



*The Division Supervisor's vehicle at the entrapment location
just prior to shelter deployment.*

Beaver Fire Entrapment Facilitated Learning Analysis



**Incident Date:
August 11, 2014**

*"I have always wondered
if a little piece of foil would
protect me, but I am
a believer now.
Fire shelters really work."*

Heavy Equipment Boss Trainee



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National Wildfire Coordinating Group (NWCG)

"Entrapment" Definition:

A situation in which personnel are unexpectedly caught in a fire behavior-related, life-threatening position where planned escape routes or safety zones are absent, inadequate, or compromised. An entrapment may or may not include deployment of a fire shelter for its intended purpose. These situations may or may not result in injury. They include "near misses."

1. Chronology of Events

The Beaver Fire started by lightning on July 30, 2014 on a private inholding within the Klamath National Forest. By the fire’s second day, it had grown to 611 acres. By the third day, Aug. 1, it made a substantial run to the east and burned another 1,149 acres. On August 2, a Type 2 Incident Management Team (IMT) took command of the fire. That afternoon, the fire roared to the south, growing 5,245 acres in one burn period.

By August 3, the fire had chewed up a total of 10,518 acres and was active on three sides. The fire primarily spread to the south, but both the east and west flanks were active and accounted for some of the fire spread.

August 6-10

From August 6 -10, the fire spread primarily to the west and burned mid-slope laterally along the hillside. Division A had constructed indirect dozer line out ahead of the fire to the west. (See fire progression map on next page.)

Fire spread was dependent on atmospheric stability. Because the Beaver Fire was under an inversion, rates of spread were relatively low. However, a consistent pattern emerged in which the fire behavior increased in the afternoons as the inversion lifted. At about 1700 every day, the fire would heat up and make a substantial run. During this period of westerly fire spread, the IMT would send resources to get out ahead of the fire, pick a ridge, and construct indirect line to contain the fire. Each day after the inversion lifted, the fire would spot across the dozer line, forcing the team to back off to another ridge to construct control line.

This pattern was especially apparent during August 9 and 10 when fire spread to the west increased significantly under the unstable conditions associated with nearby thunderstorm activity.

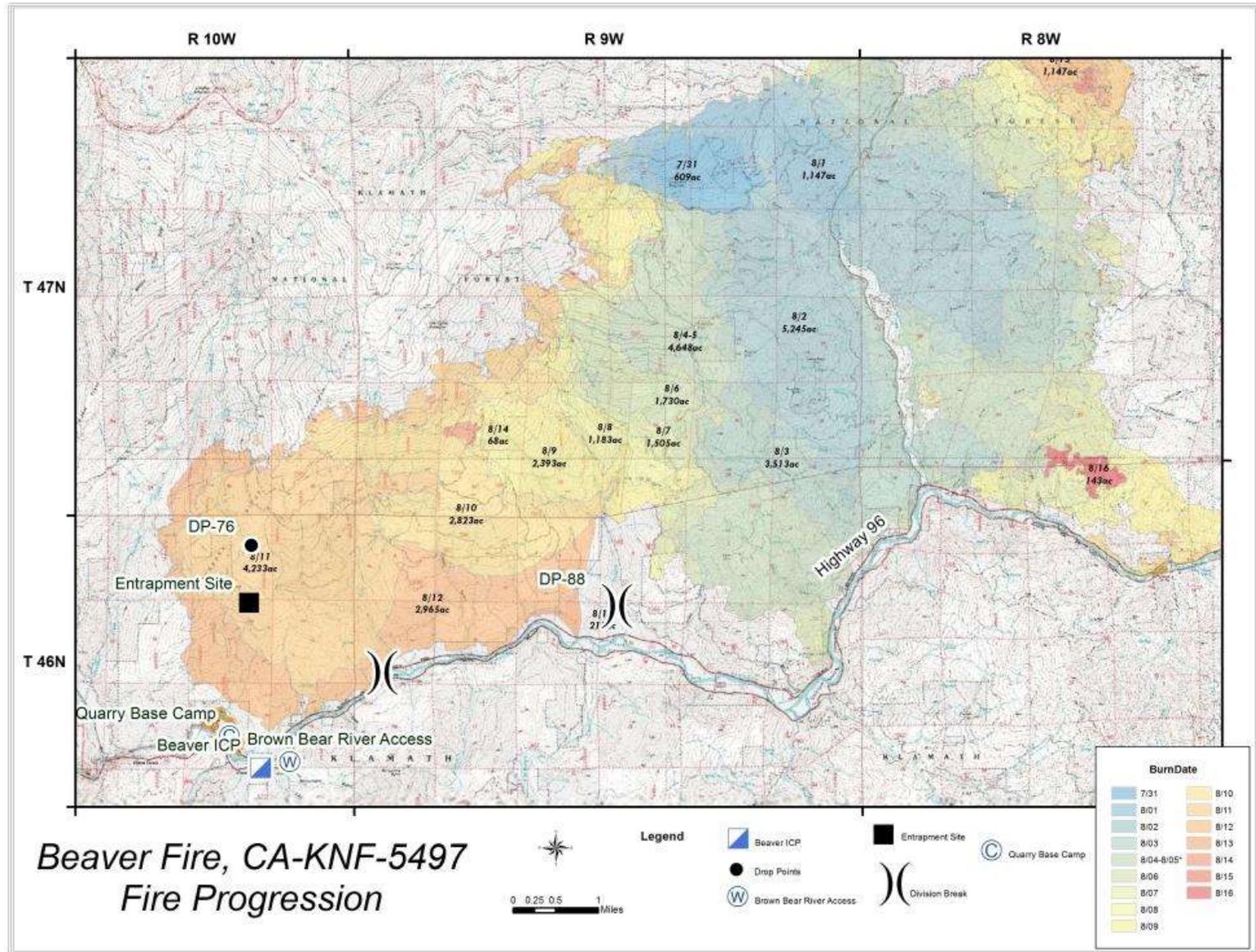


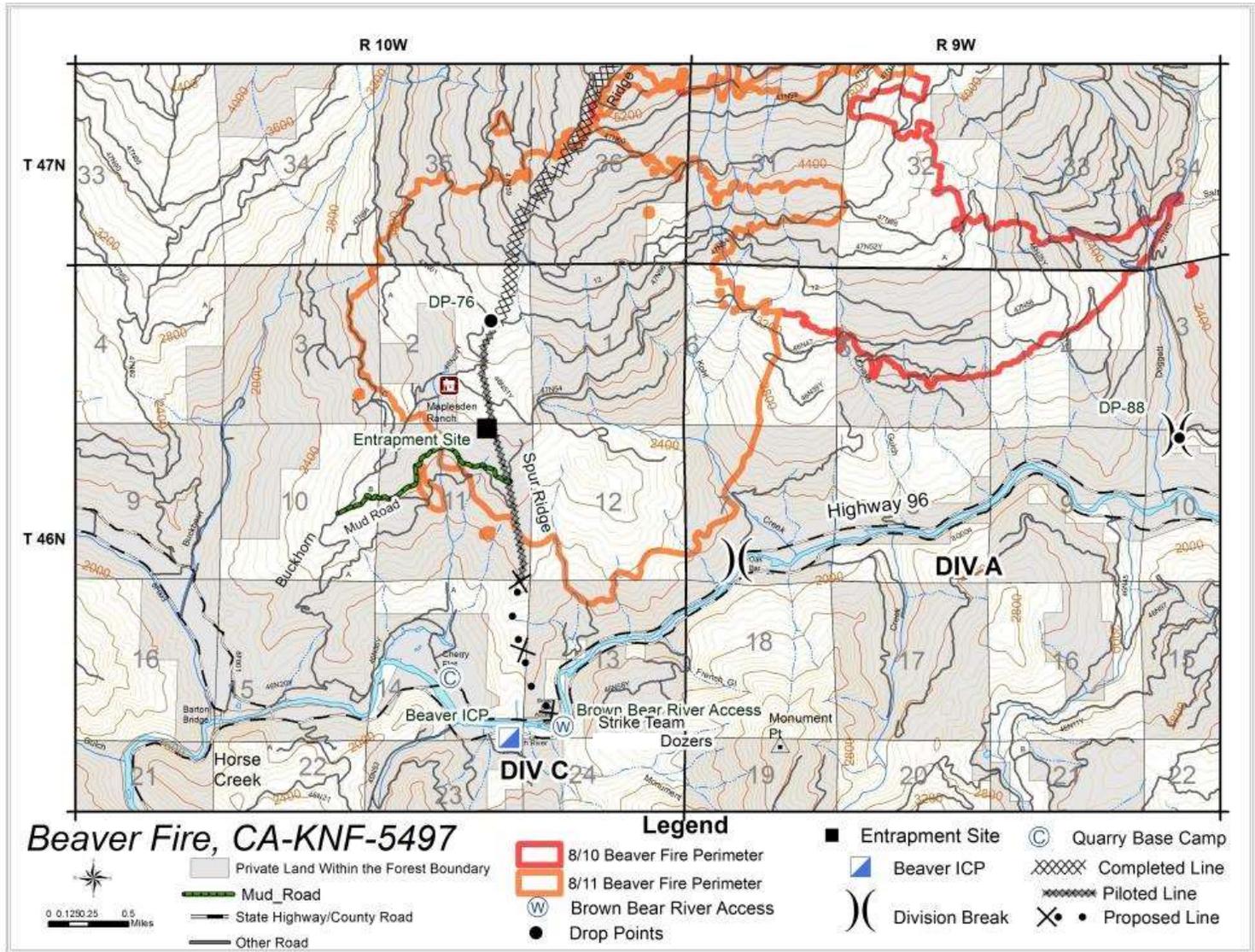
The Beaver Fire on August 10.

