FACT FINDING REVIEW

NORTH VALLEY INCIDENT

WINNEMUCCA FIELD OFFICE

NEVADA BLM

JULY 16, 2005

ENGINE BURNOVER

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July, 17, 2005

To: Everell "Butch" Hayes, Fact Finding Review Team Leader

From: State Fire Management Officer: BLM Nevada

Subject: Delegation of Authority; Incidents that occurred on the North Valley Fire in the Winnemucca Field Office Area on July 16, 2005.

This memorandum provides official delegation of authority for conducting a fact finding review of the following incidents:

Incident: BLM Winnemucca Engine Burn over "no injuries" and a separate smoke inhalation incident during the initial attack phase of the North Valley fire.
Jurisdiction: BLM
Incident Name: North Valley
Location: Orovada, Nevada area
Date of Occurrence: July 16, 2005

The review shall be conducted to objectively review statements, gather facts, and at a minimum address the following objectives:

- Determine if the "engine burn over" incident falls into any of the three accident categories identified in the Interagency Standards for Fire and Fire Aviation Operations "Red Book"
- Determine causal factors, develop findings and recommendations as appropriate.
- Determine whether the operations were in compliance with appropriate agency policy and procedures.
- Provide recommendations for enhancing our operations as they relate to the utilization of initial attack engines resources.
- Review the circumstances that related to the smoke inhalation incident and provide recommendations relating to this incident.

Request that a preliminary debriefing be conducted within 24 hours with the Winnemucca Field Office and the Nevada State Office of Fire and Aviation. Depending on the findings, we will negotiate the date for the final report. If deemed necessary we will also order in an additional team as needed.

/s/ Kevin Hull

The Fact Finding Review Team:

Team Leader: Everell "Butch" Hayes, Bureau of Land Management
Deputy State FMO, Nevada

Dave Griggs, Bureau of Land Management
State Safety Officer, BLM Nevada

Dave Davis, Bureau of Land Management
Fire Management Officer, Battle Mountain
Fire Operations Specialist/Fire Behavior Analyst

North Valley Engine Burn Over 24 Hour Briefing

Location: 7 Miles North of Orovada, Humboldt County, Nevada

Date of Occurrence: July 16, 2005

Time of Occurrence: 17:35 hours

Team Leader: Everell "Butch" Hayes

Mission: Wildland Fire Incident, Engine Operations

Activity: Initial Attack

Number Injured None

Number of Fatalities: None

Property Damage: $215,000 – Engine 2942, 1997 Freightliner Model FL70

Property #: I-259274

Narrative:

On July 16, 2005, at approximately 16:32 hours fire personnel from Orovada Volunteer Fire Department and Bureau of Land Management responded to a reported fire some 7 miles north-northwest or Orovada, Nevada. At approximately 17:31 hours the IC met the Engine 2942 Captain on the south edge of the fire on the west side of US Highway 95. Instructions were given to cool down approximately 150 feet of active backing fire on the south edge between the highway and the right of way fence. 1 to 3 foot flame lengths were observed. The objective was to tie into an existing disk-plowed line on the west side of the right-of-way fence. Engine 2942 (Type IV, Freightliner) crew initiated direct initial attack using hard line hose with Engine 2961 to follow in tandem. Engine 2942 entered the unburned green some 10 feet. About half of Engine 2942 was still on the gravel shoulder when the southwest wind abruptly shifted to the northwest causing an immediate blow up with 10 to 15 foot flame lengths. Fire and smoke were probably sucked into the turbo charger air intake which stalled the engine. Other components of the motor may have also been damaged by the initial blow up which may have also contributed to the motor stalling. Efforts to restart Engine 2942 failed and the crew and driver had to abandon Engine 2942 and escape into the safe zone on the highway some 15-20 feet away. The fiberglass hood and front tires of Engine 2942 immediately caught fire. Engine 2961 abandoned efforts to extinguish the fire due to intense heat and thick smoke off the subject engine.

There were no injuries. The fire was contained at approximately 5,158 acres. The crews of both Engine 2942 and Engine 2961 should be credited for following their training and adherence to the 10 and 18.

Timeline of Significant Events

July 16, 2005 (from the Central Nevada Interagency Dispatch's [CNIDC] WildCad log)

16:27:32	Report of a fire in the Orovada area
16:32:08	Engine 2942, Engine 2961, and Dozer 2995 dispatched to fire
16:34:42	Engine 2942 reported enroute to fire
16:42:11	Engine 2961 and Dozer 2995 reported enroute to fire
16:56:17	2903 reported name of fire will be North Valley
17:03:02	2903 reported fire bumping Highway 95
17:03:17	2903 reported fire has jumped US Highway 95 and is heading into foothills on the east side of the highway
17:31:34	Dozer 2995 reported on scene with Engine 2942 and Engine 2961
17:36:58	2903 reported Engine 2942 has burned; no injuries

The Fact Finding Team (Team) was notified by the State Fire Management Officer, Kevin Hull, of their assignment Saturday evening. Hayes and Griggs were told to meet at the Nevada State Office at 06:30 hours on Sunday, July 17, 2005. Davis was told to meet the rest of the team at the Winnemucca Field Office on Sunday morning.

