

ACCIDENT INVESTIGATION REPORT



**Firefighter Minor Injuries
Single Vehicle Rollover on Vegetation Fire**

April 17, 2008

**Chino Valley Independent Fire Protection District
CA-CHO-08002590**

**Cal Fire San Bernardino Unit
CA-BDU-08004142**

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1. Overview of Accident

On April 17, 2008 firefighting personnel from the Chino Valley Independent Fire Protection District (hereafter CVFD) were actively engaged in suppressing a working grass fire in a wildland urban interface area within the incorporated City of Chino Hills located in Southwestern San Bernardino County, California. Two Firefighters received minor injuries when they were involved in an off-road single vehicle rollover accident in CVFD Water Tender 66 during suppression of the grass fire.

On April 17, 2008 at approximately 1105 hours, a grass fire was reported near the intersection of Butterfield Ranch Road and State Highway #71 within the incorporated City of Chino Hills, California. A grass fire response was dispatched at 1106 hours and the first due Engine Company (Medic Engine 62) arrived at approximately 1114 hours. The first arriving Engine Company reported a grass fire on the hill behind 17602 Wildflower Place. A fire attack was initiated utilizing hand lines in a progressive hose lay from the first arriving company. Water Tender 66 responded to the Wildflower Incident as part of the initial grass fire assignment.

During the course of the initial attack, Water Tender 66 was directed to access the fire area. The operator of Water Tender 66 attempted to gain access by taking a dirt path that paralleled Brookwood Lane. As the road diminished, the Water Tender turned north and began driving up a steep hill that paralleled a chain link fence. Water Tender 66 easily climbed the hill. As the Water Tender leveled out at the top of the hill, the dirt area began to slope downhill and to the left near the top of a drainage north of Hummingbird Way. The drainage was on the driver's left side, this placed Water Tender 66 in a very precarious situation about 300 to 400 feet above several homes. The Water Tender continued driving forward, before the driver realized that he was on a steep side hill, the rear wheels began to slide down into the drainage. The driver tried to steer uphill toward the fence in an effort to correct his angle and stop the slide. However, the ground was soft from winter rains and the left rear wheels of the Water Tender began sinking into the dirt near the top of the drainage. The soft ground and the steep angle (side hill) at which the Water Tender was on, caused it to tip and roll over. The vehicle rolled approximately three quarters ($\frac{3}{4}$) of the way over, landing

on the passenger's right side near the top of the drainage (Longitude -117.66233, Latitude 33.93339). The two Firefighters were able to self extricate from the Water Tender. The rollover of CVFD Water Tender 66 resulted in minor injuries to both Firefighters. The Firefighter/Driver received some abrasions to his forehead, face, hands, arms, neck and shoulder. The Probationary Firefighter/Passenger also received some abrasions to his head and face.

The fact that there was an accident resulting in injuries to CVFD employees and/or Serious Property or Equipment Damage is a trigger that initiates a Serious Accident Investigation. Approximately four (4) hours after notification of this incident, CVFD assembled a Serious Accident Investigation Team.

The Serious Accident Investigation Team (hereafter SAIT) consisted of the following personnel:

Tim Shackelford, Battalion Chief Chino Valley Independent FPD (CHO) (SAIT Investigation Administrator; Training and Safety)	Scott Atkinson, Captain, Training Chino Valley Independent FPD (CHO) (SAIT Technical Specialist; Training & Safety)
Jeremy Ault, Captain, Training / EMS Chino Valley Independent FPD (CHO) (SAIT Technical Specialist; Training & Safety)	Doug Lannon, Battalion Chief Cal Fire, San Bernardino Unit (BDU) (SAIT Technical Specialist; Investigations, & Interviews)

2. Sequence of Events

On Thursday April 17, 2008 at approximately 1106 hours, Medic Engine 62 as part of a standard grass fire response, consisting of four Engine Companies, one Water Tender and a Battalion Chief; responded to a reported grass fire near 17602 Wildflower Place within the City of Chino Hills. Upon arrival, the Fire Captain of Medic Engine 62 reported a small grass fire in the open field north of the structures. The fuel was light grass approximately 3'-4' high.