August 10

Dozer Mechanical Difficulties

Three dozers and a masticator working for Division A had plans to continue the dozer line from Drop Point 76 (DP 76) down along Spur Ridge to Highway 96 near the fire’s Incident Command Post (ICP). They scouted the line, identified two areas that—with some dozer work—would make good safety zones, and began to push line down Spur Ridge when one dozer broke down. (See fire area map on page 5 that includes Spur Ridge, Division C, and Division A.)





The Dozer Operator (DZOP) turned his dozer around and limped it back to DP 76 to begin repairs. A second dozer followed him up the ridge to help fix it. While they were completing this repair work, this second dozer cleared the surrounding area to provide extra protection. The third dozer continued constructing line down the ridge.

Because the repair job took longer than expected, the two dozers did not construct any more line that shift. The third dozer made it three-quarters of the way down the ridge with “piloted” line before he also had mechanical difficulties. (“Piloted” line is the first pass of dozer line, incomplete line that has been pushed-in to mark the line’s route. In this case, the follow-up dozers were to improve and finish this line.)

Meanwhile, quite a bit farther up the hill above DP 76, the masticator was improving the dozer line by mowing down brush on the fire side of the line.

During the August 10 shift, the fire once again slopped over the completed portion of indirect dozer line north of DP 76. From the observed fire behavior, it looked like the current plan was no longer viable. Therefore, the indirect dozer line that they were constructing was not worth completing.

At this point, the Operations Section Chief (OSC2) decided to “draw a bigger box”—meaning that he wanted to get farther out ahead of the fire to begin constructing indirect line. Using this strategy, the ground resources would have more time to complete the plan before the fire reached their location.

August 11 – Morning

Take Advantage of Predicted Weather Change

On the morning of August 11, the IMT decided to back off and try to get ahead of the fire behavior by devising this “Big Box” plan. Implementing this strategy would provide more time to complete the suppression plan before the fire moved into areas where resources were working. However, after consulting the infrared flight data, it was decided that the (previously mentioned) slop-over from the day before was not as large as originally believed. Furthermore, because the fire was still two miles away from DP 76, it was believed that the dozers could easily line the slop-over during the present day shift.

OSC2 also saw an opportunity to take advantage of a predicted weather change. They had been experiencing easterly winds for the past three days which was uncommon for that area. On the following morning (August 12), winds were predicted to switch back to the more normal western pattern.

The Revised Plan

The revised plan for the August 11 shift was for Division C Supervisor (DIVS C)—a team division supervisor who did not have any resources assigned to him for that shift—to scout the ridge line (“Spur Ridge,” see map on previous page) just above ICP. OSC2 knew that ridge already had received some “piloted” dozer line. He was also aware that an experienced strike team of three dozers had finished their previous assignment and—if needed—was available. (Previously, this section of line had been assigned to DIVS A. But on August 11, this revised plan had created the new division called DIVS C.)

The revised plan for the August 11 shift was for DIVS C to scout the ridge line (Spur Ridge) just above ICP. OSC2 knew that ridge already had received some ‘piloted’ dozer line. He was also aware that an experienced strike team of three dozers had finished their previous assignment and—if needed—was available.

Red Flag Warning

The Incident Meteorologist (IMET) stated that August 11 was going to be a critical weather day. He announced that a Red Flag Warning was again in effect, similar to warnings that had been issued for the previous two days due to abundant dry lightning, dry fuels, and gusty outflow winds.

The morning briefing had informed that thunderstorms were going to move into the area around 1400. After briefing, a Division Supervisor asked the IMET to give radio weather updates over the command frequency every two hours from noon to 1800. He asked for these updates to occur even if nothing had changed since the last report. The IMET agreed. (The IMET actually ended up giving radio updates about every hour from noon until the blowup occurred.)

The Value in Holding Spur Ridge

OSC2, OSC2 Trainee, and DIVS C all saw value in holding Spur Ridge to keep the fire off of the Highway 96 corridor and away from the structures located within this corridor. This ridge also represented a good strategic location to hold the fire on the west side. The dozer line on that ridge connected Highway 96 to a road system located higher up the hillside. This road system was fairly extensive and provided some beneficial opportunities to catch the fire. The weak point—most resistant to control—was the area located to the west of Spur Ridge and below the road system.

If feasible, the plan was to establish the dozer line. Then, once the wind switched to a favorable direction, to conduct a firing operation on that line. OSC2 told DIVS C that if he didn't feel comfortable putting a line in, they would stay with the "Big Box" plan that the other fire resources were currently working under.

DIVS C scouted the line and said he liked the plan. He felt comfortable because there were a couple of different places along Spur Ridge where dozers could dive off to the west away from the fire and safely exit the area. OSC2 acknowledged this and assigned the strike team of dozers to DIVS C. The dozers began constructing line from the Highway 96 corridor uphill toward DP 76.

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along Spur Ridge where dozers
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Meanwhile, DIVS A's broken-down dozer and masticator (that had been working south on the same section of line the day before) were still located at DP 76. However, they had now been reassigned to other missions closer to the fire's edge near Drop Point 88.

The remaining dozers from the previous day were also reassigned to another mission. The Heavy Equipment Boss Trainee (HEQB (t)) left the DZOP to complete the repair work on his dozer while he scouted the new mission near Drop Point 88.

When the HEQB (t) sized up the new assignment at DP 88, he didn't think it was feasible to build the line before the fire reached their new location. The Division Supervisors from A and C discussed this and made the decision to abandon that mission and send the dozers and HEQB (t) back to Spur Ridge to finish line construction.

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New Heavy Equipment Boss Assigned

While the masticator was still in the area near DP 76, the Heavy Equipment Boss (HEQB) assigned to it had timed out and gone home. A new HEQB showed up that morning, jumped in with the masticator and assumed the role of HEQB trainer for HEQB (t). With the change in plans and all resources back working the Spur Ridge line, HEQB was unclear if he was now working for DIVS C or for DIVS A.

DIVS C Scouts for Dozer Line to Protect Camp; Meets with Private Land Owners

At 1045, DIVS C went to the ICP to scout a proposed dozer line to protect the camp. He then met with the strike team of dozers to line them out on their assignment. At 1100, he went with the Public Information Officer (PIO) to meet with an upset land owner about the dozer lines that had been constructed on her private property.

After that, DIVS C met with private land owners at the Maplesden Ranch and nearby properties to discuss what he had concluded from his structure triage.

DIVS C finally made it to DP 76 and met with the operator of the broken-down dozer. The DZOP assured DIVS C that he had accrued a total of 40 years of fire experience working a full career as an agency fire employee plus his contract work post retirement. He asked if he could start building line. He felt some urgency that this was “*the last stand ridge*” on which to catch the fire. DIVS C told him to wait for HEQB (t).

