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RFP109793 Addendum #2

Potential offeror Q&A and Company Answers

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Q&A Attachment #2

Q&A Attachment #3

RPP-18490 Rev. 0

IDF Construction Inspection Plan Errata

Drawing 830837

Drawing 830839

Drawing 830846

Drawing 830848

Drawing 830849

RFP-109793 Addendum #2 Attachment A

CH2M HILL HANFORD GROUP
P.O. BOX 1500
RICHLAND, WASHINGTON 99352

Request For Proposal No. : 109793-TP
RFP Issue Date: March 29, 2004
Bid Due Date: May 17, 2004

ADDENDUM NO. 2
DATED April 21, 2004
Integrated Disposal Facility (IDF) Project; Schedule B - Landfill Construction

Request For Proposal (RFP) 109793-TP is amended as follows:

1. Instructions to Offerors is changed as follows:
    a. In Paragraph 17.0, BONDS, after the first sentence, insert the following: "(Bonds may be secured by irrevocable letters of credit subject to the requirements set forth in FAR Part 28.204-3.)"

    b. Paragraph 20.0, MATERIALS, is hereby deleted.

2. In RFP Attachment, "Construction Specification Institute (CSI) Cost Breakdown Format", the Offeror shall insert a separate item identified as "Secondary Leak Detection System (SLDS)" and provide required pricing. The SLDS pricing data shall be included in the grand total.

3. "RFP 109793-TP, Potential Offeror Questions and Company Answers," and attachments thereto, are included herewith and made a part hereof.

4. The document included with the initial issue of the RFP identified as "RPP-18490 Rev. 0, IDF Construction Inspection Plan," which is dated March 2004, is hereby deleted in its entirety and replaced with "RPP-18490 Rev. 0, IDF Construction Inspection Plan," dated April 2004, included with this Addendum No. 2. An Errata file is provided to facilitate tracking of the changes.

5. Revision B of each of the following drawings, included with this Addendum No. 2, replaces the corresponding Revision A drawing issued with the original RFP:
    a. Drawing H-2-830837; Sheet 1 of 1
    b. Drawing H-2-830839; Sheet 1 of 1
    c. Drawing H-2-830846; Sheet 1 of 1
    d. Drawing H-2-830848: Sheet 1 of 1

6. Drawing H-2-830849; Rev. A, Sheet 2 of 2 included with Addendum No. 2 is added as applicable to Schedule B of the IDF Project.

7. Addendum 2, Attachment A, attached hereto and made a part hereof, changes certain identified RFP documents issued in the original RFP. Offerors are required to make the changes to the RFP documents, and incorporate the above noted revised and new Drawings as indicated in said Attachment A for purposes of proposal pricing. The changes will be incorporated into the contract documents prior to award.

Receipt of this addendum shall be acknowledged with the submittal of the proposal. All other conditions and requirements of the RFP remain unchanged.

CH2M Hill Hanford Group

____/s/_____
Thomas J. Parkes
Construction Contract Administration

RFP-109793-TP
Addendum No. 2
Potential Offeror Questions and Company Answers

1) **Question**: Please clarify locations of gutter(s) on Leachate Transfer Building (Dwg. No. H-2-830868)

Answer: Clarification of down spout and gutter location is contained herein Addendum No. 2, Attachment A, Item D-10.

2) **Question**: Please clarify if Leachate Storage Tank (Drawing No. H-2-830869) has an exterior ladder on the side to permit one to view the floating cover.

Answer: An exterior ladder will be required on the Leachate Storage Tank(s), as identified herein Addendum No. 2, Attachment A, Item CS-31

3) **Question**: Instructions to Offerors, Paragraph 20.0 requires all material be of U.S. manufacture unless prior written approval is granted by CH2M Hill. Is the term "U.S. manufacture" intended to mean the same as "domestic construction material" defined in Construction General Provisions, Article 9.1, FAR 52.225-11, Buy America Act – Construction Materials under Trade Agreements Contract? If not, please define "U.S. manufacture".

Answer: The Construction General Provisions, Article 9.1, FAR 52.225-11, Buy America Act is the requirement that will be in the subcontract. The construction material must satisfy the requirements of that article. This Addendum No. 2 deletes the RFP instruction in question.

4) **Question**: Summary of Work, Section 01010, paragraph 1.5.3.1, lists Company Safety Procedures – HNF-IP-0842, Vol. 9, Safety, as a reference document. Can this document be made available for down loading from CH2M Hill Hanford web site?

Answer: Company Safety Manual applicable to all work performed on the Hanford Site is available at: http://www.hanford.gov/chgcp/. Summary of Work (SOW), Section 01010, paragraph 1.5.3.1 has been modified herein Addendum No. 2 Attachment A, Item SW-5 to clarify the applicable Company Safety Manual.

5) **Question**: Please clarify content of WRCSOF Work Package identified as prepared by Contractor and approved by CH2M Hill in Summary of Work, Section 01010, paragraph 1.9.2.

Answer WRCSOF Work Package shall contain copies of the following documents:

a) Completed/Approved WRCSOF form which describes the work to be completed under the applicable WRCSOF.
b) Index of applicable drawings, specifications, and ECN's applicable to work specified on WRCSOF form.
c) Copies of all Permits (i.e. excavation, backfill, concrete pour slips, etc)
d) Completed Pre-Job Briefing forms & attendance rosters.
e) Copy of Contractor submitted company approved JSA covering entire work scope contemplated by WRCSOF.
f) Lockout/Tagout Authorizations
g) Waste Planning Checklist
h) Summary Log of work accomplished (by date) and anticipated next days major work activities.

6) **Question**: Construction General Provisions, Article 8.1, Work Hours, limits Contractor to working only day shift without prior approval from CH2M Hill. Would CH2M Hill approve a first and second shift operation (2 shifts, 8 hours in duration) during the excavation phase of Contract performance?

Answer: Statement of Work, Section 01040 Coordination, paragraph 1.6 outlines the Working Hours applicable to the IDF Schedule B Contractor. During Excavation of the IDF Landfill, Company will approve Contractor implementation of multiple shifts (maximum of 2) of 10 hours per shift up to 6 days per week as required to ensure timely completion of Interim Milestone No. 002. Exact working hours shall be determined after Contract award. Any use by Contractor of multiple shifts, and/or extended work hours in addition to those work hours identified in paragraph 1.6.1, shall require approval by the Company and will be provided by the Contractor at no additional cost to the Company.

7) **Question**: In viewing the PDF file for the CIP plan, it appears there may be a mix-up in the attachments to the plan. Page identifying information skips around between Attachment 2, to Attachment 3, then back to Attachment 2. Please verify that the PDF file for the CIP Plan is correct.

Answer: A revised version of the CIP has been included herein Addendum No. 2. The revised CIP corrects the identified problem. In addition, the revised version of the CIP contains final versions of the System Construction Acceptance Tests (S-CATS) to be performed by the Contractor, and provides preliminary secondary Leak Detection System (SLDS) testing requirements.

8) **Answer**: Since the price for steel products has been increasing rapidly, recent procurements have addressed the issue by issuing amendments which incorporate economic price adjustments for steel. Does CH2M Hill Hanford Group, Inc. intend to incorporate a similar economic price adjustment for steel into RFP 109793-TP?

Answer: It is Company's position that the amount of steel involved in the IDF Project does not warrant this price adjustment. The RFP will remain as currently written.

9) **Question**: IDF Statement of Work (SOW), Section 01315, Paragraph 1.3.10, lists by activity name the 47 minimum activities to be addressed in the resource loaded (separate dollar amounts for labor materials and equipment) Subcontract Schedule to be submitted after Subcontract Award.
Instructions to Offerors, Paragraph 21.9, requires a resource loaded Subcontract Schedule listing major activities be submitted with Offeror's Proposal. From a viewpoint of a General Contractor, the schedule submitted with an Offeror's Proposal should logically be an abridged or higher level version of the 47 minimum activity Subcontract Schedule. Furthermore, the activities of the Subcontract Schedule would logically be the activities of the Estimated Payment Schedule required by Instructions to Offerors, Paragraph 21.12

Instructions to Offerors, Paragraph 21.3, provides a CSI Cost Summary format for submitting a breakdown of Offeror's lump sum price with its Proposal. However, the activities of SOW, Section 01315, do not necessarily correlate or otherwise easily match up to the activities of the CSI Cost Summary.

Having to furnish with its Proposal to CH2M Hill cost data in two separate and distinct formats creates considerable additional effort for each Offeror, not to mention the opportunity for errors in so doing. Additionally, when the requirement for submission of cost data in the Termination Liability Schedule is considered, the potential for confusion and inconsistency is even greater.

Since the 47 activities of the IDF SOW, Section 01305, Subcontract Schedule, will be used throughout the life of the Subcontract, it is recommended that cost data supporting an Offeror's Proposal follow these activities alone.

Please consider amending the CSI Cost Summary activities to match those of the SOW.

Answer: The CSI Cost Summary activities will remain as currently written except as provided herein Addendum No. 2. The resource loaded Subcontract Schedule required per the Instructions to Offerors, Para. 21.9 may be organized to coordinate with the CSI Cost Breakdown, and/or the minimum schedule breakdown of activities per Statement of Work 109793, Section 01315, Para. 1.3.10, per Contractors discretion.

10) **Question**: Regarding drawings issued via AutoCAD: Can a "Pen Configuration" for the plotter set-up that is identified as "22x34final.ctv" be provided? Also, if you can come up with the "batch plot routine" this will allow us to print in bulk versus one at a time.

Answer: AutoCAD drawings were provided at Contractor's request. No representations or certifications were made by Company regarding Contractor use of the provided AutoCAD drawings. Use of the provided drawings is the sole responsibility of the Contractor. Official release drawings are posted for Contractor use on Company website at: http://www.hanford.gov/chgcp/ in PDF format.

11) **Question**: Certain phases of IDF construction such as placement of admix and geosynthetic liner material are critically dependent on good weather (i.e., no precipitation, no freezing temperatures, low wind speed, etc.). Will CH2M Hill support a Contractor work schedule of six (6) ten hour work days per week (the 6th day being a weather make-up day, if needed) during these good weather dependent phases of IDF construction?

Answer: Yes, if it is determined by Company to be required to maintain Project Schedule, such support shall not be unreasonably withheld.

12) **Question**: Construction Specification Section 02200, sheet 1, line 38 states "For any use of existing water fill station or a water connection on the IDF site, the rate of water withdrawal shall be limited to approximately 200 gpm through the use of an orifice plate"… Can this withdrawal rate be increased? Anticipated needs are approximately 1,000 to 1,700 gpm.

Answer: A revision to Section 02200, sheet 1, lines 39 through 41, of the Construction Specifications is provided herein Addendum No. 2.

13) **Question**: Where are the required admix liner test pads to be constructed?

