

A NEW WAY TO MANAGE STRUCTURAL FIRE DEBRIS FROM A CATASTROPHIC WILDFIRE ("THE ANGORA PROTOCOL")

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ABSTRACT

On June 24, 2007, a catastrophic wildfire ("the Angora Fire") turned the picturesque south shore of Lake Tahoe into a burning inferno, leaving in its path 12.55 km² (3,100 acres) of charred forest and residential properties land and destroying 248 homes and 8 other structures. The Angora Fire was indiscriminate in the nature of destruction leaving behind destroyed homes, garages, vehicles, and boats. A catastrophe of this magnitude, in the watershed of Lake Tahoe, required an innovative recovery plan to protect the fragile ecosystem of Lake Tahoe. From the ashes, a new program was created to assist homeowners back into their homes quickly while simultaneously protecting the national treasure known as Lake Tahoe. For the first time in United States (US) history, government resources and independent contractors and consultants were used in a coordinated manner to remove hazardous ash and debris (including burned timber, chimneys, and foundations) from private lands. Every property owner that lost a structure voluntarily participated in this newly proposed program that was created by the California Integrated Waste Management Board (CIWMB). This coordinated effort resulted in what is known across the US as the "Angora Protocol." This program removed 256 structures in 39 days, clocked 28,000 labor hours without one accident, removed over 8,000 hazardous trees, placed erosion control on the vacant lots (within the required 120 day deadline), and resulted in no reportable injuries or accidents. After one year of the fire, over 180 homes were being rebuilt with more than 50 homes scheduled to be completed by the end of 2008. The Angora Protocol was clearly a success in managing to assist property owners rebuild their homes and to restore the environment rapidly and appropriately.

INTRODUCTION

After the June 2007 Angora Fire¹ charred the land and destroyed homes within the watershed of Lake Tahoe, California, USA, the Governor of California, (Mr. Arnold Schwarzenegger) requested an innovative recovery plan that would keep the ecosystem of Lake Tahoe undamaged. The County of El Dorado ("the County"), the CIWMB and the Governor's Office of Emergency Services (OES) developed a plan that most thought was impossible – a coordinated debris removal effort that would be implemented immediately with an environmental objective to protect the Lake Tahoe ecosystem. This coordinated effort would result in what is now known across the US as the "Angora Protocol" for removing structural ash and debris from a wildfire. Within 39 days from the start of the fire 256 structures were cleared of debris. Within 120 days, 191 sites had erosion control placed, 261 sites had hazardous trees removed, and 72 sites were in the re-building process.

The Mission

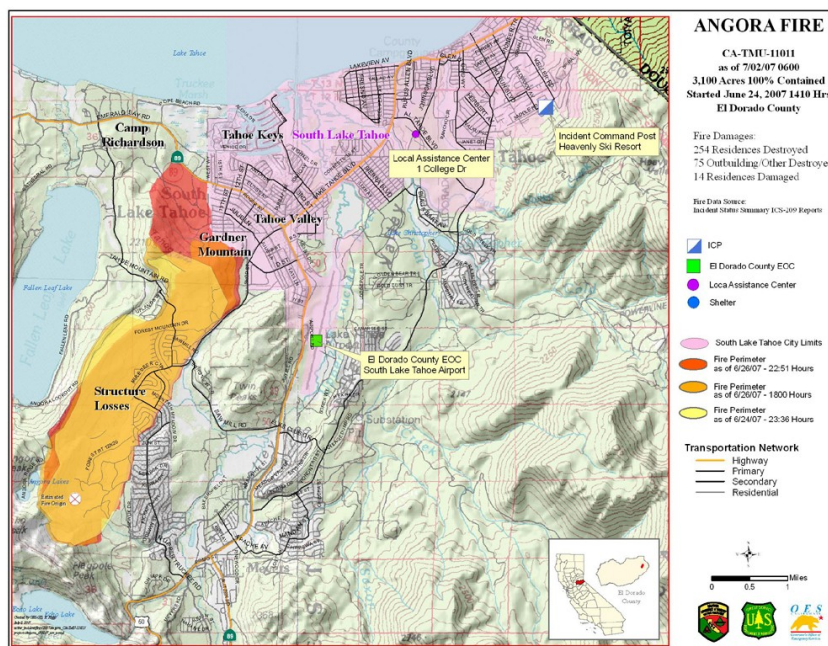
On July 2, 2007, Executive Order S-09-07² (the Order) was issued by the Governor of California. The Order declared a State of emergency as a result of the wildfire in El Dorado County. The Order stated that all State agencies with responsibility, regulatory authority, or expertise related to recovery efforts in

connection with the Angora Fire shall cooperate fully and act expeditiously in coordination to mitigate the fire effects on the Tahoe Basin. The order also stated the following:

... that statutes, rules and regulations, as they apply to the removal, storage, transportation and disposal of hazardous and non-hazardous debris resulting from the fire and other requirements related to necessary restoration and related activities ... are hereby suspended to the extent necessary for expediting the removal and cleanup of debris from the fire ..

However, the most unique part of the executive order was that it required State agencies to work with local officials to design and implement a comprehensive structural debris removal plan that will treat the removal of structural debris as a single organized project; hence, the “Angora Protocols” were created.

Figure 1. Location of the Angora Fire, South Lake Tahoe, California³.



The Plan

To address the governor’s mission, the County, CIWMB, OES and other agencies formed a Multi-Agency Coordination System (MACS) under Firescope’s incident command system⁴. From formation of MACS, an innovative agreement among the County, CIWMB, and OES was developed. Typically, State disaster funds cannot be granted to another State agency (i.e., CIWMB); therefore, the three agencies entered into a Memorandum of Understanding⁵ (MOU) to allow for an expedited structure debris removal. The MOU stated the County would be the lead agency for the project, the CIWMB would provide a removal contractor, and OES would provide disaster assistance funding. Specifically, the County was to secure permission to enter the impacted property through Right-to-Entry Permits and collect available insurance payment for debris removal. Right-to-Entry permits allowed the County and State officers, employees, agents, contractors, and subcontractors to enter the affected properties for the purposes of ash and debris removal. The CIWMB was responsible for developing a scope of work related to debris removal and related environmental restoration activities and completing the removal of destroyed homes with 120 days. OES was to provide coordination, technical assistance and support for the overall plan and funding expertise regarding the California Disaster Assistance Act.

After MACS recognized that it would be more cost effective and beneficial to the environment and economy to have one systematic approach for a comprehensive debris removal program, the CIWMB prepared two sets of project specifications for the County to adopt. The first document⁶ was for the State sponsored contractor and consultants. The second document⁷ was designed for home owners that elected to opt out of the State sponsored cleanup process and perform structural removal on their own. The objective of these two plans was to meet the requirements of the Order which directed the State agencies to implement a structural debris removal plan that would treat the removal of debris, both private and State, as a single organized project. It was initially assumed by the MACS that removing all the homes would cost seven million dollars. However, the MACS also presumed that at least 20 to 40 percent of the home owners who lost homes would opt out of the program.

Figure 2. Typical Burned Home at the Angora Fire⁸.



The Funding

Innovative to this plan was the funding mechanism and how it was applied. While previously coordinated debris removal programs in California have only addressed the removal of ash and debris⁹ from a public right-a-way, this new program examined the potential impacts of the ash to the community and environment. The MACS determined that in this disaster the economic and environmental effects of leaving the debris removal to each individual homeowner, on their timelines, had the potential to be very devastating to the surrounding community and the fragile Lake Tahoe ecosystem. MACS also recognized the speed at which a coordinated debris program could be accomplished was crucial to limiting the amount of environmental damage that could be potentially sustained by the community, the land, the creeks and Lake Tahoe.

In most fires, debris removal is normally completed by individual homeowners. Typically, the majority of the ash and debris is not removed for three to six months⁹, with some of the ash taking up to 18 to 24 months to remove. Prior to Angora, State and Federal Disaster Funding in California only reimbursed removal of ash and debris from a public right-of-way⁹. Since this disaster did not qualify for Federal Disaster Funds from Federal Emergency Management Agency for structural debris removal, only State Disaster Funds were used for the structural debris removal. By using only State disaster funds, there were fewer restrictions on how the funds could be used. In this disaster response, as long as the homeowner signed a Right-to-Entry Permit¹⁰, all above-ground impacted items, except for tree stumps, were removed.

For the first time in State Disaster Funding⁹, funds were directed to remove all fire related debris from a private land. Specifically, the funds were used to remove concrete foundations, chimneys, and other structural items that were typically left behind. This new concept provided the homeowner with a certified clean lot with no debris remaining except for structures that were deemed critical for erosion control. This protocol provided the homeowner a lot that was ready to build or sell.