July 17, 2005

The Team met with Winnemucca Field Office Manager Gail Givens and FMO Jeff Fedrizzi and members of his staff at approximately 11:00 hours. After receiving an initial briefing the Team interviewed all personnel from Engines 2942 and 2961, Dozer 2995, and the Incident IC 2903. All of these employees were offered Critical Incident Stress Debriefing by the Field Office.

Narrative

The narrative is based on statements from and interviews with the following individuals:

Andrew Daves (2903) Incident IC at time of engine burn over

Mike Hendrickson, Engine 2942 Operator and Engine Module Leader
Jason Cain, Engine 2942 Crewperson
Leslie Case, Engine 2942 Crewperson

Billy Bell, Engine 2961 Operator
Aaron Griggs, Engine 2961 Crewperson
Chris Friar, Engine 2961 Crewperson

John Etcheverry, (2995) Dozer Operator

NOTE: ALL OF THE FOLLOWING EVENTS OCCURRED DURING A TIME PERIOD OF BETWEEN 15 and 45 SECONDS WHICH IS CONSISTENT WITH ALL PARTICIPANTS / WITNESSES.

Incident IC Daves provided briefing to Engine 2942 on scene just south of the fire's southern edge on the pavement of US Highway 95. IC directed Engine 2942 to initiate direct attack on the fire's southern edge to prevent further spread to south and secure approximately 142' from the edge of Highway 95 to the right-of-way fence where line had already been constructed by the Orovada VFD.

Engine 2942 turned from the pavement along the southern edge of the fire. With approximately 1/3 of the Engine in the green and the remainder still on the gravel shoulder of Highway 95 Crewperson Cain manned the passenger side hard line and began to spray water onto flaming vegetation. Observed fire behavior at this time by all present was 1-3' backing flame lengths and winds from the SW. Cain extinguished one sage brush plant and looked up to observe a wind shift from SW to ENE. At this point Cain had eye contact with Engine Operator Hendrickson through the Engine's passenger window and verbal contact with Crewperson Case who was preparing to assist with the hard line.

When the wind shift occurred everyone observed an immediate change in fire behavior. Flame lengths increased to 10-15' and almost immediately enveloped the front of Engine 2942. Case retreated a few feet and deployed her shroud. Cain also retreated and went around the rear of the Engine to the driver's side with the hope of using the other hard line to douse flames at the front of the engine. This proved unsuccessful.

Hendrickson also observed the change in fire behavior and attempted to place Engine 2942 in reverse. After some difficulty getting the engine in reverse (Cain heard the backup alarm engage and saw the backup lights come on) the Engine's diesel motor stalled. Hendrickson immediately applied the brakes to prevent the engine from rolling forward and unsuccessfully attempted to restart the diesel motor. By now the front of the engine had begun to burn. Hendrickson exited the Engine through the driver's door and retreated to Highway 95 some 15-20 feet away where he made contact with Cain and Case.

IC Daves briefed Engine 2961 immediately after briefing Engine 2942. Engine 2961 was to provide tandem coverage. During the briefing of Engine 2961 Engine Operator Bell, Crewpersons Griggs and Friar, and IC Daves observed Engine 2942 engulfed in flames. Griggs deployed a hard line from Engine 2961 and began straight streaming the advancing flame front but was unable to get close enough to actually put water on the burning Engine which was 20-25' away.

It was at this point that Griggs inhaled smoke from the burning Engine which resulted in precautionary medical treatment. Griggs was returned to duty after on scene treatment by medical personnel and transport to the hospital in Winnemucca for observation.

As Engine 2942 was consumed by fire, the left front tire and the right rear outside dual tire along with locking rims were "blown" approximately 26 and 30 feet respectively away from the engine. Had anyone been attempting to extinguish the fire in close proximity to Engine 2942 serious injuries may have resulted.

