



U.S. Department of Energy  
**Office of River Protection**

0056162

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01-REQ-043

AUG 28 2001

Mr. Michael A. Wilson, Program Manager  
Nuclear Waste Program  
State of Washington  
Department of Ecology  
P. O. Box 47600  
Olympia, Washington 98504

**RECEIVED**  
JAN 23 2002  
**EDMC**

Dear Mr. Wilson:

**U-107 SALTCAKE DISSOLUTION DEMONSTRATION**

The U.S. Department of Energy, Office of River Protection (ORP) is informing the State of Washington Department of Ecology (Ecology) of its intent to perform the U-107 Saltcake Dissolution Demonstration consistent with the conditions of Interim Stabilization for Tank 241-U-107 (U-107) commencing September 2001. This letter follows discussions on the U-107 demonstration scope and schedule with Ecology staff initiated in April 2001. The demonstration supplements the current interim stabilization approach by exploring the use of alternative means of dilution water addition to support upcoming Single-Shell Tank (SST) Retrieval Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) commitments by improving our understanding of:

- Performance of controlled dissolution as a retrieval strategy.
- Effect of alternative delivery methods for dilution water during interim stabilization.
- Performance of Leak Detection, Mitigation, and Monitoring systems compatible with upcoming SST Retrieval activities.

The interim stabilization of U-107 in accordance with the Interim Stabilization consent decree will not be compromised for the demonstration. If the demonstration activities present a challenge to the successful stabilization of U-107, the demonstration will be stopped and resumed later if possible. ORP believes U-107 is an ideal demonstration application due to the timing, applicability to similar tanks yet to be interim stabilized, and significant inventory of long-lived, mobile radionuclides. These characteristics provide ORP with an outstanding opportunity to reduce risk to human health and the environment and improve performance of future interim stabilization and retrieval activities. The demonstration includes deployment of the Topographical Mapping System (TMS), an innovative technology developed to quantify tank volumes and residuals.

The expectation for the demonstration is to transfer approximately 105 kgal of salt solution (brine) to the Double-Shell Tank (DST) system. The brine consists of:

- ~30 kgal of dissolution water added in a controlled application directly to the surface of the waste using spray nozzles.
- ~21 kgal of waste dissolved by the spray nozzle additions.
- ~54 kgal of dilution water added into the saltwell (1 gallon dissolved salt from tank: 1 gallon of dilution water) to support transfer of the brine. This dilution is designed to help adjust for the uncertainty associated with the dissolution process and help mitigate the potential for line plugging and is consistent with current interim stabilization activities.

The following figures and tables have been included as Attachment 1 to illustrate the demonstration activities:

- Figure 1 is a flowchart for the demonstration event sequence.
- Figure 2 is a schematic of the water distribution system.
- Figure 3 shows the spray nozzle configuration.
- Table 1 is a schedule of water addition and sampling events.

Leak detection will be accomplished using two approaches:

- Approach 1: Utilizes the existing Interim Stabilization Program's leak detection requirements and the monitoring of existing drywells near Tank U-107.
- Approach 2: The approach is designed to evaluate in-tank leak detection based on a total system mass balance. Process flow rates, liquid levels, and surface topography measurements (and their uncertainties) will be analyzed to determine the viability of this in-tank method of leak detection.

Process samples will be acquired and analyzed in accordance with Data Quality Objectives for Tank 241-U-107 Saltcake Dissolution Test, River Protection Project (RPP)-7947, Rev. 0 and Tank 241-U-107 Grab Sampling and Analysis Plan, RPP-8282, Rev. 0.

Specific information regarding the demonstration can be found in Attachment 2: "Process Control Plan for Single-Shell Tank Saltcake Dissolution Proof-of-Concept," RPP-7715, Rev. 1. ORP is preparing a revision to the attached Process Control Plan. The revision incorporates an increase in dilution water (Revision 1 assumes transfer of brine with a higher specific gravity) and makes some editorial changes to the document. The data in Attachment 1, Table 1 are from the draft of Revision 2 of Attachment 2, which is currently under peer review. ORP will forward Revision 2 of the Process Control Plan to Ecology when it comes available.