To complete this mission before winter, disaster funds were made available to the County to remove the debris from private property. If the homeowner signed the Right-to-Entry Permit, the CIWMB and its contractors assumed responsibility to clean up the property. Once the property was cleaned and approved by the county for re-occupancy, the owner was required to reimburse the County the amount their insurance provided for debris removal. The funding matrix for this protocol was as innovative as the removal concept. The funding matrix was as follows:

1. If the removal costs exceeded the homeowner's insurance coverage, the incident would cover the remaining costs.
2. If the removal costs were less than the homeowner's insurance coverage, the homeowner only had to pay the actual removal costs.
3. If the homeowner did not have insurance, the incident would cover 100% of the removal cost.

By accounting for the cost of the incident up front, the directive became clear: Protect the community and Lake Tahoe.

Incident Command System

With the number of local and State government agencies and critical time constraints, the CIWMB operations section chief (OSC) used the Incident Command System to manage the project. The ICS model⁵ is a management tool for command, control and coordination of all agencies and/or private companies as they work toward the common goal. The incident used a unified command system between El Dorado County Office of Emergency Service, El Dorado County Environmental Management, and the CIWMB.

The CIWMB provided staff and resource in operations, planning, logistics, finances, and provided the necessary contractors, resources and management to operate the debris removal operation center (DROC). The County and OES also provided staff and resources to the DROC. Figure 3 shows the organizational chart for the Angora Debris Removal Project. In general, each agency had the following responsibilities:

The County:

- Participate in MOU between OES and the CIWMB
- Establish a Unified Command and act as the lead agency
- Contact property owners to inform/educate about the voluntary participation in a coordinated removal program
- Obtain participation via Right-to-Entry Permit from the homeowners
- Require property owners follow the same removal specification for the incident if property owners decline to participate
- Implement nuisance abatement or other enforcement processes to ensure property owners either participate in the State program or complete debris removal on their own
- Establish an operation center for the public to obtain information on the debris program
- Provide staff to the incident and operations center to collect and maintain all records
- Establish a Joint Information Center (JIC) for public meetings and press events
- Collect funds after the incident from the insurance companies

- Assist in the technical aspects of the project including waste disposal, confirmation sampling, final lot approval, project acceptance
- Remove burned trees that posed a fall hazard

The CIWMB:

- Participate in MOU between OES and the County
- Reassign staff from the normal day to day duties to assist with the incident
- Provide support and incident command positions (i.e., Operations and Planning Chiefs) to the Unified Command
- Provide command and control for the resources
- Establish an equipment staging area large enough for the required amount of equipment
- Provide debris removal funding to the incident
- Provide contractor resources to remove the debris and recycle material where possible
- Remove vegetation and trees necessary to complete debris removal and erosion control
- Provide contractor management resources
- Provide technical assistance to the JIC
- Provide health and safety oversight
- Provide environmental consultants
- Provide erosion control
- Coordinate with the County on removal of any remaining vegetation so that its removal does not impact debris removal and erosion control activities
- Coordinate with the County and impacted waste management facilities regarding the recycling, reuse and disposal of debris

