



## ecology and environment, inc.

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Will Duncan III, Federal On-Scene Coordinator  
United States Environmental Protection Agency  
Emergency Response Section  
ERS SFD-9-2 and EROS SFD-9-4  
75 Hawthorne Street  
San Francisco, CA 94105

**Subject: Mojave River Pyrotechnics Removal - Letter Report**  
**34033 Poplar Street, Barstow, San Bernardino County, California**  
Latitude: 34° 54'44.09" North, Longitude: 116° 59'56.37" West

### INTRODUCTION

In December 2012, Federal On-Scene Coordinator (FOSC) Will Duncan III, of the United States Environmental Protection Agency (U.S. EPA) Region 9 Emergency Response Section (ERS), tasked Ecology and Environment, Inc.'s (E & E) Superfund Technical Assessment and Response Team (START) to provide technical support during a removal action at the Mojave River Pyrotechnics site, located in Barstow, California. The START was tasked with 1) marking proposed excavation areas to remove the near-surface perchlorate-impacted soil and areas for the installation of an impermeable liner, 2) conducting monitoring of dust generated during excavation activities, and 3) documenting removal activities.

### SITE DESCRIPTION

The Mojave River Pyrotechnics Removal site is composed of one property, the former residence of the owner of the pyrotechnics manufacturing facility (Attachment A, Figure 1). The residential property consists of four conjoined 5-acre parcels located at 30433 Poplar Street in Barstow, San Bernardino County, California (Attachment A, Figure 2). The San Bernardino County assessor parcel numbers for the Poplar Street property are 0425-091-21-0-000, 0425-091-22-0-000, 0425-091-23-0-000, and 0425-091-24-0-000. The property is situated approximately 0.25 miles south of Old Highway 58 and 1 mile northwest of Interstate 15.

The northwestern parcel of the Poplar Street property contains two residential structures and associated outbuildings in the northern portion of the parcel, with the remainder of the parcel consisting of undeveloped land. Within the northwestern parcel are two locations where significant perchlorate contamination was found during previous START and U.S. EPA assessment activities. These two locations are designated as the "garden area" and "trash pile area." The other three of the four parcels are undeveloped land. The Mojave River drainage

channel is immediately adjacent to the parcels to the south. Adjacent to the north of the property is Poplar Street, on the other side of which is undeveloped property. Residential properties are present immediately west and northeast of the Poplar Street property, but the majority of the immediate surrounding area is undeveloped.

The site is situated at an elevation of approximately 2,000 feet above mean sea level. The topographic relief is flat with a gentle slope toward the Mojave River, which runs behind the properties. North of the site the land slopes steeply upward due to the presence of the Mitchell Range. The site is located within the Mojave Desert Geomorphic Province. Surface and shallow subsurface soils in the site vicinity are Holocene and Pleistocene-aged alluvium derived from weathering of the surrounding mountain ranges. Based on sampling activities conducted at the site, soils at the site are generally fine to coarse-grained sands, with minor amounts of interspersed clays, silts, and gravels.

The California Regional Water Quality Control Board, Lahontan Region (RWQCB) estimates groundwater at the site to occur between 25 and 50 feet below ground surface (bgs). During the April 2012 soil sampling activities, wet soils were encountered at the site at approximately 28 feet bgs. Groundwater would be anticipated to flow toward the Mojave River.

## **BACKGROUND**

In December 2010, U.S. EPA Region 9 ERS FOSCs Duncan and Harry Allen tasked the START to provide technical assistance for a Removal Assessment of perchlorate contamination in soil at two properties in the city of Barstow, San Bernardino County, California. The RWQCB had requested U.S. EPA assistance in evaluating the two properties, which were suspected of potentially contributing to known perchlorate contamination in groundwater in the area.