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ORP and its contractor CH2M HILL Hanford Group Inc. (CHG) assessed the demonstration and believe it complies with the current set of applicable regulatory commitments. This is inclusive of radioactive and non-radioactive air Notices of Construction, the Single-Shell Tank Resource Conservation and Recovery Act (RCRA) Part A Form 3, the Interim Stabilization Consent Decree, and the M-45-00B Single-Shell Tank Retrieval milestone. ORP does not foresee any negative impact to, and is not requesting relief from, current near-term retrieval and interim stabilization based on the availability of Double-Shell Tank space used to support the demonstration. A Notice of Construction supporting the demonstration was approved by the Washington State Department of Health on December 18, 2000. A new section (Section 4.1.5 "Salt Cake Dissolution") was added to the non-radioactive air Notice of Construction and was approved by Ecology on December 17, 2000. The current RCRA Part A permit (approved December 22, 1999, includes the T01 process code for in-tank treatment of wastes and a restriction on the total volume of waste (600 kgal) that can be treated in a single day.

Treatment is defined as mechanical retrieval, sluicing, and saltwell pumping of the mixed waste. ORP does not consider this demonstration a retrieval action in the same context as the M-45 series Tri-Party Agreement Milestones for the following reasons:

- The demonstration does not seek to demonstrate the limit of the technology.
- The demonstration is being performed within the existing regulatory requirements applicable to interim stabilization.
- The demonstration will not require an Ecology assessment as to the adequacy of waste removal in accordance with tank retrieval and closure requirements.

ORP believes conducting the test in the near term will support compliance with the Tri-Party Agreement M-45-03 Milestone for the Saltcake Dissolution Retrieval Technology Demonstration at tank 241-S-112 (S-112). There is a potential that the interim stabilization and retrieval of S-112 can be combined. Combining interim stabilization and retrieval of S-112 enable accelerated retrieval of over 500,000 gallons of waste containing approximately 550 curies of long lived, mobile radionuclides with multi-million dollar cost savings in the critical 2002-2006 budget years.

The U-107 Saltcake Dissolution Demonstration activity is a positive example of ORP's, and CH2M HILL Hanford Group, Inc. (CHG) ongoing commitment to removal of single-shell tank waste. It is vital that we move forward as soon as possible if we are to take advantage of this opportunity. To that end please show your comments on this plan by September 4, 2001.

Mr. Michael A. Wilson  
01-REQ-043

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If you have any questions, please contact Joe Cruz, Requirements Division, (509) 372-2606.

Sincerely,



Harry L. Boston,  
Manager

REQ:EJC

Attachment

cc w/attach:

J. Richards, CTUIR  
P. Sobotta, NPT  
R. Jim, YN  
R. Naventi, BNI  
F. Beranek, BNI  
M. P. DeLozier, CHG  
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P. R. Bemis, CHG  
M. Brown, Ecology  
N. Uziemblo, Ecology  
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O. S. Kramer, FHI  
J. S. Hertzell, FHI  
T. Martin, HAB  
M. L. Blazek, Oregon Energy  
C. E. Clark, RL  
D. E. Jackson, RL  
H. M. Rodriguez, RL  
Administrative Record