Answer: Section 02666, page 6 of 12, line 18, of the Detailed Design Specifications, RPP-18489, Rev. 0 states: "The location of the Test Pads will be designated by the Construction Manager and the CQA Certifying Engineer". Company intends this to mean that the Contractor can request the locations for placement of the required test pads, but must receive approval from Company and the CQA Certifying Engineer.

14) **Question**: What is the required size of each of the test pads?

Answer: The minimum size requirements for construction of the Horizontal Test Pad and the Sideslope Test Pad are identified on pages 6 – 7 of 12, of Section 02666, of the Detailed Design Specifications, RPP-18489, Rev. 0

15) **Question**: How long after the test pads are constructed will it take the Company to conduct the required testing and approve mass placement of the admix liner?

Answer: There are 2 test pads -- horizontal and sideslope. Laboratory permeability on Shelby tubes from both pads will be performed; field permeability will only be performed on horizontal test pad. The CQA certifying engineer will prepare an interim report which summarizes the construction and testing of the test pads, including comparison of the results of the test pad constructed on the horiz. surface with the results of the test pad on the side slopes. The CQA certifying engineer will recommend changes to compaction methods, if necessary, to the IDF project engineer. Lab permeability tests could require up to 14 days to reach a stable value and the Boutwell tests (field permeability) could also require 14 days to achieve termination criteria. Allowing for test set-up, test execution and data reduction, analysis and interim recommendations report, a period of 6 weeks should be provided following horizontal test pad completion and 5 weeks following sideslope test pad completion. One interim report documenting both test pads will be prepared after completion of both test pads, however the CQA engineer can provide recommendations and/or approval of construction methods in the time frame noted for each test pad. Note this assumes that test pad construction and testing proceeds without problems that would require corrective measures or retesting.

16) **Question**: What locations on the IDF site have been designated as "admix base soil borrow areas" from which soil can be excavated to be blended with the required bentonite for the admix liner?

Answer: Drawing H-2-830828, sht. 1 of 3, Zone B:5/6 depicts location identified as "Admix Base Soil Borrow Area". Detailed Design Specifications, RPP-18489, Rev. 0, Section 02666, page 3 of 12, line 27 through 31, states: "The base soil for the admix liner shall consist of natural soil **derived from the admix base soil borrow area shown on the Drawings**, as specified in Section 02317, BORROW AREA EXCAVATION, **or from site excavations**. Base soil from either source shall not be excavated below a depth of 5 feet below ground surface (after stripping) without evaluation of the material suitability and approval from the Engineer."

17) **Question**: Does CH2M Hill Hanford Group, Inc. have geotechnical report/analysis of the designated admix liner borrow areas? Will this information be provided?

Answer: Company does have results of geotechnical analyses conducted of areas identified as potential admix base soil borrow areas and will make the geotechnical reports available. The geotechnical reports are included herein Addendum No. 2 Q & A Attachments 1 & 2

18) **Question**: Has CH2M Hill Hanford Group, Inc. conducted testing (mixing) of the insitu admix base soil with the specified bentonite to achieve the specified admix liner material? If so, are these test results available?

Answer: CH2M Hill Hanford Group, Inc. has conducted testing (mixing) of the insitu admix base soil with the specified bentonite. Test results are included herein Addendum No. 2 Q & A Attachment 3.

19) **Question**: What is the process for release surveys for equipment coming on-site?

Answer: Statement of Work (SOW), Requisition No. 109793, Rev. 0, Section 01110, Para. 1.8.1.3 through 1.8.1.6 identifies the radiological surveys to be conducted by the Company. In addition, Section 01130, Para. 1.7 of the SOW identifies Radiological Controls and surveys to be conducted by the Company prior to removal of material and equipment from the site.

20) **Question**: Note 1 on Drawing H-2-831130 indicates that access to the site shall be from use of existing roads off of Baltimore Ave. Is this the only access allowable for Schedule B Contract work?

Answer: Note 1 on aforementioned drawing applies to Schedule A Contractor's access to IDF Site. Schedule B Contractor may access the IDF Site as specified in Contractor proposed; Company approved; Mobilization Plan, required per Section 01500, Para. 1.3.2 of the SOW.

21) **Question**: Has CH2M Hill Hanford Group, Inc. designated a specific location within Borrow Pit No. 30 from which the Contractor can remove suitable material for use on the Project?

Answer: CH2M Hill Hanford Group, Inc. makes no representations or certifications as to the quantity or quality of material available in Borrow Pit No. 30 for Contractor processing and incorporation into the IDF Project. Contractors shall satisfy themselves as to the quantity, quality, and processing required for material as identified in Section 01019 of the SOW. Should the Contractor elect to utilize Borrow Pit No. 30, an area within the borrow pit will be coordinated with the borrow pit administrator, and other users, for Contractors use.

22) **Question**: Can the Contractor perform investigations of Borrow Pit No. 30 to satisfy itself as to the quality and quantity of material available in Borrow Pit No. 30? Who do we contact to set-up the investigation?

Answer: Offerors can perform additional investigations of available Borrow Pit No. 30. Contact Tom Parkes at (509) 373-3471 or Thomas_J_Parkes@rl.gov to coordinate additional Contractor access to Borrow Pit No. 30.

23) **Question**: Were all Prime Contractors required to be present at the Pre-Bid Conference and Site Tour conducted on April 15, 2004? Will the attendance sheet be provided to the Prime Contractors?

Answer: RFP 109793-TP letter dated March 29, 2004 stipulated that "A mandatory Pre-Proposal Conference and Site Inspection will be conducted on April 15, 2004. Pre-Qualified potential offerors who were not present at the mandatory April 15, 2004 meeting will not be allowed to submit a proposal. The identity of Potential Offerors who have pre-qualified and were present during the April 15, 2004 meeting are posted at http://www.hanford.gov/chgcp/

Grain Size Summary for Hanford IDF

SEE FIGURE 4-1 IN IDF CRITICAL SYSTEMS DESIGN REPORT FOR LOCATION OF BORINGS

	299-E17-21					**B8501**					**B8502**					**B8503**					**299-E17-23**					**299-E17-25**					**299-E17-22**				
	(ele. 735')					(ele. 740')					(ele. 736.5')					(est. ele. 738')					(ele. 734.4')	**NO GS data yet - log only**				(ele. 738.3')	**NO GS data yet - log only**				(ele. 723.8')	**NO GS data yet - log only**			
	Distance from center of Phase I cell ~				1650' SSW	Distance from center of Phase I cell ~				1650' SSW	Distance from center of Phase I cell ~				1650' SSW	Distance from center of Phase I cell ~				1650' SSW	Distance from center of Phase I cell ~				1800' SSE	Distance from center of Phase I cell ~				1500' S	Distance from center of Phase I cell ~				1500' ESE
Elevation	**Depth bgs**	**Gravel**	**Sand**	**Fines**	**USCS**	**Depth bgs**	**Gravel**	**Sand**	**Fines**	**USCS**	**Depth bgs**	**Gravel**	**Sand**	**Fines**	**USCS**	**Depth bgs**	**Gravel**	**Sand**	**Fines**	**USCS**	**Depth bgs**	**Gravel**	**Sand**	**Fines**	**USCS**	**Depth bgs**	**Gravel**	**Sand**	**Fines**	**USCS**	**Depth bgs**	**Gravel**	**Sand**	**Fines**	**USCS**
(ft)	**(ft)**	**(%)**	**(%)**	**(%)**		**(ft)**	**(%)**	**(%)**	**(%)**		**(ft)**	**(%)**	**(%)**	**(%)**		**(ft)**	**(%)**	**(%)**	**(%)**		**(ft)**	**(%)**	**(%)**	**(%)**		**(ft)**	**(%)**	**(%)**	**(%)**		**(ft)**	**(%)**	**(%)**	**(%)**	
740						**0**																													
739						1	3.2	85.7	11.1	SP-SM																									
738						2										**0**										**0**				SM					
737						3										1	0	85	15	SM						1									
736						4					**0**	25	55.1	20	SM w/ gravel	2										2									
735	**0**					**5**					1					3										3									
734	1					6	62	25.4	12.5	SP-SM/SM	2	1	87.2	11.9	SP-SM/SM	4					**0**				SM	4									
733	2					7					3	3.5	33.8	62.7	Sandy ML	**5**	0	91.5	8.5	SP-SM	1					**5**									
732	3					8					4					6					2					6									
731	4					9					**5**	21.4	48.8	29.9	SM w/ gravel	7					3					7									
730	**5**					**10**	47.8	43.3	8.87	SP-SM	6					8	0	85.8	13.9	SP-SM/SM	4					8									
729	6					11					7	43.2	44.1	12.8	SP-SM/SM w/ g	9	0.5	32.8	66.6	Sandy ML	**5**					9				SP/SP-SM					
728	7					12					8					**10**					6					**10**									
727	8					13					9	13.4	80.5	6	SP-SM	11					7					11				SP					
726	9	1	70.3	28.7	SM	14					**10**					12	51.9	37.5	10.6	SP-SM	8				SP	12									
725	**10**					**15**					11	4.7	90.5	4.7	SP-SM	13					9					13									
724	11	14.3	76.7	9	SP-SM	16	0.1	67.9	32	SM	12					14	6	62.5	31.5	SM	**10**					14					**0**				SM
723	12	0	65.5	34.5	SM	17					13					**15**					11					**15**				SP-SM/SM	1				
722	13	0	89	11	SP-SM	18					14	0	86	14	SM	16					12					16					2				
721	14	0.9	61.5	37.6	SM	19	0	73.5	26.5	SM	**15**					17	0	87	13	SP-SM/SM	13					17					3				
720	**15**					**20**	1	87.7	11.3	SP-SM	16	1.1	77.2	21.7	SM	18					14					18					4				
719	16					21	0	86.9	13.1	SP-SM/SM	17					19	0.3	76.7	22.9	SM	**15**					19					**5**				
718	17					22					18	0.3	93.2	6.5	SP-SM	**20**	0.1	75.9	23.9	SM	16					**20**					6				
717	18	0	93	7	SP-SM	23	0	88.5	11.5	SP-SM	19					21					17					21					7				SP/SP-SM
716	19					24					**20**					22					18					22					8				
715	**20**	2.6	69.1	28.2	SM	**25**					21					23	0.1	70.4	29.5	SM	19					23					9				
714	21					26					22	11.9	73.1	15	SM	24					**20**					24					**10**				
713	22					27					23					**25**					21					**25**					11				
712	23					28					24	1.8	89.9	8.3	SP-SM	26	4.3	84.2	11.5	SP-SM	22					26					12				
711	24					29					**25**					27	13.2	75.5	11.3	SP-SM	23				SP w/some gravel	27					13				
710	**25**					**30**	1.1	83.1	15.8	SM	26					28	6.3	79.2	14.5	SM	24					28					14				
709	26					31					27					29					**25**					29					**15**				
708	27	4.2	89.1	6.7	SP-SM	32					28					**30**					26					**30**					16				
707	28					33	0.7	84.4	14.9	SM	29	1.8	90.4	7.8	SP-SM	31					27					31					17				
706	29	6.3	82.4	11.3	SP-SM/SM	34					**30**					32					28					32					18				
705	**30**					**35**	0.3	88.7	11	SP-SM	31	1.3	91.8	6.9	SP-SM	33					29				SP/SP-SM	33					19				
704	31					36					32					34					**30**					34					**20**				
703	32	4.1	77.2	18.7	SM	37					33					**35**					31					**35**					21				
702	33					38					34					36					32					36				SP-SM	22				
701	34					39	0.2	87.8	11.9	SP-SM/SM	**35**					37					33					37					23				
700	**35**	3.2	88.1	8.7	SP-SM	**40**					36					38					34					38					24				
699	36					41					37					39					**35**					39					**25**				
698	37					42					38	0	93.5	6.5	SP-SM	**40**					36					**40**					26				
697	38					43					39					41					37					41					27				
696	39	1.1	90	8.9	SP-SM	44					**40**					42					38					42					28				
695	**40**					**45**					41					43					39					43					29				
694	41					46					42					44					**40**					44					**30**				
693	42					47	0	94	6	SP-SM	43	1.3	92.3	6.4	SP-SM	**45**					41					**45**					31				
692	43					48					44					46					42					46					32				
691	44					49					**45**					47					43					47					33				
690	**45**					**50**					46					48					44					48					34				
689	46	*0*	*69.3*	*30.7*	*SM*	51					47					49					**45**					49					**35**				
688	47	0	81.5	18.5	SM	52					48					**50**					46					**50**					36				
687	48					53					49					51					47					51					37				
686	49					54					**50**					52					48					52					38				
685	**50**	1.5	69	29.6	SM	**55**					51					53					49					53					39				
684	51					56					52					54					**50**					54					**40**				
683	52					57					53					**55**					51					**55**					41				
682	53					58					54					56					52					56					42				
681	54					59					**55**					57					53					57					43				
680	**55**					**60**					56					58					54					58					44				
679	56					61					57					59					**55**					59					**45**				
678	57					62					58					**60**					56					**60**					46				
677	58	*0*	*80.2*	*19.8*	*SM*	63					59					61					57					61					47				
676	59					64					**60**					62					58					62					48				
675	**60**					**65**					61					63					59					63					49				
674	61					66					62					64					**60**					64					**50**				
673	62					67					63					**65**					61					**65**					51				
672	63					68					64					66					62					66					52				
671	64					69					**65**					67					63					67					53				
670	**65**					**70**					66					68					64					68					54				
669	66					71					67					69					**65**					69					**55**				
668	67					72					68					**70**					66					**70**					56				
667	68					73					69					71					67					71					57				
666	69					74					**70**					72					68					72					58				
665	**70**	*0*	*3.8*	*13.8*	*SP-SM*	**75**					71					73					69					73					59				
		Reference #7 for most samples					Reference #7					Reference #7					Reference #7					Reference #13					Reference #13					Reference #13				
		% not corrected for Wentworth Scale					% not corrected for Wentworth Scale					% not corrected for Wentworth Scale					% not corrected for Wentworth Scale					USCS based on log description and					USCS based on log description and					USCS based on log description and				
		USCS reflects if FC were up to 3% higher					USCS reflects if FC were up to 3% higher					USCS reflects if FC were up to 3% higher					USCS reflects if FC were up to 3% higher					estimated visual silt content					estimated visual silt content					estimated visual silt content				
		than reported and for 15% = SM					than reported and for 15% = SM					than reported and for 15% = SM					than reported and for 15% = SM																				
		Reference #11 for samples in italics																																	
		% are correct for fines; gravel off a bit																																	
		USCS based on SM = 15% fines																																	