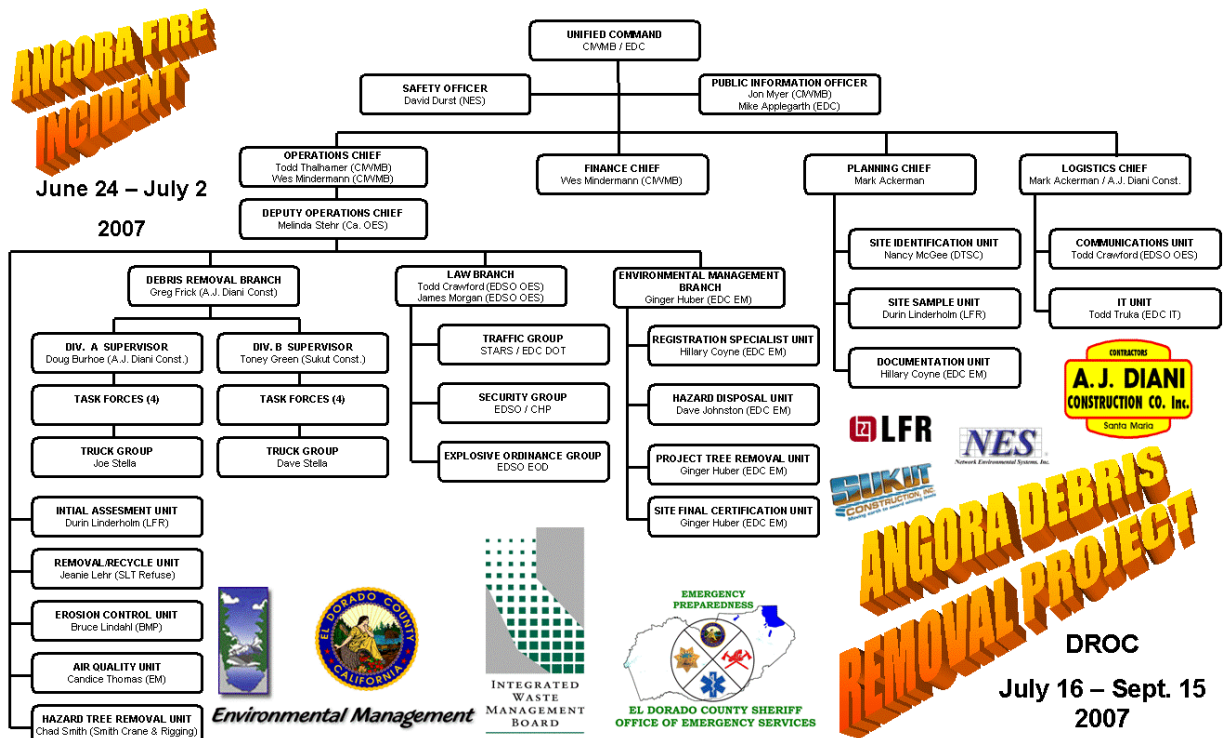
The OES:

- Implement and coordinate the Executive Order
- Implement the State's Emergency Plan
- Task the appropriate agency to assist local government
- Participate in MOU between the County and the CIWMB
- Provide staff to the incident as necessary
- Facilitate incident issues and funding and reimbursement requests
- Provide other resources to the incident
- Provide technical assist with the debris removal

THE PROTOCOLS

Three days after the Angora Fire had been contained, the Unified Command composed of the County, CIWMB, and OES, proposed this new systematic approach to the South Lake Tahoe neighborhood at a community meeting. The community was informed of this new approach to remove all the burned structures, debris and ash by September 1, 2007. Over fifty homeowners signed up in the program by the next day.

Figure 3. Organizational Chart for the Angora Incident.



Eight days later the CIWMB mobilized its response contractor and consultants to remove burned debris and ash, including destroyed cars, foundations, building materials, large appliances, and household contents; to perform confirmation soil sampling of the cleaned up building sites; and to install interim erosion/storm water run-off controls. The major items of work for the contractor included:

- Establish a DROC and provide site sanitation
- Coordinate contractor resources
- Install address and project signs
- Remove and dispose of solid waste and demolition debris
- Haul ash debris to an appropriate facility
- Segregate and sort recyclable metal debris
- Haul metal debris to appropriate recycling facility
- Segregate and sort concrete debris
- Haul concrete to appropriate recycling facility
- Provide traffic control
- Install erosion control
- Remove trees that pose a fall hazard to the work crews
- Track Costs

Additionally, to provide quality assurance and quality control to the project, the contractor was directed to employ independent third party consultants to perform the following tasks:

- Prepare a site specific health and safety plan

- Prepare a community safety plan
- Prepare a native soils background report
- Perform field documentation for each home site
- Perform site specific air monitoring
- Perform confirmation sampling for each home site
- Prepare final report for the project and for each home site

The Process

Before removal activity began, the Contractor was directed to re-establish all addresses of destroyed homes. This small step provided a sense of community and set the standard for safety. At all times during the project, each task force was aware of their location. Without these addresses, a number of the streets, (e.g. Pyramid Court, Pyramid Street, Lookout Point Circle) would not have a single address. By re-establishing address, the magnitude of the project became apparent. Initial intelligent on the number of burned homes was approximately 10% over and 10% under the reported totals. Given the lack of addresses and downed power lines and debris, the accuracy of destroyed homes was noteworthy. By re-establishing addresses, questions as to whether or not the debris pile was a home or a recreational vehicle, boat, or garage became clear. Only one case caught the removal operation by surprise. In this case, the actual home's address was placed on a detached garage and not the home. Unknowing to the incident, the detached garaged burned and not the home. This hazard was realized when the contractor was removing debris from the reported destroyed home and an electrical panel was ripped off the wall from an adjacent home. With the electrical wires from leading to the actual home, contractor realized the suspected home was a detached garage.

