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Accident Investigation
Factual Report

Mudd Fire
Entrapment / Fire Shelter Deployment
Elko, Nevada

August 23, 2006

E 3144 looking towards communications site

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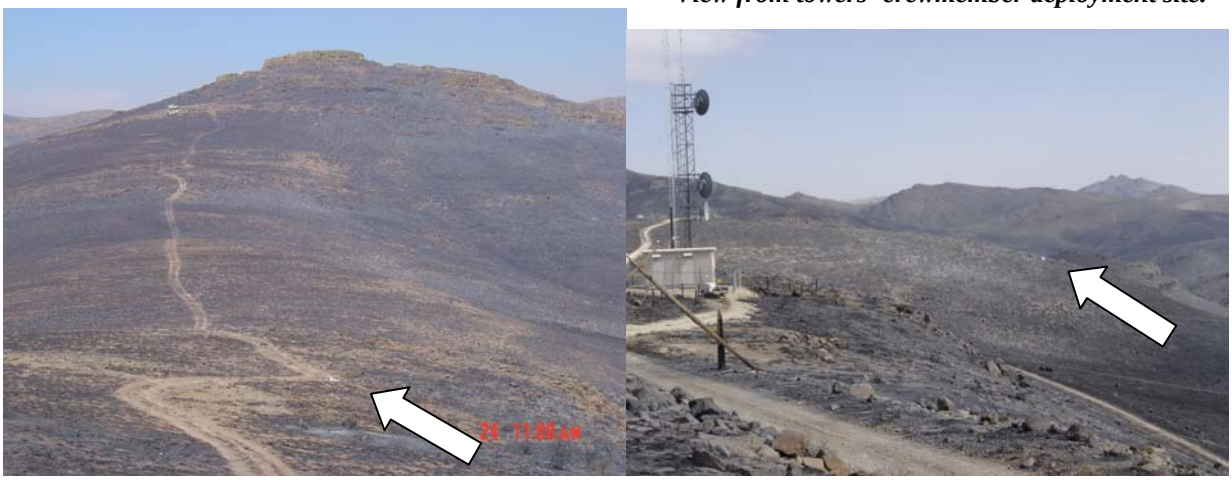
Preface

The Mudd Fire was initially dispatched at approximately 1459 August 23, 2006. The fire origin was just north of the Adobe Summit near mile marker 37 on State Route 225 west of Elko, Nevada and determined to have originated on Nevada Division of Forestry jurisdiction. The cause of the fire was the result of a hot diesel exhaust emission, investigated and determined by a separate investigation team.

The fire burned 13,456 acres as follows: private lands within Elko County protected by the Nevada Division of Forestry via the Elko County Fire Protection District and Bureau of Land Management under the protection of the Elko District Field Office.

View from towers -crewmember deployment site.



Engine Operator Deployment site with Engine 3144 in the background.

Investigation Team Leader:

_____ _____

Robert Ashworth, Deputy State Forester, Nevada Division of Forestry **Date**

Investigation Chief Investigator
Vince Mazzier, Bureau of Land Management

Investigation Team Members
Dave Dini, Investigator, Nevada State Fire Marshall's Office
Helen Graham, Operations Specialist, Bureau of Land Management
Tony Dietz, Safety Specialist, Nevada Division of Forestry
Ken Loda, Fire Behavior Specialist, Bureau of Land Management
Shauna Olson, Documentation Specialist, Nevada Division of Forestry

Executive Summary

Prior to Initial Attack (IA) of Mudd Fire

The Adobe Range located west and north of Elko, Nevada runs predominately in a Northeast/Southwest direction. There are three primary plant communities in the Adobe Range; open stands of mostly annual and some perennial grasses, with scattered shrubs, these are often old burn scars; a variety of sage (mostly Wyoming Big Sage) in varying proportions with interspersed grasses described above; and above 6000' elevation in addition to the lower-elevation shrubs, Juniper begin to appear. Juniper are scattered at the lower elevations and can be common above 6500'. At about 6500' elevation Bitterbrush and Serviceberry begin to appear regularly. Bitterbrush and Serviceberry increase as a proportion of the vegetative community with higher elevation. Willow and Cottonwood occur in some of the riparian areas.

