

ATTACHMENT 1

**POST-CLOSURE MONITORING, MAINTENANCE, AND INSPECTION OF THE
INDUSTRIAL WASTE LAGOON, ASSOCIATED WASTEWATER COLLECTION
DITCHES, AND GROUNDWATER TREATMENT SYSTEM**

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I. Monitoring Plan - The security, maintenance, and inspection requirements of this plan apply to the Industrial Waste Lagoon (IWL) and associated ditches that remain on the Tooele Army Depot. A risk assessment has been completed on the ditch sections located on property that was excessed and transferred to the Redevelopment Agency of Tooele City in 1998. The results of this assessment identified no unacceptable risk, therefore no further action is required at the excessed and transferred ditch sections.

A. Security

(1) Post closure use of or on the Industrial Waste Lagoon and associated ditches shall not disturb the integrity of the final cover, liner, or any other component of the containment system without the approval of the Executive Secretary.

(2) The Permittee shall protect against illegal trespassing on the IWL or associated ditches that remain on TEAD property. The entire TEAD property, which contains the IWL, shall be surrounded by barbed wire perimeter fences. Security on the Depot confines shall be maintained by 24-hour surveillance, and by patrolling armed security personnel. In addition, access to the Depot shall be restricted and gained only through guarded gates.

(3) The IWL shall remain fenced and access gates shall be locked for the duration of the post closure period. Access to the IWL shall be strictly enforced with access only being granted for inspection and maintenance of the cap, and other investigative activities that are approved by the Executive Secretary.

(4) Inspection of the ditches located on property transferred to the Redevelopment Agency of Tooele City in December 1998 shall be conducted in accordance with Table 2.

B. Groundwater Monitoring

(1) The primary objectives of the groundwater monitoring program shall be:

(a) To monitor the groundwater contaminant concentrations at various locations in the plume which shall allow for tracking of the reduction in the size of the plume.

(b) To monitor the effectiveness of the system in relationship to reducing contaminant concentrations within the footprint of the plume.

(c) To monitor aquifer characteristics and collect data required to confirm capture and containment of the plume through on-going modeling efforts.

(2) Table 1 provides a list of monitoring wells available for use under the groundwater monitoring program specified in Module V of this permit. A map showing the location of available monitoring wells is provided as Figure 1. Neither Table 1 nor Figure 1 are all-inclusive. Groundwater investigations are ongoing at TEAD and periodically new monitoring wells are constructed. The selection of groundwater monitoring wells during semi-annual sampling events shall not be limited by the wells listed in this attachment.

2. Maintenance Plan

A. This section describes a program of routine maintenance designed to maintain the IWL cover during post-closure care. Maintenance plans are presented for the security fences, erosion damage, settlement, vegetative cover, and run-on/run-off control structures.

(1) Security Fence Maintenance. Repairs to the security fence around the IWL shall include patching holes in the chain-link fabric, reattaching the fabric to the posts, replacing chain-link fabric or replacing posts. In any case, the repairs shall meet the fence specifications (JMM, 1988a, p. 2G-1 to 2G-4) and conform to the design drawings. Maintenance activities shall be initiated within 24 hours, if deterioration of the fencing system is identified during any inspection event.

(2) Erosion Damage. The most common problem on portions of the cover system is the development of large or small gullies. The cover system is especially susceptible to gullying when it has no vegetation. However, even after vegetation has been firmly established, gullying may continue to threaten the integrity of the cover. Areas most susceptible to gully formation on the IWL cover are those steeper slopes around the perimeter of the cap.

(a) In the event that a gullying problem (as defined by linear erosional features greater than 3 inches in depth and greater than 5 feet in length) does develop, repair procedures shall consist of regrading and filling using stockpiled soil followed by re-establishment of vegetation. Corrective action shall be initiated within 72 hours upon identification of gullying during any conducted inspection.

(3) Another potential problem is that of sideslope stability. The cover sideslopes range up to 10 percent inclination, and there is a potential for slippage of material laterally down the slope. This process may be initiated by a high degree of saturation as may occur during spring melt cycles.

(a) Repairing sideslope stability shall entail a partial reconstruction of the sideslopes with subsurface drains. Corrective action to address material slippage laterally down slopes shall be initiated within 72 hours upon discovery during any inspection event. Design specifications for the reconstruction activities to be conducted shall be submitted to the

Executive Secretary for review and approval within seven working days prior to execution of reconstruction activities.

