

California Department of Forestry and Fire Protection

Review Report of Serious CAL FIRE Injuries, Illnesses, Accidents and Near-Miss Incidents



Hatchery Accident Investigation

**Burn-Over and Shelter Deployment
Nine Injuries
One Engine Destroyed
One Engine with Major Damage**

**Inyo Complex
Seven Oak Fire**

**Incident Number CA-INF-000784
Accident Investigation Incident Number CA-CSR-000068**

California South Region

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REVIEW TEAM PROCESS

The review process of this incident comprised of an evaluation of the accident site along with analysis of the fuels involved and the burning conditions present at the time of the incident. Statements were taken from those involved to help construct a timeline and present a clear picture of the chain of events leading up to and through the conclusion of the incident.

The Serious Accident Review Team (SART) was activated the evening of July 7, 2007, with reporting instructions for the following morning. The team formed at the Independence Fire Station and received a briefing from San Bernardino Unit Chief and Division Chief #1. The team comprised of representatives from both CAL FIRE and the U.S. Forest Service (USFS). Team Members were Ed Wristen, Team Leader, Tulare Unit; Mike Davidson, Lead Investigator, Tulare Unit; Gad Amith and Mathew Brandt, Safety Program Representatives, Riverside Unit; Michelle Reugebrink, Safety Program Representative, Tahoe National Forest; Gabe Santos, Training Program Representative, Madera/Mariposa Unit; Hank Epling, CDF Firefighters Representative, Lake Napa Unit; Darren Hensley, Automotive Technical Specialist, Riverside Unit; Pete Scully, Fire Behavior Technical Specialist, San Diego Unit; Tom Foley, Fire Shelter Technical Specialist, San Bernardino Unit; Eric Watkins, Investigator, Fresno Kings Unit; and Joe Aguirre and Doug Taylor, Technical Drawing Specialists, California South Region Office.

The SART went to the secured accident site and conducted a thorough examination, identifying and marking the location of any fire suppression equipment that indicated pre-accident activities. The scene was documented with digital photographs, both from the ground and the air, and drawn as a plot plan. Please see those documents as an attachment to this report.

Even though each member on the strike team was directed to provide a written statement, many of them were also interviewed by the team. The nine employees involved in the shelter deployment were all interviewed along with the strike team leader and other strike team personnel. The team also interviewed the command staff of the Seven Oak Fire, the medical personnel who rendered the initial medical care, and the tenant of the accident site. Transcripts or summaries of those interviews are included with this report.

The safety program representatives examined, photographed, and cataloged all of the personal protection equipment (PPE) in use by those involved in the entrapment. They documented the injuries sustained and formulated a medical care timeline.

The training program representative examined the training records of those involved. It was determined that everyone met or exceeded the minimum qualifications required for the positions held.

The fire behavior technical specialist examined the physical characteristics of the accident site, gathered Remote Automated Weather Stations (RAWS) weather readings, analyzed fuel information, and utilized firsthand knowledge from those involved, to evaluate the fire's behavior. That report is attached as supporting data.

The automotive technical specialist examined the automotive equipment damaged in the burn-over along with their maintenance records. Arrangements were made to transport that equipment to the CAL FIRE automotive facilities in Davis. Because of scheduling conflicts with the tow company, the supervision of the equipment removal was turned over to the local unit.

The fire shelter technical specialist, along with specialists from the USFS, examined and collected the fire shelters deployed during this entrapment. Each

person involved in the deployment was interviewed as to the operation of the shelters.

The technical drawing specialists divided the accident site into 50' X 50' grids. The location of each pertinent item was documented and incorporated into the final plot map drawing of the scene. Those drawings are included in this report.

The investigation program representative collected two combination nozzles into evidence. A 1" nozzle was located at the end of the south most 1½" hose lay and a 1½" nozzle was located on the end of the north most 1½" hose lay. These items of evidence are stored in the Tulare Unit evidence locker.

The accident site was secured 24 hours a day, until released by the SART.

All team members, except the two safety program representatives, completed their assignments and returned to their home units, Thursday, July 12, 2007. The safety program representatives cleared the area the following day, July 13, 2007.

OVERVIEW OF ACCIDENT

On July 7, 2007, at approximately 1400 hours, burning activity on the "Seven Oak" fire intensified in Division "A". The fire began traveling in a northeasterly direction towards the Mt. Whitney Fish Hatchery, a historic location. Fire suppression personnel initiated a plan to burn out an area of vegetation between the hatchery and the main fire. At approximately 1415 hours the firing began under favorable wind conditions. A pie shaped section of land in front of the hatchery was successively burned out. The division supervisor decided to continue the burning to the west, where they could tie the line into an area that had burned the previous day. As the firefighters continued to "carry" the fire to the west, the wind conditions changed and the fire crossed North Oak Creek Road, the planned control line. The time was approximately 1430 hours.

Strike Team 9442C was assigned to Division "A" and had engines positioned to pick up any spot fires which may occur from the burning operation. The strike team leader directed Engine 4480 to pick up the "slop over" and directed Engine 4452 to assist. The fire was burning toward a riparian area containing structures. The engines entered the driveway located at 1659 W. Oak Creek Road and began two hose lays off of Engine 4480. Engine 4480 was staffed with a limited term fire apparatus engineer and four firefighters. Engine 4452 was staffed with a fire captain and three firefighters. The engineer off of Engine 4480 pointed out a small pond adjacent to the engine and identified it as their safety zone. The firefighters laid one hose lay toward the main fire and started a second hose lay toward a spot fire northwest of the engine's location. The fire captain walked around the property assessing the area. Neither engine company had been down that driveway before and was surprised to see how many structures were located there. The firefighters felt they were making good progress with the hose lays and that they were going to be able to contain the fire. At approximately 1445 hours, the conditions quickly changed and the burning intensified. The winds increased and began changing directions. Realizing they

were losing control, the firefighters dropped their nozzles and retreated toward the engine and the pond identified as their safety zone. Captain 4452 was separated from his crew and retreated to his engine and sought refuge in the cab. The engineer and seven firefighters entered the small pond and deployed fire shelters for extra protection as buildings and trees burned around them.