The next step in the process was for the homeowner to sign a Right-to-Entry Permit. Once this agreement was completed by the County and homeowner, an Angora Debris Project Sign was added to the address sign. This step signaled the property was ready for removal and ensured the Contractor did not perform a removal on lot that was not under a Right-to-Enter Permit. The project sign was also designed to provide status of the cleanup to the homeowner. With most Wildland-Urban Interface (WUI) Fires, the homeowner has little time to collect even personal items let alone a computer. By placing a different color sticker on each step, the homeowner could determine the progress of the cleanup at all times. Figure 4 shows a picture of a lot awaiting removal.

Once the Right-to-Entry Permit was signed the consultant performed the following tasks:

- A preliminary radiological scan around each structure
- Measured and recorded dimensions of burned structure footprints and ash footprints at each parcel
- Noted any burned debris requiring removal (e.g., number of vehicles, snowmobiles, hot tub, etc.)
- Flagged and noted household hazardous waste or other potential hazards (e.g., propane tanks, paint cans, ammunition, etc.)
- Photographed each parcel prior to ash and debris removal to document as-is conditions

After the field data was obtained, the contractor began the structural debris removal using Hazardous Waste Operation protocols with all workers in the exclusion zone wearing Level C personal protective equipment. The decision to work in Level C personal protective equipment was based on past ash and debris sampling events^{11,12} from residential structures that were consumed by wildfires. Residual ash contains concentrated amounts of heavy metals, such as arsenic, barium, beryllium, copper, chromium, cadmium, lead and zinc that have been deemed an immediate threat to public health and safety by the California Environmental Protection Agency¹².

Figure 4. Project Address and Status Signs for Angora⁸.



To protect the site worker and community the CIWMB's OSC irected air monitoring services be performed by a Certified Industrial Hygienist during removal activities. The services performed included the following activities:

- Prepare a Community Safety Plan and a Contractor Health and Safety Plan to guide community and contractor efforts in the restoration process
- Perform industrial hygiene air sampling during structural debris removal for metals and asbestos at selected representative lots throughout the duration of the structural debris removal project to ensure worker and community safety
- Collect operator breathing zone air samples to characterize worker conditions
- Collect fugitive dust emission data to assess the effectiveness of dust control measures
- Collect local area meteorological data for each day site structural debris removal work was performed

The Removal

Since the ash was hydrophobic in nature, each lot was water 24 to 48 hours in advance to control dust. Before the contractor began work, the industrial hygiene consultant placed air monitoring stations around the work zone. The contractor then mobilized an additional water truck to control the dust from heavy equipment, such as an excavator, loader, skid steer to load and transport and the ash, debris, metal and concrete. After the material was loaded into a truck, each truck was dry decontaminated and the load was tarped. Material hauling was accomplished by using approximately 100 covered end-dumps. Each truck made an averaged of 2 ½ loads per day. To control the trucking and provide for efficiency, all the trucks were sent to a main staging area. From the main staging area, each truck was dispatched by radio to the various work areas. As a measure to control track out from the equipment and to protect the remaining

community from other debris, the contractor was directed to employ a wet street sweeper. The street sweeper was utilized daily to capture debris from the coordinated removal and other agencies and contractors working in the fire area.

Prior to the final debris being removed from each site, CIWMB sent its inspector to review the progress and provide direction on the final disposition of the lot. After the lot was accepted by the CIWMB inspector, the consultant then collected confirmation soil samples and photographs. The project was considered complete after each lot was compared to cleanup goals and approved by the unified command, erosion control placed on the sites that were not rebuilding for the winter. The OSC and consultant then documented the final observations and prepared the final invoices and reports for the County. Only after the homeowner provided the insurance funds for debris removal to the County, did the County release the final reports clearing the property.

Figure 5. Loading Operations in Level C Personal Protection Equipment at Angora⁴.