The Fire Captain from Medic Engine 62 requested all incoming units to stage at the intersection of Wildflower and Sunny Meadow, this information was relayed by the Duty Battalion Chief (B1615) to incoming units. CVFD crews began attacking the fire utilizing a progressive hose lay operation. The Duty Battalion Chief (A Fire Captain was in a "move-up" role as the Duty Battalion Chief) arrived on scene and parked his vehicle on Wildflower Place, which provided him an overview of the operational area.

The crew from Medic Engine 66 arrived at the scene and began assisting Medic Engine 62 personnel with their hose lay. The Duty Battalion Chief asked the Fire Captain from Medic Engine 62 if he wanted Water Tender 66 to assist with the operation, he responded, "Affirmative". The Fire Captain from Medic Engine 62 also advised, "Best access is from Hunter's Hill".

The Firefighter operating Water Tender 66 repeatedly requested assistance on the radio. The Fire Captain of Medic Engine 66 could see Water Tender 66 on the paved road of Wildflower Place below him, after hearing the repeated requests for assistance, he directed a Probationary Firefighter to provide assistance. Based on the location of Water Tender 66, the Fire Captain from Medic Engine 66 believed that the request entailed assisting with either supplying an engine company or refilling the Water Tender at a hydrant.

At 1129 hours, the Duty Battalion Chief cancelled the request for Cal-Fire. He reported, "Knockdown" on the fire; at this point Command had not been established. Two minutes later, Deputy Chief 1602 arrived on scene and made contact with the Duty Battalion Chief. At 1137 hours the Duty Battalion Chief advised Dispatch the following: "Fire is under control. For

organizational purposes (I am) establishing Wildflower IC". The Incident Commander (Duty Battalion Chief) then contacted the Fire Captain from Medic Engine 62 and advised him that he would be assigned Division "A". The Incident Commander then asked "Who is on the east side?" The Fire Captain from Medic Engine 62 informed him that it was the crew of Medic Engine 63. It was clear that up to this point in the incident personnel accountability had not been addressed. Once the Incident Commander determined that Medic Engine 63 was on the east side of the incident he assigned the Fire Captain from Medic Engine 63 responsibility for Division "Z".

The Firefighter operating Water Tender 66 never heard the radio traffic describing the "best access"; he drove onto a dirt path that runs parallel to Brookwood Lane. Water Tender 66 then traveled approximately ¼ of a mile on the dirt path and climbed a steep hill. The terrain of the dirt path changed from "uphill" to "side-slope". During the attempt to traverse the side slope portion of the hillside, the driver felt the rear of the vehicle begin to slide. He turned the wheels upslope and accelerated, at this point the driver's side tires began to "dig-in" the soft dirt, the vehicle overturned. The vehicle rolled onto the driver's side and continued over, it came to rest on the passenger side on a steep portion of the hillside. The driver and passenger exited the vehicle through the driver's side window. Once clear of the vehicle the Firefighter/Driver attempted to utilize a portable radio to contact the Incident Commander, his radio communication was broken. At approximately the same time Dispatch received notification from a citizen that Water Tender 66 had been involved in an accident; the Incident Commander was advised of this information by Dispatch.

The Incident Commander ordered Brush Engine 64 to assist the crew of Water Tender 66. The Firefighter/Driver and Firefighter/Passenger of Water Tender 66 were transported to a local hospital with minor injuries. Upon being released from the hospital, the injured Firefighters did not have any transportation available; they contacted the Chino Valley Fire District Administration Office to request someone be sent to pick them up. The Incident Commander had not made provisions for a District Representative to accompany the Firefighters to the hospital or to provide for their return transportation.

3. Findings

Weather Conditions

Weather observations at the Corona Airport Weather Station for April 17, 2008 at 1100 hours were:

Temperature	85 degrees Fahrenheit
Relative Humidity	6%
Wind Speed	4 mph with gusts to 15mph
Direction	ENE
Visibility	Clear, Good visibility at 10 miles

Communications

Communications on the fire ground were difficult. The 800 MHz system has historically provided mediocre communications in this area of the District. Much of the radio traffic during the incident was “scratchy” or “broken”.

Personal Protective Equipment (PPE)

All personnel were utilizing proper Personal Protective Equipment. Both Firefighters in Water Tender 66 were using their seatbelts, this likely prevented serious injury.