A building behind Engine 4452 began to burn, so the captain moved the engine away from the heat. He would exit the engine periodically trying to cool down his surroundings.

Air support arrived overhead and began dropping on the fire. Once conditions stabilized, the firefighters who sought refuge in the pond, left the pond and joined the captain at Engine 4452. Realizing it was still too hot, the entire group returned to the pond.

The house adjacent to Engine 4452 continued to burn, eventually spreading to and igniting the engine. At approximately 1545 hours, the two engine crews were able to walk out of the accident site and join the rest of their strike team out on the road.

This entrapment resulted in burn and respiratory injuries to all nine employees, the total loss to one Model 5 fire engine, and major fire damage to one Model 1 fire engine. A Serious Accident Review was conducted to determine the chain of events which led to the entrapment so that the department may prevent this from occurring again.

SEQUENCE OF EVENTS

The Inyo Complex, 12 fires burning in the Owens Valley, was the result of a dry lightning storm that came through the valley on the early afternoon of July 6, 2007. At approximately 2300 hours, a U.S. Forest Service (USFS) jurisdiction fire, the Seven Fire, and a state jurisdiction fire, the Oak Fire, burned together and became the Seven Oak Fire. The Seven Oak Fire was 8,000 acres in size and set up as a Unified Command fire with an Incident Commander from each agency. Even though the fire was in Unified Command, the CAL FIRE IC worked the north half of the fire, Division Y, and the USFS IC worked the south half of the fire, Division "A". Each Division had its own tactical net. Division "A" was



The Oak Fire, Friday afternoon, east of the Mt. Whitney Fish Hatchery

operating on Tac 2, Division Y was utilizing White 2. With multiple fires burning in the area, resources and relief were difficult to obtain.



The Oak Fire, Friday night, east of the fish hatchery

On July 6, 2007, at approximately 2200 hours, Strike Team 9442C left Tuolumne/Calaveras Unit enroute to the Inyo Complex. The Strike Team consisted of engines E-4455, E-4461, E-4452, E-4480, and E-4466, led by B-4415. They arrived at Owens Valley Camp at approximately 0200 hours and were assigned to the Seven Oak Fire. They were instructed to report to the Mt. Whitney Fish Hatchery, located northwest of the community of Independence, at 0800 hours; so, they slept for a couple of hours on the camp lawn.

The Seven Oak Fire morning briefing was scheduled to be held at the Independence Airport at 0600 hours. The briefing was late and commenced at approximately 0700 hours. During the briefing, it was discovered that the Division "A" position had not been filled. A crew strike team leader from Los Angeles County Fire Department, was qualified to fill that position so he was appointed. The briefing was conducted by both Incident Commanders. Three strike teams of crews and Strike Team 9442C were assigned to Division "A". The assignment for Division "A" was to keep the fire from running into the town of Independence and to protect the



The Mt. Whitney Fish Hatchery

structures in the area of the Mt. Whitney Fish Hatchery. During the briefing, there was no mention of any structures being identified as non-defendable. Strike Team 9442C did not attend the morning briefing; their instructions were to report at the Mt. Whitney Fish Hatchery at 0800 hours.

At approximately 0755 hours, Division "A" set out to relieve the night shift crews. He assigned one crew to the fish hatchery to continue prepping the structures located there.

Strike Team Leader 9442C received an in-the-field briefing by the incident commander at approximately 0800 hours. The IC informed Strike Team 9442C that he was assigned to Division "A" and that resources were limited. Strike Team 9442C was responsible for the areas of Fish Hatchery Road along with North, South, East, and West Oak Creek Roads. The protection of the historic Mt. Whitney Fish Hatchery was a high priority. The IC pointed out that there were homes located in the oak trees, but there was no discussion about the conditions of the homes or their defensibility. The area had been evacuated the

day before and the evacuations were still in place even though the Sherriff's Department was letting some people in to gather belongings. They discussed the erratic burning conditions from the day before and the predicted wind conditions for that day.



Fire above the Bright Ranch approximately 0820 hours.

Strike Team Leader 9442C conducted a thorough safety tailgate session with his crews before assigning them their tasks. They discussed the expected burning/weather conditions, radio frequencies, structure locations, use of PPE, and the importance of the hatchery.

They programmed their portable radios to contain Inyo National Forest Net for Command, NIFC Tac 2 for tac, and Forest Service Air to Ground. Engine 4461 was assigned to relieve Engine 3561, at the Bright Ranch. The remaining engines were directed to familiarize themselves with the hatchery and the surrounding structures. Strike Team Leader 9442C familiarized himself with the fish hatchery and then began scouting out the structures located east of the hatchery. He was able to look at every structure in the area except for an old homestead just west of the fish hatchery. At approximately 0930 hours, his attention was drawn to an increase in fire activity up toward the end of South Oak Creek Road beyond the Bright Ranch. He drove up to investigate and discovered fire burning in an oak thicket. He directed Engine 4480 to come in and address the threat.



Entrance to the Bright Ranch.