FINDINGS

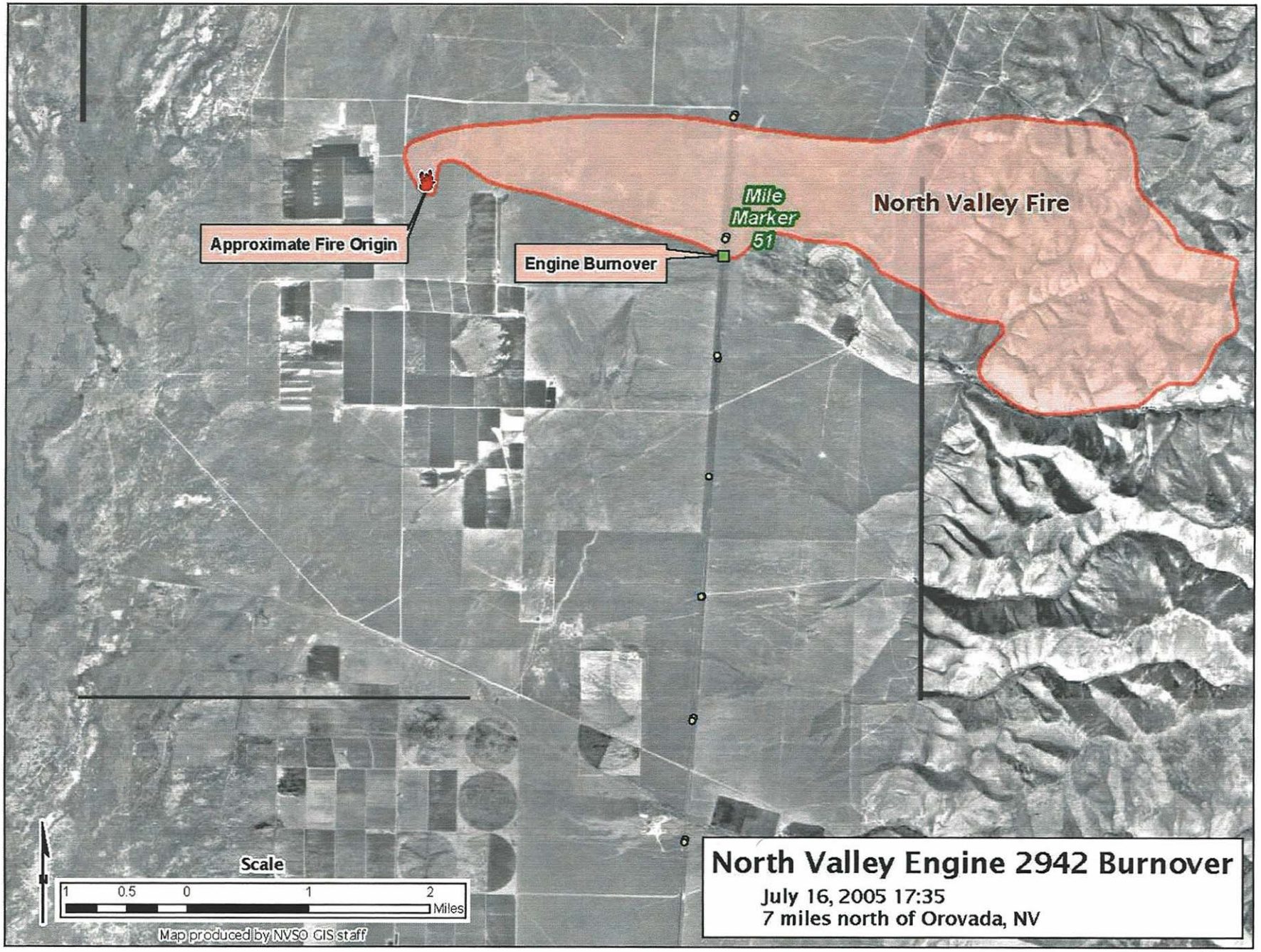
- The 10 Standard Fire Orders and 18 Watch Out Situations were adhered to
- Work / Rest Guidelines were followed
- Proper tactics were employed by experienced fire fighters
- All fire fighters met appropriate and current IQCS standards
- No shelter deployment or entrapment occurred
- All firefighters interviewed were aware that a Red Flag Warning had been issued by the National Weather Service the morning of July 16th. The warning was read over the radio by Central Nevada Interagency Dispatch at approximately 10:30 hours
- A review of Engine 2942's maintenance records revealed nothing out of the ordinary
- It would appear that the diesel motor stall was partially caused by the intake of oxygen-depleted air / flames into the air filter / turbocharger assembly
- Contributory factor to the rapid ignition of Engine 2942 was pre-heating of the tires, motor, and other mechanical components during the response to the fire from Winnemucca