(4) Vegetative Maintenance. Since vegetation has been established on the cover system, a certain amount of maintenance is necessary. In the event that invading plants species become established on the cover system, the selective use of herbicides shall be used to control these plants. Under certain circumstances, if an infestation of large insects threatens a stand of vegetation, the use of insecticides may become necessary. The application of herbicides or pesticides on the cover system shall be approved by the Executive Secretary prior to the initiation of any corrective action.

(5) Soil Maintenance. Chronically weak vegetation may signal a need for revitalization of the vegetative soil layer. Soil characteristics which may be of concern are texture, water-holding capacity and drainage properties, nutrient content and accumulation of toxic salts. In the event of vegetative die-off or stress, the cover soils shall be amended with appropriate nutrients to revitalize cover vegetation. A plan for the application of such nutrients shall be submitted for approval to the Executive Secretary.

(6) Run-on/Run-off Control Structures. Run-on/Run-off control ditches shall be kept clean of debris and vegetation. If debris or vegetation are found in these structures during inspections that may result in inadequate drainage of the capped lagoon, action shall be initiated within 72 hours to clear the drainage structures.

3. Inspection Plan

A. The IWL shall be inspected periodically (as defined in Table 2) during the post-closure period to observe and document changes as they occur to the cover. Proper observation and documentation through inspection reports shall enable rapid repair or routine maintenance of the IWL cover should either be necessary. Inspection frequencies, procedures and documentation are applicable to the security fence, erosion damage, vegetative cover condition, and run-on/run-off control structures. Inspection schedules for the Industrial Waste Lagoon and associated Wastewater Collection Ditches are shown in Table 2. Information necessary for documentation of these inspections is listed in Table 3. An inspection form is presented in Figure 2.

(1) Routine Inspections. Visual inspections are the most efficient and cost effective method of examining the integrity of the IWL cover. Visual inspections shall be made on foot by Tooele Army Depot or contract personnel. Inspections shall document any breaches in the fence, wildlife, and unusual odors.

(2) Erosion Damage. In the semi-arid environment in which TEAD is located, erosion will occur only after intense precipitation events. TEAD or contract personnel shall inspect the surface of the IWL cover on foot for evidence of erosion or ponded water as specified in Table 2 or within 24 hours of a storm event with precipitation amounts greater than ¼ inch in one hour. If erosion damage greater than three inches in depth has occurred, or if vegetative cover has been destroyed due to erosion, corrective action shall be initiated within 72 hours.

**Table 1
Groundwater Monitoring System**

Monitoring/Piezometer Well ⁽¹⁾ Designation	Measuring Point Elevation (Ft, MSL)	Screen Interval (Ft – Ft)
A-01	4907.1	413 - 423
A-02	4759.68	272 - 282
A-02A	4758	278 - 298
A-03	4704.81	222 - 232
A-04	4720.04	236 - 246
A-05	4690.38	214 - 224
A-06	4666.2	277 - 287
A-07	4670.02	276 - 286
A-07A	4671	302 - 322
A-08	4681.53	287 - 297
B-01	4680.26	288 - 298
B-02	4815.65	335 - 345
B-03	4721.11	268 - 270
B-04	4645.88	170 - 180
B-05	4692.02	420 - 430
B-06	4587.63	285 - 295
B-07	4607.5	280 - 290
B-08	4605.34	222 - 232
B-09	4654.97	370 - 380
B-10	4681.41	284 - 294
B-11	4589.22	274 - 284
B-12	4569.29	256 - 266
B-13	4566.87	444 - 454
B-14	4537.9	210 - 220
B-15	4533.09	286 - 296
B-16	4534.79	285 - 295
B-17	4494.59	440 - 450
B-18	4504.11	210 - 220
B-19	4484.65	256 - 266
B-20	4644.71	396 - 406
B-21	4682.13	244 - 254
B-22	4694.62	364 - 374
B-23	4623.22	269 - 279
B-24	4681.85	378 - 388
B-25	4478.71	560 - 570
B-26	4779.53	314 - 324
B-27	4706.19	256 - 266