At approximately 1000 hours, Division "A" came into the area and did a face-to-face with Strike Team Leader 9442C. By the conversation they had, Division "A"

assumed the IC had already been there and had directed Strike Team 9442C to do structure protection. They looked at the current burning conditions and formulated a plan to possibly burn out the vegetation between the North and South Oak Creek Roads to reduce the threat to the fish hatchery if the fire continued to travel in that direction.

Division "A" met with the Incident Commander at approximately 1200 hours and talked about getting additional resources. He had crews trying to cut line south of the Bright Ranch but the fire activity was picking up and they felt it was unsafe to continue without air support. Division "A" felt that the Sage Fire had a higher priority because resources continued traveling north. It was his understanding that he had to do the best he could with what he had.

Helicopter 535 came into the area and agreed to support Engines 4480 and 4466 and the hand crews as they cut line south of the Bright Ranch in an attempt to tie the fire line into a rock outcropping. Engine 4455 was assigned to patrol South Oak Creek Road, and Engine 4452 was directed to another area of the division called Onion Valley.



Fire coming down toward the hatchery.

At approximately 1400 hours, the fire crested a nearby knoll and continued its northerly travel toward the Mt. Whitney Fish Hatchery and other nearby residences. The afternoon winds were picking up and it was just a matter of time before the fire reached the area. A request for air support was made.

Division "A" authorized Strike Team Leader 9442C to use fire on the South Oak Creek Road near the Bright Ranch to reduce the fuel along the road. Engine 4452 was directed to return to the area of the fish hatchery.

At approximately 1410 hours, Division "A" met both of the Incident Commanders and Strike Leader 9442C at the Mt. Whitney Fish Hatchery. Also present were IMT 3 Member A from Redlands Fire and his brother, IMT 3 Member B, from San Bernardino City Fire. They were on IMT 3 and were scouting the area for the transition. The group decided to start the planned backfire operation along North Oak Creek Road to reduce the fuel loading along the road. The CAL FIRE IC left the area to make contact with the Sheriff to ensure the area was evacuated. Los Angeles County hand crew 1173G, began burning out North Oak Creek Road. The burning started approximately a ¼ mile from the North & South Oak Creek intersection and they took fire to the southeast toward the intersection. The wind conditions were favorable, the fire was drawing in. They continued burning around the intersection and up South Oak Creek Road a short distance. E-4480 and E-4466 were directed to support the burning operation. E-4455 and E-4452 were directed to enter the hatchery and prepare for any possible extension. E-4461 was directed to stage at the intersection and watch for spots. The oncoming fire front was approximately 300 yards away and would be hitting the area of the hatchery.

The CAL FIRE IC contacted an engine strike team assigned to Division Y and directed them to respond to the fish hatchery for structure protection. Chief #1 responded with four of his engines. He deployed those engines and waited for further assignment. Chief #1's strike team came into the Oak Fire the evening before, prior to the two fires merging, and staged at the Mt. Whitney Fish Hatchery. At that time, the fire was utilizing CAL FIRE Command 1 and White Fire 2 for tactical. Chief #1's strike team was later reassigned to another area of the fire. Chief #1 was not aware that the fire was divided into divisions and that each division had its own command and tactical frequencies. Chief #1 was monitoring his assigned frequencies but did not hear any radio traffic. He was not aware that there was a burn-over occurring. When Chief #1's engines arrived at the hatchery Friday evening, the local CAL FIRE engine gave them

pre-plans of the hatchery and shared with them the fact that the residence just west of the hatchery was identified as undefendable. This information was not shared with any other equipment assigned to the fire.



View of the Seven Oak Fire from the airport, 1150 hours



View of the Seven Oak Fire from the airport, 1428 hours

Division "A" directed Strike Team Leader 9442C to carry fire further up North Oak Creek Road toward the Oak Creek Campground. The campground had burned the day before so the intentions were to tie the burn into the black. The campground was identified as a safety zone for the resources working in front of the fire. Because the winds were still favorable, Strike Team Leader 9442C instructed 1173G to go in 50 feet and fire parallel to the road. His hopes were to add depth to the fire break and minimize the threat of the advancing fire front. The crew followed instructions and began burning out. This firing started just west of, and across the street from, 1659 West Oak Creek Road. Even though the address is listed as west, it is located on North Oak Creek Road. Almost immediately, at approximately 1430 hours, the winds changed to a southwest wind. Division "A" heard Strike Team Leader 9442C directing those firing, to narrow it up so that they were not taking such a big bite. Strike Team Leader 9442C was concerned the firing was going to hit the road too hard. He positioned himself further to the west where he would have a better view. The fire did hit too hard and the fire crossed the road. A large dust/fire whirl formed and carried the fire into a riparian area just west of the hatchery which contained

houses. The hand crew stopped the firing operation and proceeded up to the safety zone at the campground.

The CAL FIRE IC returned and saw what was occurring. According to CAL FIRE IC, he told Division "A", face to face, that there were structures in that area that were non-defendable. He told him that no engines are to go in there. He watched Division "A" talk on the radio as he walked away but could not remember what was said over the air or who it was said to. The USFS IC also heard the CAL FIRE IC tell Division "A" not to protect that structure. Division "A" did not remember anyone telling him the structures were undefendable, he did not share that information with Strike Team Leader 9442C. IMT 3 Member B, who was riding in the back of Strike Team Leader 9442C's vehicle, heard Strike Team Leader 9442C direct his engines to "get into the structure and protect the home."

Strike Team Leader 9442C stated that he directed E-4480 to try to catch the slop-over. He directed E-4452 to come in and give E-4480 a hand. He said that he did not direct them into the driveway, his intentions were not structure protection but to pick up the fire.