SAMPLING

Since structural debris and ash from a catastrophic wildfire contain levels of heavy metals and asbestos, which are an immediate threat to public health and safety¹², the CIWMB's OSC designed an air monitoring and soil confirmation sampling protocol for these potential exposures. The protocols were utilized to ensure the community was not exposed a second time and that the debris and ash removal met California residential cleanup goals.

Air

To protect the community from removal related emissions and ensure compliance with regulatory standards, the CIWMB's OSC directed the contractor to use a certified industrial hygienist to perform air monitoring for the duration of the project. The methods⁷ for the air monitoring were:

- Fugitive Dust - El Dorado County Air Quality Management District, Rule 223 or other U.S. EPA approved equivalent methods for PM10 monitoring
- Heavy Metals - National Institute for Occupational Safety and Health (NIOSH) Method 7300, Metal Scan
- Asbestos - NIOSH Method 7402, High Volume

Soil

To ensure the soil was cleaned to a regulatory standard, the CIWMB's OSC directed the collection of confirmation soil samples. The initial standard for acceptance was based on visual observations and then confirmed by metal analyses to help assess the effectiveness of the removal efforts. Confirmation soil samples were collected and analyzed in accordance with procedures described in other documents¹³. The samples were analyzed by a State-certified analytical laboratory with a 5 day turn around. Once debris and ash removal was completed at a given parcel, the consultant performed the following activities:

- Collected confirmation soil samples for laboratory analyses of Code of California Regulations, Title 22 metals by Environmental Protection Agency (EPA) Method 6010/6020 and mercury by EPA Method 7471A
- Collected confirmation soil samples for laboratory analyses of petroleum hydrocarbons by EPA Method 8015B and 8021B at parcels with underground storage tanks
- Evaluated the analytical results by comparing the soil sampling results to cleanup goals to determine whether additional excavation was necessary

Cleanup goals

The cleanup goals¹⁴ for the Angora Debris Removal Project were developed by first determining the local background for metals and comparing those naturally occurring metals to the Cal/EPA, Department of Toxic and Substances Control, California Human Health Screening Levels (CHHSL)¹⁵. The CHHSL were used to evaluate the potential for soils to pose human health risk to residents. If a background metal exceeds the CHHSL metal, then the cleanup goal for that specific metal will be set at two times the naturally occurring metal. The goal for all naturally occurring metals was set at two times background. Background concentrations were determined using public domain U.S. Environmental Protection Agency Pro UCL 4.0 software at twice the 95th percentile threshold¹⁶.

To assess the effectiveness of the ash and debris removal, all confirmation samples were compared to the cleanup goals. A parcel was approved if the analytical results were below the cleanup goals. If a CHHSL metal result exceeds the cleanup goal then three additional samples from the same container were reanalyzed. If one of the samples exceeded the goal then the property was again excavated at the direction of the CIWMB's OSC. Once the additional excavation was completed, confirmation samples were collected. If a background metal exceeded the cleanup goal, and individual site specific determination was made by the OSC. Table 1 provides the cleanup goals for the Angora Debris Removal.

RESULTS

While unexpected by the unified command, 100% of the homeowners that lost homes participated in the State sponsored program. Even eight other sites where a garage, boat, vehicle, and other debris burned signed up for the program. The fact that 100% of the homeowners who lost homes elected to participate is the single highest measure of success. The economic benefits that resulted from the coordinated effort for debris removal were noticeable during the winter of 2007 and construction season of 2008. Over 180 homes were under construction with 50 homes being completed in the first year. Without the rapid coordinated removal, the number of homes completed and under construction would be less⁹.

There were ten commitments and guiding factors that contributed to the success of this project:

1. The local government, the County, accepted the mission
2. The local government directed the necessary resources and funding to the project
3. The Incident Command System was used to manage the project

4. Funding for the project was determined and dedicated without delay
5. The program was rapid in the roll out (i.e., three days from the containment of the fire) and removal of debris
6. The protocols were applied to both the government contractor (State Sponsored) and the private contractor (homeowner)
7. A State response contractor under contract with hazardous waste experience was mobilized
8. The project was based on Time and Materials contract with pre-defined markups
9. Safety was the priority and not production
10. Quality assurance and quality control were implemented at each step in the process

Table 1. Cleanup Goals for the Angora Structural Debris Removal¹⁴.