B-28	4608.33	380	-	390
B-29	4542.07	468	-	478
B-30	4535.69	225	-	235
B-31	4514.28	422	-	432
B-32	4502.61	225	-	235
B-33	4480.32	377	-	387
B-34	4477.72	224	-	234
B-35	4469.45	212	-	222
B-36	4623.9	229	-	239
B-37	4444.91	192	-	202
B-38	4445.21	480	-	490
B-39	4460	300	-	310
B-40	4461.6	174	-	184
B-41	4478.22	176	-	186
B-42	4423.29	190	-	200
B-43	4423.9	484	-	494
B-44	4434.73	163	-	173
B-45	4434.89	488	-	498
B-46	4418.08	208	-	218
B-47	4414.44	198	-	208
B-48	4414.32	472	-	482
B-49	4434.95	260	-	270
B-50	4463.07	240	-	250
B-51	4462.56	260	-	270
B-52	4479.04	260	-	270
B-53	4495.74	254	-	264
B-54	4788.64	353	-	362
B-55	4684.2	648	-	658
B-56	4666.27	656	-	666
B-57	4599.8	505	-	515
B-58	4586.47	422	-	432
B-59	4533.75	690	-	700
B-60	4509.75	268	-	278
B-61	4518.34	448	-	458
B-62	4521.89	270	-	280
C-01	4471.15	280	-	290
C-02	4445.09	262	-	272
C-03	4428.1	258	-	268
C-04	4413.07	235	-	245
C-05	4441.91	242	-	252
C-06	4474.87	274	-	284
C-07	4513.9	304	-	314
C-08	4532.04	335	-	345

C-09	4658.11	348	-	368
C-10	4683.18	264	-	284
C-11	4618.31	280	-	300
C-12	4742.49	300	-	320
C-13	4716.47	288	-	308
C-14	4701.96	268	-	288
C-15	4791.45	329	-	349
C-16	4818.3	340	-	360
C-17	4820.69	343	-	363
C-18	4761.12	318	-	338
C-19	4817.63	353	-	363
C-20	4809.84	360	-	380
C-21	4827.53	358	-	378
C-22	4825.3	366	-	386
C-23	4849.19	370	-	390
C-24	4819.73	362	-	388
C-25	4682.02	353	-	373
C-26	4824.74	358	-	378
C-27	4871.49	409	-	429
C-30	4749.84	281	-	296
C-31	4814.41	440	-	450
C-32	4857.73	384	-	404
C-33	4822.63	353	-	373
C-34	4802.49	339	-	359
C-35	4784.64	310	-	330
C-36	4779.36	270	-	285
C-37	4784.19	427	-	447
C-38	4741.61	390	-	510
C-39	4820.78	440	-	460
C-40	4745.61	264	-	294
C-41	4804.70	356	-	376
C-42F	4785.10	340	-	360
C-43F	4754.87	319	-	339
C-44	4722.81	280	-	300
C-45	4689.99	249	-	269
C-46	4689.57	319	-	349
C-47F	4824.53	349	-	379
C-48F	4823.67	349	-	379
C-49	4710.02	260	-	280
C-50F	4796.10	330	-	360
C-51F	4792.05	313	-	343
C-52	4818.46	427	-	457
C-53F	4786.11	307	-	337

D-1	4636.86	265	-	285
D-2	4726.34	355	-	375
D-3	4546.08	205	-	225
D-4	4635.35	275	-	295
D-5	4556.67	195	-	215
D-6	4648.47	280	-	300
D-7	4556.54	195	-	215
D-8	4500.06	155	-	175
D-9	4449.62	128	-	148
D-10	4477.52	186	-	206
D-12	4800.56	345	-	365
D-13	4717.40	362	-	382
D-14	4592.80	255	-	275
D-15	4494.12	180	-	200
D-16	4580.11	232	-	251
D-17	4476.25	129	-	149
D-18	4476.07	155	-	205
D-19	4497.75	148	-	168
MW-01	5033.40	718	-	788
N-03A	4724.63	298	-	337
N-03H	4714.30	223	-	263
N-08B	4474.69	182	-	280
N-111-88	4783.20	317	-	337
N-112-88	4799.32	310	-	330
N-114-88	4795.81	315	-	334
N-115-88	4749.92	276	-	295
N-116-88	4754.21	265	-	285
N-117-88	4702.48	220	-	235
N-118-88	4722.16	240	-	260
N-119-88	4749.37	266	-	275
N-120-88	4777.66	300	-	320
N-127-88	4702.26	222	-	242
N-128-88	4701.92	235	-	254
N-129-88	4702.41	223	-	243
N-130-88	4704.12	225	-	244
N-131-90	4690.68	214	-	234
N-132-90	4690.54	220	-	240
N-133-90	4714.76	246	-	266
N-134-90	4655.84	184	-	204
N-135-90	4705.48	227	-	247
N-136-90	4713.02	233	-	253
N-142-93	4727.40	355	-	375
N-143-93	4796.30	325	-	345