The properties were a former pyrotechnics manufacturing facility and the former home of the owner of the facility. According to information provided by the RWQCB, the Mojave River Pyrotechnics Company, which closed in the mid-1980s, allegedly handled perchlorate for the manufacturing of various pyrotechnic devices. The owner/ operator of the facility was James Bray, who resided at the residential property that was one of the subjects of the assessment. Because perchlorate contamination had been recently detected at a nearby public water supply well and in private domestic wells in the vicinity of the properties, the RWQCB suspected that chemicals containing perchlorate may have been disposed at the Bray residential property and/or at the former pyrotechnics manufacturing facility.

The U.S. EPA and START conducted four sampling events at the residential property in December 2010, March 2011, August 2011, and April 2012 (Attachment A, Figure 2). Based on perchlorate concentrations found in soil at the residence, assessment activities were expanded during the third sampling event to include the nearby former pyrotechnics manufacturing facility. The results from these assessment activities are summarized in the START Mojave River Pyrotechnics Assessment Reports dated October 2011 and September 2012 (Technical Direction Document No. TO2-09-10-12-0003).

## U.S. EPA AND START REMOVAL ACTIVITIES

Based on the perchlorate soil sampling analytical results and plume modeling data summarized in the *Mojave River Pyrotechnics Assessment Report, April 2012 Field Work*, prepared by START in September 2012, FOSC Duncan decided to remove the surface 3 feet of soil in each decision area that contained perchlorate concentrations above the U.S. EPA residential regional screening level (RSL) for perchlorate in soil of 55 milligrams per kilogram (mg/kg). This action would remove the perchlorate source material impacting groundwater and reduce the potential for direct exposure to residents at the site. FOSC Duncan also elected to install an impermeable liner in each decision area at the 3 feet bgs depth to cover the perchlorate-impacted soils that remain below 3 feet bgs to mitigate further contamination of ground water beneath the site by minimizing surface water infiltration through the contaminated soils still present at the site.

Prior to the start of removal activities, START member Diener, U.S. EPA FOSCs Duncan and Rich Martyn, and U.S. EPA Emergency and Rapid Response Services (ERRS) contractor Removal Manager Chernick mobilized to the site on November 19, 2012, to conduct a pre-removal site walk. During this site walk, START used the assessment plume modeling results to delineate the approximate location of the proposed areas for removal of contaminated soils in each decision area (Attachment A, Figures 3 and 4). Due to the physical constraints of access roads, installed utilities, and mature trees in the garden area, the U.S. EPA adjusted the proposed removal excavation boundaries in the garden area to accommodate these site features. No adjustments to the proposed removal area in the trash pile area were deemed necessary.

The U.S. EPA directed ERRS to arrange for laboratory analysis of backfill material samples provided by potential local suppliers to determine if the imported material would be suitable to be used at the site. The U.S. EPA directed START to assist ERRS by taking receipt of the backfill soil samples provided from three quarries (Best Rock Quarry, Brubaker-Mann, and Robertson's) and delivering them to the Test America, Inc. laboratory in Irvine, California, to be analyzed for perchlorate by U.S. EPA Method 314.0 and metals by U.S. EPA methods 6010B/7471A. Analytical results were received by ERRS on November 28, 2012, and provided to START for summary in this report. Perchlorate was not detected in any of the samples, but levels of arsenic and vanadium above their respective RSLs were noted in the three samples:

- Arsenic (U.S. EPA RSL, May 2012 = 0.39 mg/kg for residential soil)
  - Results from April 2012 U.S. EPA/START assessment data: Arsenic in site soil ranged from 1 – 2 mg/kg
  - Arsenic concentrations in soil from potential backfill suppliers:
    - Robertson's – 4.3 mg/kg
    - Brubaker-Mann – 270 mg/kg
    - Best Rock Quarry – 13 mg/kg
- Vanadium (U.S. EPA RSL, May 2012 = 5.5 mg/kg for residential soil)
  - Results from April 2012 U.S. EPA/START assessment data: Vanadium ranged from 8 – 25 mg/kg

- Vanadium concentrations in soil from potential backfill suppliers:
  - Robertson's – 20 mg/kg
  - Brubaker-Mann – 1.3 mg/kg
  - Best Rock Quarry – 42 mg/kg

ERRS and the U.S. EPA discussed the analytical results and elected to procure backfill material from Robertson's, as their levels of arsenic and vanadium, while above the U.S. EPA RSL, were the closest match to background levels of these metals that were previously documented in the site soils during the assessment. A copy of the analytical results of the backfill material provided by ERRS is provided in Attachment B.

