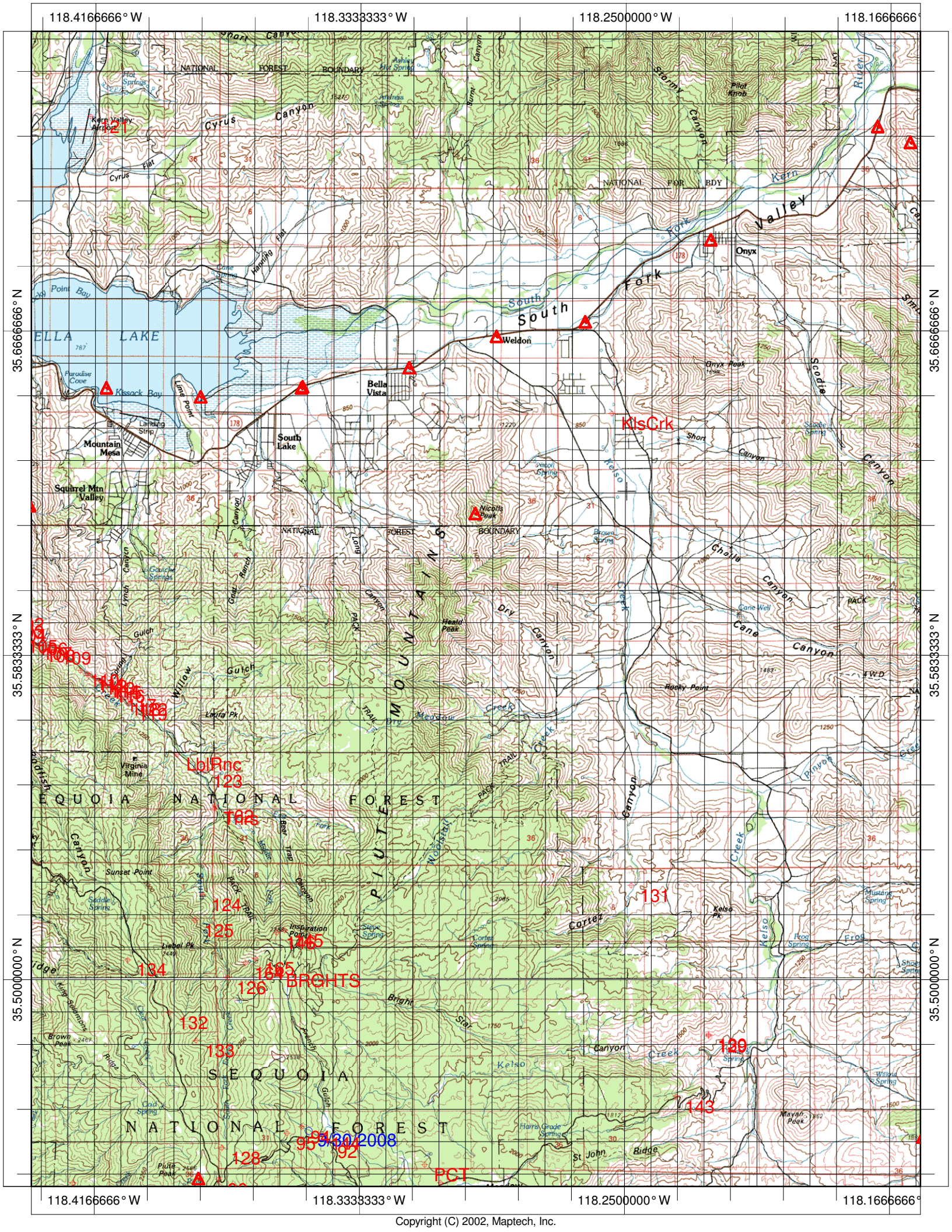
Comment: Picture of Walker Basin/Caliente Creek

Name: 149

Short Name: 10/3/2008

Coordinates: 035.3163615° N, 118.7035268° W

Comment: "Railroad at Bena"



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  - Comment: ff
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Comment: Thompson Creek Flat Parking Spot

