



RENNIE FARM SITE HISTORY

Historic Site Use. Since 1965, Dartmouth has owned the approximately 223-acre Rennie Farm in Etna, NH. From the mid-1960s until 1978, a less than ½-acre area on the property was used by Dartmouth as a State licensed burial site for animal carcasses from medical and other research. Human remains used in teaching by Dartmouth Medical School were buried in a separate approximately 10-foot by 10-foot area adjacent to the animal carcass burial area.

Initial Site Cleanup. Plans for excavation and remediation of the site began in 2010. Site remediation was approved by the New Hampshire Department of Health and Human Services, Radiological Health Section (RHS) and began in late October 2011. In November 2011, unexpected hazardous chemical waste was encountered. Dartmouth notified the New Hampshire Department of Environmental Services (DES) and removed the contaminated materials.

Source removal and remediation continued through December 2011. Prior to undertaking the remediation and throughout the excavation, numerous soil and groundwater samples were collected and analyzed, consistent with State regulations and with State oversight, for purposes of site closure. After analyzing samples taken from the site, RHS deemed the site free of radiological contamination and safe for unrestricted use.

Groundwater. The focus of Dartmouth's work with DES has been related to groundwater contamination beneath the Rennie Farm in the area near the excavation. Prior to site excavation, four groundwater monitoring wells were installed and have been regularly sampled for radiological and chemical contaminants. In April 2012, for the first time, groundwater sample analysis at Rennie Farm detected 1,4-dioxane (a volatile organic compound [VOC] used in laboratories) at concentrations exceeding the New Hampshire groundwater standard. No other contaminants have been discovered in excess of NH Groundwater Standards.

Phased Investigation. Since the detection of 1,4-dioxane in groundwater, Dartmouth has continued to monitor groundwater quality and has conducted a phased investigation consistent with State environmental requirements. Results have indicated decreasing concentrations of 1,4-dioxane near the excavation area, but testing results also indicate that concentrations are not yet below the NH Groundwater Standard within a portion of the former animal carcass burial area and an area downslope of the burial area.

The movement of water and 1,4-dioxane below ground at the Rennie Farm site is complex. For complex sites like Rennie Farm, investigations to determine the area where contaminants are present are often completed in phases in accordance with State regulations. The results of each phase are used to design the next phase of work to ultimately determine the area impacted by the contaminant. Work by Dartmouth at the Rennie Farm site has included installation of a total of 33 groundwater monitoring wells in five phases, groundwater and surface water monitoring, geologic mapping, and geophysical surveys and data evaluation. This work is focused on monitoring 1,4-dioxane beyond the former animal carcass burial area and remediation of 1,4-dioxane within the burial area.

Five out of the total 33 groundwater monitoring wells were installed during 2014. Results from those samples indicated 1,4-dioxane was present in groundwater at the Rennie Farm site beyond the excavation area, but within Dartmouth property boundaries. The results of the sampling and analyses were presented to DES along with a work plan proposing the installation of eight additional sample points at Rennie Farm in locations within Dartmouth property boundaries further from the burial area in the direction of groundwater flow. DES approved the work plan and the proposed wells were drilled during June 2015.

Samples collected during the summer of 2015, from the eight monitoring wells installed during June 2015, showed one sample point with 1,4-dioxane at levels in excess of the NH Groundwater Standard. In order to ensure the safety of our neighbors, and in consultation with DES, we sought permission to sample private water supply wells of neighbors in the vicinity of the Rennie Farm premises. Nine private water supply wells in the vicinity of the site were selected for sampling in concert with DES to ensure protection of public health in light of observed groundwater sampling results and groundwater flows in this area. Access was obtained to 8 of the 9 wells, and the 8 wells sampled during the late summer and early fall of 2015.

1,4-dioxane has been detected within one of the private water supply wells selected for sampling. The detected concentrations of 1,4-dioxane in samples collected from the well range from approximately 6 micrograms per liter ($\mu\text{g/L}$) to 4 $\mu\text{g/L}$, and exceed the New Hampshire Ambient Groundwater Quality Standard (NH AGQS) of 3 $\mu\text{g/L}$. The private water supply well is located adjacent to the Rennie Farm property. Bottled water was immediately provided to the home serviced by the private water supply well, and a treatment system installed in the home to remove 1,4-dioxane from the water pumped from the well.

In addition to wells selected for sampling, a total of 16 private water supply wells have been sampled at the request of the individual property owners. 1,4-dioxane has not been detected in the samples collected from these wells.

A recent geophysical survey of the former laboratory animal burial area, performed to provide information needed for the design of a remedial system, indicated the potential for buried materials within three anomalous areas. The three areas were excavated, and bagged laboratory waste was encountered within one of the anomalous areas. The remaining laboratory waste will be excavated and removed from the site. The recent geophysical survey included the entire historic burial area and surrounding adjacent areas of the site that would have been accessible for the burial of laboratory waste, and did not identify any other anomalous areas. Preliminary groundwater sampling performed adjacent to the location of the recently excavated laboratory waste did not detect 1,4-dioxane.

The animal carcasses that had been buried at the site were used in tests involving radionuclides. Soil and groundwater testing for radionuclides before, during, and after the removal of the animal carcasses during 2011 did not detect radionuclides above background levels. Groundwater samples were recently collected from wells located adjacent to and downslope from the former burial area for analysis of a suite of radionuclides. Analysis of the samples did not indicate the presence of radionuclides above background levels.

Due to the presence of the human remains within 10-foot by 10-foot area adjacent to the former laboratory animal burial area, groundwater samples were also collected from monitoring wells for analysis for formaldehyde. Laboratory analysis of the samples did not detect formaldehyde within the groundwater samples.

Work is ongoing to remediate the former burial area to remove the source of the 1,4-dioxane and control transport of 1,4-dioxane from the Rennie Farm property. Additional groundwater monitoring wells are also being installed to monitor the extent and attenuation of the 1,4-dioxane beyond the Rennie Farm property.

Dartmouth will remediate the site and continue monitoring groundwater wells and selected drinking water supply wells under a Groundwater Management Permit to be issued by the DES. The groundwater management permit will outline the scope and interval of groundwater and drinking water testing. Permits are issued with 5-year terms but can be modified or extended based on testing data.