Apparatus Description

- 1991 Peterbuilt Water Tender
- 6 x6 All-Wheel Drive with locking axles
- N-14 Cummins engine, 410 HP, 15 speed transmission with deep reduction
- 4,000 gallon tank
- Approximately 30 feet long, 10 feet high weighing 64,000 lbs

Terrain/Site Conditions

The site of the accident is a wildland urban interface area in the southern portion of Chino Hills. The fuel in the area was primarily light grass approximately three to four feet in height. The accident site is near the top of the ridgeline just west of Highway #71. The actual accident site was a steep side-sloping hill, calculated to be a 33% slope. Measurements were taken at the location, for every ten feet of distance traveled down slope, the elevation decreased over three feet.

Fire Ground Strategy and Tactics

Upon arrival of the first due unit, the fire was estimated at one to two acres in light grass. The fuel in the area fire was light. The potential for significant spread of the fire was minimal, as there was an area (access road) that was mineral soil directly upslope of the fire. Even if the fire had spread beyond the immediate area, there was virtually no threat to structures. The incident involving the Water Tender occurred approximately eight to ten minutes after the fire was under control. It may not have been necessary to utilize Water Tender 66 for a “mop-up” operation in this type of terrain.

Personnel Accountability Reporting

Water Tender 66 is typically staffed with a Firefighter and a Fire Captain from Medic Truck 66. The crew from Medic Engine 62 had taken Water Tender 66 from Station 66 for training purposes. Water Tender 66 was responded to the incident by a single Firefighter. At the scene, a second Firefighter was directed to the Water Tender by his Fire Captain. This staffing configuration “split” crews and reduced two engine companies to three personnel each. It also did not provide for any direct supervision of the Water Tender operation. Due to the lack of an Incident Command System being established early on, it is unlikely that Personnel Accountability had been considered until later in the incident.

4. Causal Factors

Several Causal Factors led up to the injuries suffered by the two Firefighters involved in the incident. The cumulative effects of these factors created a situation that allowed the incident to occur.

The first and greatest causal factor was a lack of supervision. On the day of the accident, the Firefighter/Driver of Water Tender 66 was performing driver's refresher training. Water Tender 66 is normally staffed with a Firefighter as a driver and a Fire Captain from Medic Truck 66 as a supervisor. Although the District does not have a written Standard Operating Procedure for staffing of the Water Tender, personnel have become accustomed to the presence of a Fire Captain in the unit. The Fire Captain handles radio communications, guides the driver, and evaluates the overall safety of the operation. It is reasonable to believe that a Fire Captain, not focused on driving the unit, may have heard the radio traffic advising that the best access would be from Hunter's Hills Road. It is also reasonable to believe that a Fire Captain with experience in the operational procedures and limitations of the unit may have directed the operator to avoid driving the unit across the side-slope hill. The presence of a Fire Captain in the unit may have prevented the incident.

The second causal factor was "cultural acceptance". Since being placed into service in 1991, the use of Water Tender 66 has "evolved" to include difficult off-road terrain. The capabilities of the unit have been continually "pushed" with a positive outcome until now. Although there have been "close calls" in the past we have continued to use the unit in terrain beyond what would be normally considered safe for fire apparatus. Essentially, the power and versatility of the unit has created an environment where it has been acceptable to "take it a little further" than the last time. As an organization, we have grown accustomed to the unit operating in difficult terrain under fire conditions. This "attitude" has created an environment where the acceptable "mission" for Water Tender 66 has evolved to beyond what is safe.

The third causal factor identified was the partial collapse of the dirt path that Water Tender 66 was traveling on. Although the top layer of dirt appeared dry and packed (approximately 2"-3"), the portion underneath was soft with moisture. When the down slope portion of the path gave way, the driver's side tires dropped several inches; this increased the angle of travel for the vehicle.

The fourth causal factor was the attempt by the operator of Water Tender 66 to drive on terrain that was beyond the capabilities of the apparatus. The slope was calculated at approximately 33%. As the driver of Water Tender 66 crested the hill, the hood of the vehicle obscured his view; this prevented him from fully recognizing the steep slope of the “side hill”. Once he fully realized the scope of the situation, he was in a position that prevented him from taking any other action than continuing in the same direction of travel.