E-4480 had three firefighters spread out along North Oak Creek Road looking for spot fires with back pumps. The fourth firefighter was in the cab with the engineer. When Engineer 4480 received his directions, he notified the other firefighters and started backing down the driveway of 1659 West Oak Creek Road, a driveway they had not been in before. Engineer 4480 spotted the engine in a small open area between two wooden bridges. He exited the engine, looked around, and pointed out a small pond located next to the engine and identified it as their safety zone. Engineer 4480 later stated that he was uncomfortable with the assignment and chose not to go in any further than he did. He felt it was too dangerous. Several spot fires were visible so the crew began extending two 1 ½" hose lays.

E-4452 was staged on North Creek Road, west of the Y intersection, while the burning operation was being conducted. Captain #1 heard the Strike Team Leader direct E-4480 to drive in there and check the area because spots were starting to land on that side of the road. E-4480 reported back that there were spots all over and they needed some help. Strike Team Leader 9442C instructed E-4452 to go in and give them a hand.

The firefighters from E-4480 began laying hose when a private vehicle loaded with personal property came out from around a structure. The driver, a 77-year-old female, lived on the property. At about this same time, E-4452 was entering the property to assist. Both engines had to move out of the way to allow the civilian to escape. Engineer 4480 stated that if it were not for him moving his engine to let the civilian out, Engine 4452 would not have gotten around him and entered further onto the property.

The engines continued to set up their suppression activities, with the crew members from E-4452 assisting with the hose lays off of E-4480. One hose was laid to the west toward the outer boundaries of the riparian. The other was stretched to the northwest behind the structures where spots were visible. Captain 4452 maneuvered his engine around Engine 4480 and crossed a second wooden bridge where he backed up into an opening north of the pond. Captain 4452 walked the perimeter of the area, sizing up the situation. At first, things were looking pretty good and everyone felt they were going to be able to pick the fire up. Then, the main fire hit and the intensity suddenly increased. The fire got up into the trees, making the hose streams ineffective. The firefighters off E-4480 recognized that they were in trouble and began heading to the pond identified earlier as their safety zone. The crew from E-4452 saw what was happening and followed suit. Captain 4452 was separated from his crew and sought refuge in the cab of the engine as the fire compromised their position. Engineer 4480 entered the pond and notified Strike Team Leader 9442C that

they were being overrun with fire. This information was relayed to Division “A” and air support was requested. Fire shelters were deployed in the pond for extra protection. A couple of the firefighters could not get their shelters opened. So they shared with others. Firefighters were holding their breath underwater as long as they could to escape the intense heat.

The Inyo National Forrest dispatch log shows that at 1454 hours, the USFS IC requested the Independence ambulance to standby at the Mt. Whitney Fish Hatchery. This request was placed prior to the burn-over incident. There was no indication that this volunteer ambulance was staffed and responded.

The Inyo National Forrest dispatch log shows that at 1505 hours, the USFS IC requested an immediate need for air tankers to support trapped firefighters.

In the pond, roll call was taken and the crews continued to communicate with each other and Strike Team Leader 9442C. Structures, vehicles, and trees were burning all around them as they attempted to stay calm. Captain 4452 moved his engine around trying to keep it away from the heat. He would exit the vehicle periodically and spray water with his hardline, trying to keep things cool. He removed his fire shelter from its case and unfolded it in the cab in case it got to where he felt he needed it.

Air Tactical Bravo 5 had just arrived on the Inyo Complex and was in a holding pattern over the Seven Oak Fire when he noticed fire running toward some structures. Bravo 5 came up on the air to ground frequency and heard the USFS IC calling for Air Attack 410. Bravo 5 offered his assistance and learned that there were firefighters trapped and that they needed immediate air support. Bravo 5 called in two S2 Tankers that he had in orbit just south of the



Air Tanker coming in to assist.

fire, and directed them to drop on the houses. Three helicopters were also brought in to assist; they were Copters 534, 554, and 551.

Division "A" made a note on his steno pad documenting the time of the burn-over as 1445 hours. He also documented tanker drops at 1450, 1455, and 1505 hours.

After awhile, things calmed down on the ground and the crew members exited the water and moved toward E-4452. They gathered in a group at E-4452, using their shelters around them as a shield. Those who had lost their shelters in the water were placed in the middle, protected by the group. The house adjacent to the engine was on fire and fire was burning the trees to the north.



Fire Fighter photo of Air Tanker drop

While the burn-over was occurring, Strike Team Leader 9442C handed his camera to a fire fighter from Engine 4466 and directed him to take pictures. The Strike Team Leader also took time to call his unit chief and advised him that he was burning up two of his engines. He

wanted to advise the chief before he read

it in a flash report. When the fire intensity seemed to decrease, Strike Team Leader 9442C attempted to drive into the premises. He was able to get within 50 feet of the cattle guard, but the heat did not allow him to get any closer. He returned to his vantage point up on North Oak Creek Road where he continued to check in with those involved via the radio.



Firefighter photo during entrapment.

The structure next to Engine 4452 became more involved. The group, huddled near the engine, decided to return to the safety of the pond, and Captain 4452 joined them. They watched as the burning structure heated an adjacent propane tank to venting temperatures. The propane fire spread to Engine 4452, totally consuming it. Eventually, conditions cooled to the point where the crew felt they could walk out to the road. Engineer 4480 got out and checked and gave the OK for the rest of the crew. Four of the crew members carried their shelters with them to the cattle guard before disposing of them.

At 1551 hours, it was announced that those involved in the entrapment were out and OK.

At 1559 the USFS IC announced that there were no injuries and ordered a Critical Incident Stress Debriefing for the following day.

