



PROJECT

Reduction of TNT and RDX Concentrations in Soil (Pilot, Bench, and Full Scale Soil Corrective Measures)

Site: Tooele Army Depot - TNT Washout Facility/SWMU-10

Client: MWH Constructors, Inc. under contract to the US Army Corps of Engineers (USACE)

Contractor: Plexus Scientific Corporation



SUMMARY

The Tooele Army Depot (TEAD) is in Tooele, Utah, 35 miles southwest of Salt Lake City. It consists of two separate areas, the North Area and the South Area. The North Area covers about 25,000 acres in Tooele Valley south and west of Tooele.

Since 1943, TEAD has had a fourfold mission: store ammunition, demilitarize ammunition, rebuild military equipment, and store military equipment. In fulfilling its mission, TEAD decommissions munitions by cutting the casings and removing and recycling the explosive material. The casings are then rinsed with water to remove residual explosives. Between 1948 and 1965, rinse waters were discharged into the "TNT Washout Area," which covers less than 1 acre in the North Area. The Army has detected trinitrotoluene (TNT) and cyclomethylenetriamine (RDX) in soil near the TNT Washout Area (designated as SWMU-10), threatening ground water. About 2,500 people depend on wells within 3 miles of the site as a source of drinking water.



THE CHALLENGE

Project plans included treatment of approximately 10,000 yards of soil impacted with TNT and RDX at concentrations as high as 2,500 and 1,000 mg/kg, respectively. In addition, soils were required to be treated to levels below the remediation goals of 86 mg/kg TNT and 31 mg/kg RDX.

Initial treatability and feasibility analyses suggested that conventional composting would be the most cost-effective alternative for soil treatment, utilizing organic amendments at a rate of 70 weight percent (wt %) of the total compost mass, and treating in seven batches over the course of twelve months' time. However, a combination of factors



resulted in an increase in projected costs. The combination of a considerable rise in fuel and shipping costs, a long haul distance to the site from agricultural areas, and the need for relatively large quantities of compostable organic materials combined to make the originally-preferred alternative economically unfavorable.

As a consequence of changes in project economics, Plexus Scientific recommended use of DARAMEND as an alternate form of treatment to reduce costs and make it possible for the project to be completed within budget. MWH and the Army Corps accepted this alternative following the completion of pilot-scale soil treatment that met the site remediation goals.



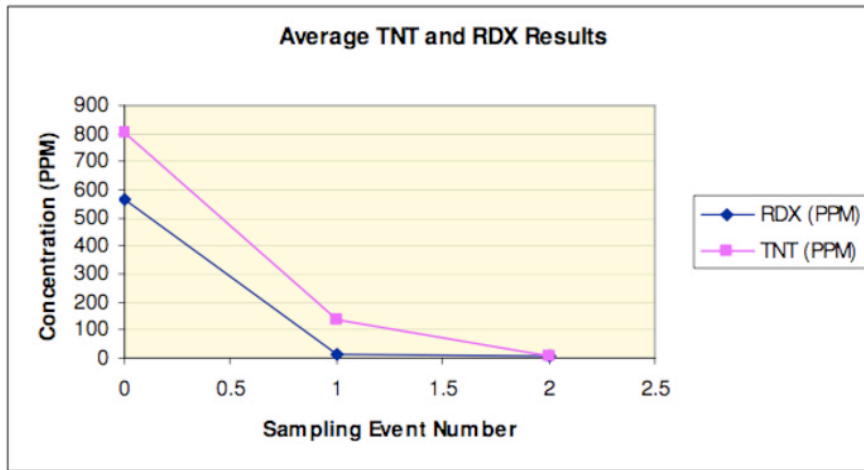
FIELD WORK

Pilot-scale soil treatment with DARAMEND was conducted at TEAD SWMU-10 to assess field efficacy of DARAMEND for composting site soils for treatment of TNT and RDX. Both the pilot and a concurrent bench-scale treatment study effectively demonstrated that the DARAMEND technology effectively treated site soils to levels below the remediation goals of 86 mg/kg TNT and 31 mg/kg RDX. Based on these results, the Army implemented Full-Scale DARAMEND treatment of the SWMU-10 soils.

For the full-scale treatment, soil was treated in large batches (about 3,000 cubic yards each) in a large sprung structure. In an effort to reduce treatment time and the associated labor and equipment costs, DARAMEND was added in a single dose of 3.5 wt% to soil mass upon initiating treatment of each batch, rather than through smaller incremental additions at the start of each treatment cycle. Given the very dry arid soils and limited water supply, it took approximately a week to add sufficient water to the soil to achieve adequate moisture content for treatment.

THE RESULT

Plexus Scientific effectively treated soils to remediation goals in a single application cycle. Results for the first batch of soil are typical of subsequent batches, and are shown on the next page. Note that additional reductions continued to occur with additional tilling and soil resting, but without the addition of more DARAMEND. Treatment of the three batches was completed in approximately five months, considerably less than the original estimate of one year with conventional composting.



THE CONCLUSION

DARAMEND was highly effective in the treatment of TNT and RDX in soil, providing a safe, effective, reliable and more economical alternative to conventional composting. Moreover, at a material cost of \$62/yd³, the DARAMEND approach provided great economic value to the clients, saving them both time and money.