A rather wet winter resulted in annual grass production that was somewhat higher than average. A dry spring and summer cured those grasses and also drought-stressed the shrubs.

On Tuesday afternoon, August 22, and again with their Wednesday morning Fire Weather Forecast, the Elko office of the National Weather Service issued a Red Flag warning for high winds and low relative humidity from 1000 to 2100. August 23 was a transition day to a new pattern with a strong low pressure system beginning to move through the area. High temperatures were expected to be around 94° in the valleys and 90° on the ridges with minimum relative humidity about 5% in the valleys, 8% at the ridge tops. It was expected that about 1000 the winds would become southwest 10 to 15 mph with gusts to 30 mph with ridge top winds west 20 to 30 mph.

All significant conditions were favorable for extreme fire behavior the afternoon of August 23. The condition of the live fuels contributed substantially to the spread and flame lengths. Particularly rapid fire spread occurred when slope and winds were in alignment.

Initial Attack through Shelter Deployment

The Mudd Fire began on August 23 at approximately 1459 as a result of a hot diesel exhaust emission. The fire is located in the Elko County Fire Protection District jurisdiction managed by the Nevada Division of Forestry.

Initial attack resources dispatched and responded in support to the Nevada Division of Forestry was provided by the Bureau of Land Management Elko District Field Office, a number of local area agency resources including the City of Elko Fire Department and numerous outside agency resources that were in the area for the purpose of large fire suppression and area support.

As the fire spread in an east to southeast direction generally towards the City of Elko, initial attack resources were directed into what is known as the "Snow-Bowl" area of Elko. These resources included a group of four Bureau of Land Management engines without a designated

task force leader. The Bureau of Land Management engines included a Carlin, NV Type 4 heavy engine E1947, a Carson City, NV Type 4 heavy engine E3943, a Bakersfield, CA Type 6 light engine E3144, and a Kingman, AZ Type 6 light engine E263 accompanied with a chase vehicle.

The engines arrived in the Snow-Bowl area and made contact with the Division Supervisor for Division D, which consisted of the eastern portion of the fire. Strategy and possible tactics were discussed and it was decided that the engines would stage at the intersection of 5th Street and Snow-Bowl road. The Engine Boss for Carlin engine E1947 was then designated as the leader of the taskforce due to local knowledge of fire behavior, terrain, and roads.

Once the task force arrived at the intersection of 5th Street and Snow-Bowl road it was decided to scout north on 5th Street and recon the area for a possible burn out operation. A scouting party was formed consisting of the engine bosses for engines 263, 1947, 3144, and one crewmember utilizing the chase vehicle for transportation and enabling all four engines to remain behind at the intersection of 5th Street and Snow-Bowl road.

Upon arriving at a good vantage point the designated Task Force Leader, the engine boss for E1947, called for the engines to advance to their location in order to conduct burning operations. From their vantage point they were unaware that the fire had split into two separate heads as they did not have a view of the western most head of the fire.

The engines departed the intersection of 5th Street and Snow-Bowl road with E3144 taking the lead. A short time later contact was made with the scouting party and they reported that fire was threatening 5th Street road and the engines were turning around. Engine's 1947, 263, and 3943 turned around and returned to a second location north of the intersection of 5th Street and Snow-Bowl road consisting of adequate safety zones for the engines. Engine 3144, however, had out distanced the others and did not receive the order to turn around. Repeated attempts to contact them failed with only one response from E3144; other than "stand by," no other contact was made by the engines. Communications were established between the Engine Boss of E3144 and the engine itself on their local tactical frequency.