N-144-93	4770.50	291	-	311
N-145-93	4688.20	295	-	315
N-146-97	4726.28	251	-	271
N-147-97	4719.29	244	-	264
N-148-97	4700.24	225	-	245
N-150-97	4745.54	269	-	289
P-01D	4679.86	485	-	495
P-01S	4680.2	200	-	210
P-04D	4693.61	356	-	366
P-04S	4693.73	220	-	230
P-05D	4748	305	-	315
P-05S	4748.25	264	-	274
P-06D	4814.14	440	-	450
P-06S	4812.96	358	-	368
P-07D	4720.99	414	-	424
P-07S	4720.95	290	-	300
P-08D	4687.3	358	-	368
P-08S	4687.42	72	-	82
P-09D	4679.35	414	-	424
P-09S	4679.47	289	-	299
P-10D	4680.85	322	-	332
P-10S	4681.26	222	-	232
P-11D	4587.7	358	-	368
P-11S	4587.64	234	-	244
P-12D	4603.8	230	-	240
P-12S	4603.91	230	-	240
P-13D	4598.77	580	-	590
P-13S	4598.74	280	-	290
P-14D	4643.75	348	-	358
P-14S	4644.01	262	-	272
P-15D	4539.24	498	-	508
P-15S	4539.03	224	-	234
P-16D	4558.59	626	-	636
P-16S	4558.59	264	-	274
P-17D	4537.47	556	-	566
P-17S	4537.61	218	-	228
P-18D	4672.37	376	-	386
P-18S	4672.33	300	-	310
P-19D	4504.88	544	-	554
P-19S	4504.63	213	-	223
P-20D	4493.15	590	-	600
P-20S	4492.94	180	-	190
P-21D	4552.18	460	-	470

P-21S	4552.2	238	-	248
P-22D	4551.92	370	-	380
P-22S	4552.02	370	-	380
P-23D	4551.96	460	-	470
P-23S	4551.96	320	-	330
P-24D	4550.44	460	-	470
P-24S	4550.49	233	-	243
P-25D	4640.86	460	-	470
P-25S	4640.82	214	-	223
P-26D	4585.8	457	-	467
P-26S	4585.03	300	-	310
P-27D	4600.07	665	-	675
P-27S	4600.09	230	-	235
P-28D	4454.45	480	-	490
P-28S	4454.26	170	-	180
P-29	4655.48	232	-	242
P-30	4600.59	230	-	235
P-31	4600.59	225	-	235
P-32	4445.91	255	-	265
P-33	4429.2	250	-	260
P-34	4431.53	245	-	255
P-35	4417.97	239	-	249
P-36	4490.08	295	-	305
P-37	4430.65	250	-	260
P-38	4441.14	265	-	275
P-39	4446.79	257	-	267
P-3D	4644.99	444	-	454
P-3S	4644.97	190	-	200
P-40	4605.36	276	-	296
P-41	4605.21	466	-	486
P-42	4579.86	280	-	300
P-43	4580.07	550	-	570
P-44	4619.07	480	-	500
T-1	4677.77	235	-	265
T-2	4690.4	234	-	264
T-3	4683.3	239	-	269
T-4	4620.24	165	-	195
T-5	4612.14	300	-	330
T-6	4597.92	241	-	271
T-7	4793.97	306	-	337

- (1) Wells designated as P are piezometer wells. All others are monitoring wells.
(2) Wells with a F designation (x-xxF) have flush surface completions.

- (3) Wells with a D designation (x-xxD) are deep paired wells.
- (4) Wells with a S designation (x-xxS) are shallow paired wells.