The fifth causal factor was a lack of “Command and Control” on the fireground. Prior to “Wildflower Command” being established, it was unclear who was running the incident. CVFD units were dispatched at 1106 hours; Medic Engine 62 arrived at 1114 hours and “Wildflower IC” was established at 1137 hours. The twenty-three minute period without an Incident Command system in place created an environment with a lack of “Command and Control”. If an appropriate Incident Command System had been in place, the events leading to this incident may have been prevented.

5. Supporting Data

Narrative of the Investigation

The SAIT was formed on April 17, 2008 at 1630 hours. The initial meeting of the team was at the accident site adjacent to 17643 Hummingbird Way, Chino Hills CA. During the course of the investigation, one or more members of the SAIT performed the following tasks:

- Visited the ACCIDENT SITE
- Photographed the ACCIDENT SITE
- Took measurements and collected other data from the ACCIDENT SITE
- Interviewed the Firefighter/ Driver of WT66
- Interviewed the Firefighter/ Passenger of WT66
- Interviewed the Captain of Medic Engine 62
- Interviewed the Firefighter from Medic Truck 66 that performed the Daily Unit Check on Water Tender 66
- Interviewed the Duty Battalion Chief

- Obtained WEATHER DATA from nearby Corona Airport Weather Station
- Obtained a recording of communications between the fire ground and Ontario Fire Dispatch Communications with time stamp information
- Obtained the Computer Aided Dispatch (CAD) records for the Wildflower Incident
- Obtained CVFD Standard Operating Procedures (SOP) for off-road responses
- Obtained the Training Records for the operator of Water Tender 66
- Obtained the service records for Water Tender 66
- Obtained post-accident inspection report for water tender 66 (Tires and Brakes)

Evidence

Evidence collected during the course of the investigation included: statements, interviews, photographs, maps, drawings, sketches, post-accident inspection of the apparatus and weather data from the weather station at the Corona Airport.

6. Attachments

A. Witness Accounts

- i. Firefighter (Water Tender Driver) typed Statement
- ii. Firefighter (Water Tender Passenger) typed Statement
- iii. Copy of California Drivers License Class “B”
- iv. Training Records for Firefighter/Driver of WT66

B. Records

- i. Ontario Fire Dispatch Computer Aided Dispatch (CAD) Event Report for the incident
- ii. Ontario Fire Dispatch tapes regarding the Grass Fire

C. Other Written Documents

- i. Weather Observations from Corona Airport

D. Visual Documentation

- i. Photographs of the Water Tender
- ii. Photographs of the Fire Scene
- iii. Photographs of the Accident Scene by Investigator

- iv. Photographs of the Accident Scene by FC
- v. Photographs of the Accident Scene by BC
- vi. Maps of the Accident Scene
- vii. Sketches of the Accident Scene

7. Working Recommendations

Opinion and Conclusion

Based on our training, experience and information from the investigation, it is the opinion and conclusion of the members of the Serious Accident Investigation Team (SAIT) that the injuries suffered by both Firefighters were foreseeable and therefore preventable. This accident may have been prevented if:

- A Fire Captain was assigned to Water Tender 66 to provide supervision, monitor the radio and perform a safety evaluation.
- An Incident Command System had been in place prior to Water Tender 66 being directed to access the area.
- A risk benefit analysis had been completed prior to utilizing Water Tender 66 in that type of terrain.
- The influence of “cultural acceptance” in the decision making process had been eliminated.*

****The “cultural acceptance” associated with utilizing Water Tender 66 in terrain beyond what is normally acceptable for Fire Apparatus played a significant role in the events of April 17, 2008. The physical characteristics of the unit (high center of gravity) predisposed the unit to be unstable when used on a steep side-slope. The accepted use of Water Tender 66 in this type of terrain on previous occasions provided personnel with a false sense of safety.***

Safety Issues for Review

The SAIT has identified the following safety issues for review:

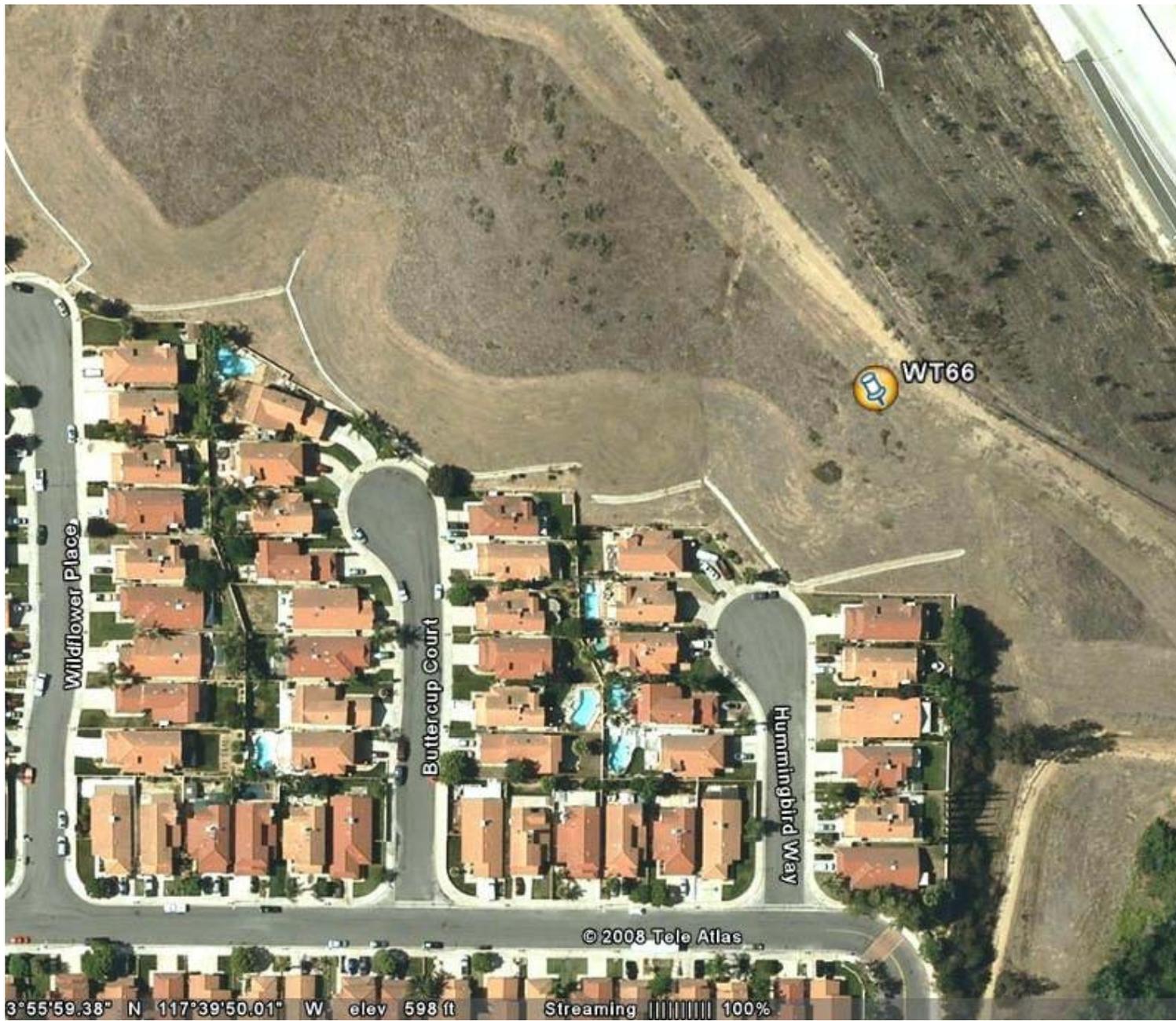
- Command and Control – An Incident Command System needs to be established and announced on the Fire Command Channel or designated Tactical Channel upon arrival at the incident. Any changes made to the Command Structure during the incident need to be announced on both the Fire Command Channel and designated Tactical Channel so that assigned resources clearly understand who is in charge and to whom they should report. Clear, concise orders are necessary to avoid confusion. Avoid “splitting” crews whenever possible, this makes Personnel Accountability Reporting more difficult.
- Communications – Communications need to be established and maintained. This can be accomplished via radio or face-to-face. If there is difficulty in transmitting or receiving information via radio, it is recommended that units switch to “direct channels”, utilize VHF radios or rely on “face-to-face” communications.
- Standard Operating Procedures (SOP) – Current Standard Operating Procedures need to be followed and enforced by Fire Captains and other Supervisors. Additional Standard Operating Procedures need to be developed to address the staffing configuration of Water Tenders and the limitations of those units. Update current CVFD Standard Operating Procedure for “off-road” responses. Clearly define the capabilities of apparatus and ensure that “cultural acceptance” does not change acceptable risk analysis for assigned tasks.
- Personnel Accountability Reporting (PAR) – Personnel Accountability Reporting must be established and maintained on the fire ground. It should be reevaluated at regular intervals until the incident is terminated. Moving personnel (splitting crews) to different units adds to confusion on the fireground.