Figure 1. Proof-of-Concept Event Sequence

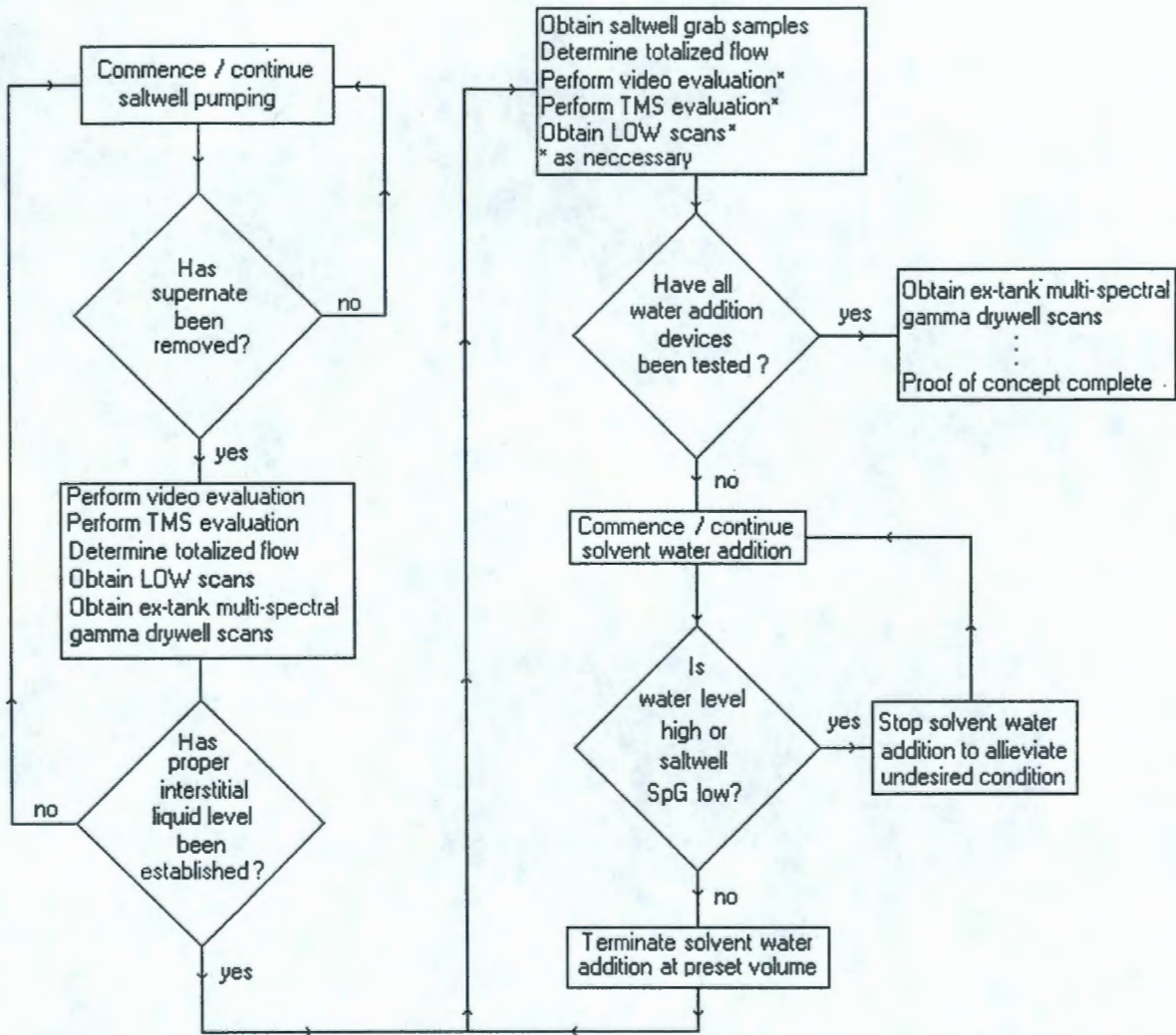