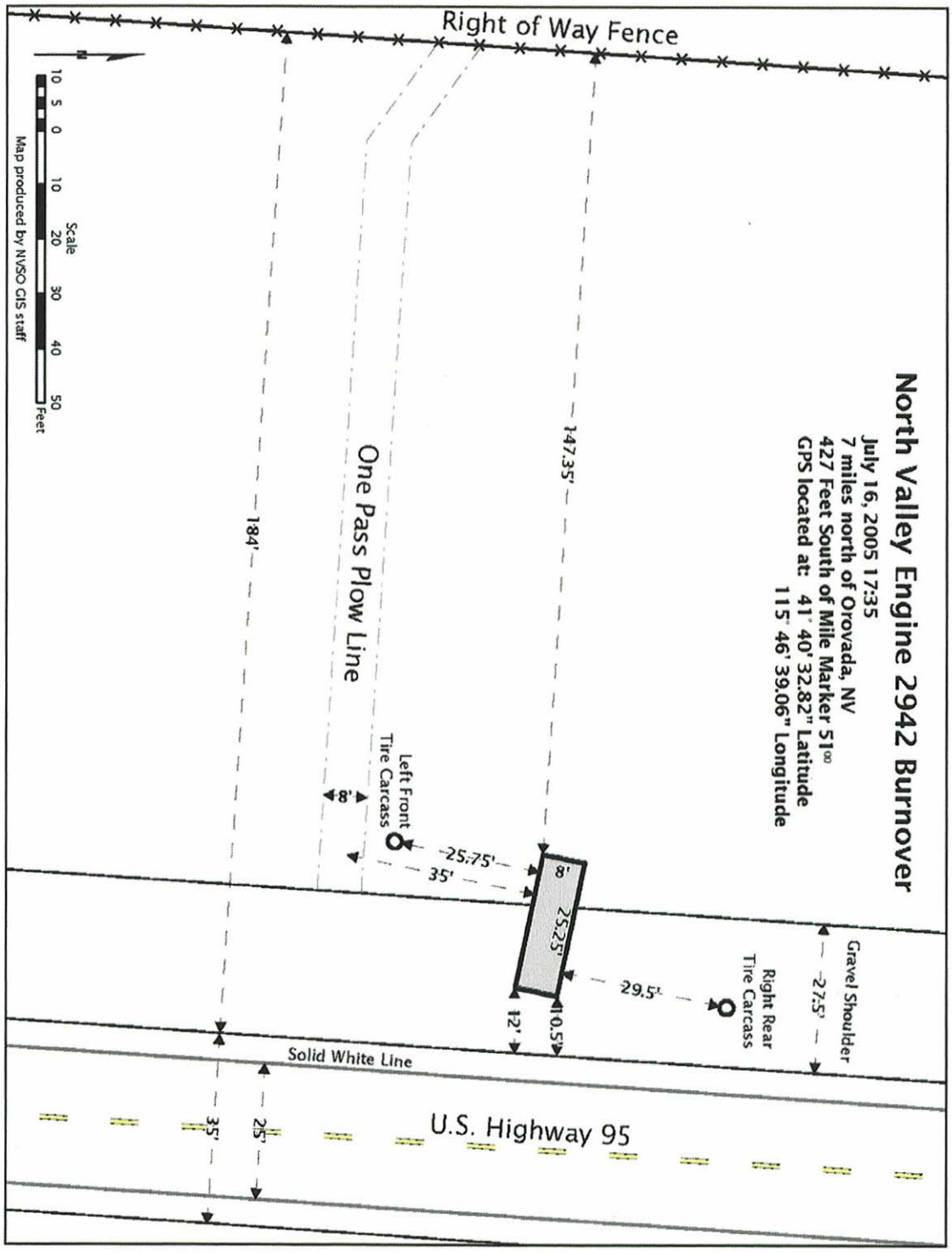
CONCLUSIONS

- The Fact Finding Team (Team) determined that this event constitutes an Incident with Potential as outlined in the Interagency Standards for Fire and Fire Aviation Operations (19-6)
- The Team, in conjunction with the Field Office and State Fire Management Officers, concluded that there would have been no added benefit from requesting a Serious Accident Investigation Team to be ordered.

RECOMMENDATIONS

- Have all Great Basin firefighters re-visit and re-emphasize all safety bulletins previously prepared and released in the Great Basin.
- Emphasize what we know to date: **THIS IS NOT A "NORMAL" FIRE YEAR!** Previous years' tactics must be re-evaluated to ascertain if they remain viable or should be re-considered, or even discarded for this year.
- The fuels and fuel loadings may exceed what Nevada witnessed in 1999. Revisit all of our lessons learned from the post-1999 season and employ tactics and strategic thought processes based on those lessons.
- Ensure safety briefings on all units in order to revisit the "Common Denominators…" booklet.
- All units should review the lessons in S-290 related to cold front passages and the potential shifting/variable winds after a passage has occurred.
- Personnel responding to wildland fires involving vehicles should confine their actions to the wildland portion of the incident and keep a safe distance away from any burning vehicles.
- The Equipment Development Unit at the National Office of Fire and Aviation should evaluate the placement of the air intake assembly on this model Engine.