Strike Team Leader 9442C was in the driveway when the firefighters came



Gathering after entrapment.

walking out. They all gathered to greet and hug each other. Strike Team Leader 9442C stated that they were all standing, they were all talking, and they all looked pretty good for what they had been through. Division "A" told him that he had ordered a medic unit and that it was on its way. Everyone was milling around, getting something to drink, removing PPE,

and taking photographs. Division "A" was prodding the group trying to get them moving to the airport where an ambulance was supposed to meet them. After determining that there were no apparent injuries, Strike Team Leader 9442C, Captain 4452, and Engineer 4480 and several fire fighter re-entered the site to see what damage occurred to the engines and retrieved what personal belongings they could. They all looked around, discussing the incident and



Group re-enters burn-over site and takes pictures.

taking pictures. E-4480 was still running so Strike Team Leader 9442C directed Engineer 4480 to drive it out to the road.

Strike Team Leader 9442C admitted that Division "A" told him three or four times that

he needed to get everyone moving. The crew members were eventually loaded

onto the remaining engines and transported to the Independence Airport for a medical evaluation. Engineer 4480 drove his engine to the airport. They arrived at the airport at 1715 hours but there were no ambulances present. At 1720 hours, the USFS IC notified his dispatch center that the Strike Team Leader was requesting a medical flight for one person with 3rd degree burns on an ear. At 1725 hours, two more injured employees were added to that request. The injuries to one were burns to the face, ear, and back; and other with burns to the face, eyebrows, and possibly eyes.

At 1758 hours, plans were in place to transport the firefighter with burns on his face, ear, and back to Lone Pine by ambulance and flown out from there. The other two fire fighters were to be transported to Northern Inyo Hospital and flown from there. Strike Team Leader 9442C told the USFS IC that it was CAL FIRE Burn Policy, to transport burn injuries directly to the burn center. He would not allow his crew members to go to the local hospital. The transportation plans in place were put on hold and other arrangements were started.



Engine 4452 burning.

After waiting for the ambulance to arrive, Division "A" drove into town and located one. At approximately 1825 hours, he directed the ambulance to the airport, where Lone Pine paramedics began

evaluating those involved in the burn-over. A second ambulance arrived at the airport and assisted with the evaluations. It was determined that two firefighters and Engineer 4480 needed to be transported to the burn center in Fresno. The remaining employees were evaluated but refused oxygen therapy with many denying injuries or complaints.

Division Chief #1 arrived at the airport as the last two firefighters were being evaluated. The paramedic approached him and informed him that they wanted to transport three fire fighters to Northern Inyo Hospital for further evaluation. He told them that as per CAL FIRE policy, they needed to be transported to the nearest burn center. Division Chief #1 called Unit Chief #1 who concurred that they needed to be transported to the burn center.

Division Chief #1 met with those involved in the burn-over and instructed each of them to write down what occurred to provide to the SART. He contacted the Red Cross for assistance but got an answering machine. Red Cross never returned his call. Division Chief #1 directed Strike Team Leader 9442C to stop at the Bishop K-Mart and purchase clothing for his crew. Strike Team Leader 9442C told him that between the strike team they would have enough clothing for the crew. Strike Team Leader 9442C also told him that he could CAL-Card their meals.

Because of weight and altitude issues getting over the Sierras, the local medical helicopter could only take one patient at a time. This would require three separate trips back and forth to transport the injured, which would take an extended period of time. A fixed wing aircraft was ordered that was capable of transporting all three injured firefighters to the Fresno Burn Center. The aircraft experienced some mechanical problems and CHP assisted by providing a code three transport for the mechanic. At 1839 hours, it was determined the plane was inoperable, which forced another change in the transportation plans. Two helicopters were coming from Fresno with 50-60 minute ETAs.

It was decided to take those injured to Lone Pine by ground ambulance to await the helicopters. At 1940 hours, two of the crew members were picked up by Mercy Air. At 1955 hours, the last crewmember was picked up by the CHP helicopter and transported to the Fresno Burn Center.

The remainder of the strike team drove themselves to a motel in Mammoth Lakes, two hours away. Attempts were made to locate rooms in Bishop, but with the fires and the road closures, there were no rooms available. The strike team arrived at Mammoth Lakes in time to catch the last restaurant open before closing for the night. The next day, Strike Team Leader 9442C gave those who lost their belongings \$60 out of his own wallet to go replace the basics, such as toothbrushes and razors, that were lost in the fire. Strike Team Leader 9942C was the only CAL Card holder on the strike team. Based on the magnitude of the personnel issues facing this Strike Team, he felt hard pressed to ensure his personnel were OK and coping with what had happened to them, as well as provide for their personal needs.

Captain #2, Tuolumne/Calaveras Unit, came over and conducted a critical incident stress debriefing Sunday morning. Monday morning, approximately 0900 hours, he contacted Division Chief #1 and informed him that two of the firefighters were experiencing respiratory problems and asked if it was OK to take them to the local hospital.

At approximately 1030 hours, Division Chief #1 received a telephone call from Unit Chief #2. Unit Chief #2 expressed his concerns that the local hospital was only giving the firefighters inhalers. It was also discovered by the SART that another firefighter had burn injuries. It was decided to transport the remaining six employees involved in the burn-over to the Fresno Burn Center for further evaluation. The Team Medical Unit Leader was contacted and arrangements were made to fly the fire fighters from Mammoth to Fresno.

Captain #2 expressed his concerns that the strike team felt as if they had been abandoned. Nobody from the forest ever came to check on their welfare or see if they needed any further assistance. They felt the CAL FIRE supervisors only came after complaints were voiced and only made brief appearances.