*The DZOP
felt some urgency
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‘the last stand ridge’
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catch the fire.*

August 11 – Afternoon

Flanking Fire, Group Torching, Uphill Runs

At approximately 1300, HEQB (t) arrived at Spur Ridge and his Operator began improving the dozer line down the ridge. A few hours later, he reached the proposed safety zone from the day before and began construction.

At the beginning of the day, the map showed that the fire was burning in heavy timber approximately two miles from their location. When DIVS C went to scout the fire’s location, he discovered the fire was actually now approximately one mile away from DP 76. He saw a flanking fire with 2.5-foot flame lengths and some group torching with uphill runs.

DIVS C returned to DP 76 and became one of the lookouts for his resources. At the same time, DIVS A Trainee was serving as a lookout from a good vantage point down on Highway 96. DIVS A Trainee had radio communication with DIVS C and agreed to let him know if the fire spotted across the Kohl Creek drainage. OSC2 continued to check in with DIVS C to make sure everything was okay. In total, he checked in with DIVS C three times throughout that day.

Branch 2 had previously been assigned as Division Supervisor for divisions T and U. This was his first day as Branch Director. Because he had not spent much time on this side of the fire, he decided go scout and size-up the fire on this side.

Several days before, DIVS V had been assigned as a Structure Protection Group Supervisor. Being very familiar with the area, he had scouted all of the roads and developed a structure defense plan west of the fire, including the newly formed Division C. He was reassigned as Division Supervisor for Division V, which was “a pretty cold piece of line.” When he received this assignment, he was told his resources would be the first called to help anyone who was short-handed.



Throughout the afternoon of August 11, fire activity was escalating on the Beaver Fire.

HEQB Monitors Fire’s Forward Progression

Throughout the afternoon, HEQB had been watching the fire activity pick up. Because the fire was located uphill from them, HEQB felt comfortable about their location. He said that as long as the fire was above—or on their same contour on the hillside—he felt comfortable. If the fire ever got below them he would pull out.

As the fire was chunking its way west toward them, HEQB said that he “*had his radio in one hand and his map in the other*” as he kept tabs on the radio traffic indicating where and how the fire was progressing.

At 1539, DIVS A (t) called DIVS C and told him that the fire had spotted across the Kohl Creek drainage. He took photos of the spot fires. DIVS C acknowledged the transmission and thanked DIVS A (t) for the information.

Severe Thunderstorm Warning Issued

At 1420, DIVS C had contacted Air Attack about the possibility of pretreating the proposed dozer line with fire retardant. Air Attack replied that there would be value in this and he would order a lead plane to look it over. Shortly after, a storm cell moved in and the aircraft left the fire.

At 1509, the IMET gave a weather update over command that the National Weather Service had issued a Severe Thunderstorm Warning which called for hail and wind gusts up to 60 mph. The IMET also stated Branch 2 would most likely experience the worst conditions. He ended the broadcast by stating: “*This is a serious situation.*”

Sometime between 1635 and 1644, the IMET issued an unscripted weather update to let resources know that there were no more thunderstorm cores immediately above the Beaver Fire. He informed that Branch 2 was most likely going to experience outflow gusts of 30 to 35 mph. DIVS C coordinated with DIVS V and the preplanned structure defense plan was implemented. DIVS V grabbed his resources and headed over to help in DIVS C.



Photo 1
1529 Hours



Photo 2
1539 Hours



Photo 3
1559 Hours



Photo 4
1605 Hours

Fire Progression

This series of photos was taken by DIVS A (t) from his lookout post on Highway 96. The fire activity is located approximately two miles northeast of the eventual entrapment site.

Time to Head to Safety

Between 1630 and 1700, the dozer was constructing the safety zone with HEQB (t) nearby. The masticator and his HEQB were farther down the ridge, located on the other side of some private property. Because the masticator is capable of throwing chips as far as 300 feet, the masticator’s HEQB had to keep his distance while the machine was working.

HEQB was positioned where he could hear the fire over the noise of the equipment. He thought the fire sounded really close and immediately radioed HEQB (t) to ask if he could also hear the fire. HEQB (t) stepped away from the dozer to listen and radioed that he could. HEQB(t) went down the hill to have a face-to-face with his trainer. On his way down the hill, he walked past the private property that had several old cars and farm equipment located next to the piloted, incomplete dozer line. The masticator and HEQB—after discussing the situation—had already negotiated these obstacles and were safely down the ridge on the other side of them.

At the same time, all other resources in the area were retreating along their escape routes to safety.

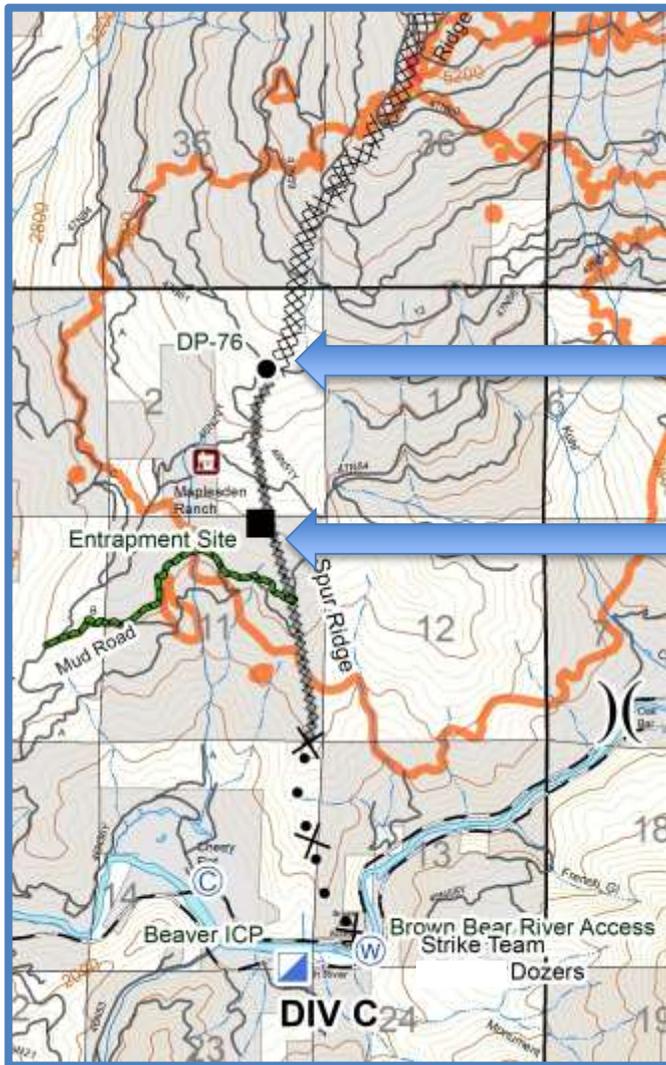
HEQB (t) and DZOP’s Escape Route is Blocked, Hiking Out is Not Feasible:

Decision Made to Confront the Fire Where They Were

The current piloted escape route was under construction and still needed significant work. For HEQB (t) and DZOP, this escape route was blocked by the aforementioned farm equipment and vehicles, as well as a small drainage in that same area. (See map on next page.) These obstacles were positioned between the dozer’s location to the north and the masticator’s location to the south.

HEQB (t) did not believe the dozer could clear its way around the private resident’s farm equipment and exit the area quickly enough to avoid the fire, nor that the DZOP would leave his dozer and hike out. Furthermore—with the fire front quickly approaching—he wasn’t sure if the DZOP would even be able to make the hike in time even if he was willing to leave the dozer.

Therefore, HEQB (t) went back up the hill with his DZOP and made a plan to construct the incomplete safety zone as large as possible and confront the fire where they were.



**With Fire Moving Toward Them,
Decision Made to Exit Drop Point 76**

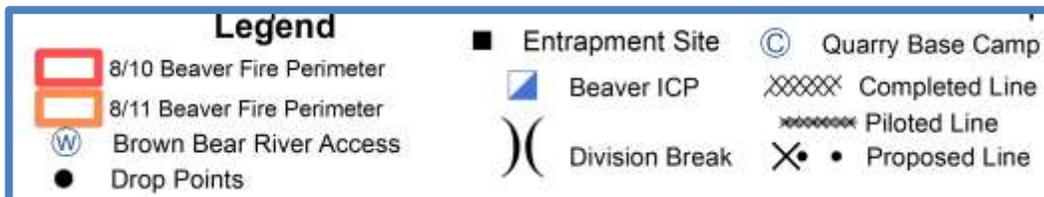
Top arrow points to Drop Point 76, where—with the fire quickly approaching their position—DIVS C, Operations Branch Director (OPBD), DIVS V, and a Strike Team Leader from DIVS V met to evaluate their rapidly escalating situation. They decided they needed to make a quick exit in their vehicles via the existing road system. DIVS C opted to drive south on the incomplete piloted dozer line to check on HEQB (t) and DZOP.