Approximate Fire Origin
Engine Burnover
Mile Marker 51
North Valley Fire
Scale
1 0.5 0 1 2
Miles
Map produced by NVSO GIS staff
North Valley Engine 2942 Burnover
July 16, 2005 17:35
7 miles north of Orovada, NV


North Valley Engine 2942 Burnover
July 16, 2005 17:35
7 miles north of Orovada, NV
427 Feet South of Mile Marker 51
GPS located at: 41° 40' 32.82" Latitude
115° 46' 39.06" Longitude
Right of Way Fence
147.35'
184'
One Pass Plow Line
Left Front Tire Carcass
8'
25.75'
35'
8'
25.25'
29.5'
Right Rear Tire Carcass
12'
10.5'
Gravel Shoulder
27.5'
Solid White Line
U.S. Highway 95
35'
25'
Scale
10 5 0 10 20 30 40 50
Feet
Map produced by NVSO GIS staff

NORTH VALLEY WILDLAND FIRE INCIDENT

FIRE BEHAVIOR NARRATIVE

CLIMATOLOGY/WEATHER

Climatology

The winter of 2004/2005 saw an above average snowfall and precipitation events across Central/Northern Nevada and the area of the North Valley Wildland Fire Incident. The spring of 2005 also saw above average precipitation events. These two weather phenomenons followed nearly seven years of protracted drought across the same region.

This information is significant for two reasons:

1) the sudden influx of moisture over a several month period provided the upper soil horizons with several inches, if not a foot of more of soil moisture-soils that had been extremely dry for several (seven plus) years. This renewed soil moisture provided ample opportunity for extraordinary perennial and annual plant growth at nearly all elevations of north central Nevada;

2) While helpful, this influx of moisture was insufficient to "break the drought". While not pertinent to this incident, the lack of relief is best reflected in the pinion/juniper woodland complexes. Live fuel moistures in these fuels in the Central Nevada Mountains above 6,500 feet elevation never recovered from their winter dormancy, with live fuel readings in the mid-90% range. This live fuel range would indicate the potential for extreme to advanced fire behavior. The Nevada Live Fuel Moisture Project indicates that the Winnemucca fuel sampling site, National (N2A, north of the incident) the previous two weeks had a sagebrush fuel moisture of 115%-or the potential for "high" fire behavior. The New Jungo site (N2B, south of the incident) had a reading of 95% live sagebrush moisture- or the potential for "extreme" fire behavior (Reference: Great Basin Live Fuel Moisture website).

Weather

The morning fire weather forecast for Elko Fire Weather Zone 451 indicated a **red flag warning** and was issued at 0730 hours for:

"Red flag warning in effect Saturday from 12 pm PDT to 10 pm PDT for fire weather zones 451 ...452... and northern 454 for low relative humidities and strong gusty winds."

The forecast went on to state in the discussion:

..Discussion..Winds will be come strong and gusty this afternoon following passage of a cold front across northern Nevada. .. Winds will slowly decrease during the evening hours. The combination of strong winds and low relative humidities will increase the potential for rapid wildfire growth. ....."

One observation from this FBAN: Passing cold fronts have traditionally posed potential red flag warnings for western states fire fighting forces. Tied to these forecasts and red flags per the S-290 "Intermediate Fire Behavior" course, is the inevitable "shifting/variable winds" once a cold front passes.

Zone 451 forecast for July 16, 2005 included:

Valley Temperature	92-102 degrees F
Minimum Relative Humidity	7-17 percent
20 foot winds	West winds increasing to 15to 20 with gusts to 40 mph… strongest winds in the north (Note from Davis: this means in the northern reaches of the forecast zone)
Haines Index	5
Chance of wetting rain	0 percent

Review of the Texas Springs RAW Station data reflects the following for 1600 hours, July 16th:

Temperature	1600 hrs.: 91Degrees F 1700 hrs.: 91 degrees F
Dew point	1600 hrs.: 29 Degrees F 1700 hrs.: 24 degrees F
Winds	1600 hrs.: 20 MPH from West 1700 hrs. 19 MPH from West

This summary data reflects conditions northwest of the fire at a higher elevation for a single point in time; but do "truth" the accuracy of the forecast for Zone 451 for July 16th, 2005.