Name: 155

Short Name: 10/5/2008

Coordinates: 035.4367032° N, 118.4238541° W

Comment: Thompson Creek 1st Y

Name: 156

Short Name: 10/5/2008

Coordinates: 035.4382452° N, 118.4216542° W

Comment: Thompson Creek Debris Dam

Name: 157

Short Name: 10/5/2008

Coordinates: 035.4399032° N, 118.4199443° W

Comment: Thompson Creek 2nd Y

Name: 158

Short Name: 10/5/2008

Coordinates: 035.4418692° N, 118.4170454° W

Comment: Thompson Creek 2nd Y Rejoin

Name: 159

Short Name: 10/5/2008

Coordinates: 035.4429032° N, 118.4146135° W

Comment: Above Thompson Creek High Intensity Burn w/ hydrophobic soil"

Name: 160

Short Name: 10/5/2008

Coordinates: 035.4438483° N, 118.4122735° W

Comment: Thompson Creek Pool Area Blocks Path

Name: 161

Short Name: 10/5/2008

Coordinates: 035.4417812° N, 118.4162594° W

Comment: Thompson Creek emphemeral stream

Name: PtMtvr

Short Name: 10/7/2008

Coordinates: 035.4446411° N, 118.3845975° W

Comment: Piute Mt Overlook

Name: Wlkt
Short Name: 10/7/2008
Coordinates: 035.4412741° N, 118.3906983° W
Comment: piute rd meeting poinr after w
Name: PPK
Coordinates: 035.4270428° N, 118.4080836° W
Comment: Piute Peak RAW tipping bucket
Name: WBE
Coordinates: 035.3840419° N, 118.4110832° W
Comment: Walker Basin East RAW tipping bucket
Name: 99
Short Name: 10/1/2008
Coordinates: 035.5941764° N, 118.4477111° W
Comment: Low water crossing on Erskine Creek
Name: 100
Short Name: 10/1/2008
Coordinates: 035.5940634° N, 118.4476771° W
Comment: Tree Mudd High Water Mark at WP 99
Name: 101
Short Name: 10/1/2008
Coordinates: 035.5942484° N, 118.4475261° W
Comment: Rockmud High Water Mark at WP 99
Name: 102
Short Name: 10/1/2008
Coordinates: 035.5932913° N, 118.4443422° W
Comment: Erskine Creek crossing No 3
Name: 103
Short Name: 10/1/2008
Coordinates: 035.5913893° N, 118.4442522° W
Comment: Erskine Creek crossing No 4
Name: 104
Short Name: 10/1/2008
Coordinates: 035.5904563° N, 118.4435922° W
Comment: Erskine Creek Crossdrain
Name: 105
Short Name: 10/1/2008
Coordinates: 035.5877122° N, 118.4401003° W
Comment: Erskine Creek crossing No 5
Name: 106
Short Name: 10/1/2008
Coordinates: 035.5869252° N, 118.4370085° W
Comment: Erskine Creek crossing No 6
Name: 107
Short Name: 10/1/2008
Coordinates: 035.5858412° N, 118.4356195° W