Grain Size
SEE FIGUI

Elevation (ft)	299-E17-12 Depth bgs (ft)	Gravel (%)	Sand (%)	Fines (%)	USCS
	(est. elev. 722')				
	Distance from center of Phase I cell ~				1700' ESE
740					
739					
738					
737					
736					
735					
734					
733					
732					
731					
730					
729					
728					
727					
726					
725					
724					
723					
722	**0**				
721	1				
720	2				
719	3				
718	4				
717	**5**				
716	6				
715	7				
714	8	3.5	89	7.4	SP-SM
713	9				
712	**10**				
711	11				
710	12				
709	13				
708	14				
707	**15**				
706	16				
705	17				
704	18				
703	19				
702	**20**	0	93	7	SP-SM
701	21				
700	22				
699	23				
698	24				
697	**25**				
696	26				
695	27				
694	28				
693	29				
692	**30**	0	90	10	SP-SM
691	31				
690	32				
689	33				
688	34				
687	**35**				
686	36				
685	37				
684	38				
683	39				
682	**40**	0	97	3.5	SP
681	41				
680	42				
679	43				
678	44				
677	**45**				
676	46				
675	47				
674	48				
673	49				
672	**50**	1.7	92	6.2	SP-SM
671	51				
670	52				
669	53				
668	54				
667	**55**				
666	56				
665	57				

Reference #12
% reported are per ASTM/USCS
USCS based on SM = 15% fines

Elevation of top of waste at Phase I north end (under cover)
Elevation of bottom of admix layer at Phase I north end

Elevation (ft)	299-E17-20 Depth bgs (ft)	Gravel (%)	Sand (%)	Fines (%)	USCS
	(est. elev. 720')				
	Distance from center of Phase I cell ~				1750' ENE
740					
739					
738					
737					
736					
735					
734					
733					
732					
731					
730					
729					
728					
727					
726					
725					
724					
723					
722					
721	**0**				
720	1				
719	2				
718	3				
717	4				
716	**5**				
715	6				
714	7				
713	8				
712	9				
711	**10**				
710	11				
709	12				
708	13				
707	14				
706	**15**				
705	16				
704	17				
703	18				
702	19				
701	**20**	0.1	95.5	4.4	SP
700	21				
699	22				
698	23				
697	24				
696	**25**				
695	26				
694	27				
693	28				
692	29				
691	**30**	0.3	92	8.2	SP-SM
690	31				
689	32				
688	33				
687	34				
686	**35**				
685	36				
684	37				
683	38				
682	39				
681	**40**	0	96	3.9	SP
680	41				
679	42				
678	43				
677	44				
676	**45**				
675	46				
674	47				
673	48				
672	49				
671	**50**	0.3	96	4	SP
670	51				
669	52				
668	53				
667	54				
666	**55**				
665	56				

Reference #12
% reported are per ASTM/USCS
USCS based on SM = 15% fines

Elevation (ft)	299-E24-18 Depth bgs (ft)	Gravel (%)	Sand (%)	Fines (%)	USCS
	(ele. 716')				
	Distance from center of Phase I cell ~				900' NE
740					
739					
738					
737					
736					
735					
734					
733					
732					
731					
730					
729					
728					
727					
726					
725					
724					
723					
722					
721					
720					
719					
718					
717					
716	**0**				
715	1				
714	2				
713	3				
712	4				
711	**5**				
710	6				
709	7				
708	8				
707	9				
706	**10**	1.2	87	12	SP-SM
705	11				
704	12				
703	13				
702	14				
701	**15**				
700	16				
699	17				
698	18				
697	19				
696	**20**	0	96.5	3.4	SP
695	21				
694	22				
693	23				
692	24				
691	**25**				
690	26				
689	27				
688	28				
687	29				
686	**30**	0	95.5	4.4	SP
685	31				
684	32				
683	33				
682	34				
681	**35**				
680	36				
679	37				
678	38				
677	39				
676	**40**	0	92	8.2	SP-SM
675	41				
674	42				
673	43				
672	44				
671	**45**				
670	46				
669	47				
668	48				
667	49				
666	**50**	1.1	97.5	1.5	SP
665	51				

Reference #12
% reported are per ASTM/USCS
USCS based on SM = 15% fines

Elevation (ft)	299-E24-161 Depth bgs (ft)	Gravel (%)	Sand (%)	Fines (%)	USCS
	(est. elev. 722')				
	Distance from center of Phase I cell ~				850' ENE
740					
739					
738					
737					
736					
735					
734					
733					
732					
731					
730					
729					
728					
727					
726					
725					
724					
723					
722	**0**				
721	1	0.3	82.2	17.4	SM
720	2				
719	3				
718	4				
717	**5**	10.3	64.6	25.1	SM
716	6				
715	7				
714	8				
713	9				
712	**10**				
711	11				
710	12	6.6	90.6	2.8	SP
709	13				
708	14				
707	**15**				
706	16				
705	17				
704	18				
703	19				
702	**20**				
701	21				
700	22				
699	23	0.7	98.3	1	SP
698	24				
697	**25**				
696	26				
695	27				
694	28				
693	29				
692	**30**				
691	31				
690	32				
689	33	4.9	92.2	2.9	SP
688	34				
687	**35**				
686	36				
685	37				
684	38				
683	39				
682	**40**				
681	41				
680	42				
679	43				
678	44				
677	**45**	3	94.1	2.9	SP
676	46				
675	47				
674	48				
673	49				
672	**50**				
671	51				
670	52				
669	53				
668	54				
667	**55**				
666	56				
665	57				

Reference #7
% not corrected for Wentworth Scale
USCS reflects if FC were up to 3% higher than reported and for 15% = SM

Text in Ref #7 for boring 161 and 162 states:
1 to 2' "sand"
2' to 14' "gravelly sand"
14' to 59' "sand with occ. minor gravel"

Elevation (ft)	299-E24-7 Depth bgs (ft)	Gravel (%)	Sand (%)	Fines (%)	USCS
	(ele. 716')				
	Distance from center of Phase I cell ~				750' N
740					
739					
738					
737					
736					
735					
734					
733					
732					
731					
730					
729					
728					
727					
726					
725					
724					
723					
722					
721					
720					
719					
718					
717					
716	**0**				
715	1				
714	2				
713	3				
712	4				
711	**5**	15.6	70.7	13.7	SP-SM/SM
710	6				
709	7				
708	8				
707	9				
706	**10**	14	71.2	14.8	SM
705	11				
704	12				
703	13				
702	14				
701	**15**	7.2	80.9	11.9	SP-SM/SM
700	16				
699	17				
698	18				
697	19				
696	**20**	1.1	86.8	12.2	SP-SM/SM
695	21				
694	22				
693	23				
692	24				
691	**25**	2	89.6	8.4	SP-SM
690	26				
689	27				
688	28				
687	29				
686	**30**	1.1	95.4	3.5	SP-/SP-SM
685	31				
684	32				
683	33				
682	34				
681	**35**	4.6	92.2	3.1	SP/SP-SM
680	36				
679	37				
678	38				
677	39				
676	**40**	1.6	88.3	10.1	SP-SM
675	41				
674	42				
673	43				
672	44				
671	**45**	0.4	82.8	16.8	SM
670	46				
669	47				
668	48				
667	49				
666	**50**	0.3	92.2	7.5	SP-SM
665	51				