Further confirmation of the forecast's accuracy may be found in the North Valley Incident Commander's size up of the fire as he arrived on scene (from the Central Nevada Interagency Dispatch's [CNIDC] WildCad log:

16:56:17 hours, 2903: "….strong winds, dry fuels, traffic hazards, spread high running fire slope 1-2. (IC estimated size at this time at 30+acres)

17:03:02, 2903: flat and rolling fuel, grass and brush, wind direction from the west, 8-10 mph ….., fire bumping highway 95."

It is important to note that virtually everyone interviewed related to this incident identified that they were fully aware of the red flag warnings forecasted the morning of July 16th, 2005. Further, each individual was aware of the three safety bulletins related to fuel conditions and the potential fire behavior associated with the fuel situation.

Fire Behavior

Normally, a post-fire incident run using BEHAVE plus or another software would be appropriate in attempting to analyze the fire behavior of the incident.

It is ultimately the FBAN's role to interpret the results of any computer fire behavior runs. When calculating forecasts for a shift, the ground "truthing" of the FBAN's forecast is paramount to better estimate future fire behavior for firefighter safety and tactical planning of resource allocation.

Post-incident analysis often has additional advantages over computer model projections for estimating values such as rates of spread or flame lengths. These may be based on eye witness statements and other resources such as dispatch logs.

Such is the case with the North Valley Engine Burn Over Incident. Several seasoned firefighter witness statements (all with very consistent observations) along with the WildCad dispatch log from CNIDC provide sufficient detail to permit a straight forward post-incident analysis of the fire behavior related to the North Valley Wildland Fire.

The fire behavior analysis for this incident is broken down into two parts: 1) the observed and calculated fire behavior (rate of spread and flame lengths only) for the North Valley Fire, and 2) observed fire behavior of the engine burn over incident.

North Valley Observed/Calculated Fire Behavior

Using the CNIDC WildCad dispatch log and associated times, along with a simple map using TopoUSA™, the following rate of spread was developed for this incident:

Point of Origin Lat/long	N 41 degrees, 41.123 minutes	W 117 degrees, 49.424 minutes
Point due east on highway 95	N41 degrees, 41.123 minutes	W 117 degrees, 46.621 minutes
Distance between points as measured on TopoUSA (trademark)	2.41 miles (x 5,280 feet/mile= 12,725 feet	
N. Valley Fire reported	16:27:32 Hours	
N. Valley IC 2903 on scene	16:46:25 Hours	
IC reports fire at 30 acres	16:56:17 Hours	
IC reports fire has jumped highway 95	17:03:17 Hours	
Total Elapsed Time-report to Jumped Highway 95	00:35:45 Hours	

Calculations

*Note: assumes no influence of slope, as reported, 0-2%.

12,725 feet/35.75 minutes = 355.9/feet minute

355.9 feet/minute/66 feet/chain = 5.39 chains/minute

5.39 chains/minute x 60 minutes/hour = 323.5 chains per hour

Observations By This FBAN

Based on the observations of the fire fighters and these calculations, it is important to note the significance of this fire's run the first 35+ minutes of its life.

Of particular concern are: 1) the absolute lack of influence of terrain-a large open valley with little elevation change over two plus miles, 2) the low wind speed observed during this run: a steady 8-10 MPH with gusts to 15 MPH., 3) while mostly steady from the west or west-south-west, wind shifts were noted by the IC during his interview, as much as 90 degrees to the north!

The North Valley wildland fire was mostly a fuel load , relatively low wind speed event!

A review of the "Common Denominators of fire behavior on tragedy and near miss forest fires" indicate three of the four common denominators were present:

1) Most incidents happen on smaller fires or on isolated sections of larger fires.

2) Flare-ups generally occur in deceptively light fuels, such as grass, herbs, and light brush.

3) Most fires are innocent in appearance before unexpected shifts in wind direction and or speed result in "flare-ups". In some cases tragedies occur in the mop-up stage.

For conceptual purposes: a football field is 100 yards long. This fire was moving at nearly 118 yards a minute-or more than one football field a minute.

Flame Lengths of the North Valley Fire

Several seasoned Nevada firefighters witnessed the emerging North Valley wildland fire: both prior to jumping the Highway 95 and after it jumped the Highway.

During his interview, the initial attack IC estimated flame lengths on the fire as being between 15 and 20 feet.

Mike Whalen, Great Basin Type II Incident Commander, assumed control of the fire after the burn over. Mike's assessment of the flame lengths mirrored the IA IC's: 15-20 feet average flame lengths.

Observed Fire Behavior During the Burn over Incident

All personnel interviewed contributed the following observations of the fire line that was to be extinguished by engine 2942 prior to and during the flare-up.