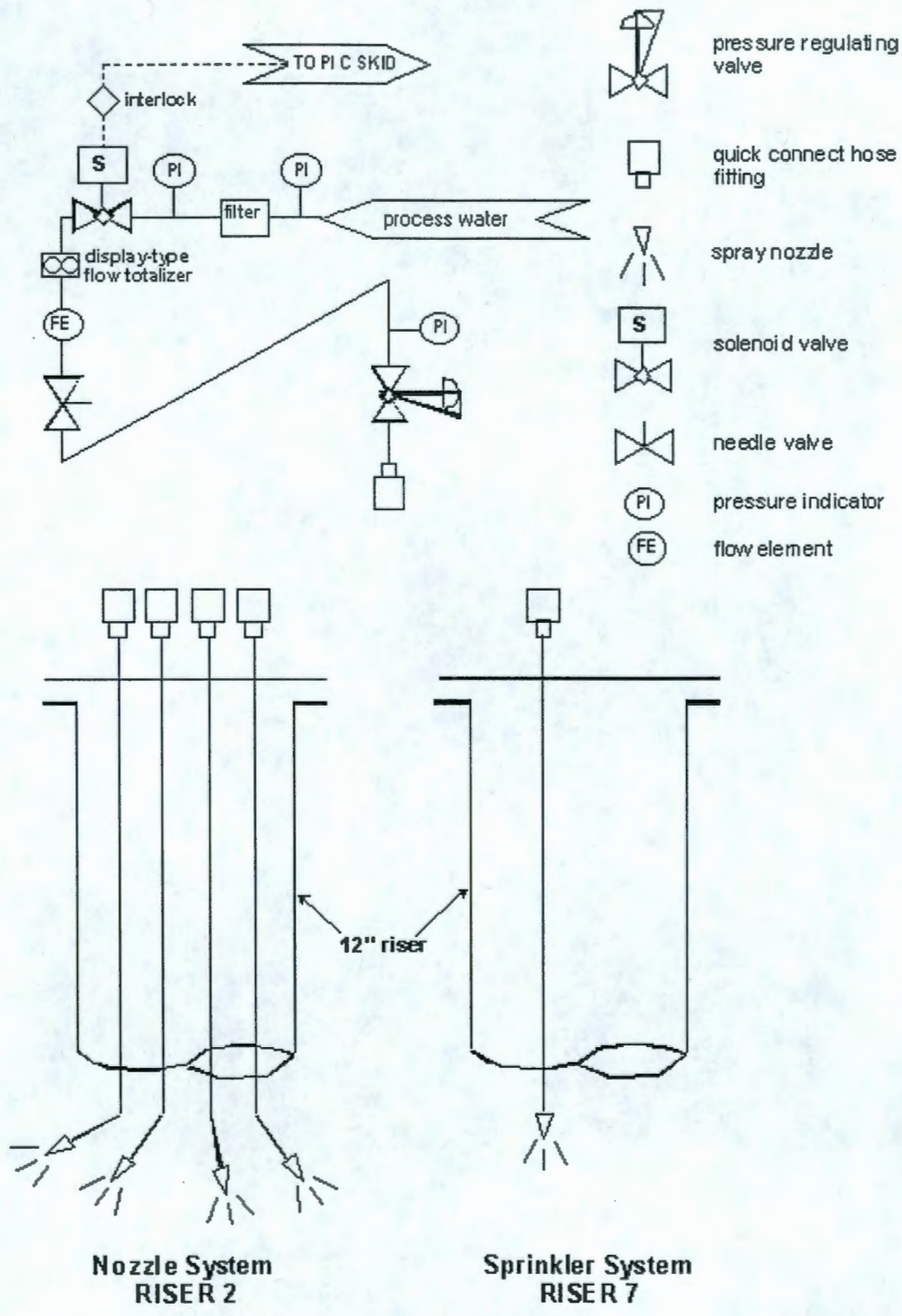


