



STATE OF NEW MEXICO
OFFICE OF THE STATE ENGINEER
SANTA FE

Scott A. Verhines, P.E.
State Engineer

CONCHA ORTIZ Y PINO BLDG.
POST OFFICE BOX 25102
130 SOUTH CAPITOL
SANTA FE, NEW MEXICO 87504-5102
(505) 827-6091
FAX: (505) 827-3806

July 18, 2014

U.S Department of Energy/ Los Alamos National Laboratory
C/O Steve White
P.O Box 1663
Los Alamos, NM 87545

Re: Plugging Plan of Operation, LANL Wells DT-5 and DT-5A, Los Alamos, NM.

Greetings:

After a review of the Well Plugging Plan of Operations submitted on July 11, 2014, The Office of the Engineer is returning a favorable approval with specific Plugging Conditions and has accepted the Plugging Plan submitted for filing.

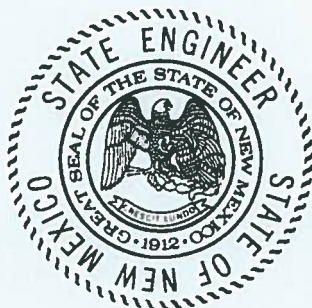
Please return a completed Well Plugging Report that itemizes the actual abandonment process and materials used within 20 days after completion of well plugging. In addition, please include a copy of the approved Plugging Conditions enclosed.

Please address any questions via- telephone to Ramona Martinez at 505.827.6120 or via e-mail at Ramona.Martinez2@state.nm.us.

Sincerely,


Ramona Martinez
Basin Supervisor

Enclosure
cc: file





DISTRICT 6
SCOTT A. VERHINES, P.E.
NEW MEXICO STATE ENGINEER

Materials submitted by Los Alamos National Laboratory (LANL) request the plugging of two wells (DT-5A and DT-5). The wells will be sealed to comply with provisions of NMAC 19.27.4 and the New Mexico Environment Department's Hazardous Waste Bureau. Plugging services will be provided by Boart Longyear (WD-1161).

LANL Well Name	OSE file No.	X coordinate NM State Plane Central zone NAD 1983 (feet)	Y coordinate NM State Plane Central zone NAD 1983 (feet)	Total depth to be sealed (feet)	Casing diameter (s) (inches)	Depth to water (feet b.g.s.)
DT-5A	unknown	1625310.0	1754789.4	1821 b.g.s.	8 12	1186
DT-5	unknown	1625310.0	1754789.4	927 b.g.s.	8	dry above 927

b.g.s. = below ground surface

Contacted Michael Dale (NMED-HWB, 505-661-2673) on July 17, 2014.

Specific Plugging Conditions of Approval for LANL wells DT-5A & DT-5, Los Alamos, NM, Los Alamos County.

1. Water well drilling and well drilling activities, including well plugging, are regulated under 19.27.4 NMAC, which requires any person engaged in the business of well drilling within New Mexico to obtain a Well Driller License issued by the New Mexico Office of the State Engineer (NMOSE). Therefore, the firm of a New Mexico licensed Well Driller shall perform the well plugging.
2. Approximate theoretical volume of sealant required for abandonment of well intervals ranges from 2.61 gallons per foot for 8-inch ID casing to 5.88 gallons per foot for 12-inch ID casing. Some highly porous volcanic formations may result in uptake of considerably higher volumes than calculated. If surface casings are removed, borehole volume may require more than casing. LANL and its contractor should account for volumes of sealant materials used, especially cement. In the event the theoretical volume is exceeded by 25% or more for cement sealant, use of bentonite chips would be appropriate rather than pumping multiple borehole volumes of cement slurry.
3. For multiple intervals from 520 feet b.g.s. to surface (DT-5A) and 200 feet b.g.s. to surface (DT-5) as specified in Plugging Plan of Operations submitted, LANL requests use of cement as a sealant. Fundamental water demand for Type I/II Portland neat cement grout is 5.2 gallons per 94 lb/sack cement. Use of mix water increment in excess of this amount results in a thinned mix of cement prone to shrinkage that may disrupt effective sealing and hydraulic separation. AWWA Well Standards allow use of a maximum of 6.0 gallons water per 94 lb/sack cement if necessary for pumpability of neat cement grout. NMAC 19.27.4.30.C.1 specifies placement of sealant by use of a tremie pipe for depths greater than 20 feet b.g.s.. Thus, applicant's proposal of 6 gallons of water per 94-lbs sack of cement is acceptable.
4. For the intervals from approximately 1821 feet to 520 feet b.g.s. (DT-5A) and 927 to 200 feet b.g.s.(DT-5), applicant requests use of bentonite chips (3/8-inch Hole Plug) as a sealant. NMAC 19.27.4.30.C.1 specifies placement of sealant by use of a tremie pipe. When a tremie is used, it shall extend to near total depth of the well at the initiation of the plugging. The tremie shall be incrementally removed to retain the tremie bottom a limited distance above the top of the rising column of bentonite chips throughout the plugging process.