July 9, 2007, at 1817 hours, Investigators interviewed the tenant of 1659 W. Oak Creek Road. She stated that she was evacuated from her home on Friday, July 6, 2007. The tenant returned to the area Saturday, at approximately 1100 hours, and found no one posted at the road closed sign. She drove home feeling safe with all of the aircraft working. Even though she did not think there was any danger, she continued to put personal items into her car. She stated that she was inside the house when she sensed a change in conditions. She got into her car to leave and saw the firefighters on her property. The firefighters had to move their trucks so that she could leave. As she left, she observed what she called the bunkhouse begin to burn.

July 10, 2007, the remainder of the Strike Team was released to return to their home unit.

Friday, July 13, 2007, at 1800 hours, the Seven Oak Fire was contained at 28,708 acres. The containment lines were 80percent man-made, with 20 percent being natural barriers.

FINDINGS

All personnel were properly trained and qualified for the positions they held. As a result of a fire fighter fatality in 2004, Tuolumne/Calaveras Unit trains all of its personnel the S-190 class. (Training Program Report, Statement of B-4415)

A good safety tailgate session was conducted by ST 9442C at the beginning of the shift. (Statements from members of ST9442C)

The Limit Term FAE identified the pond to his crew as a safety zone. (Statements from Engineer 4480 and his crewmembers)

At the time of the burn-over, proper personal protective equipment was in use and performed as expected. (Statements from involved employees and the Safety Program Report)

Good communications occurred during the burn-over. (Statements from involved employees, B-4415, and Division "A")

A 1" nozzle was being utilized on one of E-4480s 1½" hose lays. (Evidence collected at scene)

Five old style fire shelters and two new generation shelters were deployed in a small pond. (Statements from involved employees, Fire Shelter Program Report)

Two fire fighters experienced difficulties removing their fire shelters from the PVC bag. (Statements from involved employees, Fire Shelter Program Report)

1659 W. Oak Creek Road has a history of being in violation of the PRC 4291. (Statements from CAL FIRE IC)

Local firefighters are familiar with 1659 W. Oak Creek Road and knew that it had been identified as un-defendable in a wildland fire situation. (Statements from CAL FIRE IC)

The undefendable status of 1659 W. Oak Creek Road was not shared with ST 9442C prior to the burning operation. (Statements from CAL FIRE IC, Division "A", B-4415)

ST 9442C, E-4480, or E-4452 did not have the opportunity to recon 1659 W. Oak Creek Road prior to the threat. (Statements from B-4415, Captain #1, and Engineer 4480)

Division "A" did recon 1659 W. Oak Creek Road prior to the threat and felt that it may be defendable depending on burning conditions at the time. (Statement of Division "A")

Engineer 4480 felt uncomfortable at 1659 W. Oak Creek Road, yet chose to stay and initiate suppression actions. (Statement of Engineer 4480)

Firefighters felt that they were picking the fire up, but the conditions changed and the fire increased in intensity. (Statements from involved employees)

Southern California is experiencing a drought; fuel conditions are extreme. (Fire Behavior Analysis Report)

Weather conditions on the Seven Oak Fire were predicted and expected. (Statements from CAL FIRE IC, Division "A", and B-4415)

The rapidly progressing fire compromised fire fighter safety which forced fire fighters to take refuge in the pond. (Statements from involved employees)

The main fire would have crossed N. Oak Creek Road and hit 1659 with more intensity than the slop-over fire did. (Statements from CAL FIRE IC, Division "A", B-4415, and the Fire Behavior Analysis Report)

Other fire activity in the area impacted the availability of resources. (Statements from CAL FIRE IC, Division "A", and B-4415)

Initial Attack resources worked in excess of 24 hours. Even though resources were tired, fatigue did not appear to affect the decision-making process. (Statement of CAL FIRE IC)

The accident occurred during the transition period to an Incident Command Team. (Statements from CAL FIRE IC, Division "A", IMT 3 Members A & B)

Radio frequency assignments were in place, but not all resources were monitoring proper channels. (Statements from CAL FIRE IC, USFS IC, Division "A", B-4415, Chief #1)

There was no written IAP and Strike Team 9442C did not attend the morning briefing. (Statements from CAL FIRE IC, Division "A" and B-4415)

Providing medical treatment, and air transportation for the injured, to the Burn Center, was much delayed. (Statements from CAL FIRE IC, Division "A", B-4415, crewmembers involved, Ambulance Personnel, Safety Program Report)

CAUSAL FACTORS

Engineer 4480 entered 1659 W. Oak Creek Road and observed the condition of the property. Even though he did not feel comfortable with the assignment, he gave direction to his crewmembers to begin laying hose.

Engineer 4480 stated that he did not feel comfortable with the assignment once he saw what it involved. Yet he initiated a plan which involved two hose lays off his engine instead of exiting.

Captain 4452 entered 1659 W. Oak Creek Road and observed the condition of the property. He supported the plan initiated by Engineer 4480 by directing his crewmembers to assist the crew of E-4480 with their hose lay.

Captain 4452 had an opportunity to re-evaluate their situation when he had to back out of the way to let the civilian escape. He chose to stay and even caused damage to his engine trying to get further into the property.

CONTRIBUTORY FACTORS

The undefendable status of 1659 W. Oak Creek Road was never communicated to Strike Team 9442C.

Per statements taken, CAL FIRE IC and the local Engine Companies were aware of the conditions at 1659 W. Oak Creek Road. The property has a history of being in violation of PRC 4291. This information was not shared with anyone during the morning briefing or fire line meetings.