Figure 2. Schematic of the Water Distribution System for Tank 241-U-107



**Figure 3. Approximate Tank-Wide Spray Configuration**

patterns are approximate and not to scale

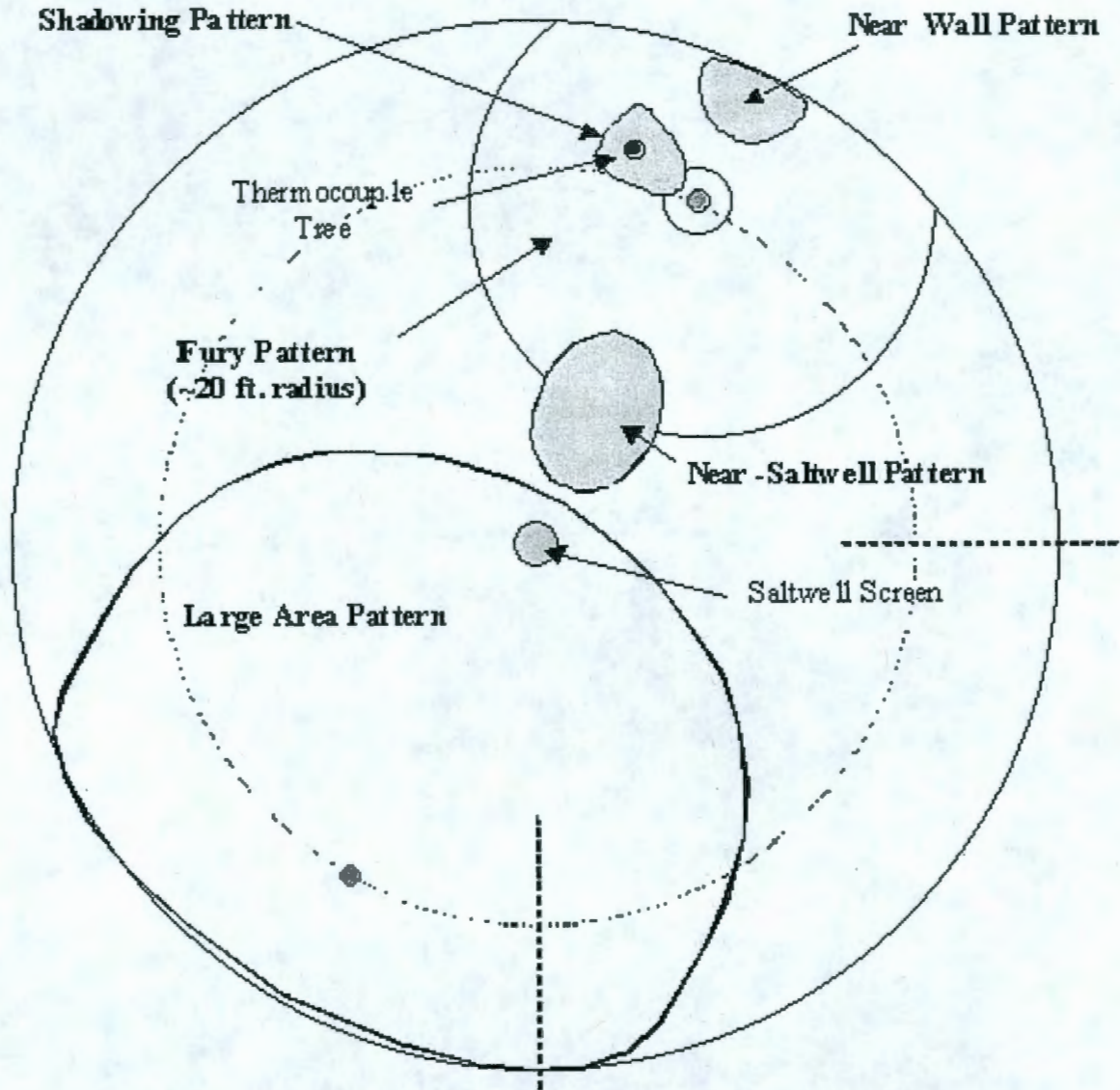


Table 1. Water Addition and Sampling Schedule

Day #	Activity	Notes	Water addition rate (gpm)	Volume of water added (gal)	Total Water added (gal)	Volume of brine produced & liberated (gal)	Volume of dilution water (gal)	Volume of brine + dilution water (gal)	Total volume of brine + dilution water (gal)	Estimated duration of water application (hrs)	Estimated Camera Duration (hrs)	Cumulative volume of brine pumped @ 4 gpm 50% efficiency
1	Video of tank surface Liquid grab sample #1 TMS scan #1										4	2,880
2	Initial near-saltwell test		4	400	400	676	676	1,352	1,352	1.7	3.7	5,760
	Initial shadowing test		2.5	500	900	845	845	1,690	3,042	3.3	5.3	
3	Initial near-wall test TMS scan #2		3	400	1,300	676	676	1,352	4,394	2.2	4.2	8,640
4	Near-saltwell, large volume channeling test	1	4	1,000	2,300	1,690	1,690	3,380	7,774	4.2	6.2	11,520
5	Near-saltwell, large volume channeling test Liquid grab sample #2	1, 2	4	1,000	3,300	1,690	1,690	3,380	11,154	4.2	6.2	14,400
6	Near-wall, large volume test	3	3	1,000	4,300	1,690	1,690	3,380	14,534	5.6	7.6	17,280
7	Near-wall, large volume test	3	3	1,000	5,300	1,690	1,690	3,380	17,914	5.6	7.6	20,160
8	Near-wall, large volume test	3	3	1,000	6,300	1,690	1,690	3,380	21,294	5.6	7.6	23,040
9	Near-wall, large volume test	3	3	1,000	7,300	1,690	1,690	3,380	24,674	5.6	7.6	25,920
10	Near-wall, large volume test	3	3	1,000	8,300	1,690	1,690	3,380	28,054	5.6	7.6	28,800
11	Near-wall, large volume test	3	3	1,000	9,300	1,690	1,690	3,380	31,434	5.6	7.6	31,680
12	Near-wall, large volume test	3	3	1,000	10,300	1,690	1,690	3,380	34,814	5.6	7.6	34,560
13	Near-wall, large volume test	3	3	1,000	11,300	1,690	1,690	3,380	38,194	5.6	7.6	37,440
14	Wait for draining & settling TMS scan #3				11,300				38,194			40,320
15	Fury test	4	3.75	1,000	12,300	1,690	1,690	3,380	41,574	4.4	6.4	43,200
16	Fury test	4	3.75	1,000	13,300	1,690	1,690	3,380	44,954	4.4	6.4	46,080
17	Fury test Liquid grab sample #3	2, 4	3.75	1,000	14,300	1,690	1,690	3,380	48,334	4.4	6.4	48,960
18	Wait for draining & settling				14,300				48,334			51,840
19	Wait for draining & settling TMS scan #4				14,300				48,334			54,720
20	Move TMS to R7				14,300				48,334			57,600
21	Move TMS to R7				14,300				48,334			60,480
22	Move TMS to R7 TMS scan #5				14,300				48,334			63,360
23	Large area Test A	5	6.5	1,200	15,500	2,028	2,028	4,056	52,390	3.1	5.1	66,240
24	Large area Test A	5	6.5	1,200	16,700	2,028	2,028	4,056	56,446	3.1	5.1	69,120
25	Large area Test A	5	6.5	1,200	17,900	2,028	2,028	4,056	60,502	3.1	5.1	72,000
26	Large area Test A	5	6.5	1,200	19,100	2,028	2,028	4,056	64,558	3.1	5.1	74,880
27	Large area Test A	5	6.5	1,200	20,300	2,028	2,028	4,056	68,614	3.1	5.1	77,760