START prepared a Quality Assurance Sampling Plan (QASP) for air monitoring that was delivered to the FOSC prior to the start of removal work (Attachment C). Removal site work began on December 3, 2012. The following summaries cover the operating period from December 3, 2012, through December 10, 2012. There were no site activities on December 9, 2012. Photo documentation of the removal activities is presented in Attachment D.

### ***Haul Road Construction and Road Maintenance***

ERRS constructed a haul road that traversed the two northern parcels of the site to allow vehicle traffic a dedicated route through the site, prevent vehicles from becoming stuck in the sandy/soft soils, and allow direct loading of haul trucks with contaminated soils from each decision area. The haul road was constructed by covering a geotextile fabric with approximately 6 inches of imported clean gravel. Twenty-one truckloads (536 tons) of gravel were required to complete the road. The road was compacted and watered daily to maintain its integrity and reduce nuisance dust emissions.

ERRS conducted daily maintenance of the two private dirt roads that were utilized to access the site (Poplar Street and Shady Lane). Truck and vehicle traffic on these dirt roads caused the soil to become soft and uneven in several areas. ERRS repaired these roads by applying water for dust suppression and moisture conditioning, placing gravel to harden soft spots and fill in depressions, back dragging with an excavator bucket to smooth over the road surface, and compacting with a vibrating roller.

### ***Trash Pile Area***

Prior to the start of excavation activities, START located and marked out the corners of the proposed trash pile area excavation using a Global Positioning System (GPS) unit for reference. START also marked out a small area near sample location MR-028 in the southeast parcel of the site where a small container was observed and perchlorate was detected during the August 2011 assessment. Excavation of contaminated soils in the trash pile decision area began on December 4, 2012, and continued through December 6, 2012. The perchlorate-impacted soil removed from the area around sample location MR-028, along with the investigation-derived waste from the April 2012 U.S. EPA/START removal assessment activities, was added to the stockpile of contaminated soil that was excavated from the trash pile area.

Based on the plume modeling results, the lateral extent of perchlorate contamination deeper than 3 feet bgs in the trash pile area did not extend beyond the dimensions of the impacted soil from surface to 3 feet bgs. Therefore, no further excavation was required prior to the installation of the

liner as the areas for contaminated soil excavation and liner installation were identical. ERRS compacted the bottom of the excavated area and installed a seamless 12-mil polyvinyl chloride (PVC) liner. The liner dimensions were larger than the final excavation, so the excess material was folded over onto itself prior to being anchored. START documented the GPS coordinates at the corners of the installed liner; the extent of the final excavation and liner placement in the trash pile area is provided in Figure 5, Attachment A. ERRS took delivery of 26 truckloads of clean fill sand (670 tons) and completed backfill of the trash pile area on December 7, 2012.

### ***Garden Area***

Prior to the start of excavation activities, START marked out the corners of the proposed excavation in the garden area. Excavation of contaminated soils in this decision area began on December 4, 2012, and continued through December 7, 2012.

Solid white material, consistent with perchlorate-containing solids that were observed during the assessment soil sampling, was also observed during the excavation. Photo documentation of the white solid is presented in Attachment D. The U.S. EPA directed ERRS to remove an additional 6 to 12 inches of soil from the southern portion of the garden area excavation to ensure that all of the visible white solid material was removed and transported for off-site disposal.