Members of Strike Team 9442C scouted out the properties east of Mt. Whitney Fish Hatchery but did not make it to 1659 W. Oak Creek Road, which is just west of the hatchery.

Per statements taken, B-4415, E-4452, and E-4480 each scouted out the properties east of the hatchery. Neither made it to 1659 W. Oak Creek Road prior to the burn-over.

Shift in wind conditions caused the firing out operation to jump the road and run into the riparian area.

Per statements taken, CAL FIRE IC, USFS IC, Division "A", and B-4415.

This accident occurred during the transitional period to an Incident Command Team.

Per statements taken, the Initial Attack ICs worked the incident in excess of 24 hours without sleep. The Incident Command Team was on scene at approximately 1000 hours yet the transition was set for 1800 hours. The fire continued to operate as a reactionary initial attack fire with limited resources and without any maps or IAP.

The tenant violated the evacuation order and re-entered the premises. The engines had to move to give the tenant the opportunity to escape. The moving of E-4480 allowed E-4452 the opportunity to commit himself further onto the property.

Per statements taken, E-4480's initial position blocked the driveway preventing E-4452 from getting past. Once that engine was moved, E-4452 proceeded around E-4480.

Fire suppression personnel resorted to their core training, which saved their lives.

Per statements taken, the pond had been identified as a safety zone, if needed, by Engineer 4480. When things did not work as planned, each employee resorted to their core training and gathered at their identified safety zone. They communicated with, and supported one other. Working as a team, they survived this incident.

CIRCUMSTANCES

Weather conditions on Friday, the day the fires started, were frequent lightning strikes along the high country accompanied by strong, gusty and erratic winds. Temperatures were in the high 90's to low 100's with a reading of 103 recorded at the Oak Creek RAWS (located 1.1 miles NW of accident site) at 1647 hours. On scene fire personnel recorded at least one wind gust to 58 mph on a hand held Kestrel weather meter. Relative humidity was generally in the single digit readings. One hour fuel moistures were reported by fire personnel to be 0-2 percent.

Weather conditions on Saturday, the day of the accident, skies were clear with no cumulous build-up. Day time temperatures ranged from the low 90s to 100 degrees at 1247 hours. Day time relative humidity's ranged from a high of 13percent to a low of 4percent at 1447 hours. Also at 1447 a wind gust was recorded at the Oak Creek RAWS of 50 mph. Winds in the afternoon were sustained 10 to 15 mph gusting into the 30's. One hour fuels would have been similar to Friday's readings of 0-2percent.

Weather conditions recorded at the Oak Creek RAWS at the time of the accident were Temperature 97 degrees, RH 5percent, winds 13 with gusts to 32 mph. Winds at the accident site at the time of the incident were reported to be 20-30 mph out of the SW.

Normal rainfall in the Owens Valley area as recorded at Bishop by the NWS shows a 30-year average of 5.02 inches for the period of July through June. Rainfall recorded for the period of July 06 through June 07 was only 1.52 inches. This is a deficit of 3.50 inches and is only 30percent of normal.

This severe rainfall deficit combined with the nature of the area has resulted in extremely low Live Fuel moisture in the native vegetation. Conditions for this

area are classified as in “Extreme Drought” on the Palmer Drought Index produced by NOAA.

Burning Index (BI) is another indicator of fire line intensity and is also calculated by the Inyo National Forest. BI can be used to give a rough estimate of average potential flame length. The BI for July 6 and 7 were 110 and 127 respectively. This equates to an average flame length of 11 and 13 feet respectively. This is an average only and wind gust or other modifying conditions can substantially increase or decrease these values.

In summary, the conditions present in the days before and the day of the accident, extremely dry fuels, high temperatures, low relative humidities and strong gusty and erratic winds, all indicate the potential for extreme fire behavior with rapid spread rates, long flame lengths, spotting potential and blow-up conditions.

The local Inyo National Forest has opted to utilize energy release component (ERC) as the basis for their Pocket Briefing Cards fire danger relationship with past conditions. ERC is a measure of fire line intensity. ERCs for Friday, July 6 and Saturday, July 7, as calculated by the Inyo Forest for Oak Creek were 25 and 26 respectively. These numbers are above the 97 percentile mark and appear to be the highest ever recorded. Whether or not a record, these numbers indicate extreme fire potential. A reading above the 97percent mark indicates that the ERC is higher than would be found 97percent of the time over the 20 years of records covered on the card.

Fire behavior on Friday was reported to be extreme with flame lengths of 15’ to 40’ depending on wind conditions. Rates of spread ranged from moderate as the winds eased to extreme when running with the wind. Personnel reported several instances of “sheeting”, a term used to describe a fire that moves so fast entire

areas are consumed in seconds. Spotting was also reported to be occurring $\frac{1}{4}$ to $\frac{3}{4}$ of a mile ahead of the fire fronts.

Fire behavior as reported by fire personnel on Saturday was significant throughout the day as the main fire moved off the high country to the North East. Crews conducted firing operations in an effort to create black line along North and South Oak Creek Roads. Winds at the time were light and crews had difficulty obtaining sufficient depth on the black line. By early afternoon crews has successfully completed firing form the intersection of North and South Oak Creek Roads approximately $\frac{1}{4}$ mile to the west and southwest. Observed flame lengths on this burning operation were from 5' to 15'. Winds were light and somewhat variable.

After completion of the first firing operation, the decision was made to make use of favorable winds to continue firing West on North Oak Creek road in advance of the main fire. Main fire was approximately $\frac{3}{4}$ mile Southwest and moving Northeast. As firing commenced at approximately 1500 hours, a pronounced change in wind conditions occurred. Winds went from nearly calm to strong Southwest. This resulted in the lit fire running hard to North Oak Creek road and crossing to the North side. This "slop-over" then progressed toward what would become the accident site. At the time of the slop-over the main fire was reported to be approximately 75 yards to the Southwest; had the firing operation not been attempted and the slop-over not occurred, the main fire would have crossed the road and produced a similar or worse result.