As E-2942 began its assignment, the winds were from the south or south-west, less than 10 MPH. Flames were backing into the wind with an average height of 1-3 feet in the grass and an occasional flare-up of a bush with four-to-five foot flame lengths.

When the wind shifted to the north or north-west and gusted (no one estimated the gust speed, but based on previous observations, it was probably in the 15 MPH range) the backing fire flared-up and became a head and/or a flanking fire (depending on which wind direction you would choose to use from various interviews) with flame lengths from 10-15 feet. The obvious measuring "stick" was the height of engine 2942 itself.

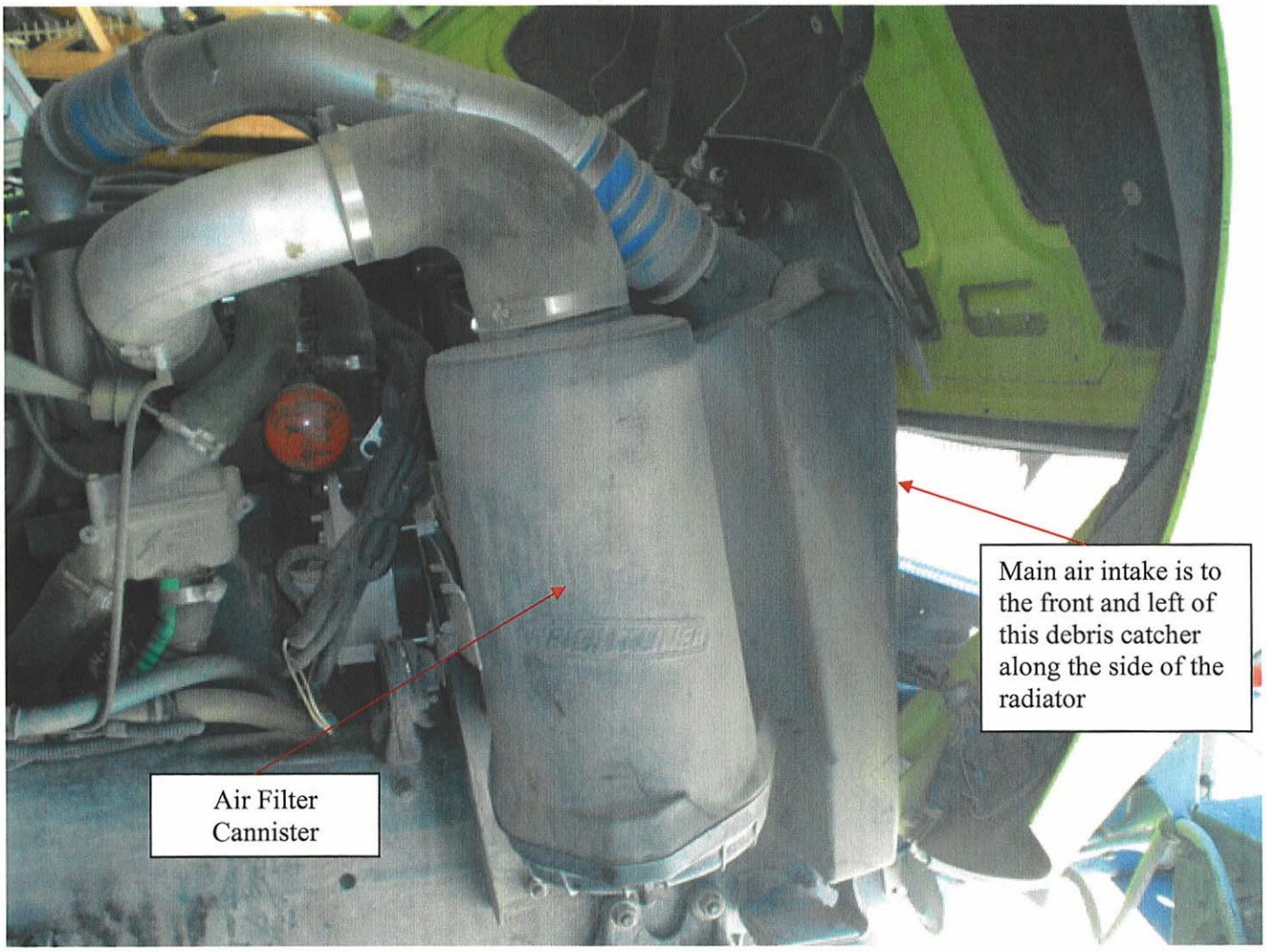
All personnel interviewed stated the flare-up flame lengths came under, around **and over the top of the front of the engine.**

Total estimated time from engagement of the fire line by engine 2942 until the engine foreman ran to the safety zone (the highway) varies in the interviews: generally anywhere from 15 to 45 seconds are believed to have occurred.