Metals	ProUCL 4.0 Calculated Background Concentration (distribution based 95th percentile) ¹	2 x ProUCL 4.0 Calculated Background Concentration	California Human Health Screening Level for Residential Use ²	Cleanup Goal
Units	mg/kg	mg/kg	mg/kg	mg/kg
Antimony	1.76	3.52	30	30
Arsenic	8.29	16.58	0.07	16.58
Barium	120	240	5,200	5,200
Beryllium	0.47	0.94	150	150
Cadmium	ND	ND	1.7	1.7
Chromium (total)	11.75	23.5	100,000	100,000
Cobalt	6.45	12.9	660	660
Copper	10.36	20.72	3,000	3,000
Lead	6.8	13.6	150	150
Mercury	0.033	0.066	18	18
Molybdenum	1.31	2.62	380	380
Nickel	6.15	12.3	1,600	1,600
Selenium	ND	ND	380	380
Silver	ND	ND	380	380
Thallium	ND	ND	5	5
Vanadium	55.8	111.6	530	530
Zinc	43.08	86.16	23,000	23,000

Material Results

A total of 64,541 tons of material was removed by the contractor during 39 days of fieldwork activity. The County's contractor removed additional 8,511 tons of burned timber. Over 3,670 truck loads of material were removed from the Angora burn area. The total breakdown of materials removed during the project is provided below:

- 6,134 tons of concrete recycled (352 truckloads)
- 2,001 tons of metal recycled (90 truckloads)
- 56,317 tons of ash and rubble removed and transported for disposal (2,823 truckloads)
- 8,511 tons of trees recycled for lumber (405 truckloads)

Given that the CIWMB's mission is to reduce waste, the operations also examined ways to recycle material as practically feasible. Besides recycling the metal and concrete from each home, the incident was able to salvage the burned timber and used the wood chips generated from the harvesting of the timber for erosion control. The total material disposed was 56,317 tons or 77% of the waste stream. The total material diverted was 16,668 tons of material or 23% of the waste stream.

Air Results

The health and safety air monitoring¹⁵ revealed a number of detections. The evaluation of the results revealed the following:

- Several metals were detected in ambient and operator breathing zone air samples collected during the structural debris removal process; however, the concentrations of those metals were well below the California Occupational Safety and Health Administration (Cal-OSHA) Permissible Exposure Limits
- Results for asbestos sampling performed indicated detectable levels of asbestos in nine of the 382 area asbestos air samples collected. The area air sampling results ranged from 0.0002 structures per cubic centimeter (s/cc) to 0.0008 s/cc, well below the Cal-OSHA limit for workers of 0.1 s/cc and the community action level of 0.005 s/cc.
- Total Dust was detected above the 0.05 milligrams per cubic meter (mg/m³) community action level on only five occasions throughout the entire project, necessitating stoppage of work at affected sites until engineering controls and/or changing meteorological conditions reduced Total Dust readings to below action levels.

Soil Results

Analytical results for confirmation soil samples collected from 248 parcels indicated low concentrations of metals, well below the cleanup goals established for the project¹⁶. The number of confirmation samples collected varied from one to four samples, depending upon the extent of the ash/debris footprint and the number of areas to be cleared. Additional removal and additional confirmation samples were conducted at two of the 248 parcels, based on a comparison of confirmation sampling results with the cleanup goals. For both properties, the data for the additionally collected confirmation soil samples indicated that removal efforts were complete (i.e., the results were below the cleanup goals established for the project). All laboratory data sheets presenting the results and approval for each soil sample collected at a given parcel were provided in a final report¹⁶ to the County.