Day #	Activity	Notes	Water addition rate (gpm)	Volume of water added (gal)	Total Water added (gal)	Volume of brine produced & liberated (gal)	Volume of dilution water (gal)	Volume of brine + dilution water (gal)	Total volume of brine + dilution water (gal)	Estimated duration of water application (hrs)	Estimated Camera Duration (hrs)	Cumulative volume of brine pumped @ 4 gpm 50% efficiency
28	Large area Test A	5	6.5	1,200	21,500	2,028	2,028	4,056	72,670	3.1	5.1	80,640
29	Large area Test A Liquid grab sample #4 TMS scan #6	2, 5	6.5	800	22,300	1,352	1,352	2,704	75,374	2.1	4.1	83,520
30	Large area Test B	6	6.5	1,200	23,500	2,028	2,028	4,056	79,430	3.1	5.1	86,400
31	Large area Test B	6	6.5	1,200	24,700	2,028	2,028	4,056	83,486	3.1	5.1	89,280
32	Large area Test B	6	6.5	1,200	25,900	2,028	2,028	4,056	87,542	3.1	5.1	92,160
33	Large area Test B	6	6.5	1,200	27,100	2,028	2,028	4,056	91,598	3.1	5.1	95,040
34	Large area Test B	6	6.5	1,200	28,300	2,028	2,028	4,056	95,654	3.1	5.1	97,920
35	Large area Test B	6	6.5	1,200	29,500	2,028	2,028	4,056	99,710	3.1	5.1	100,800
36	Large area Test B Liquid grab sample #5	2, 6	6.5	800	30,300	1,352	1,352	2,704	102,414	2.1	4.1	103,680
37	Wait for draining & settling				30,300				102,414			106,560
38	Wait for draining & settling				30,300				102,414			109,440
39	Video of tank surface TMS scan #7				30,300				102,414		4	112,320
	<b>TOTALS</b>			30,300		51,207	51,207	102,414		114	182	0
<b>Notes</b>												
1	Anticipated 3-day duration; water addition to be tied to pump performance, not to exceed 2,000 gal/day or total of 2,000 gal.											
2	Collect grab sample quickly after water addition has been stopped.											
3	Anticipated 10-day duration; water addition to be tied to pump performance, not to exceed 2,400 gal/day or total of 8,000 gal.											
4	Anticipated 5-day duration; water addition to be tied to pump performance, not to exceed 2,400 gal/day or total of 3,000 gal.											
5	Anticipated 10-day duration; water addition to be tied to pump performance, not to exceed 2,400 gal/day or total of 8,000 gal during large area test A.											
6	Anticipated 10-day duration; water addition to be tied to pump performance, not to exceed 2,400 gal/day or total of 8,000 gal during large area test B.											