**Why the Incomplete Safety Zone
Became Their Realistic Option
When the Fire Suddenly Shifted**

Bottom arrow points to the (incomplete) piloted dozer line that—when the fire suddenly shifted and approached—HEQB (t) and DZOP had intended to travel down and exit onto Mud Road.

However, due to several old cars and farm equipment located on private property next to the piloted, incomplete dozer line—in addition to the sudden, rapidly approaching fire front—this escape route was not a realistic option.

Therefore, HEQB (t) made a plan to construct the incomplete safety zone as large as possible and confront the fire where they were.



August 11 – Around 1700

Around 1700, as the fire boiled out of Kohl Creek drainage, DIVS C, Operations Branch Director (OPBD), DIVS V, and a Strike Team Leader from DIVS V met at DP 76 to evaluate their rapidly escalating situation.

DIVS V described the conditions as “*very eerie.*” They could see no fire and it was extremely quiet under the column. After a brief discussion among the group, OPBD made the call to exit, saying: “*Let’s get out of here!*” DIVS V would later reflect on how “*it was awe inspiring. It was quiet under the smoke column. It was like a rope, thick strands and twisting.*”

‘I Knew This Wasn’t Going to Be a Good Deal’

As the rest of the group headed out from DP 76, DIVS C anxiously called HEQB (t) and told him to get he and his dozer operator out of the area *immediately*. It was then that HEQB (t) let DIVS C know that there was no time to get out like the others had done. He explained that they were going to have to stay put and make a safety zone.

DIVS C asked if a truck could make it down the dozer line to them. When HEQB (t) replied that a four-wheel-drive vehicle could make it, DIVS C told OPBD: “*I have to go check on my boys.*” OPBD asked if he had a way out, and DIVS C let him know that there were “*some roads down there.*”

As DIVS C drove down the dozer line, he was feeling okay about the situation—until about halfway down the line when he noticed the downhill crown run that was following him. He later reflected that, in that instant, he got the sick feeling that: “*This isn’t gonna be a good deal.*”

They Grab Their Fire Shelters

It took DIVS C about three minutes to drive the 0.7 mile dozer line from DP 76 to the incomplete safety zone. Once he, too, saw that the old cars and abandoned farm equipment blocked their only remaining escape route (the piloted line downhill from the incomplete safety zone to Mud Road), DIVS C turned to the HEQB (t) and said, “*Make it (the incomplete safety zone) bigger!*”

Some vehicles and equipment blocked their only remaining escape route . . .

DIVS C turned to the HEQB (t) regarding the incomplete safety zone and said:

“Make it bigger.”



DIVS C holds his fire shelter as the fire advances on their position at 1735 hours.

(This photo was incorporated from the HEQB (t)’s video referenced on next page.)



Photo 1
1729 Hours



Photo 2
1731 Hours



Photo 3
1731 Hours

Fire Progression into Entrapment Site

Series of photos taken by DIVS C show the fire's progression into the entrapment site.

At 1729, DIVS C took a GPS coordinate and radioed it into Beaver communications. He then took a couple of pictures *"in case we don't survive to tell our tale."* After doing so, he worried that—if he didn't survive—people would think he might have survived if he wasn't *"fooling around taking pictures."*

DIVS C grabbed his fire shelter. HEQB (t) asked if he thought they were going to need shelters. DIVS C replied: *"Yep."* As the dozer kept working on the safety zone, HEQB (t) took out his phone and started taking video of their scene.

HEQB (t) Video

See the Fire Approaching and Entering the Entrapment Site

<http://youtu.be/MYENvpiv1WA>

HEQB (t) then texted his dad to let him know that *"things were getting a little hot on the line."* As HEQB (t) was videoing, DIVS C apologized for getting him into this situation. HEQB(t) replied: *"This ain't nothin'."*

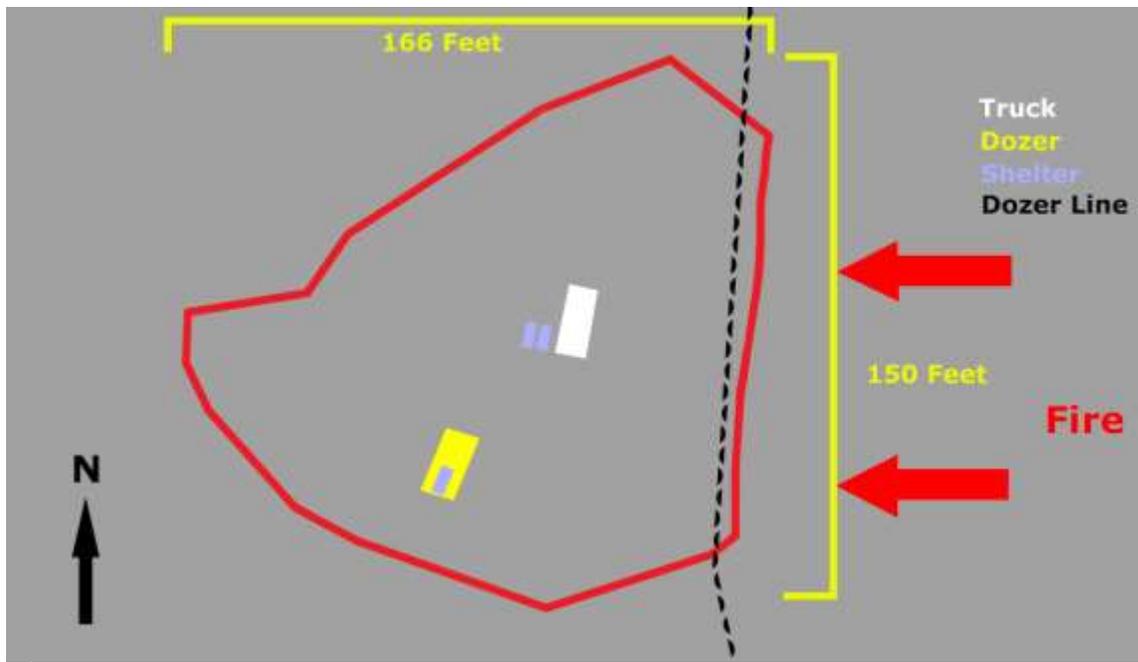
Fire Shelters Deployed

At 1737, with the fire front advancing into their site, flying embers shot at them like a fierce hail storm. A hot ember landed on HEQB (t)'s neck and he let out a yell. He then put his phone into his pocket. DIVS C and HEQB (t) started to deploy their shelters beside DIVS C's truck—to use it as a heat shield (see the entrapment site map on next page).

At the same time, DZOP backed the dozer away from the edge of the cleared area/incomplete safety zone and tried to position the machine to shield them from the heat.

DZOP couldn't see the other two men. Because he was worried about running them over, he stopped his dozer where it was—a little short of where he wanted to position it for the best protection. He held his breath, jumped from the dozer and crawled underneath it to deploy his shelter. As HEQB (t) was getting into his shelter, he made sure his DZOP was also deploying.

Over the command net, DIVS C calmly reported that all three of them had deployed their shelters.



Entrapment Site Map

The dozer-cleared area measures 0.4 acres. DIVS C and HEQB (t) deployed their shelters beside the truck while DZOP deployed his shelter beneath the rear of the dozer.

Incident-Within-Incident Protocols Enacted

After the shelter deployment was announced over command, the team's Incident-Within-Incident (IWI) protocols were immediately enacted. Because the IMT had prior IWI experience, the team had developed and practiced predetermined IWI protocols.

The team appointed the Deputy Incident Commander to take charge of the IWI. The call was made to change command frequencies as the operational tempo dramatically increased both on the ground and over the radio.

OSC2 experienced difficulty getting out on the new command radio frequency. Although he had tested it earlier, he could not hit the repeater from camp. He therefore decided to do a resource accountability check-in and went to the fire's west side.