Costs

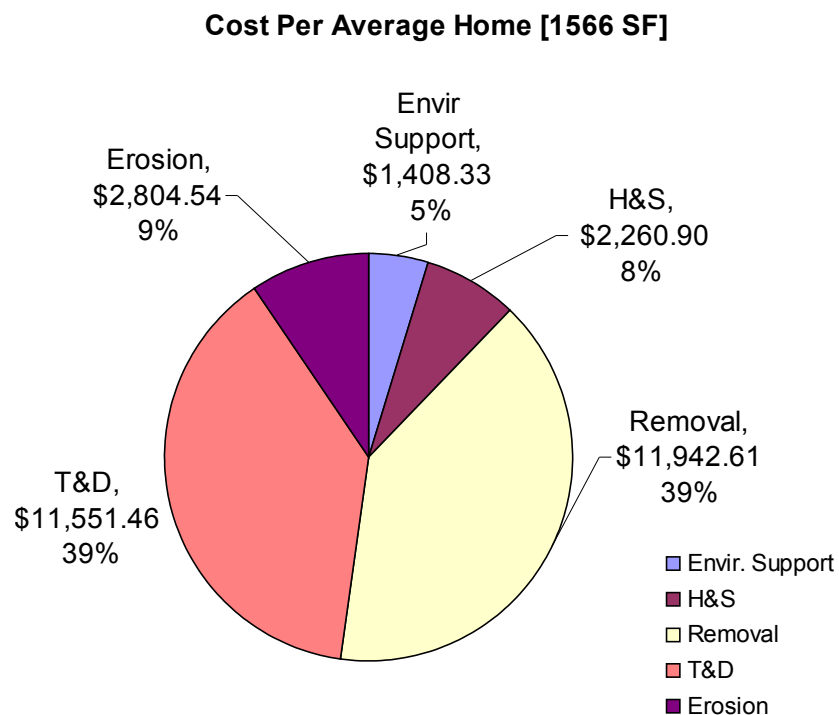
The total cost to the CIWMB for conducting and managing the emergency response and cleanup activities was \$7,352,393. The contractor cost was \$7,291,798.32. The CIWMB received full reimbursement under the Disaster Response-Emergency Operations Account. As of December 2008, the County has recovered \$3,589,023.04 in insurance or escrow payments. These funds have been provided back to the State Disaster Response-Emergency Operations Account. The approximate cost to the emergency response account was \$3,763,369.96.

After the completion of the project, the CIWMB's OSC performed a detailed cost analysis²⁰. The average size of a home in Angora was 1566 square feet (SF). The cost to remove a home varied from a minimum of \$12,954.72 to a maximum of \$79,994.23. The average cost to remove a home was \$29,402.41, while the median was \$28,675.98. Breaking down the removal cost by SF, the average was \$19.31/SF and the median was \$18.25/SF. The overall project cost and cost per average home size detail are provided in Table 2 and Figure 6 below.

Table 2. Overall Contractor Cost at Angora²⁰.

Overall Cost for the Project (excluding CIWMB management costs)	
Item	Cost
Environmental Support (Project Reports)	\$ 349,267
Health and Safety Monitoring and Air Sampling	\$ 560,703
Contractor Expenses (Removal Cost Only)	\$ 2,961,767
Transportation and Disposal	\$ 2,864,762
Erosion Control (144 home sites)	\$ 555,300
Total	\$ 7,291,798

Figure 6. Cost Detail Per Average Home at Angora²⁰.



A complete detailed cost allocation for each parcel is provided in other documents²⁰.

RECOMMENDATIONS

For these protocols to become a standard, the State, local government, local community, insurance companies, and homeowner must recognize that the accumulation of ash and debris is a significant health hazard when a wildfire destroys residential homes. While one burned home may only pose a localized hazard, 248 homes pose a risk to the community, the work force, and the environment.

As with any new program funding must be made available. Funding for this type of coordinated debris removal could be accomplished in one of three ways. The first would be to require insurance companies to

acknowledge the increased risk a large wildland-urban interface (WUI) fire has on the community and environment and adjust homeowner policies in the WUI to include additional funding for a coordinated debris program. Second, an additional fee could be placed on all homeowner policies in the WUI to establish a coordinated debris account. Lastly, an additional disposal fee could be placed on all disposed waste to establish a coordinated debris account. With these funds, a State or local government could quickly remove all fire related debris and protect the community and environment.

CONCLUSION

This project is now known as the “Angora Protocols”, and has become the standard for coordinated debris removal in the State of California; however, only a few of the protocols were adopted in California during the wildfires in 2007 and 2008. Budget restrictions and lack of government commitment have prevented these protocols from becoming the standard. Communities should not be exposed a second time from the removal of ash and debris from a WUI Fire. At a minimum, government should ensure compliance with environmental health and worker safety standard and regulations during the removal. Ash and debris can no longer be considered environmentally benign. The Angora Fire destroyed its first home on June 24, 2007. The first property owner moved into their new home on March 22, 2008, less than nine months from the day the fire started.

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