Reference #10 and 13 for stratigraphy
Lab data in email from D. Comstock
% not corrected for Wentworth Scale
USCS reflects if FC were up to 3% higher than reported and for 15% = SM

Elevation (ft)	C-4069 Depth bgs (ft)	Gravel (%)	Sand (%)	Fines (%)	USCS
	(est. elev. 721')				
	Distance from center of Phase I cell ~				750' NW
740					
739					
738					
737					
736					
735					
734					
733					
732					
731					
730					
729					
728					
727					
726					
725					
724					
723					
722					
721	**0**				
720	1				
719	2				
718	3				
717	4	0	82	18.1	SM
716	**5**				
715	6				
714	7	1.2	64.1	34.7	SM
713	8				
712	9				
711	**10**				
710	11			5.7	SP-SM
709	12				
708	13				
707	14				
706	**15**				
705	16			27.3	SM
704	17				
703	18	0	85.8	14.2	SP-SM
702	19				
701	**20**				
700	21				
699	22			3.7	SP
698	23				
697	24				
696	**25**				
695	26				
694	27				
693	28				
692	29			22	SM
691	**30**				
690	31				
689	32				
688	33				
687	34	0	81.7	18.2	SM
686	**35**				
685	36				
684	37				
683	38				
682	39				
681	**40**				
680	41				
679	42			7.8	SP-SM
678	43				
677	44				
676	**45**				
675	46				
674	47				
673	48				
672	49			6.3	SP-SM
671	**50**				
670	51				
669	52				
668	53				
667	54				
666	**55**				
665	56				

Reference #20
Lab Testing from CHG
% per ASTM/USCS for fines, gravel % reported is higher than USCS
USCS based on SM = 15% fines

Note some issues with testing in exact accordance with ASTM

Elevation (ft)	C-4070 Depth bgs (ft)	Gravel (%)	Sand (%)	Fines (%)	USCS
	(est. elev. 721')				
	Distance from center of Phase I cell ~				600' NNW
740					
739					
738					
737					
736					
735					
734					
733					
732					
731					
730					
729					
728					
727					
726					
725					
724					
723					
722					
721	**0**				
720	1				
719	2				
718	3				
717	4	0	50.3	49.7	SM
716	**5**				
715	6				
714	7				
713	8	0	70	30	SM
712	9				
711	**10**				
710	11			15	SM
709	12				
708	13				
707	14				
706	**15**				
705	16				
704	17			11	SP-SM
703	18	0	78.3	21.7	SM
702	19				
701	**20**				
700	21				
699	22				
698	23				
697	24				
696	**25**			8.4	SP-SM
695	26				
694	27				
693	28				
692	29				
691	**30**			12.4	SP-SM
690	31				
689	32				
688	33	0.4	79.3	21	SM
687	34				
686	**35**				
685	36				
684	37				
683	38				
682	39				
681	**40**				
680	41			13.7	SP-SM
679	42				
678	43				
677	44				
676	**45**				
675	46				
674	47				
673	48				
672	49			5	SP/SP-SM
671	**50**				
670	51				
669	52				
668	53				
667	54				
666	**55**				
665	56				

Reference #20
Lab Testing from CHG
% per ASTM/USCS for fines, gravel % reported is higher than USCS
USCS based on SM = 15% fines

Note some issues with testing in exact accordance with ASTM

Elevation (ft)	C-4071 Depth bgs (ft)	Gravel (%)	Sand (%)	Fines (%)	USCS
	(est. elev. 723.5')				
	Distance from center of Phase I cell ~				450' W
740					
739					
738					
737					
736					
735					
734					
733					
732					
731					
730					
729					
728					
727					
726					
725					
724	**0**				
723	1				
722	2				
721	3				
720	4			41.5	SM
719	**5**				
718	6				
717	7				
716	8	1.5	65.9	32.6	SM
715	9				
714	**10**				
713	11				
712	12			8.5	SP-SM
711	13				
710	14				
709	**15**				
708	16				
707	17			11.6	SP-SM
706	18				
705	19				
704	**20**				
703	21				
702	22				
701	23				
700	24			15.5	SM
699	**25**				
698	26				
697	27				
696	28				
695	29				
694	**30**				
693	31				
692	32			11.7	SP-SM
691	33				
690	34				
689	**35**				
688	36				
687	37				
686	38				
685	39				
684	**40**				
683	41			7.3	SP-SM
682	42				
681	43				
680	44				
679	**45**				
678	46				
677	47				
676	48			5.9	SP-SM
675	49				
674	**50**				
673	51				
672	52				
671	53				
670	54				
669	**55**				
668	56				
667	57				
666	58				
665	59				

Reference #20
Lab Testing from CHG
% per ASTM/USCS for fines, gravel % reported is higher than USCS
USCS based on SM = 15% fines