He sent Operations Trainee (OSC2 (t)) down the south side of the fire and used their line-of-sight tactical frequencies to check on all of the resources who they thought may have been impacted by the fire blow-up.

Everyone on the fire was readily accounted for except the Masticator Operator and his HEQB. (Later, this HEQB checked in with HEQB (t) when HEQB (t) was out of his fire shelter.)

The team appointed the Deputy Incident Commander to take charge of the IWI. The call was made to change command frequencies as the operational tempo dramatically increased both on the ground and over the radio.

From 1700 to 1800 Hours

From 1700 to 1800, much activity was occurring simultaneously, including:

- ❖ The IC was focused on prepping camp for a possible shelter-in-place.
- ❖ Someone in camp experienced an anxiety attack—which tied-up the incident’s ambulance.
- ❖ They were coordinating a road closure of Highway 96.
- ❖ A mandatory evacuation for area residents was going into effect.
- ❖ They were prepping for the 1800 briefing for night operations.
- ❖ They were trying to manage all of the radio traffic and communication frequency changes.

DIVS C’s Fire Shelter Experience

As the dozer was working, DIVS C had been carrying his shelter under his arm. He doesn’t really remember pulling the shelter’s tabs. Everything happened quickly.

He said he didn’t have any trouble getting into his shelter. He didn’t really think about the steps to deploying his shelter—it was automatic. While inside his shelter, he noticed embers blowing in.

DIVS C tried to call communications over command. Initially, he slid his antenna between the shelter and ground outside the shelter to try to get a better signal. Because it was dark inside the fire shelter, he had difficulty telling which channel his radio was on. It was easy to find command, but harder to find tac. The only way to figure out which channel he was on was to count the clicks of the dial.

At one point, DIVS C perceived an increase in the temperature outside. He wanted to check to see if his truck was burning. But when he lifted the shelter’s edge, he was blasted with heat. When DIVS C reached up to push on his shelter’s roof, he noted how hot the shelter was.

He remembers thinking: *“Wow, that’s hot—but it’s comfortable in here.”* While he had a full hood inside his hardhat, he never felt the need to use it. He was worried about his truck catching on fire. Inside the shelter, he noted three different waves of heat. After it calmed down a bit, he peeked out again and saw that his truck *was* on fire.



This photo, taken after the entrapment, shows the amount of receptive fuels that had been located in the bed of DIVS C’s pickup truck—including drip torches, gasoline, and trash.



Photos show the fire damage—including melted plastic—that occurred to DIVS C's pickup truck when the contents in the truck bed ignited.



HEQB (t)'s Fire Shelter Experience

"Calm down, breathe slow, and keep your face in the dirt."

HEQB (t) had to take out his knife to cut the PVC bag off of his shelter. Because the hot PVC bag acted like "Saran Wrap" and did not open easily, he used his knife to get it open. *"It wasn't like the practice shelter at all,"* informs the HEQB (t). *"I had to forcefully unfold it like an accordion."*

He kneeled down and put the shelter against his chest and pried it apart. He inserted his right arm first, then spun himself around and inserted his left. Then he dropped to the ground and inserted his legs.

The air inside the shelter was much cooler than the air outside. *"I have always wondered if a little piece of foil would protect me, but I am a believer now. Fire shelters really work."* Once he was inside the shelter, he noticed that the sides of it were *"poppin' like an ol' flag."* Wind would lift the sides off the uneven ground and embers would blow under the shelter. The HEQB (t) said it sounded like *"people were throwing handfuls of pea gravel at me."* He said he thought to himself: *"Calm down, breathe slow, and keep your face in the dirt."*

The DZOP's Fire Shelter Experience

The DZOP was physically separated from the other two firefighters. While the other two were near DIVS C's truck, the DZOP had still been trying to make their cleared area larger in size.

The DZOP's shelter story in his own words:

"By the time I got off the dozer, the fire had closed in on two sides—and was closing in on my third and fourth sides. I worked as long as I could to get us more protection. I intended to push up more berms. Embers were falling everywhere. I spent too much time getting dug in. I backed the cat in. I should have deployed sooner. My intent was to get us all together under the dozer. I was not in the best position.

I tossed off my ball cap, put my hard hat on, grabbed my gloves and shelter. I had my web gear bungeed to the cage. I grabbed it quick and rolled in the dirt under the dozer. I pulled the shelter's tabs, but they didn't work. So I ripped at it to get it open.

It was a confined space so it took a while to get the shelter open. I had to physically unfold every fold to get it deployed. That's when my leg got a little scorched. Overall, the shelter worked the way it was supposed to. Those shelters no doubt saved our lives."

Fire Hits Them in Three Waves—from Various Directions

The fire came in three distinct waves. The first wave, that came from the northeast, was the least intense because the drainage to the east of their location lessened some of the fire's intensity. When the second wave came from the east, they were inside their shelters. The third wave that came from the southwest was the most intense and hottest.

Due to the long-term drought and the lack of seasonal rains, the fire completely consumed virtually all fuel classes (see photos on next page).



Photos show the severity of the burn where the Beaver Fire burned through the entrapment location.

Top Photo – Shelter deployment site looking southeast.



Bottom Photo – Shelter deployment site looking northwest.



Photo shows shelter sites—the DZOP deploying beneath the rear of the dozer and DIVS C and HEQB (t) deploying beside the truck.

Exit Shelters to Extinguish Truck Fire

After he was in his shelter for approximately 10 minutes, DIVS C realized that the environment around them had cooled enough to allow him and HEQB (t) to exit their shelters and try to extinguish the truck fire.

Uncertain if he would need to use it again, HEQB (t) grabbed a clump of dirt to put on top of his shelter to prevent it from blowing away. Debris in the back of the truck was on fire. Both men began throwing items out of the truck bed and used fire extinguishers to put out the fire.

Once they had extinguished the truck fire, they called over to the DZOP to make sure he was okay. He answered that he was and asked if it was okay to get out of his fire shelter. At this time, they noticed a fire behind the dozer's seat and extinguished it.

Anxiously Trying to Contact DIVS C

During this time, the Communications Unit at ICP was anxiously trying to contact DIVS C on the command channel. The Communication Technician took over the radio duties and—once every minute—began trying to contact DIVS C. Because it was still being used for other traffic, they tried to clear the command channel of all traffic not related to the entrapment. The Com Tech said that it felt like an eternity before he finally received a response. (In reality, the radio logs had it at 11 minutes.)

At 1749, after extinguishing the truck and dozer fires, DIVS C called communications over command to let everyone know that they were okay and that no medical response was needed. Three minutes later, he called back to tell everyone not to worry about them. He informed that they were drinking cold water sitting on the tailgate of the truck.

The team Safety Officer (SOF2) called DIVS C on his cell phone. The two discussed the possibility of the group leaving the deployment site. After determining that they were safe at their current location, SOF2 asked them to stay in place.

SOF2 assured DIVS C that if their situation took a turn for the worse, a night-capable hoist helicopter was inbound and would be available to retrieve them.

Happy to Be Alive

After the deployment, HEQB (t) said they were telling *“hunting and fishing stories and drinking water like it was cold beer. We were fine hanging out until people got there to get us. We weren’t really in a hurry to get down. After living through that, we were just happy that we were all alive and not hurt too bad.”*

“I noticed the first burn and irrigated it with water,” said the DZOP, *“because that’s the one that was bothering me. The others got more sore later, but they’re gonna be fine.”*

DIVS C had the two firefighters call their families on his cell phone to let them know that they were okay.

1800 Hours

Activity with Structure Protection Group in Division C

Prior to the blow-up, at the same time the dozer and DIVS C had been working on the safety zone; DIVS V was interacting with private residents and trying to ensure that his Structure Protection Group resources were okay. There were approximately 22 people—including fire resources and residents—located in the area of the blowup. Resource accountability was a top priority for all those who were not involved with the entrapment.

At 1800, DIVS V saw private residents driving away from their homes down Mud Road toward Highway 96. When he learned there were still more residents who hadn’t evacuated, DIVS V went up the hill to get them out. When he found a family—with children—he informed them they needed to evacuate. Satisfied he had everyone out of the high-risk area, he also headed back down the hill.