Based on the plume modeling results, the lateral extent of perchlorate contamination deeper than 3 feet bgs in the garden area extended beyond the dimensions of the impacted soil from surface to 3 feet bgs. Therefore, prior to the installation of the liner ERRS laterally extended the excavation into the surrounding clean soil at the 3 feet bgs level to within a few feet of the installed utilities (power lines/poles, septic system and water lines) and to the root ball / drip line of the adjacent trees. The clean excavated soil was stockpiled on site and used as backfill on the liner. ERRS compacted the bottom of the excavated area and installed a seamless 12-mil PVC liner. The liner dimensions were larger than the final excavation, so the excess material was trimmed and/or folded over onto itself prior to being anchored. START documented the GPS coordinates at the corners of the installed liner; the extent of the final excavation and liner placement in the garden area is provided in Figure 6, Attachment A.

ERRS also relocated a 2-inch PVC pipe that bisected the excavation area from west to east; this pipe is the main waterline for the residence. The pipe was repositioned such that it was at least 6 inches above the installed PVC liner. ERRS installed a tracer wire above the water pipe and connected it to one of the metal irrigation spigots in the area, allowing the pipe to be more easily located during future underground utility surveys on the property. ERRS placed a piece of yellow plastic caution tape over the tracer wire to act as a visual identifier to the location of the buried water pipe. ERRS took delivery of 30 truckloads of clean fill sand (760 tons) and completed backfill of the garden area on December 10, 2012.

### ***Dust Monitoring***

During excavation activities, START collected air monitoring data throughout the workday in accordance with the QASP using Personal DataRam (PDR) and DataRam4 instruments, which measure real-time particulate concentrations in ambient air. No nuisance dust exceedances were noted. A summary of the START dust monitoring results is provided in Attachment E.

***Transportation and Disposal of Excavated Perchlorate Impacted Soils***

A total of 49 haul trucks (27 from the trash pile and 22 from the garden area) were loaded with approximately 17 cubic yards of contaminated soil each and transported off site for direct disposal at the U.S. Ecology landfill, located in Beatty, Nevada. Daily waste tracking summaries and copies of the hazardous waste manifests are provided in Attachment F.

**SUMMARY AND CONCLUSION**

The START provided technical support and documentation to assist the U.S. EPA and ERRS during the Mojave River Pyrotechnics Removal project, located in Barstow, California. The START identified the proposed excavation areas to remove the near-surface perchlorate-impacted soil and install an impermeable liner, conducted monitoring of dust generated during excavation activities, and documented the removal activities. A total of approximately 833 cubic yards of perchlorate-contaminated soil was removed from the two decision areas (trash pile and garden areas) and transported to the U.S. Ecology landfill in Beatty, Nevada for disposal. Impermeable, seamless PVC liners were installed at the bottom of each excavation area to minimize the infiltration of water from the surface into the perchlorate-impacted soils below 3 feet bgs. No further U.S. EPA activity is anticipated at this site.

This report concludes all work performed on this project. If you have any questions regarding START activities associated with this project, please do not hesitate to contact the project manager, Robin Clemens, at 510-893-6700 x4704, or me at 562-997-1200 x3643.

Respectfully submitted,

Matthew Diener  
START Member

**Attachment A: Figures:**

Figure 1 – Site Location Map

Figure 2 – March and August 2011, and April 2012 Soil Sampling Locations

Figure 3 – Trash Pile Area – Proposed Soil Excavation and Liner Installation Boundaries

Figure 4 – Garden Area - Proposed Soil Excavation and Liner Installation Boundaries

Figure 5 – Trash Pile – Final Excavation and Liner Installation Boundaries

Figure 6 – Garden Area – Final Excavation and Liner Installation Boundaries

**Attachment B: Backfill Material Analytical Data****Attachment C: QASP****Attachment D: Photographic Documentation****Attachment E: Summary of START Dust Monitoring Results****Attachment F: Daily Summaries and Copies of Hazardous Waste Manifests**

Table 1 – Waste Tracking Log 12/05/2012

Table 2 – Waste Tracking Log 12/06/2012

Table 3 – Waste Tracking Log 12/07/2012

cc: START Project File