Note some issues with testing in exact accordance with ASTM

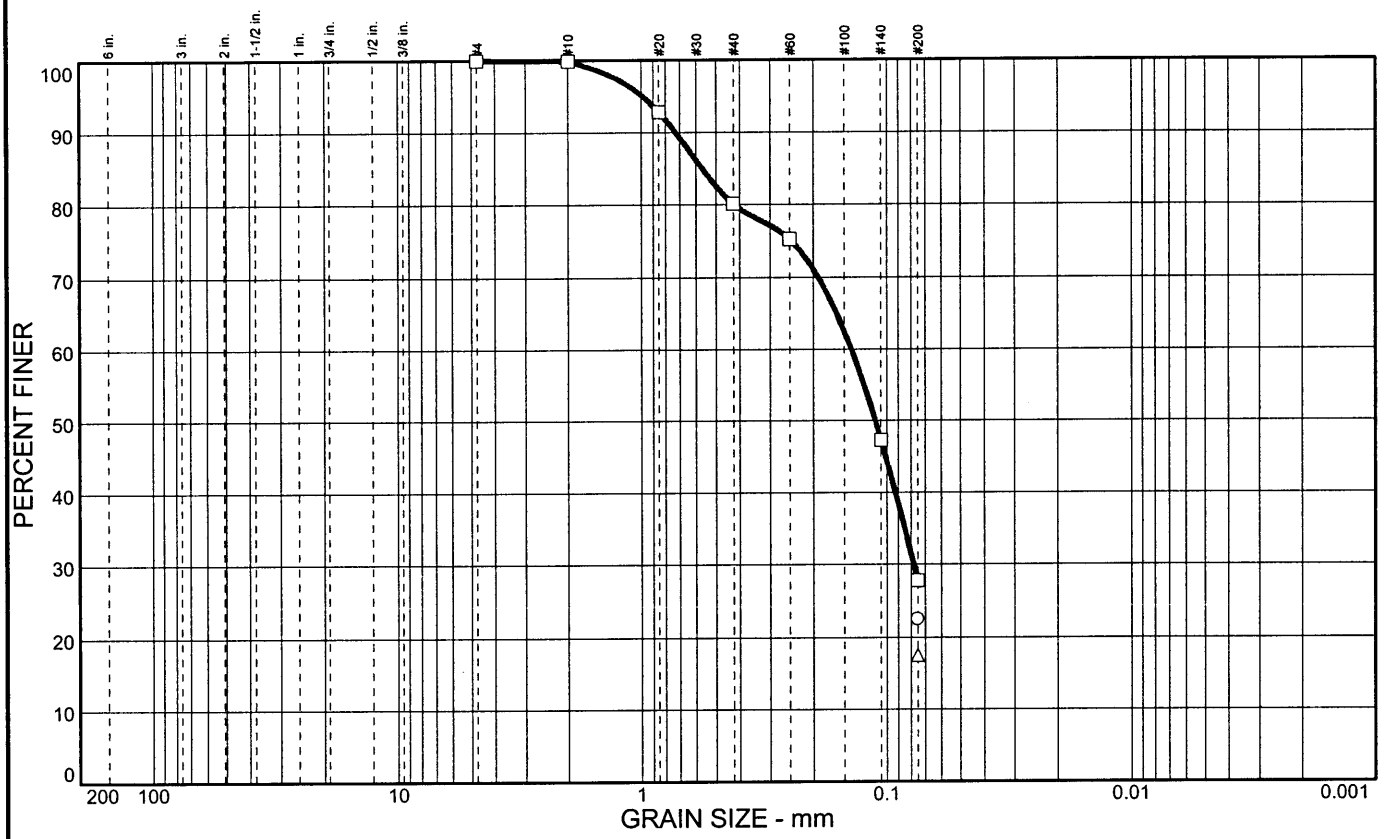
Grain Size
SEE FIGUI

	SD-1	Surficial Dune Sand Sampling				**SD-2**	Surficial Dune Sand Sampling				**SD-3**	Surficial Dune Sand Sampling				**SD-4**	Surficial Dune Sand Sampling				**SD-5**	Surficial Sampling at base of Sand Pit				**SD-6**	Surficial Sampling next to C4071			
	(est. elev. 742+/-)		Note: ele shown below = 740			(est. elev. 742+/-)		Note: ele shown below = 740			(est. elev. 742+/-)		Note: ele shown below = 740			(est. elev. 742+/-)		Note: ele shown below = 740			(est. elev. 730??)					(est. elev. 723.5)				
	Distance from center of Phase I cell ~				1200 SSE	Distance from center of Phase I cell ~				1200' SSE	Distance from center of Phase I cell ~				850' S	Distance from center of Phase I cell ~				850' S	Distance from center of Phase I cell ~				1800' SE	Distance from center of Phase I cell ~				450' W
Elevation	**Depth bgs**	**Gravel**	**Sand**	**Fines**	**USCS**	**Depth bgs**	**Gravel**	**Sand**	**Fines**	**USCS**	**Depth bgs**	**Gravel**	**Sand**	**Fines**	**USCS**	**Depth bgs**	**Gravel**	**Sand**	**Fines**	**USCS**	**Depth bgs**	**Gravel**	**Sand**	**Fines**	**USCS**	**Depth bgs**	**Gravel**	**Sand**	**Fines**	**USCS**
(ft)	**(ft)**	**(%)**	**(%)**	**(%)**		**(ft)**	**(%)**	**(%)**	**(%)**		**(ft)**	**(%)**	**(%)**	**(%)**		**(ft)**	**(%)**	**(%)**	**(%)**		**(ft)**	**(%)**	**(%)**	**(%)**		**(ft)**	**(%)**	**(%)**	**(%)**	
740	**0**					**0**					**0**					**0**														
739	1			22.5	SM	1		72.2	27.8	SM	1			17.5	SM	1		78.1	21.9	SM										
738	2					2					2					2														
737	3					3					3					3														
736	4					4					4					4														
735	**5**					**5**					**5**					**5**														
734	6					6					6					6														
733	7					7					7					7														
732	8					8					8					8														
731	9					9					9					9														
730	**10**					**10**					**10**					**10**					**0**									
729	11					11					11					11					1	2.4	58.5	39.1	SM					
728	12					12					12					12					2									
727	13					13					13					13					3									
726	14					14					14					14					4									
725	**15**					**15**					**15**					**15**					**5**									
724	16					16					16					16					6					**0**				
723	17					17					17					17					7					1		79.5	20.5	SM
722	18					18					18					18					8					2				
721	19					19					19					19					9					3				
720	**20**					**20**					**20**					**20**					**10**					4				
719	21					21					21					21					11					**5**				
718	22					22					22					22					12					6				
717	23					23					23					23					13					7				
716	24					24					24					24					14					8				
715	**25**					**25**					**25**					**25**					**15**					9				
714	26					26					26					26					16					**10**				
713	27					27					27					27					17					11				
712	28					28					28					28					18					12				
711	29					29					29					29					19					13				
710	**30**					**30**					**30**					**30**					**20**					14				
709	31					31					31					31					21					**15**				
708	32					32					32					32					22					16				
707	33					33					33					33					23					17				
706	34					34					34					34					24					18				
705	**35**					**35**					**35**					**35**					**25**					19				
704	36					36					36					36					26					**20**				
703	37					37					37					37					27					21				
702	38					38					38					38					28					22				
701	39					39					39					39					29					23				
700	**40**					**40**					**40**					**40**					**30**					24				
699	41					41					41					41					31					**25**				
698	42					42					42					42					32					26				
697	43					43					43					43					33					27				
696	44					44					44					44					34					28				
695	**45**					**45**					**45**					**45**					**35**					29				
694	46					46					46					46					36					**30**				
693	47					47					47					47					37					31				
692	48					48					48					48					38					32				
691	49					49					49					49					39					33				
690	**50**					**50**					**50**					**50**					**40**					34				
689	51					51					51					51					41					**35**				
688	52					52					52					52					42					36				
687	53					53					53					53					43					37				
686	54					54					54					54					44					38				
685	**55**					**55**					**55**					**55**					**45**					39				
684	56					56					56					56					46					**40**				
683	57					57					57					57					47					41				
682	58					58					58					58					48					42				
681	59					59					59					59					49					43				
680	**60**					**60**					**60**					**60**					**50**					44				
679	61					61					61					61					51					**45**				
678	62					62					62					62					52					46				
677	63					63					63					63					53					47				
676	64					64					64					64					54					48				
675	**65**					**65**					**65**					**65**					**55**					49				
674	66					66					66					66					56					**50**				
673	67					67					67					67					57					51				
672	68					68					68					68					58					52				
671	69					69					69					69					59					53				
670	**70**					**70**					**70**					**70**					**60**					54				
669	71					71					71					71					61					**55**				
668	72					72					72					72					62					56				
667	73					73					73					73					63					57				
666	74					74					74					74					64					58				
665	**75**					**75**					**75**					**75**					**65**					59				
		See IDF Design Report, Section 4					See IDF Design Report, Section 4					See IDF Design Report, Section 4					See IDF Design Report, Section 4					See IDF Design Report, Section 4					See IDF Design Report, Section 4				
		CH2M HILL Test Pits					CH2M HILL Test Pits					CH2M HILL Test Pits					CH2M HILL Test Pits					CH2M HILL Test Pits					CH2M HILL Test Pits				
		Surficial Samples in Dune Sands					Surficial Samples in Dune Sands					Surficial Samples in Dune Sands					Surficial Samples in Dune Sands					Surficial Sampling at Sand Pit Floor					Surficial Samples next to				
		South of Phase I					South of Phase I					South of Phase I					South of Phase I					Southeast of Phase I					Borehole C-4-71				
		Testing by STI					Testing by STI					Testing by STI					Testing by STI					Testing by STI					Testing by STI				
		USCS based on SM = 15% fines					USCS based on SM = 15% fines					USCS based on SM = 15% fines					USCS based on SM = 15% fines					USCS based on SM = 15% fines					USCS based on SM = 15% fines				

Summary of Hanford Documents

Number	Date	Author	Document #	Title (abbreviated in some cases)
7	1999	Fayer et al.	PNNL-13033	Recharge Data Package for the Immobilized Low-Activity Waste 2001 Performance Assessment
10	2000	Reidel	PNNL-13283	Second ILAW Site Borehole Characterization Plan
11	1998	Reidel, Reynolds, and Horton	PNNL-11957	ILAW Site Borehole 299-E17-21
12	2000	Valenta et al.	PNNL-13328	Particle Size Distribution Data from Existing Boreholes at the ILAW
13	2002	Reidel and Horton	PNNL-14029	Geologic and Wireline Summaries from FY 2002 ILAW Boreholes
19	2001	Reidel and Horton	PNNL-13652	Geologic and Wireline Summary from Second ILAW Borehole (299-E24-21)
20	Dec. 2002	Mitchell (Duratek)	JJD-02-2498	Letter Report for 15M ILAW Boreholes

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○				22.5					
□			72.2	27.8					
△				17.5					

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
GRAIN SIZE			
D_{60}		0.140	
D_{30}		0.0779	
D_{10}			
COEFFICIENTS			
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
#4		100.0	
#10		99.9	
#20		92.8	
#40		80.1	
#60		75.2	
#140		47.3	
#200	22.5	27.8	17.5

SOIL DESCRIPTION

○

□

△

REMARKS:

○ As Received MC=9%

□ As Received MC= 10%

△ As Received MC= 9%

○ Source: Sample No.: SD-1

□ Source: Sample No.: SD-2

△ Source: Sample No.: SD-3

SOIL TECHNOLOGY, INC.

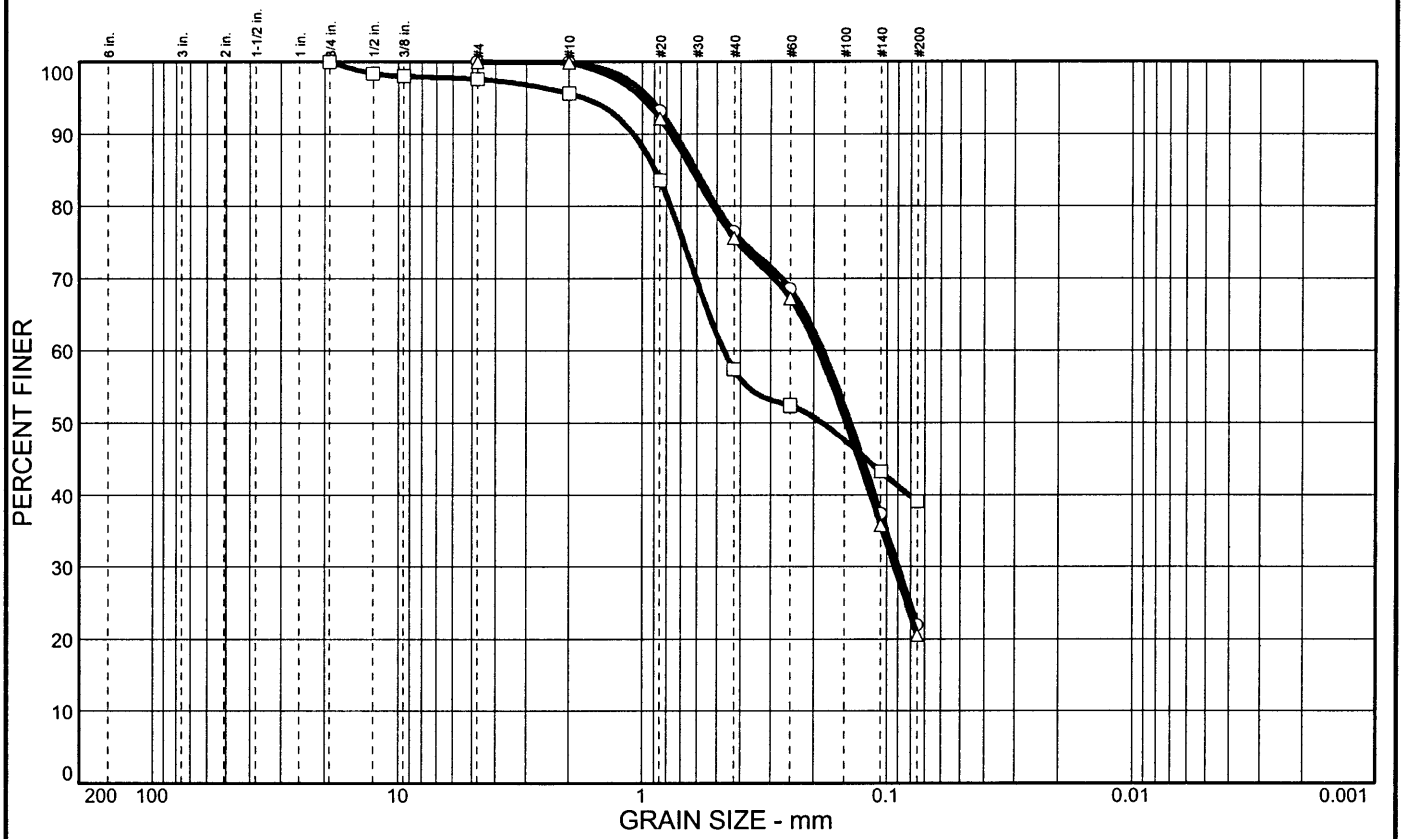
Client: CH2M Hill

Project: Handford IDF

Project No.: J-1502

Plate 1

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			78.1	21.9					
□		2.4	58.5	39.1					
△			79.5	20.5					

SIEVE inches size	PERCENT FINER ○	□	△
.75		100.0	
.5		98.4	
.375		98.0	
	GRAIN SIZE		
D_{60}	0.184	0.467	0.193
D_{30}	0.0898		0.0930
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	□	△
#4	100.0	97.6	100.0
#10	99.9	95.6	99.9
#20	93.2	83.5	92.1
#40	76.4	57.4	75.6
#60	68.5	52.4	67.2
#140	37.4	43.3	35.8
#200	21.9	39.1	20.5

SOIL DESCRIPTION

○

□

△

REMARKS:

○ As Received MC= 10%

□ As Received MC= 16%

△ As Received MC= 9%

○ Source: Sample No.: SD-4

□ Source: Sample No.: SD-5

△ Source: Sample No.: SD-6

SOIL TECHNOLOGY, INC.