Just then—at 1819—a truck passed him going the other way, driving extremely fast. DIVS V turned around and followed the truck up the hill until they encountered a wall of fire that forced them to stop. The people in the truck said that they had friends up there who hadn’t evacuated. DIVS V—who, by now, was extremely irritated—informed them, no, they had, in fact, already evacuated.

At this time, DIVS V noticed a severe drop in fire behavior. *“I was amazed how quickly the fire sat down. How the fire behavior dropped off significantly.”* DIVS V contacted DIVS C on tac and tried to make his way over to the deployment site. At the bottom of Mud Road, he met with the OSC2 and OPBD. They tried to drive closer to the deployment site, but were worried about becoming stranded themselves and creating yet another Incident-Within-Incident.

The Black Frequency

At 1815, the Deputy IC went into the com room and rather forcefully asked to clear the command channel of nonessential traffic. The team had identified and incorporated into the communications plan a backup command net called the “Black Frequency”. The Deputy IC felt that he might have added some unnecessary tension to an already tense situation, but felt it was very important to clear the frequency.

DIVS V Tries to Hike into Deployment Site

DIVS V decided to hike in and see if he could find the deployment site on foot. He got out of his truck and strapped on a pack. When DIVS V contacted DIVS C on tac, he noted how calm and collected he sounded. DIVS C was trying to direct DIVS V to their deployment site. At one point, DIVS V thought he took a wrong turn at a fork in the road. He backtracked and took the other fork.

DIVS C called DIVS V and told him that they were going to head out on the road on which a cabin was located. Because he didn't see a cabin, DIVS V decided he was in the wrong place. He therefore turned around and went back to his truck. (He would later learn that he had been very close to the deployment site. The cabin wasn't there because it had burned down.)

Medical Response

During the entrapment, SOF2 was busy coordinating a medical response. This task was more challenging than expected, given the team's formal IWI protocols. Fortunately, because there were no serious injuries, this was not an issue. The following three situations played into this challenge:

- ❖ As the advancing fire behavior was closing in on the ICP location, a person in camp reacted to the stress of the situation. The incident ambulance responded and was occupied approximately 10 minutes. It was then, once again, available for other assignments.
- ❖ SOF2 called for two medivac helicopters from Redding, Calif. and one from Medford, Ore. to come to ICP. Due to weather concerns, both called back to inform that they were unable to send their helicopters.
- ❖ In the event that personnel involved in the entrapment required Advanced Life Support after extraction, the Safety Officer also contacted the Yreka Interagency Communication Center (YICC) and requested two ambulances to respond for standby. YICC advised that no 911 ambulances would respond unless there was a confirmed patient. Safety also tried to get medical personnel from two different divisions to respond, but they were turned back due to fire activity.

SOF2 had called for a county helicopter that was night extraction capable and had a hoist, located approximately 20 air miles away at Scott Valley. At 1844, this helicopter arrived at ICP. (As it turned out, it wasn't used for patient transport on this incident.)

2000 Hours

Task Force Charlie

Around 1800, the Deputy IC assembled "Task Force Charlie" with a mission to access the entrapment area and extract the involved personnel. This task force consisted of a Task Force Leader, one Interagency Hotshot Crew, two Engines, and two Fireline Emergency Medical Paramedics.

At 2112, Task Force Charlie arrived at the deployment site. The three personnel were taken to DP 76 to be assessed by the medics. The DZOP was diagnosed with a second degree burn to a small area of his calf.

(A few days later, DIVS C's wife discovered three burn spots on DIVS C's left arm and neck that—until then—had been undetected. DIVS C believes these burn injuries were caused by hot embers blowing into his fire shelter while he was inside it. The burn spots ranged from ¼ to ¾ inch in size.)

At 2326, Task Force Charlie arrived at ICP and transferred patient care to the Medical Unit Leader. After assessments and concurrence with all parties, it was determined that all three men would continue by ground transport to Fairchild Hospital in Yreka for further evaluation. At 2355, a Fireline Emergency Medical Paramedic departed ICP to transport them to Fairchild Hospital in an SUV.

All three were treated and released. The IMT arranged hotels for two of the individuals and one, per his wishes, returned to camp.

2. Key Discussion Points Generated by the Incident's Participants

During the Facilitated Learning Analysis process, this incident's participants identified several key discussion points that they felt were important to share.

A. Critical Incident Stress Management

Everyone interviewed was in agreement that the new "Peer Led" Critical Incident Stress Management (CISM) structure works much better than the old "Clinical Professionally Led" CISM. The new process should be continued and widely adopted. (This video provides information on CISM Peer Teams and how they help to establish trust and increase effectiveness: <http://bit.ly/UCpr8T>.)

There was some concern from a Line Officer that we might be putting too much stress on our CISM leaders by giving them too many assignments. As an agency, we need to ensure that we are taking care of our CISM Teams.

B. Fuels Advisories

There seemed to be a prevailing opinion that fuels advisories are becoming more and more commonplace. This may have an effect on how seriously these messages are being considered. Some people on this incident thought it was business as usual; these advisories were coming out all the time and were the new normal.

C. Scouting

During the course of interviews for this FLA, the topic of scouting and its importance was reiterated. It is much easier to come up with a plan when you have seen the country for yourself. Getting out on the ground is invaluable.

On this incident, some resources had scouted the area extensively and had a good picture in their heads of what was out there. Branch 2 (OPBD), who was new to the area the day of the entrapment, knew he did not have as much time to completely scout the area. While he had scouted the area that morning, he said he was not as familiar with the whole area as he would have liked to be. He felt a bit behind the curve.

D. Extracting the Personnel Who Were Entrapped – 'May Day' Protocol Suggested

All resources interviewed (except the firefighters who were entrapped) were disappointed by how long it took to extract the three who had been entrapped.

On this incident, they assembled the extraction resources after the entrapment had occurred.

Some people on the fire thought it would be a good idea to have a pre-designated extraction team—to pre-designate resources to be used in the event an extraction became necessary. However, other people on the fire warned that such a pre-designated extraction team could end up being a long distance away from where an extraction might be needed.

Because communications had to make an announcement to clear the command frequency two times, one resource suggested that it might make sense to institute some type of a "May Day" protocol. Such a protocol could take a number of different forms, including someone announcing

“May Day” over the air or the Communications Unit utilizing a pre-designated tone to alert resources that emergency traffic is occurring. Any number of potential methods could be designated and communicated as a standard in fire refreshers—thus ensuring the system is communicated to all firefighters.

E. ‘Ear Muff’ Style Headphones for Dozer Operators

Beaver Fire resources found it beneficial for Dozer Operators to have “ear muff” style headphones—that plug into their radios rather than ear buds. The resources that have used the “ear muff” style headphones said they make a tremendous—positive—difference. The Dozer Boss knew what was going on because he had headphones on and could hear the radio.

F. Suggest Dozer Operators Be Familiar with IRPG ‘Safety Zone’ Construction

Some resources indicated that it would be beneficial for Dozer Operators to be familiar with “Safety Zone” construction outlined in the Incident Response Pocket Guide (IRPG).

G. Structure Protection Plan

When the fire blow-up occurred, the incident’s structure protection plan was extremely helpful. Because the group had pre-planned locations to provide structure protection and where to meet should the worst case fire scenario occur, chaos was drastically reduced and resources were easily accounted for.

H. FLA Team Arrival

There was some discussion by IMT members about the importance of preserving the deployment scene and leaving it in place until the FLA Team arrived. The importance of having the FLA Team assembled and on-site at the incident in a timely manner was also discussed. If a delay is unavoidable, contact with the Incident Management Team should occur as early as possible—even if that communication comes in the form of a phone call.

I. Importance of Communication

Have the back of adjoining resources: If you see something, say something. Don’t assume that they saw or heard the same thing that you did. The HEQB called HEQB (t) to alert him to the current fire behavior. He didn’t just assume that HEQB (t) had heard it on his own.

J. Weather

It is important to understand thunderstorms affect fire behavior even after they have passed over the area. On this incident, weather reports were given nearly every hour during critical weather periods. The information was passed down to all divisions and confirmation was obtained that the message was received.

K. Different Burn Protocols for Contractors Impede IMT’s Ability to Ensure Proper Treatment

In this case, the IMT talked the burn victim (contract Dozer Operator) into seeing a burn specialist. However, this did not occur until four days after the event. (Many comments were made about how well this IMT cared for the wellbeing of this contractor: *“The IMT treated him like one of their own”* was a common theme.)