Figure 1
Monitoring Well Locations

Table 2

**Post-Closure Inspections
Industrial Waste Lagoon and Associated Ditches**

Item	Inspection Method	Inspection Frequency
Security Fence	Routine Patrol	Weekly
Presence of Wildlife	Routine Patrol	Weekly
Unusual Odors	Routine Patrol	Weekly
Erosion Damage	Close-up	Semi-annual
Ponded Water	Close-up	Semi-annual
Vegetative Cover	Close-up	Semi-annual
Animal Burrows	Close-up	Semi-annual
Run-on/Run-off Structures	Close-up	Semi-annual
Cover Drainage System	Close-up	Quarterly

Table 3

IWL Inspection Information

Item	Required Information
Security Fence	Presence of breaches, damage, corrosion
Presence of Wildlife	Number, types, location, activities
Unusual Odors	Description, location, wind direction, strength of odor
Erosion Damage	Extent, location, depth of gullies
Ponded Water	Size, depth, location, time since last rain
Vegetative Cover	Condition, extent and location of bare soil and stressed vegetation
Animal Burrows	Locations, number, animal types
Run-on/Run-off Control Structures	Presence of debris, vegetation, and soil
Cover Drainage System	Discharge, presence, of waterlogged soil

(3) The inspection program shall monitor the presence of ponded water on the surface of the IWL cover. The purpose of the sloping cover is to promote drainage of excess water and the highly compacted foundation material should maintain the three to five percent slope for drainage. However, the presence of ponded water would indicate a localized

depression that might allow infiltration of water into the cover. Therefore, the presence of ponded water shall be used as the indicator of subsidence. TEAD or contract personnel shall inspect the IWL cover for water-filled depressions at the same frequency as the erosion inspection. If depressions greater than three inches in depth are identified, corrective action shall be initiated within 72 hours by filling and grading utilizing stockpiled soil, as well as revegetation of the area.

(4) Subsurface Inspection. In the unlikely event that a large, unexplained settlement problem or vegetative die off occurs, it may become necessary to examine the subsurface conditions beneath the distressed areas. The drilling of soil borings and collection of continuous, undisturbed soil samples shall be conducted to investigate the problem only after other methods of subsurface inspection, such as geophysical techniques, have failed. Non-destructive geophysical techniques may reveal the location of the problem if there is sufficient contrast in the soil layers within the cap. The excavation of test pits shall not be conducted due to the complex layering of the soil cap, the presence of geofabrics and the impermeable synthetic membrane. If the exploratory boring penetrates the synthetic membrane, then it shall be excavated and patched according to the specifications (JMM, 1988a, p. 2E9 – 2E11). Backfill for exploratory soil borings above and below the geofabric shall be of a low permeability, swelling clay material. The exploratory borings shall be backfilled from their total depth to the ground surface. Any means of investigation that shall breach the synthetic membrane shall be approved by the Executive Secretary.

(5) Vegetative Cover Condition. During each of the inspections, observations shall include the extent of bare areas susceptible to erosion and the presence of stressed vegetation. In addition, Tooele Army Depot or contract personnel shall note the presence of animal burrows. If repairs are made to the vegetative cover, monthly inspections shall be instituted until the vegetation has been re-established.

(6) Run-on/Run-off Control Structures. Run-on shall be intercepted by ditches around the perimeter of the IWL. Observations shall include the presence of debris, vegetation, or soil. If debris, vegetation or soil are present in the Run-on control ditches that would prevent proper drainage from the area, corrective action to clear the ditches shall be initiated within 72 hours.

(7) Cover Drainage System. The cover drainage system shall be inspected as specified in Table 2. Observations shall include the presence of debris in the discharge pipes or waterlogged soil conditions which may indicate that the drains are not functioning. If debris is found in discharge pipes that would impede flow, corrective action shall be taken within 72 hours to clear the pipes. However, it is possible that the drains may never receive any infiltration because annual potential evaporation exceeds rainfall at TEAD.

IWL AND WASTEWATER DITCH INSPECTION FORM

Inspector: _____ Inspection Date: _____

Reviewed By: _____ Date: _____

INSPECTION TYPE (check one)

Weekly (items 1-3) _____ Quarterly (items 1-3 and 9) _____ Semi-annual (items 1-9) _____

Item No.	Inspection Item	✓	IWL		Wastewater Ditches	
			Deficiency	Action Taken	Deficiency	Action Taken
1	Security Fence					
2	Presence of Wildlife					
3	Unusual Odors					
4	Erosion Damage					
5	Ponded Water					
6	Vegetative Cover					
7	Animal Burrows					
8	Run-on/Run-off Control					
9	Cover Drainage System					

Description of Daily Weather Conditions Prior to Inspection: _____