The Engine Operator and Crewmember for E3144, seeing fire impinging the road in front and behind them, began searching for an alternate route out of the area. Selecting the only available path to the top of the ridge and a possible route to a mountain top communications site for a safety area, they drove up a steep, rough, and primitive two-track road leading away from the fire. Along the way the left rear outside dual tire was flattened and the rim received extensive damage. Visibility was poor and deteriorating with the extreme burning conditions and increasing winds. Upon reaching the top of the ridge, they momentarily lost view of the path and upon seeing it had to reverse the engine in an attempt to get back on track. During this maneuver the engine lost traction and eventually slipping off a rock ledge becoming high centered.

The Engine Operator and Crewmember exited the engine; the Engine Operator began burning around E3144 for protection while the Crewmember deployed the hard line for water. The fire was approaching quickly and the Engine Operator decided their position was untenable. The Engine Operator notified the Engine Boss that they were abandoning the engine. Directing the Crewmember to gear up, grab a tool, and doing likewise the Engine Operator began running for

the communication towers approximately 1 mile distant. Both firefighters attempted to burnout the road as they proceeded.

The E3144 Engine Operator and Crewmember progressed along the ridge for approximately 1/3 of a mile. The Engine Operator seeing the fire coming directed the Crewmember to drop his gear, grab his shelter and prepare to deploy.

The Engine Operator attempted to light an escape fire using a fusee that had limited success and deployed his shelter in a sparsely fueled saddle.

Observations made by the Accident Investigation Team's Fire Behavior Specialist – "The deployment site in the saddle was the best choice available since shortly after leaving the engine, being fairly bare of vegetation and somewhat on the leeward side of the saddle. However, being in the saddle likely exacerbated the effect of the wind, locally increasing fire intensity. Also, because of the adjacent slope, this crewmember was likely hit by a second front coming uphill on that slope, as in the existing winds I would expect that the fire spotted down the slope and then burned back up."

The Crewmember continued to run approximately 800 feet around a small knob. The Crewmember ran through a flaming front and then deployed his fire shelter in the black.

Observations made by the Accident Investigation Team's Fire Behavior Specialist – "The second deployment site appeared to have more substantial vegetation nearby, yet seemed less intensely impacted. The site had the advantage of being on an aspect that was somewhat leeward, so that the fire likely struck cross-slope and with somewhat less intensity. Again, there were better deployment sites reasonably nearby (primarily uphill), but the crewmember may or may not have been able to clearly observe them, or may have felt they could not be reached in time."

Communication was lost for a short time and then "emergency transmission, deployment" was heard.

Firefighter Transport to Treatment and Status

Air Attack was enlisted to help search for the two burned over fire fighters and to coordinated aerial support. The burn over location was not readily known and took several minutes to find. Medical resources were mobilized and were ready to receive any injured personnel. Helicopters spotted one fire shelter, then the other and their occupants.

The two firefighters were transported to a waiting ambulance and were treated for 1st and 2nd degree burns at the Elko Northeastern Nevada Regional Hospital.

The E3144 Engine Operator received burns to his hands and elbows; while the E3144 crewmember received burns to his hands and face. Both are expected to make a full recovery 100%. They have been transported to their home unit and will receive further treatment at a burn center to be determined.

Melted Hard Hats

View of Escape Route Looking Down to Main Road

Clarification Point – Not to be mistaken for a RAWS site; is in fact a remote seismic station for monitoring earthquakes. Clarification is necessary due to the identification of the site would play such a prominent role in people's accounts of events.

Timeline of Events & Associated Narrative

The following are approximate times and the associated events leading up to the fire shelter deployment August 23, 2006 on the Mudd Fire taken from personnel statements and interviews. Radio transmissions associated with accurate time stamps were not available during the entrapment / deployment.

1459

- The Mudd Fire is reported to the Elko Interagency Dispatch Center.