It is important to note that contracts stipulate that contractors are responsible for procuring their own follow-up medical care. Agencies don’t have authority to require the same burn protocols for

contractors. This impedes an IMT's ability to ensure proper treatment—including the referral to burn specialists.

More information on burn injury protocol can be found in the Interagency Standards for Fire and Fire Aviation Operations at: <http://www.nifc.gov/PUBLICATIONS/redbook/2014/Chapter07.pdf> .

L. Entrapment Personnel had More Burns than Initially Diagnosed

On this incident, not all burns were initially detected on those who experienced the entrapment.

The initial injury report from the DZOP indicated that he only had one burn on his lower right leg that covered one to two percent of his body. However, the next day, two more burns were discovered on his upper right leg and buttocks. All totaled, the burned areas added up to approximately six percent of his body. This meant that his condition met the NWCG standards for burn injury criteria for referral to a burn center.

In addition, DIVS C also had three burn spots on his left arm and neck that were initially undetected, but were found a few days later by his wife.

DIVS C feels very strongly that we should be doing a better job of examining people in these situations. This is based on the fact that he had been burned without even being aware of it—coupled with the fact that the DZOP was self-conscious about disclosing one of his burns due to its location on his body (buttocks). He recommends that a change should be made to the burn injury protocol—or a new policy be implemented—that deems that anyone involved in an entrapment should go to a burn center, or at least, a trauma center.

M. Deploying Shelters Near Vehicles

Fire shelter training states to deploy shelters in the biggest clearing possible—away from large, potential fuels. Once a vehicle starts to burn, it becomes a fuel source. Therefore, if you deploy a shelter near a vehicle, you may be exposed to additional risk by needing to move while inside your shelter.

In the 1990s, the Missoula Technology and Development Center (MTDC) performed testing of fire shelters and vehicles in burnover situations. The subsequent report from this study is available at: http://www.fs.fed.us/t-d/php/library_card.php?p_num=9751%202817.

The T&D program has recently performed more testing of shelters, dozers and vehicles in burnover situations and is currently working on a publication. In short, there are both advantages and disadvantages to this practice of deploying near vehicles—and they are all very situational-dependent.

N. Beware of 'Horse Trading' Resources

During the FLA process, this incident's participants commented that when trading resources between Division Supervisors after the IAP has been written, care needs to be taken to ensure that Trainer and Trainee positions are always accounted for. On this incident, HEQB was unclear if he and his masticator were also traded over to DIVS C along with HEQB(t) and the DZOP.

3. Key Lessons Identified by the Incident's Participants

During the Facilitated Learning Analysis process, this incident's participants identified several key lessons that they felt were important to share.

A. Are You Prepared for an Incident-Within-Incident?

Everyone who was interviewed indicated that the IWI ran relatively smooth. The Incident Commander said that it is critical for the IMT to actually practice the IWI protocols within the first three days on an incident, even though this tends to be a very busy time.

On the Beaver Fire, the IMT had talked through the protocols, but didn't actually perform a simulation. On previous incidents, they had. Simulations should include testing radio frequencies in key locations. Additionally, it is important to coordinate with the host Forest concerning protocols for release of information should an IWI occur.

B. Ordering an EMS Ambulance

On this incident, the Safety Officer and Medical Unit Leader learned *not* to order an Emergency Medical Services (EMS) ambulance for a "standby" mission. Rather, the order should be placed for an ambulance to provide a "patient assessment."

The IMT ended up transporting the burn victims with their own resources rather than using a local ambulance. The ambulance company stated that it was against their policy to accept "standby assignments." Because the deployment had occurred, the IMT wanted an ambulance to assess the condition of those who had deployed. However, the way the order was placed (for a standby mission) led the ambulance company to a false conclusion regarding what had happened and what was being requested.

C. When to Deploy Your Shelter

Two of the firefighters who deployed reported that their shelter's PVC bag became hot, which made it soft and pliable. This affected the ability of the red tear strip to pull apart. If at all possible, firefighters should time their deployment so that they are inside their shelters before the flame front arrives—not only for the PVC bag functionality, but also for personal safety.

D. Fire Shelter PVC Bag Retrofit

DZOP's fire shelter PVC bag's yellow nylon pull-strap became detached during the extraction of the shelter. The pull-strap did not have a reinforcement. All units need to ensure that all shelter PVC bag pull-straps are reinforced either by stitching or gluing a piece of webbing to the pull-strap. Follow the instructions in the 2006 "MTDC Fire Tech Tip" publication – *What's New with the New Generation Fire Shelter*: http://www.nifc.gov/fireShelt/fshelt_publications.html.

E. Is Your Fire Shelter Serviceable?

Indications are that the PVC bag of the “new generation” shelter used by the HEQB (t) was dark grey and black in color—due to wear-and-tear prior to this incident. The shelter was therefore worn on the fold lines. It appears that the shelter was well beyond its service life.

Unserviceable shelters need to be taken out of service. All units need to ensure that all fire shelters are inspected in accordance to the Fire Shelter Inspection Criteria described in the 2011 “MTDC Fire Tech Tip” publication – *Fire Shelter Inspection Guide and Rebag Direction*:

http://www.nifc.gov/fireShelt/fshelt_publications.html

F. Make Fire Shelter Training More Realistic

The firefighters who deployed on this incident report that the “practice” shelters act differently than “real” shelters. Fire shelters that are taken out of service should be used for more realistic training. Firefighters should practice shelter deployments while wearing PPE in a high stress environment, with time constraints, and in different positions (standing, kneeling, and lying). Adding high ventilation fans for wind also helps create a more realistic practice.

G. Using a Radio Inside Your Fire Shelter

DIVS C had the presence of mind to slide the radio antenna out of the shelter for better radio transmissions. Firefighters should review the 2003 MTDC Fire Tech Tip – *Fire Shelters Weaken Radio Transmissions from Hand-Held Radios*:

http://www.nifc.gov/fireShelt/fshelt_publications.html

In addition, on all incidents, all command channels should be inserted at the beginning of the radio com plan. This enabled DIVS C to successfully operate his radio in the darkness of the fire shelter.

H. Immediate Burn Injury Treatment

It is very important to cool burn injuries as soon as possible. The DZOP irrigated his lower leg burn injury with cold water. This very likely limited the amount and severity of that burn injury.

4. Key Observations from the FLA Team

During the Facilitated Learning Analysis process, the FLA Team identified several key observations that they felt were important to share.

A. Safety Zone Not Big Enough

At this incident's entrapment site, there was 0.41 acres of cleared vegetation. No one on the incident felt that this was large enough for a safety zone. Based on the latest research (http://www.firescience.gov/projects/07-2-1-20/project/07-2-1-20_Safety_zones_07112014.pdf), the FLA Team calculated that the safety zone in this case would have needed to be 4.15 acres in size (assuming 30-foot average fuel height, zero slope, and winds less than 10 mph).

As stated in the Incident Response Pocket Guide (IRPG), the current guideline is to use four times the average flame height. With an average flame height of 60 feet, that calculates out to 4.15 acres. The difficulty regarding this current guideline is that, on this incident, no one anticipated the type of fire behavior that occurred. Ironically, it is impossible to know if a safety zone is truly safe until *after* the fire burns through.

B. Gloves

Because work gloves are not designed for fine motor skills, this FLA Team recommends that a discussion be held by the NWCG Risk Management Committee and the NWCG Equipment Technology Committee about the possibility of equipment operators and drivers being allowed to wear flame-resistant flight gloves during fire operations. Firefighters should ensure that if they are not actively wearing leather work gloves, they should at least have them attached to their person (belt loop, radio harness, cargo pocket, etc.).

C. Trigger Points

There was much discussion surrounding "Trigger Points" on this incident.

The FLA Team's understanding of the definition of a "Trigger Point" is: *"A preplanned event or time that initiates a predetermined response."* This differs somewhat from the NWCG definition (see next page). The FLA Team recommends that the NWCG reevaluate its "Trigger Point" definition. "Predetermined Response" is important to include so that firefighters understand what will happen at each Trigger Point. That will minimize confusion and radio traffic during high-tempo events.

The resources on the dozer line talked about feeling comfortable as long as the fire was on their same contour or higher. While it was not explicitly stated as a "Trigger Point," that is, in effect, what it was.