The following sequences of events are based on burn patterns, leaf freeze, photos and witness statements.

The slop-over moved with a rapid rate of spread through the shrub fuels and into the riparian area with flame lengths estimated to be in excess of 50', pushed by strong, gusty Southwest winds. These winds were the result of the onset of the

normal down slope, down canyon winds. After the initial run into the riparian to where engine 4480 was engaged, subsequent runs engulfed the driveway access and cutting of the engines egress.

A short time later the fire pushed due north running through the Western edge of the riparian to the Northern edge. Flame lengths on this run, as evidenced by photos were near 100'. As a result of both of these runs through the broad leaf vegetation, numerous fire brands were cast into the riparian area igniting spot fires through out in the receptive duff material.

As the fire arrived on the Northern edge of the riparian area it became influenced by conflicting winds blowing down the West-East aligned North fork of Oak Creek and other minor drainages. The result was a 180 degree shift in wind causing the fire to run back through the riparian to the South. This third run was far more intense, with flame lengths well in excess of 100', due to significant pre-heating from the previous run. Smaller finger runs progressed to the southeast deeper into the riparian area. By this time the fire was well established in the riparian with significant heat generation. This extreme convected heat, coupled the competing drainage winds caused the fire to move in multiple directions, all the while building additional heat load.

The final run affecting the accident site began on the Northwest corner of the riparian and moved East along the riparian perimeter. Based on the deep char and significant fuel consumption of the mature trees and heavy spalling on the rocks adjacent to the riparian, I believe this final run was in the form of a intense fire whirl.

Conditions in the riparian area where the engines were located quickly became unmanageable due to extreme heat, multiple fire fronts impacting the area and spotting throughout. Adding to the heat load were several structures and large volumes of stored man-made materials including flammable gasses and liquids.

Personnel in the area had to seek shelter in the pond due to the extreme heat and choking smoke produced by the burning materials. Temperatures remained extreme for several hours due to deep seated heat and continuing burn out of heavy materials.

At some point after the accident, the fire moved out of the riparian to the North burning approximately $\frac{3}{4}$ of a mile through the shrub fuel before halting at its final perimeter.

Those involved in the burn-over, had put in a full day of work before being dispatched to the Inyo Complex. They left their home Unit at approximately 2200 hours and arrived in Owens Valley at approximately 0200 hours. Because there were no motel vacancies available, they chose to sleep on the lawn at Owens Valley Camp. The Strike Team was awoken at 0500 hours when the lawn sprinklers came on. The Strike Team ate breakfast arrived at the Mt Whitney Fish Hatchery at 0800 as instructed. Even though the Strike Team was operating on a minimum amount of the sleep, they did not feel that fatigue played a role in the accident.

The training records of those involved were examined. It was determined that everyone met or exceeded the minimum qualifications required for the positions held.

The Personal Protection Equipment in use by those involved in the entrapment were examined, photographed, and cataloged. Through interviews and equipment examination, it was determined that everyone was wearing full protective equipment and that the equipment operated as it was designed to.

SITE CONDITIONS

Accident site is located on an alluvial plain approximately 4000 feet east from the base of the escarpment that begins the eastern slope of the Sierra Mountain range. Slope from the base of the escarpment east to the valley floor, a distance of approximately 5 miles, averages 7percent. Slopes on the escarpment range from 30-50percent on the lower areas to near vertical at the higher elevations. Slope at the accident site is 7percent.

The eastern slope of the Sierra is marked by a series of steep drainages aligned from west to east. These drainages help to amplify and funnel the diurnal wind that occur each afternoon as the valley heats and rising air is replaced by cooler air from the west.

The accident site is located at the confluence of the South and North forks of Oak Creek. These creeks and associated drainages, though not deep or pronounced appear to have had a directional effect on the fires spread. Additionally, both of these creeks have abundant flowing water which allows the riparian area involved to exist and sustain the heavy vegetation present prior to the accident.

Though slope was not a direct factor in the accident, the proximity of the site to the steep escarpment, placed it well within the influence of the strong down slope winds that historically occur in this area every afternoon in the summer months.

Fuels on the alluvial planes (outside the accident site) are made up of several shrub species with very sparse grass. Species present include Black Brush, Rabbit Brush, Great Basin Sage, California Buckwheat, Mormon Tea, Burro Brush and other local shrubs. According to local fuels management personnel, this fuel type is not represented by any of the Behave fuel models. Fuels are generally sparse and require wind for fire spread.

No records of live fuel moistures could be obtained and local personnel did not know of any LFM ever being sampled in this area. Fuels are obviously extremely dry and flammable due to the present drought conditions. Fuel conditions were described by some local fuel managers as “explosive”.

Fuels in the riparian area where the accident occurred were very different containing several species of mature trees. Cottonwood, Poplar, Live Oak, Willow, Pine and Cypress are the most prominent. Trees ranged in height from 10' to near 100'. Canopy was near 100percent crown closure. Also present were unidentifiable (due to burned nature) brush and large shrub species. A heavy duff layer was also present.

Littered throughout the accident area was a heavy concentration of small structures and stored man made materials of various make-up, many appeared to be highly flammable. The location has a history of being in violation of Public Resource Code section 4291.

Local fire personnel reported that fires occurring in these types of riparian areas historically burn readily with great intensity, long flame lengths and extreme heat.