1520

- Bureau of Land Management engines 1947, 3144, 3943, and 263 with a chase vehicle (engine group) leave from Carlin for Elko to cover station.

1550

- The BLM engine group was diverted to respond to the Mudd Fire after arriving at Bureau of Land Management Elko Field Office.

1610

- The engine group arrives at Snow-Bowl area; ties in with Division "D" Division Supervisor; a briefing is held between the Division Supervisor and all engine bosses.
- E1947 Engine Boss is identified as the Task Force Leader.
- The engine group observes fire location and its potential to hit the access road within next 10-15 minutes.
- E263 Engine Module Leader inquired to the Division Supervisor about air support and air support scouting the fire to the east.
- E263 Engine Boss observes spot fires 200'-300' ahead of the main fire uphill.

1620

- The engine group leaves the Snow-Bowl area for Snow Bowl and 5th Street junction located about ¼ mile below the Snow-Bowl area.

1642

- Air Attack reports "be advised that 5 SEAT's on the ground Elko are not going to lift-off due to wind."

1646

- Air Attack advises "the fire is making a run in multiple directions.

1640

- The engine group stages all engines at Snow-Bowl and 5th Street junction.
- E263 Engine Module Leader, E263 Engine Operator, E1947 Engine Boss, and E3144 Engine Module Leader drive the E263 chase vehicle to scout ahead (scouting group).
- All engines of the engine group are left behind at Snow-Bowl and 5th Street junction.

1700

- The scouting group arrives, position the E263 chase vehicle in a safe location at the top of the canyon to observe fire activity.
- E1947 Engine Boss relays by radio the fire location and activity information to Division "D" Division Supervisor through the E1947 Engine Operator.
- E263 Engine Module Leader attempts to contact E263 Engine Boss by radio several times with no success.

1708

- E1947 Engine Boss contacts E1947 Engine Operator by radio to lead all engines up the canyon to their location.
- E263 Engine Module Leader observes canyon access to location filled with heavy smoke and reports to E1947 Engine Boss of possibly seeing fire just above the road.
- After departure E1947 Engine Operator notified E1947 Engine Boss "there is fire to our left approximately 200 yards from the road".
- E1947 Engine Boss acknowledges all engines are turning around to get back to the staging area.
- All engines turn around except for E3144 that had out distanced the engine group.
- E1947 Engine Operator and E3943 Engine Boss try to contact E3144 without success with one return message of "stand-by" received from E3144.

1714

- E3144 Engine Operator notifies E3144 Engine Module Leader by radio that E3144 had a flat tire and is continuing on their good dual tire; soon followed by radio that the engine is stuck being high centered.
- E263 Engine Module Leader contacts air attack by radio.

1718

- E263 Engine Module Leader contacts E263 Engine Boss by cellular phone to inquire status; Engine Boss reports that E263 is at the Snow Bowl and 5th Street junction and safe.
- E263 Engine Module Leader continues to coordinate with Air Attack for assistance to E3144; Air Attack reports difficulties in providing assistance due to high winds and heavy smoke.
- E3144 Engine Operator burns out around E3144 and notifies E3144 Engine Module Leader that they are abandoning the engine and running for it.
- E3144 Engine Module Leader advises E3144 Engine Operator to light an escape fire if possible or get into the deepest black that they can find.

1723

- Communications is lost with E3144 Engine Operator and Crewmember; efforts to lead Air Attack to E3144's location continue.

1737

- E3144 Engine Operator notifies E3144 Engine Module Leader and states "deployment."
- E263 Engine Module Leader notifies Air Attack of the shelter deployment.