- Risk versus Gain Analysis – A risk versus gain analysis should be made prior to initiation of fire ground operations. Fire ground operational decisions should be based on this analysis. This analysis must be constantly re-evaluated to ensure strategy and tactics are modified appropriately.

- Fire Ground Strategy and Tactics – Strategy and Tactics on the fire ground need to be well organized and coordinated.

- Training and Qualifications Records – Training and Qualifications Records should be kept current and in a central location; and should be periodically evaluated and updated as needed. Adopt and provide personnel with an “off-road” driver’s training program that focuses on safety and apparatus limitations.

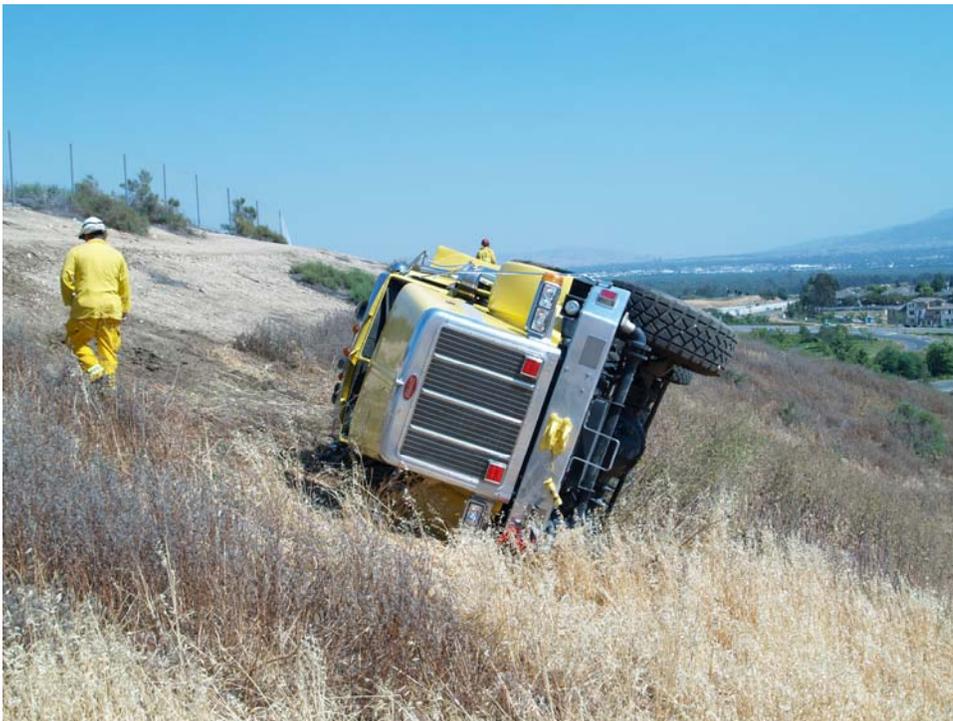
- Hospital Liaison Officer – A Hospital Liaison Officer should be assigned to every injured employee to ensure that the injured employee receives all necessary care. The Hospital Liaison Officer will ensure that required paperwork is completed and arrange for the transportation of personnel upon their release from the facility.





Tire tracks from Water Tender 66







Twenty feet from the fence, there is a six foot, seven inch change in elevation.



Angle measurement in the accident area.