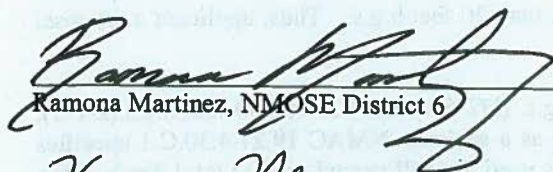
When placing bentonite chips above static water level, the chips shall be hydrated with sufficient potable water to allow the chips to yield. Options include: (A) use tremie for mixture of chips and water (as a carrier), or (B) use of dry-tremie for the chips in short intervals followed or preceded by addition of potable water increment sufficient for yielding of chips.

Potable water shall be added to the well in increments such that the chips are discharged into a column of standing water, if possible. If borehole lithology is too permeable to retain added water prior to chip placement, potable water shall be discharged into the borehole/well following placement of short intervals of chips to provide the bentonite sufficient available water to swell and seal the borehole/casing.

Alternately, a surface pour of the requested bentonite pellets is authorized, provided that the depth of the well be accurately determined prior to plugging, and that the top of the column of chips be sounded and column height / volume of sealant emplaced be recorded at approximate 25' intervals over the course of plugging to gauge appropriate progress of plugging and establish that the chips have not bridged inappropriately up-hole. If bridging occurs using any method of placement, the bridging shall be rectified before continuing with plugging. Sealant manufacturer's recommendations should be followed regarding screening fine particles from the chips and rate of pour to avoid bridging.

5. For DT-5A only, the sequence of plugging includes: 1) tremie bentonite chips inside 8-inch casing to approximately 540 feet b.g.s.; 2) cut 8-inch casing at 520 feet b.g.s. and remove casing; 3) tremie bentonite chips for any annular space to approximately 520-515 feet b.g.s.; and 4) tremie cement from approximately 520 to surface. This sequence protects access to the 8-inch casing and reduces potential losses of cement to lost circulation zones encountered during drilling, which may still be present in the annulus space outside 8-inch casing.
6. The plug may be terminated below grade as necessary to allow approved redevelopment onsite, provided any plug consist of cement or concrete within 10' of ground level, and a minimum 6-inch thickness of reinforced cement grout or concrete completely covers the top of any casing cut off below grade. More stringent local building codes may apply.
7. Should the NMED, or another regulatory agency sharing jurisdiction of the project authorize, or by regulation require a more stringent well plugging procedure than herein acknowledged, the more-stringent procedure should be followed. This, in part, includes provisions regarding pre-authorization to proceed, remediate contaminants, inspect, pull/perforate of casing, or prohibit free discharge of any fluid from the borehole during or related to the plugging process.
8. NMOSE witnessing of the plugging will not be required, but shall be facilitated if a NMOSE observer is onsite. NMOSE witnessing may be requested during normal work hours by calling the District 6 NMOSE Office at 505-827-7848, at least 48-hours in advance. NMOSE inspection will occur dependant on personnel availability.
9. A NMOSE Plugging Record (available at: <http://www.ose.state.nm.us/PDF/WellDrillers/WD-11.pdf>) itemizing actual abandonment process and materials used shall be filed with the State Engineer (NMOSE, PO Box 25102, Santa Fe, NM 87504-5102), within 20 days after completion of well plugging. Please attach a copy of these plugging conditions.

The NMOSE Well Plugging Plan of Operations dated July 2 and July 11, 2014, with annotation, is hereby approved with the aforesaid conditions applied.


Ramona Martinez, NMOSE District 6

Date: 7/12/14


Kevin Myers, NMOSE Hydrology Bureau

Date: 7/17/14



WELL PLUGGING PLAN OF OPERATIONS



NOTE: A Well Plugging Plan of Operations shall be filed with and accepted by the Office of the State Engineer prior to plugging.

I. FILING FEE: There is no filing fee for this form.

II. GENERAL / WELL OWNERSHIP:

Existing Office of the State Engineer POD Number (Well Number) for well to be plugged: DT-5

Name of well owner: U.S. Department of Energy/Los Alamos National Laboratory

Mailing address: P.O. Box 1663

City: Los Alamos State: New Mexico Zip code: 87545

Phone number: 505-667-3005 E-mail: meverett@lanl.gov

III. WELL DRILLER INFORMATION:

Well Driller contracted to provide plugging services: Boart Longyear

New Mexico Well Driller License No.: 1161 Expiration Date: 10/31/2014

IV. WELL INFORMATION:

Note: A copy of the existing Well Record for the well to be plugged should be attached to this plan.

- 1) GPS Well Location (BRASS CAP): East: 1625310.0
North: 1754789.4
Well coordinates are New Mexico State Plane Grid Coordinates, Central Zone (North American Datum, 1983[NAD 1983]).
- 2) Reason(s) for plugging well: The borehole represents a conduit to subsurface.
- 3) Was well used for any type of monitoring program? No If yes, please use section VII of this form to detail what hydrogeologic parameters were monitored. If the well was used to monitor contaminated or poor quality water, authorization from the New Mexico Environment Department may be required prior to plugging.
- 4) Does the well tap brackish, saline, or otherwise poor quality water? No If yes, provide additional detail, including analytical results and/or laboratory report(s):
- 5) Static water level: Dry, according to LANL's work plan to plug and abandon borehole.