- E263 Engine Module Leader contacts E263 Engine Boss by cellular phone to ask if search and rescue could be attempted by coming up through the black behind the fire.
- E263 Engine Module Leader contacts air attack to assure the Incident Commander and medical assistance was notified.
- E3144 Engine Operator notifies E3144 Engine Module Leader that a helicopter had just flown over him.
- E263 Engine Module Leader relays E3144 Engine Operator's notification by air/ground radio frequency; both helicopters immediately responded to E3144 Engine Operator's location.
- E3144 Engine Operator notifies E3144 Engine Module Leader "I deployed in a two track road, and E3144 Crewmember kept running, I don't know where he is".
- E3144 Engine Module Leader advised E3144 Engine Operator "you need to make sure you stay in a safe location, but you need to start looking for the E3144 Crewmember" and as well asks about injuries; E3144 Engine Operator responds "have burned hands and elbows a little but o.k."
- E3144 Engine Operator is located by helicopter.
- The scouting group starts to drive towards E3144's believed location. Helicopter provides E3144's location and reports E3144 Crewmember is still missing.

1755

- Air Attack informs E263 Engine Module Leader that E3144 Engine Operator and crewmember have been picked up and evacuated by helicopter.

1800

- E3144 Engine Operator and Crewmember arrive to ambulance location.

1820

- The scouting group arrives at ambulance site.

Personal Line Gear w/Gloves

Investigation Process

An accident investigation team was initiated immediately upon notification of the shelter deployment on August 23, 2006. The team consisted of:

Team Leader	Bob Ashworth Nevada Division of Forestry
Chief Investigator	Vince Mazzier Bureau of Land Management
Investigator	Dave Dini Nevada State Fire Marshall's Office
Operations Specialist	Helen Graham Bureau of Land Management
Safety Specialist	Tony Dietz Nevada Division of Forestry
Fire Behavior Specialist	Ken Loda Bureau of Land Management
Documentation Specialist	Shauna Olson Nevada Division of Forestry

The accident investigation team arrived in Elko, Nevada the afternoon of August 24th, 2006 and in-briefed with the Elko BLM Field Office Manager and NDF Northern Regional Manager and began the collection of evidence and information related to the shelter deployment.

The process of information and evidence gathering consisted of:

- Gather written statements and of all personnel involved with the shelter deployment and interview key personnel.
- Visited the shelter deployment site; gather photos of the area, equipment involved and equipment location.
- Develop map and sketches of the deployment site
- Gather weather reports, training records, and time reporting documentation.
- Evaluated all environmental, human, organizational and equipment/material factors that may have contributed to this incident.
- Fire Shelters were mailed to MTDC for further analysis.

The investigation team held a preliminary out-briefing with the BLM National Office, NDF State Office, the Elko BLM Field Office Manager and NDF Northern Regional Manager.

Causal Factors and Findings

Based upon site visits, interviews, review of written statements, training records, and time documents and photographic documentation, the accident investigation team identified the following causal factors and findings:

Direct Causal Factors

Direct Environmental Causal Factor 1:

Finding: Extreme fire behavior and expected weather changes were not given adequate consideration when planning strategy and tactics.

Direct Organizational Causal Factor 1:

Finding: The assembled BLM engine group was responding to fires as a task force without adequate supervision. A qualified Task Force Leader was not assigned.

Direct Mechanical Causal Factor 1:

Finding: The failure of the left outside rear tire due to driving over rough terrain and the subsequent loss of traction when trying to pull the engine back up to the two-track was directly responsible for the engine skittering off a rock ledge and becoming high centered and subsequently being abandoned.

Direct Human Causal Factor 1:

Finding: Adequate deployment sites near the engine were not utilized in favor of a perceived distant safety zone.

Direct Human Causal Factor 2:

Finding: The crewmember chose not to stay in the same area as the engine operator and sustained more extensive burns by running through a flame front.

Indirect Causal Factors

Indirect Organizational Causal Factor 1:

Finding: Several of the basic tenets of wildland firefighting were compromised during this operation. This includes six of the 10 Standard Firefighting Orders and six of the 18 Watch out Situations.

Standard Fire Order

2. *Know what your fire is doing at all times*.