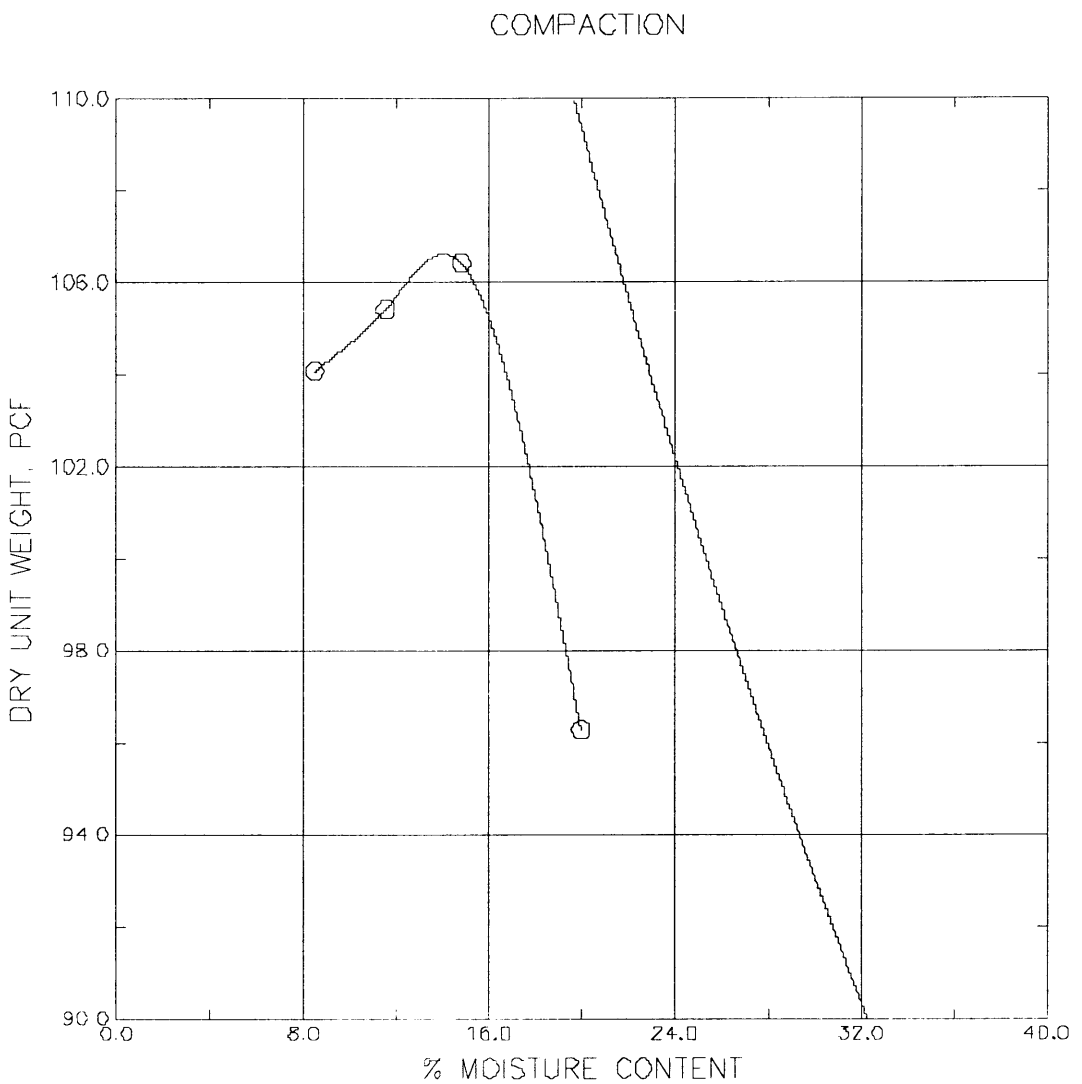
Client: CH2M Hill

Project: Handford IDF

Project No.: J-1502

Plate 2

Soil Technology, Inc Standard Proctor D-698	Boring No SD-6 Sample No. : Tested by tp Filename SD-6	Project : IDF Handford Project No.: J-1502 Location : Date: Thu Feb 13 2003



Sample Description :
Compaction Test Designation : ASTM D698-B
Maximum Dry Density : 106.6 PCF
Optimum Moisture Content : 14.0 %

Figure 3

CH2M Hill
Handford IDF

Flexible Wall Hydraulic Conductivity of Remolded Specimens
Table 1

Sample Identification	Water Content %		Wet Density (Pcf)		Saturation①		Hydraulic Conductivity② (cm/sec)
	Before	After	Before	After	Before	After	
Comp2-1	13.5	19.2	127	135	.72	1.0	$2x\ 10^{-8}$
Comp2-2	17.7	21.4	123	134	.78	1.0	4×10^{-8}
Comp3-1	13.2	19.3	124	132	.66	1.0	$<1 \times 10^{-8}$③②
Comp3-2	17.4	20.9	122	136	.76	1.0	$<1 \times 10^{-8}$③②
Comp3-3	10.3	15.7	136	139	.75	1.0	$<1 \times 10^{-8}$③
Comp3-4	14.2	15.7	139	141	1.0	1.0	$<1 \times 10^{-8}$③②

①Specific gravity assumed 2.7
② inflow ≠Outflow
③ Near system detection limit 1×10^{-8} cm/sec. Due to the nature of the samples tested, not all of the testing conditions specified by ASTM D-5084 were met.
Comp 2 is 8% Bentonite with base soil composite
Comp 3 is 12% Bentonite with base soil composite

Flexible Wall Hydraulic Conductivity Test Parameters
Table 2

Exploration Number	Triaxial Pressure (psi)			Average Effective Confining Stress (psi)	Gradient (*i*)
	Cell	HW	TW		
Comp2-1	65	60.5	59.5	5	11
Comp2-2	65	60.5	59.5	5	10
Comp3-1	65	60.5	59.5	5	10
Comp3-2	65	60.5	59.5	5	10
Comp3-3	65	60.5	59.5	5	12
Comp3-4	65	60.5	59.5	5	10

HW = Head Water; TW = Tail Water; i = h/l

CH2M Hill
Handford IDF

Flexible Wall Hydraulic Conductivity of Remolded Specimens
Table 1

Sample Identification	Water Content %		Wet Density (Pcf)		Saturation①		Hydraulic Conductivity (cm/sec)
	Before	After	Before	After	Before	After	
Comp3-5	8	16	130	138	.54	1.0	$< 1 \times 10^{-8}$②③
Comp3-6	10	21	115	135	.45	1.0	1×10^{-8}
Comp3-7	10	19	123	131	.54	.98	$< 1 \times 10^{-8}$③
Comp3-8	11	21	119	133	.53	1.0	$< 1 \times 10^{-8}$②③

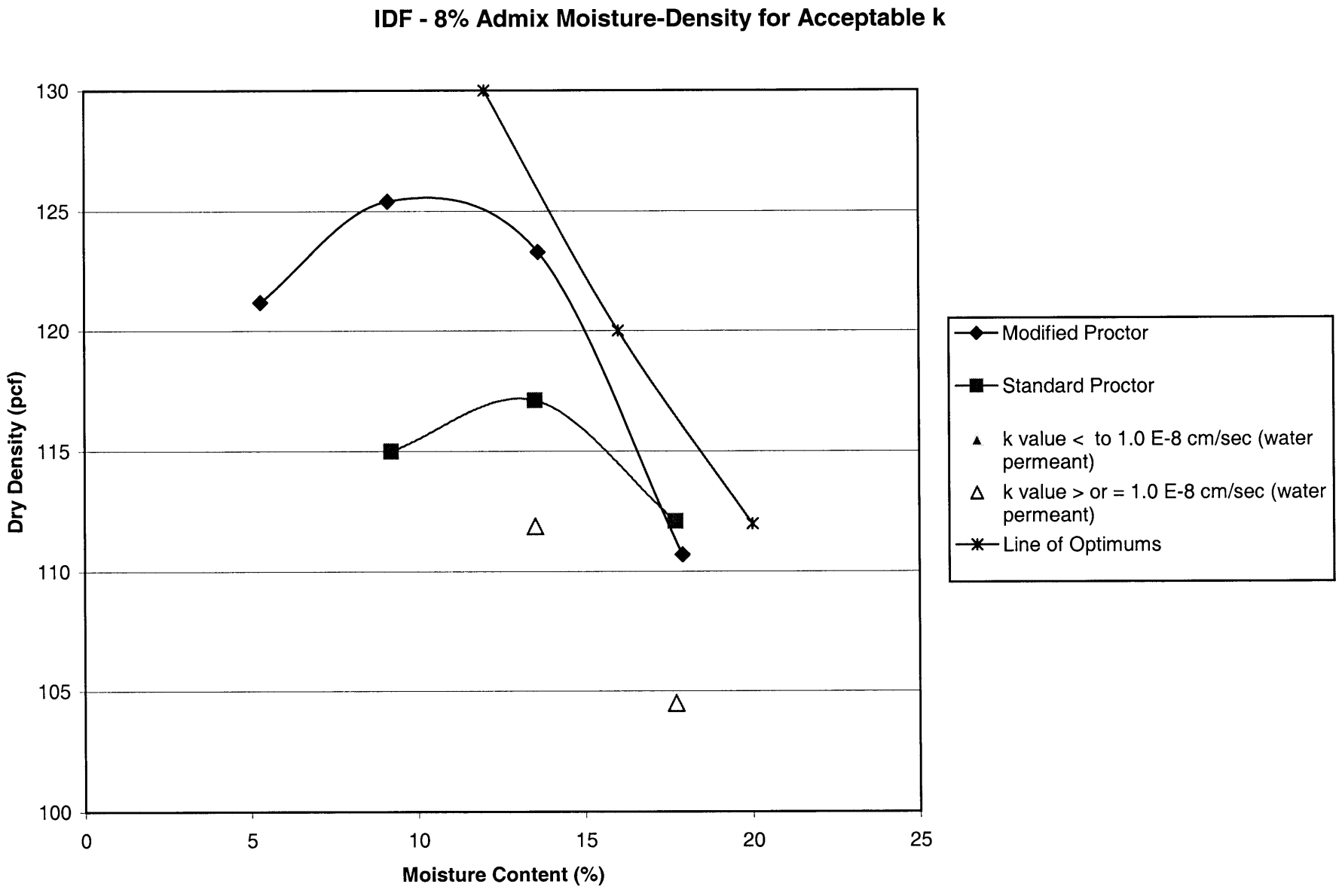
①Specific gravity assumed 2.7
② inflow ≠Outflow
③ Near system detection limit 1×10^{-8} cm/sec .
Comp 3 is 12% Bentonite with base soil composite

