Work Plan to Plug and Abandon Test Well 4

Primary Purpose	This work plan summarizes the methods Los Alamos National Laboratory (LANL) proposes to remove the existing sampling equipment presently lodged downhole at Test Well 4 (TW-4) to restore it for use as a water-level monitoring well. TW-4 is located on private property in Los Alamos, New Mexico. The pump, transducer, and associated tubing became stuck in 2006 as the equipment was being removed. A rotary drilling rig will be used to attempt to remove the pump and tubing so that TW-4 can again be used for water-level monitoring of the regional aquifer near upper Acid Canyon. If the sampling equipment cannot be removed from the well, TW-4 will be plugged and abandoned in a manner consistent with the requirements in the guidelines of Sections IV.B.1.b.v and X.D (Well Abandonment) of the Compliance Order on Consent (the Consent Order) as well as those of the New Mexico Office of the State Engineer. The construction of TW-4, the proposed restoration technique, and, if required, the proposed abandonment methods are detailed below.
Conceptual Model	Groundwater monitoring well TW-4 was installed in 1950 to monitor the regional aquifer beneath Acid Canyon near the former Technical Area 45 Radioactive Wastewater Treatment Plant. Construction details are as follows: • 0–109 ft: 16-in.-inside diameter (I.D.) steel casing • 0–288 ft: 12-in.-I.D. steel casing • 0–633 ft: 10-in.-I.D. steel casing • 0–1195 ft: 6-in.-I.D. steel casing • 1195–1205 ft: 6-in.-diameter well screen
Current Condition	The well casing and screen at TW-4 are believed to be intact. The sampling equipment became tangled and stuck in 2006 at approximately 1030 ft below ground surface (bgs) as the submersible pump was being removed. Approximately 160 ft of the 2-in. galvanized drop pipe holding the pump had been removed when the pump and some of the transducer tubing became stuck in the innermost 6-in. casing. At least one of the 2-in. polyvinyl chloride transducer gauge tubes and a portion of the pump's electrical cable separated from the pump's drop pipe and fell down the 6-in. casing.
Proposed Well Restoration Method	LANL proposes to mobilize a rig to the wellhead with minimal disturbance to nearby trees and private property. After mobilization, an effort will be made to locate and raise the electrical cable. Then an effort will be made to pull the pump with the existing 2-in. drop pipe, which is accessible and landed at the surface on the 6-in. well casing. A significantly larger and more powerful pump hoist will be used than the machine that was used in 2006. If the fishing effort is successful and the pump is able to be removed, the well will be inspected with a downhole video camera, and a natural gamma log collected to document the existing conditions. TW-4 will be retained as a water-level monitoring well. It will be outfitted with a dedicated water-level transducer and the surface completion will be remodeled so as not to be as obtrusive. The existing pump jack concrete surface pad will be removed, the casing strings will be trimmed to ground surface, the surface pad will be reconstructed as a flush-mount completion, and the chain link fence around the wellhead will be removed.

Abandonment Methods	If the fishing effort is unsuccessful and the pump remains stuck in the well, the well will be abandoned. An attempt will be made to extract the entire length of 6-in. casing using either appropriately sized casing jacks (with rings and slips) or a rotary drill rig. If the 6-in. casing proves impossible to extract, an oilfield slickline or wireline subcontractor will mechanically separate the pump from the pipe via the 2-in. pump column drop pipe. This option would allow the pump to drop the bottom of the well where it would be grouted in place. No surface water or perched zone pathways were identified during drilling at TW-4. Therefore, no casing string extractions or perforations would be required during abandonment at TW-4. If the 6-in. casing is extracted and the pump remains in the well, hydrated bentonite chips will be installed in the hole from total depth (TD) to 50 ft bgs. In either case, the top 50 ft will be filled with neat cement to 2 ft bgs. If the pump is separated from the drop pipe and falls to the bottom of the well, it will be grouted in place with a 50-ft neat cement plug from TD to 1155 ft bgs before removing the 2-in. drop pipe. Then, hydrated bentonite chips will be installed to 50 ft bgs before filling the remainder of the well to 2 ft bgs with neat cement.	
Surface Completion If TW-4 Is Abandoned	The well will be cement-grouted to within 2.0 ft of ground surface. A 2-ft × 2-ft × 2-ft-deep concrete surface pad with a brass marker will be installed and surveyed in accordance with Section IX.B.2.f of the Consent Order, which states that pertinent structures may be horizontally located with a global-positioning system to within 0.5 ft.	
Waste Disposal	No sampling will take place during restoration or plugging and abandonment of this well. The intent is to reuse and recycle all materials. If some materials cannot be recycled, they will be disposed of in accordance with the waste characterization strategy form that applies to this activity.	
Summary Report	A brief summary report will be prepared detailing the restoration methods used and describing the outcome. It will also present borehole logs (video and natural gamma), list the quantities of materials used, and describe the final abandonment details, if the well were plugged and abandoned. Figures depicting the location of the well and the well schematic at the completion of the project will also be included in the report. The proposed schedule for project completion and reporting follows.	
Schedule	**Activity**	**Completion Date**
	Remove pump and/or plug and abandon TW-4	June 21, 2010
	Submit report to the New Mexico Environment Department	July 16, 2010