    The location of the fire perimeter, size, and direction of burn was not established and was not possible to be determined by ground based resources. Aerial observation for the area was not requested by the Division Supervisor

5. *Post lookouts when there is possible danger*.

While the scouting party was in place and acting as lookouts, they were not in a position to accurately assess the situation; aerial observation should have been utilized.

7. *Maintain prompt communications with your forces, your supervisor, and adjoining forces.*

Communications were established but were inadequate for the location and frequencies were congested. The E3144 ENOP changed radio frequencies to avoid communication congestion however this removed the ability to communicate on established frequencies.

8. *Give clear instructions and insure they are understood.*

Instructions from the Division Supervisor to the BLM engines and the instructions from the apparent engine group leader to the group were not clear, not understood, nor was the plan clear.

9. *Maintain control of your forces at all times.*

Loss of organizational control occurred on Division B at all operational levels. This includes the Incident Commander, Division Supervisor, and Engine Bosses. Engines were left without adequate supervision.

10. *Fight fire aggressively, having provided for safety first*

A burnover requiring the deployment of fire shelters indicates an unsafe operation

Watch out Situations

4. *Unfamiliar with weather and local factors influencing fire behavior*

Individuals involved in the burnover/deployment were not local and did not have total awareness of fire behavior in this fuel type.

5. *Uninformed on strategy, tactics, and hazards.*

Strategy and tactics were not clear nor agreed upon.

6. *Instructions and assignments not clear*.

Orders given by the Division Supervisor, and the engine bosses to their crews were not clear, as evidenced by their actions.

7. *No communication link with crew members/supervisor*.

Radio communications were inconsistent between the supervisor and the crew. Critical information was not received by the crew from the engine boss nor was information received and transmitted between the Division Supervisor and the group leader

11. *Unburned fuel between you and fire.*

Continuous fine fuels were present between the fire and the crews.

12. *Cannot see main fire, not in contact with anyone who can.*

Resources were unaware of the fire's perimeter location or direction of spread. They were not able to see that the fire had split into two heads.

Indirect Organizational Causal Factor 2:

Finding: The engine group lacked a common radio frequency for engine to engine communication.

Indirect Organizational Causal Factor 3:

Finding: The assigned division group supervisor did not have Air to Ground communication capability.

Indirect Organizational Causal Factor 4:

Finding: A clear emergency declaration notifying all incident personnel of an imminent threat to firefighters was not broadcast.

Indirect Human Causal Factor 1:

Finding: The engine bosses in the scouting party did not clearly communicate their concern for the proposed burnout plan and did not verbally refuse the assignment due to safety concerns.

Indirect Human Causal Factor 2:

Finding: Individuals involved did not use gloves when deploying and utilizing fire shelters.