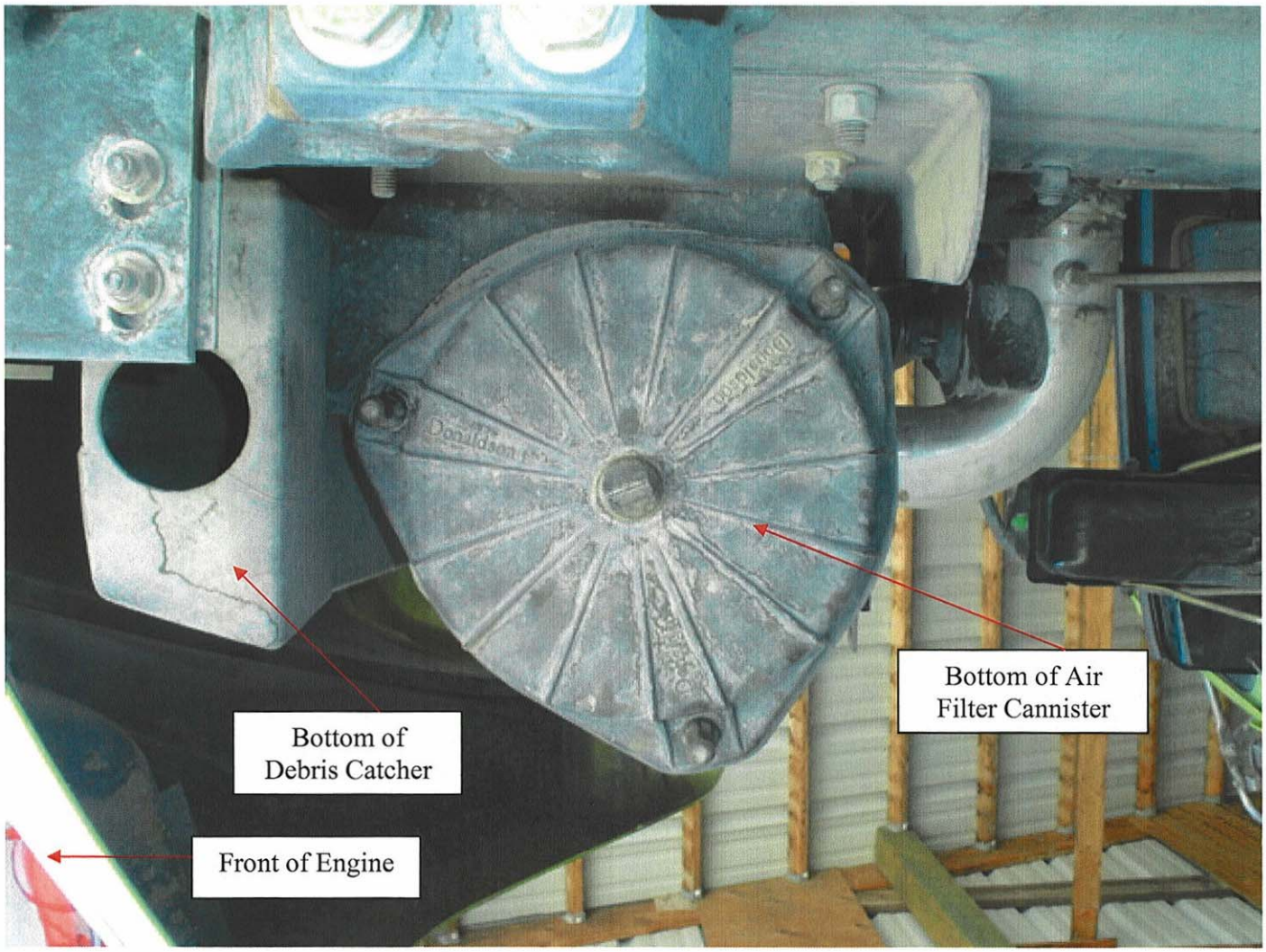
/s/ David C. Davis, Fire Management Officer, Battle Mountain FO July 23, 2005
Fire Behavior Analyst
Fire Operations Specialist

E-6945: SAME MAKE AND MODEL AS THE ENGINE INVOLVED IN BURNOVER

(E-2942)



DEBRIS CATCHER /AIR FILTER ASSEMBLY BETWEEN RIGHT FRONT TIRE AND MOTOR



DEBRIS CATCHER/AIR FILTER ASSEMBLY TAKEN FROM BELOW

ENGINE 2942 ENGULFED IN FLAME

ENGINE 2942 AFTER BURNOVER

JULY 16, 2005