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feet below land surface / feet above land surface (circle one)

- 6) Depth of the well: 927 feet
- 7) Inside diameter of innermost casing: 8.0 inches.
- 8) Casing material: Carbon steel
- 9) The well was constructed with:
☒ an open-hole production interval, state the open interval: The well may be open hole from 180 ft bgs to 927 ft bgs.
_____ a well screen or perforated pipe, state the screened interval(s): _____
- 10) What annular interval surrounding the artesian casing of this well is cement-grouted? None
- 11) Was the well built with surface casing? Yes If yes, is the annulus surrounding the surface casing grouted or otherwise sealed? No indication of seal from LANL's construction record. If yes, please describe: _____
- 12) Has all pumping equipment and associated piping been removed from the well? Yes If not, describe remaining equipment and intentions to remove prior to plugging in Section VII of this form.

V. DESCRIPTION OF PLANNED WELL PLUGGING:

Note: If this plan proposes to plug an artesian well in a way other than with cement grout, placed bottom to top with a tremie pipe, a detailed diagram of the well showing proposed final plugged configuration shall be attached, as well as any additional technical information, such as geophysical logs, that are necessary to adequately describe the proposal.

- 1) Describe the method by which cement grout shall be placed in the well, or describe requested plugging methodology proposed for the well: 3/8" bentonite chips will be installed from total depth to 200 ft bgs. Then, ~~hydrated~~ cement grout will be placed from 200 ft bgs to ground surface with a tremie pipe. - *KEM*
- 2) Will well head be cut-off below land surface after plugging? Well head will be cut-off near ground surface.

VI. PLUGGING AND SEALING MATERIALS:

Note: The plugging of a well that taps poor quality water may require the use of a specialty cement or specialty sealant

- 1) For plugging intervals that employ cement grout, complete and attach Table A.
- 2) For plugging intervals that will employ approved non-cement based sealant(s), complete and attach Table B.
- 3) Theoretical volume of grout required to plug the well to land surface: Approximately 249 cubic ft of bentonite chips and 513 gallons of neat cement grout.
- 4) Type of Cement proposed: Portland Type I/II cement
- 5) Proposed cement grout mix: 6 gallons of water per 94 pound sack of Portland cement.
- 6) Will the grout be: _____ batch-mixed and delivered to the site
_____ X mixed on site

- 7) Grout additives requested, and percent by dry weight relative to cement: None
- 8) Additional notes and calculations: None

VII. ADDITIONAL INFORMATION: List additional information below, or on separate sheet(s):

Test well DT-5 was drilled to 927 ft bgs in 1960. Water was not encountered. Circulation could not be maintained in the borehole due to numerous fractures and the hole was terminated at 927 ft bgs. The well may have 180 ft of 8-in casing and may be open hole from 180 ft bgs to 927 ft bgs. The well will be backfilled with 3/8" bentonite chips from total depth to 200 ft bgs. Then, cement grouted from 200 ft bgs to the surface.

Hydrated Kcm

VIII. SIGNATURE:

I, Theodore Ball, say that I have carefully read the foregoing Well Plugging Plan of Operations and any attachments, which are a part hereof; that I am familiar with the rules and regulations of the State Engineer pertaining to the plugging of wells and will comply with them, and that each and all of the statements in the Well Plugging Plan of Operations and attachments are true to the best of my knowledge and belief.

Theodore Ball

Signature of Applicant

7/11/14

Date

IX. ACTION OF THE STATE ENGINEER:

Reviewed by NMSE Hydrology
Jm Jm 7/17/14

This Well Plugging Plan of Operations is:

- ☒ Approved subject to the attached conditions.
☐ Not approved for the reasons provided on the attached letter.

Witness my hand and official seal this 18th day of July, 2014

Scott A. Verhines, State Engineer

By: [Signature]

TABLE A - For plugging intervals that employ cement grout. Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of grout placement (ft bgl)			Surface
Bottom of proposed interval of grout placement (ft bgl)			200
Theoretical volume of grout required per interval (gallons)			513
Proposed cement grout mix gallons of water per 94-lb. sack of Portland cement			6
Mixed on-site or batch-mixed and delivered?			On-site
Grout additive 1 requested			
Additive 1 percent by dry weight relative to cement			
Grout additive 2 requested			
Additive 2 percent by dry weight relative to cement			

TABLE B - For plugging intervals that will employ approved non-cement based sealant(s). Start with deepest interval.

	Interval 1 – deepest	Interval 2	Interval 3 – most shallow
			Note: if the well is non-artesian and breaches only one aquifer, use only this column.
Top of proposed interval of sealant placement (ft bgl)	200 ft bgs		
Bottom of proposed sealant or grout placement (ft bgl)	927 ft bgs		
Theoretical volume of sealant required per interval (gallons)	249 cubic ft		
Proposed abandonment sealant (manufacturer and trade name)	Baroid Holeplug 3/8" bentonite chips		