Appendix A

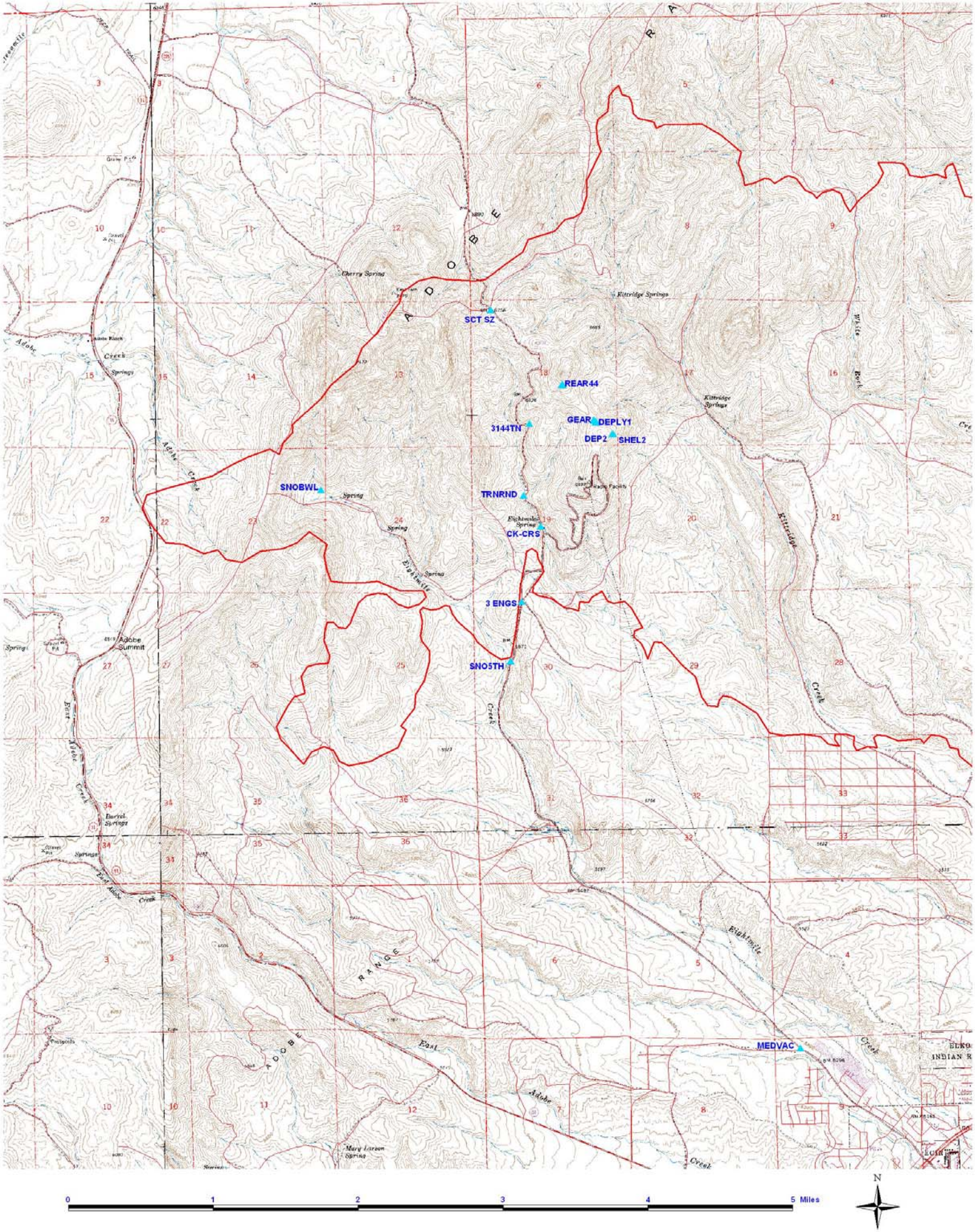
Accident Site Maps

Mudd Fire Deployment Investigation Map Legend

Point Name	Description
SNOBWL	Snow Bowl Location of Briefing with DIVS
SNO5TH	Junction of Snow Bowl and 5th St, Initial Staging Location for Engine Group
CK-CRS	Eight Mile Spring Crossing, Landmark for the road taken up canyon
SCT SZ	Scouting Group Safety Zone
TRNRND	Location of Turn Around Point used by Engines 263, 1947 and 3943
3 ENGS	Location where engines staged after turning around due to fire threatening road
3144TN	Turn off to Emergency Escape Route used by 3144 to access ridgeline
REAR44	Rear Bumper Engine 3144 where it came to rest after slipping off road
GEAR	Location of Line Gear dropped by Engine Operator and Firefighter
DEPLY1	Deployment Location of Engine Operator
DEP 2	Deployment Location of Firefighter
SHEL2	Final Location of Firefighter Shelter after Exit
MEDVAC	Location where firefighters were transferred to ambulance from helicopter

* Shelter 1 was at to DEP1 and was not discernible at any resolution

Mudd Fire Deployment Overview August 23, 2006



Mudd Fire Deployment Detail August 23, 2006