DIVS A (t) was asked to act as lookout for DIVS C from a good vantage point. He was to let DIVS C know when the fire spotted across Kohl Creek. As instructed, when DIVS A (t) saw the fire spot across the drainage, he radioed it in to DIVS C. After doing so, he was surprised that the resources on DIV C kept working the dozer line. When DIVS C heard DIVS A (t)'s call, he drove out to the fire's edge to assess the situation. DIVS A (t) did not understand that the resources on DIVS C had tied their implicit Trigger Point to downhill fire spread—and were not as concerned about lateral fire spread.

Trigger Points, as with safety zones, are not a guarantee of effectiveness. Trigger Points need human interpretation. Such interpretation is not always totally accurate. In addition, a clear distinction should be made between “Management Action Points” and “Trigger Points” in NWCG’s Glossary.

The NWCG Glossary current “Management Action Point” definition:

“Geographic points on the ground or specific points in time where an escalation or alternative of management actions is warranted. These points are defined and the management actions to be taken are clearly described in an approved Wildland Fire Implementation Plan (WFIP) or Prescribed Fire Plan. Timely implementation of the actions when the fire reaches the action point is generally critical to successful accomplishment of the objectives. Also called Trigger Points.”

If you look up “Trigger Points” in the NWCG Glossary, it simply redirects you to the definition of a “Management Action Point.” Trigger Points are less formal and can be identified at any time. They should not be thought of as tied to a WFIP. Furthermore, WFIP is also an antiquated term that is no longer used in fire management.

D. The Decision to Hold the Spur Ridge

Whether you agree with the decision to hold Spur Ridge or not, we think it is important to explain the context within which the decision was made. This discussion requires critical thought about the need to manage the tradeoff between short-term risk and long-term risk. It also requires critical thought about the differences in terrain conditions associated with a short- vs long-term plan.

At the end of the August 10 shift, the IMT thought it was faced with a long-term scenario. The terrain in front of the fire was nasty and inaccessible. Once they saw the results of the infrared flight, they realized that they might have the option to choose between implementing a plan that accepted more short-term risk, or a plan that accepted more long-term risk.

In an effort to avert long-term risk, the Operations Section Chief (OSC2) saw the possibility of salvaging the previous plan. Because he wanted more information about the viability of that option, he assigned DIVS C to go scout and see what was there.

When he heard back from DIVS C that he thought it was doable, OSC2 assigned a relatively small number of resources that had a chance to make a huge difference. To him, it was worth a shot. He therefore gave DIVS C three very experienced dozers that had been doing good work in other places on the fire. He had a high degree of confidence in both DIVS C and the DZOPs on the assigned strike team.

Throughout the day, OSC2 checked with DIVS C to make sure that things were progressing well. In OSC2’s mind, it would be great to pursue the option that would avert the long-term risk scenario, but if it wasn’t doable he was willing to accept that.

There is a lot of talk about “margin” these days, but it seems important to note that simply stepping away from the ridge and backing off doesn’t necessarily guarantee an increase of “margin.” We should not adopt the attitude that “when in doubt, we should just kick the can down the road.”

If the IMT did not institute this plan and someone got hurt later on down the road, the team might have kicked themselves for not at least trying to catch the fire on Spur Ridge. We work in a complex environment. It is unpredictable.

5. Facilitated Learning Analysis Team

Heather Provencio, Team Leader
Deputy Forest Supervisor, White River National Forest

Joe Harris, FLA Coach
Public Affairs Officer, Dixie National Forest

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Jason Virtue, Subject Matter Expert
Assistant Fire Management Officer, Black Hills National Forest

Paul Keller, Writer Editor
Wildland Fire Lessons Learned Center

6. Appendices: Appendix 1 – Equipment Report

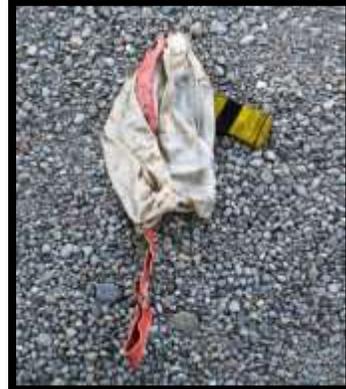
Entrapment/Shelter Deployment Site

- **Latitude:** N 41° 51.027, Longitude: W 122° 58.105
- **Elevation:** 3257 feet.
- **Size:** 0.4 acres
- **Description:** The entrapment site was a small clearing in the timber. The dozer spent approximately 25 minutes improving the site in an attempt to make it a safety zone. The fire arrived before that goal was accomplished. The dozer pushed over approximately 20 trees on the south side of the site and cleared small manzanita brush throughout. The dozer work provided a sufficient deployment site that offered protection from direct flame contact. However, a high level of radiant heat was present during the burnover. All equipment and flagging that marked the locations of the equipment and personnel were removed before the FLA Team's arrival. Measurements of the locations of equipment were taken by IMT personnel.



DIVS C

- **Fire Shelter:** Manufacture Date – January 2005. No signs of extreme heat. Due to a brief rain shower after the entrapment, the shelter was wet when inspected.
 - Structural Condition: 1-inch tear of the inside corner of the floor opening. Along fold lines there were a few small cracks in aluminum foil of outer shell.
- **PVC Bag:** The bag was partially melted during the entrapment. The bag and red tear strip appear to have performed as designed.
- **Clothing:** The FR clothing had numerous spots of dye sublimation and char from hot embers— 8 spots on shirt and 103 on pants.



HEQB (t)

- **Fire Shelter:** Manufacture Date – July 2003. The shelter was recalled and retrofitted in 2004. No signs of extreme heat. Due to a brief rain shower after the entrapment, the shelter was wet when inspected.
 - Structural Condition: Aluminum foil was worn away on many of the fold lines of the outer shell. Delamination of the foil to the outer shell, inner shell, and floor materials was present. The water from the rain shower may have increased the amount of delamination.

- **PVC Bag:** Dark gray aluminum foil residue was present inside the bag, indicating excessive wear prior to the deployment. The bag was partially melted during the entrapment.
- **Hard Plastic Liner:** The exposed edges of the liner were melted and deformed.
- **Clothing:** FR Shirt had spots of dye sublimation and char, most likely caused by hot ember contact during the entrapment.
- **Fireline Pack:** Numerous melt spots were present on the pack, most likely caused by hot ember contact during the entrapment.



DZOP

- **Fire Shelter:** Manufacture Date – January 2005. No signs of extreme heat. Due to a brief rain shower after the entrapment, the shelter was wet when it was inspected.
 - Structural Condition: OK
- **PVC Bag:** The yellow nylon webbing pull-strap was detached during the extraction of the shelter. The pull-strap had no reinforcement. The firefighter reported that the red tear strip did not initially open the bag when he pulled it, but he was able to tear the bag open along the red tear strip. The bag had several melted spots.

- **Fireline Pack:** General melting of the exposed nylon cloth was present.
- **Hard Plastic Liner:** The exposed edges of the liner were melted and deformed.



Truck

- The DIVS C truck was damaged due to the contents in the bed igniting as well as by radiant heat from the vegetation fire during the entrapment. The rear view mirror assemblies, front grill, light bar, and tail lights were melted and deformed.



Material - Conditions and Corresponding Temperatures

Nomex IIIA - Char	825 F
Nylon Pack Cloth - Melt	500 F
Nomex IIIA - Dye Sublimation	450 F
Truck Light Fixture - Polycarbonate - Melt	310 F
Human Survivability - air temperature	300 F
Shelter PVC Bag - Melt	280 F
Shelter HDPE Liner - Melt	270 F
Truck Plastic Assemblies - Melt	220 F
Human Skin - second degree burn	131 F

Appendix 2 – Glossary of Incident Command System Acronyms

DIVS A – Division A Supervisor

DIVS A (t) – Division A Supervisor Trainee

DIVS C – Division C Supervisor

DIVS V – Division V Supervisor

DP – Drop Point

DZOP – Dozer Operator

HEQB – Heavy Equipment Boss

HEQB (t) – Heavy Equipment Boss Trainee

IC – Incident Commander

ICP – Incident Command Post

IMET – Incident Meteorologist

IMT – Incident Management Team

IWI – Incident-Within-Incident

OPBD – Operations Branch Director

OSC2 – Operations Section Chief

SOF2 – Safety Officer