Flexible Wall Hydraulic Conductivity Test Parameters
Table 2

Exploration Number	Triaxial Pressure (psi)			Average Effective Confining Stress (psi)	Gradient (*i*)
	Cell	HW	TW		
Comp3-5	65	61	59	5	18
Comp3-6	65	61	59	5	21
Comp3-7	65	61	59	5	20
Comp3-8	65	61	59	5	16

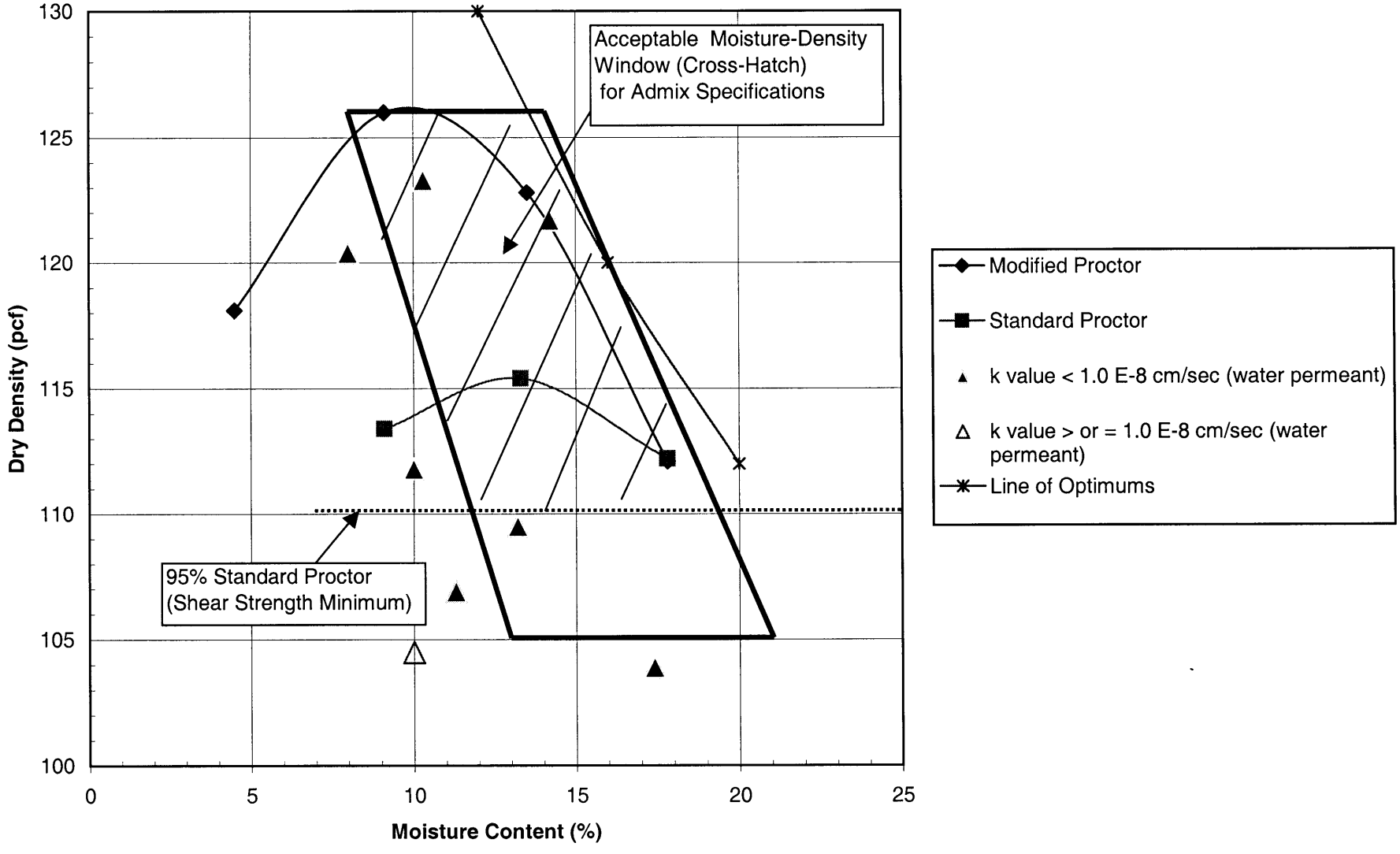
HW = Head Water; TW = Tail Water; i = h/l

IDF - Admix Design
MW Reimbold/CH2M HILL
03/20/2003

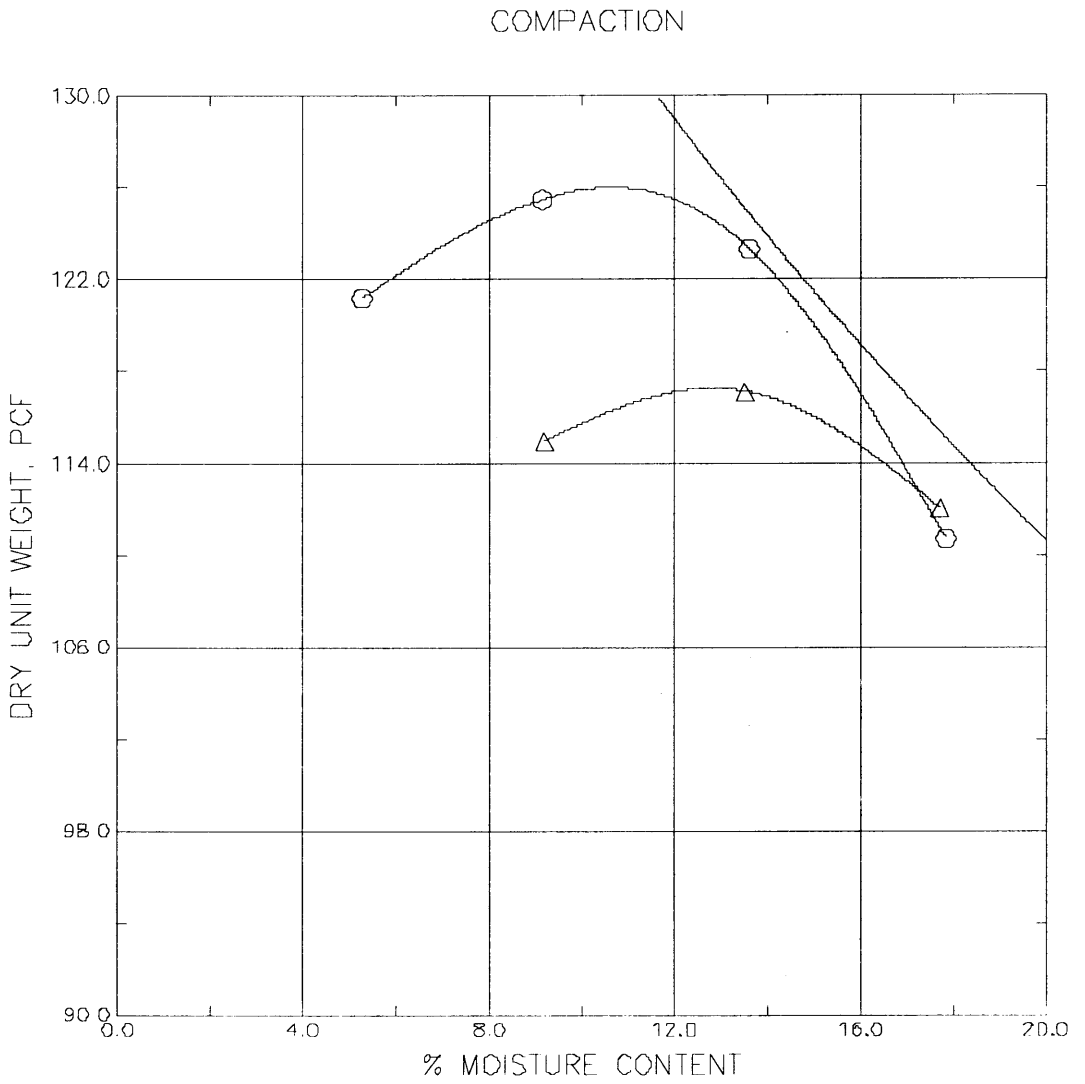


IDF - Admix Design
MW Reimbold/CH2M HILL
03/20/2003

IDF - 12% Admix Moisture-Density for Acceptable k



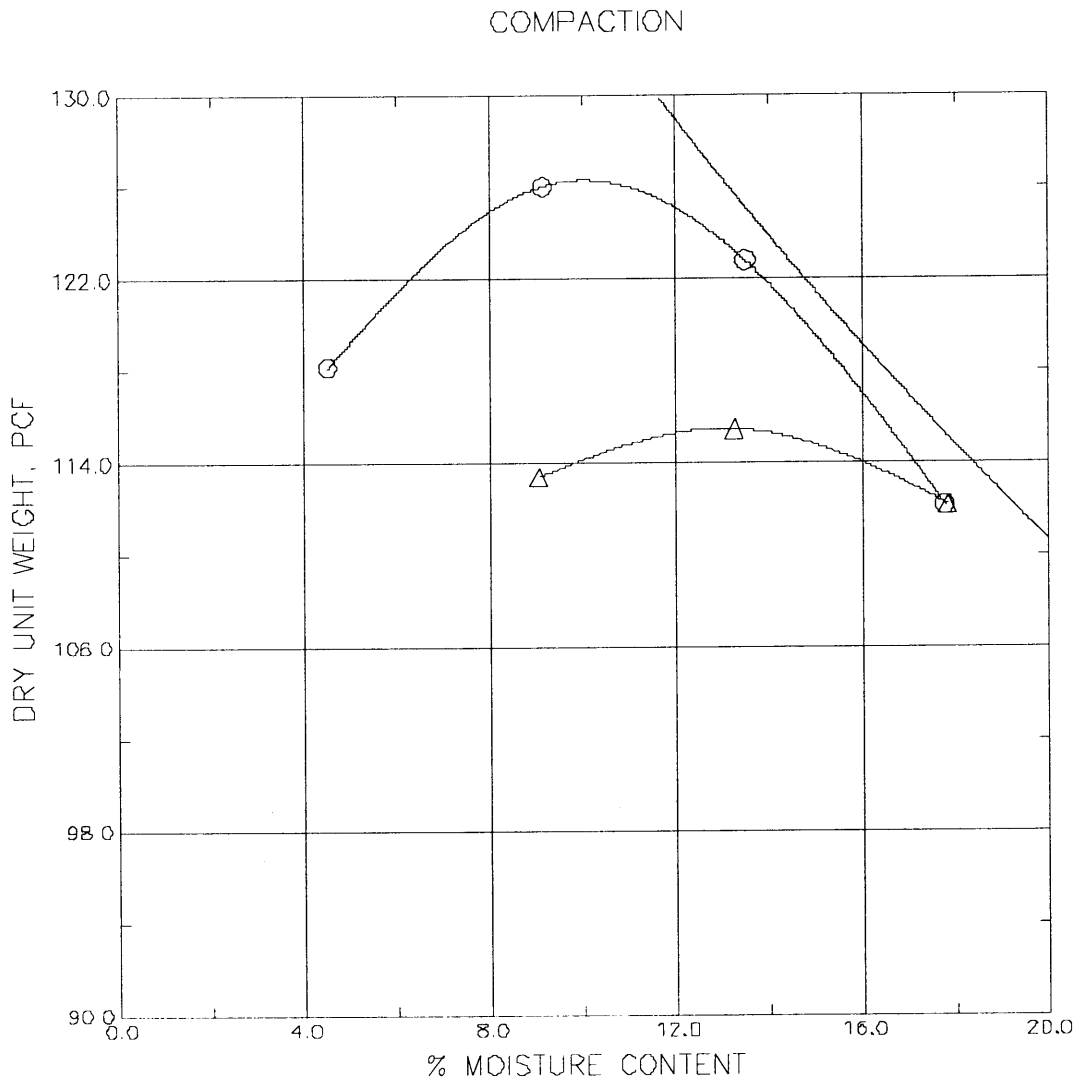
Soil Technology, Inc Standard and Modified Proctor		Project : IDF Handford Project No.: J-1502 Location : Date: Thu Feb 06 2003