Comment: Erskine Creek crossing No 7

Name: 108

Short Name: 10/1/2008

Coordinates: 035.5853631° N, 118.4342866° W

Comment: Erskine Creek crossing No 8

Name: 109

Short Name: 10/1/2008

Coordinates: 035.5848871° N, 118.4294897° W

Comment: Erskine Creek crossing No 9

Name: 110

Short Name: 10/1/2008

Coordinates: 035.5790619° N, 118.4205980° W

Comment: Erskine Creek crossing No 10

Name: 111

Short Name: 10/1/2008

Coordinates: 035.5780609° N, 118.4185781° W

Comment: Erskine Creek crossing No 11

Name: 112

Short Name: 10/1/2008

Coordinates: 035.5776569° N, 118.4181101° W

Comment: Erskine Creek crossing No 12

Name: 113

Short Name: 10/1/2008

Coordinates: 035.5769099° N, 118.4158172° W

Comment: Erskine Creek crossing No 14

Name: 114

Short Name: 10/1/2008

Coordinates: 035.5761859° N, 118.4142393° W

Comment: Erskine Creek crossing No 15 Large Culvert

Name: 115

Short Name: 10/1/2008

Coordinates: 035.5757348° N, 118.4136723° W

Comment: Erskine Creek crossing No 16

Name: 116

Short Name: 10/1/2008

Coordinates: 035.5748618° N, 118.4126193° W

Comment: Erskine Creek crossing No 17

Name: 117

Short Name: 10/1/2008

Coordinates: 035.5725418° N, 118.4092534° W

Comment: Erskine Creek crossing No 18

Name: 118

Short Name: 10/1/2008

Coordinates: 035.5716357° N, 118.4078255° W

Comment: Erskine Creek crossing No 19

Name: 119
Short Name: 10/1/2008
Coordinates: 035.5704707° N, 118.4055766° W
Comment: Erskine Creek crossing No 20
Name: 120
Short Name: 10/1/2008
Coordinates: 035.6027817° N, 118.4736582° W
Comment: SCE Flume
Name: 122
Short Name: 10/2/2008
Coordinates: 035.5715347° N, 118.4055326° W
Comment: Helicopter WP 122
Name: 123
Short Name: 10/2/2008
Coordinates: 035.5531072° N, 118.3821085° W
Comment: Helicopter WP 123
Name: 124
Short Name: 10/2/2008
Coordinates: 035.5212667° N, 118.3821577° W
Comment: Helicopter WP 124
Name: 125
Short Name: 10/2/2008
Coordinates: 035.5147396° N, 118.3846147° W
Comment: Helicopter WP 125
Name: 126
Short Name: 10/2/2008
Coordinates: 035.5001612° N, 118.3745561° W
Comment: Helicopter WP 126
Name: 134
Short Name: 10/2/2008
Coordinates: 035.5046056° N, 118.4058831° W
Comment: Helicopter WP 134
Name: 162
Short Name: 10/6/2008
Coordinates: 035.5442781° N, 118.3785017° W
Comment: Erskine Creek Confluence of South, Middle and East
Name: LblRnc
Short Name: 10/6/2008
Coordinates: 035.5573164° N, 118.3902712° W
Comment: Liebel Ranch
Name: Trlrs
Short Name: 10/6/2008
Coordinates: 035.5437271° N, 118.3787966° W
Comment: Trailers
Name: 121

Short Name: 10/2/2008
Coordinates: 035.7215234° N, 118.4176881° W
Comment: Helicopter WP 121

Name: 129
Short Name: 10/2/2008
Coordinates: 035.4852181° N, 118.2234080° W
Comment: Helicopter WP 129

Name: 130
Short Name: 10/2/2008
Coordinates: 035.4852741° N, 118.2233440° W
Comment: Helicopter WP 130

Name: 143
Short Name: 10/3/2008
Coordinates: 035.4695417° N, 118.2337437° W
Comment: Inadvertant Waypoint

Name: 131
Short Name: 10/2/2008
Coordinates: 035.5236528° N, 118.2477721° W
Comment: Helicopter WP 131

Name: 145
Short Name: 10/3/2008
Coordinates: 035.5121803° N, 118.3567646° W
Comment: Inspiration Point

Name: 146
Short Name: 10/3/2008
Coordinates: 035.5115333° N, 118.3590845° W
Comment: Picture Looking down Inspiration Point

Name: 164
Short Name: 10/7/2008
Coordinates: 035.5039683° N, 118.3688823° W
Comment: Janette Mine Entrance

Name: 165
Short Name: 10/7/2008
Coordinates: 035.5049483° N, 118.3657534° W
Comment: Red Pick up truck starting point

Name: BRGHTS
Short Name: 10/7/2008
Coordinates: 035.5017412° N, 118.3591876° W
Comment: Bright Star Mine

Name: KlsCrk
Short Name: 10/6/2008
Coordinates: 035.6453623° N, 118.2535138° W
Comment: Kelso Creek