Symbol	Boring No.	Sample No.	Depth	Filename	Maximum Dry Density, PCF	Optimum Moisture Content, %
⊖	Comp-2	8% Bentonite	D-1557	C2-8-M	126.0	10.7
△	Comp-2	8% Bentonite	D-598	C2-8-S	117.2	12.8

Figure 1

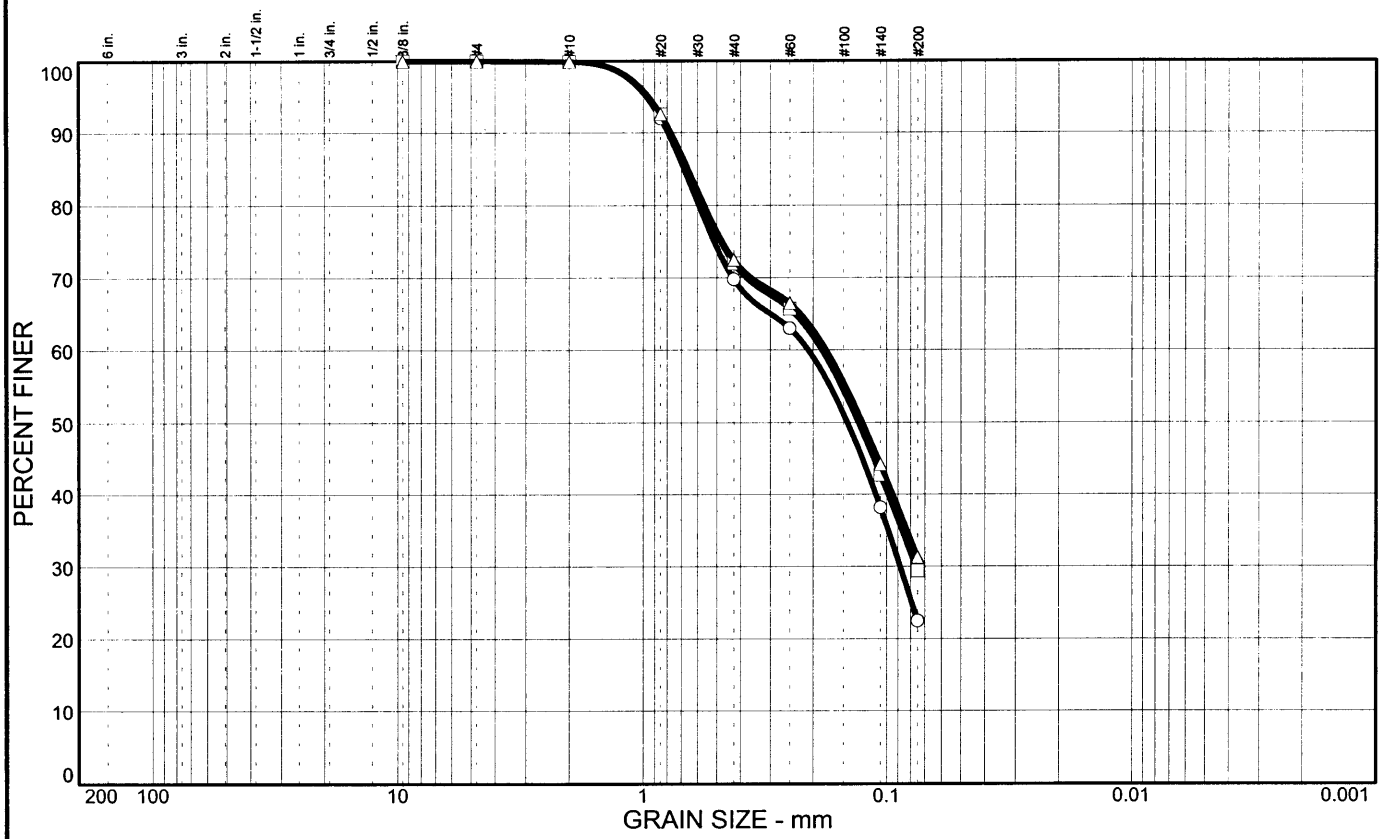
Soil Technology, Inc Standard and Modified Proctor		Project : IDF Handford Project No.: J-1502 Location : Date: Thu Feb 06 2003



Symbol	Boring No.	Sample No.	Depth	Filename	Maximum Dry Density, PCF	Optimum Moisture Content, %
⊖	Comp--3	12% Bentonite	D-1557	C3-12-M	126.3	10.0
△	Comp-3	12% Bentonite	D-698	C3-12-S	115.5	13.0

Figure 2

Particle Size Distribution Report



	% COBBLES	% GRAVEL	% SAND	% SILT	% CLAY	USCS	AASHTO	PL	LL
○			77.5	22.5		SM			
□			70.6	29.4		SM			
△			68.7	31.3		SM			

SIEVE inches size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
.375	100.0	100.0	100.0
	GRAIN SIZE		
D_{60}	0.210	0.185	0.177
D_{30}	0.0881	0.0762	
D_{10}			
	COEFFICIENTS		
C_c			
C_u			

SIEVE number size	PERCENT FINER ○	PERCENT FINER □	PERCENT FINER △
#4	100.0	100.0	100.0
#10	99.9	99.9	99.9
#20	92.0	92.6	92.6
#40	69.8	72.0	72.5
#60	63.0	65.7	66.5
#140	38.2	42.7	44.2
#200	22.5	29.4	31.3

SOIL DESCRIPTION

○ Silty sand

□ Silty sand

△ Silty sand

REMARKS:

○ Classification based on granisize only

□ Classification based on grainsize only

△ Classification based on grainsize only

○ Source: Sample No.: COMP-1

□ Source: Sample No.: COMP-2

△ Source: Sample No.: COMP-3

SOIL TECHNOLOGY, INC.

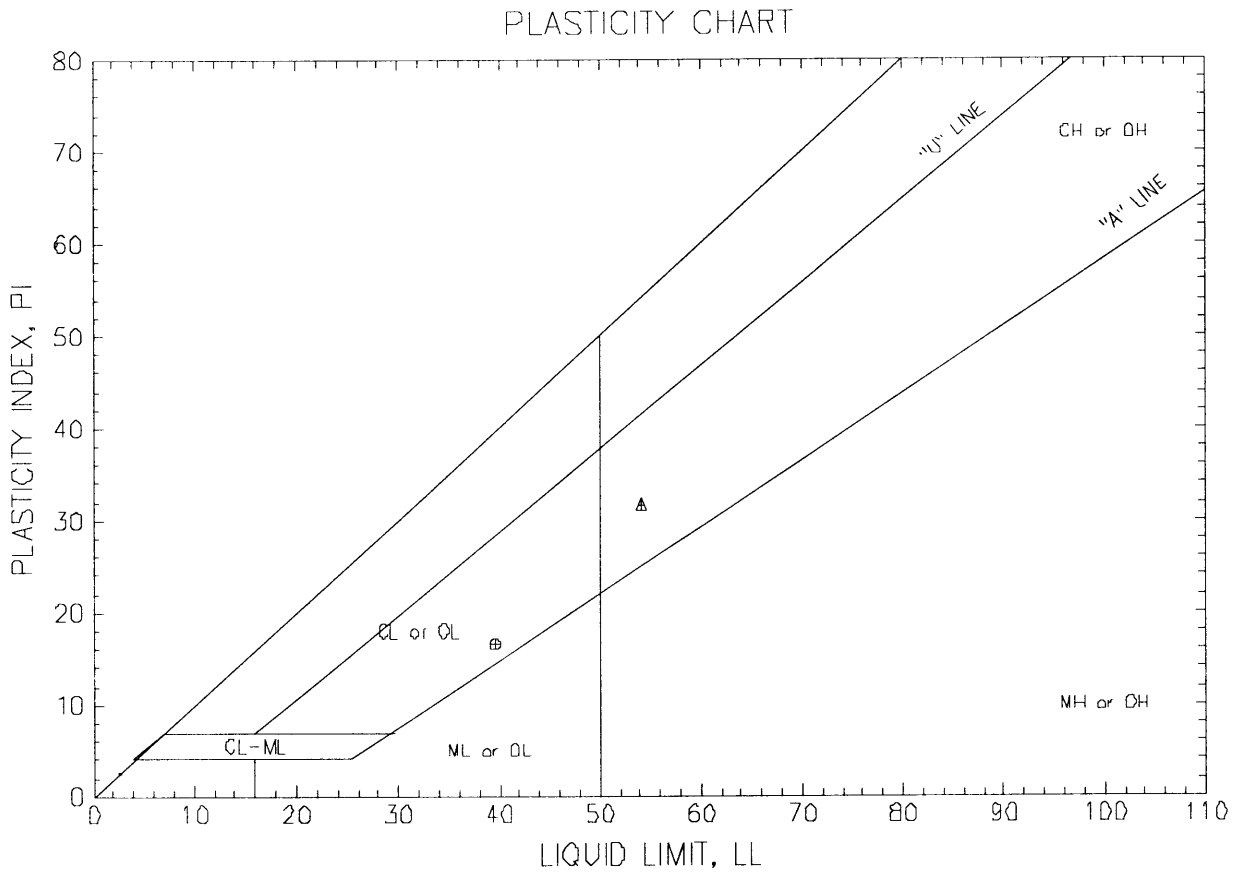
Client: CH2M Hill

Project: Handford IDF

Project No.: J-1502 Plate 3

Soil Technology, Inc
Atterberg Limits
D-4318

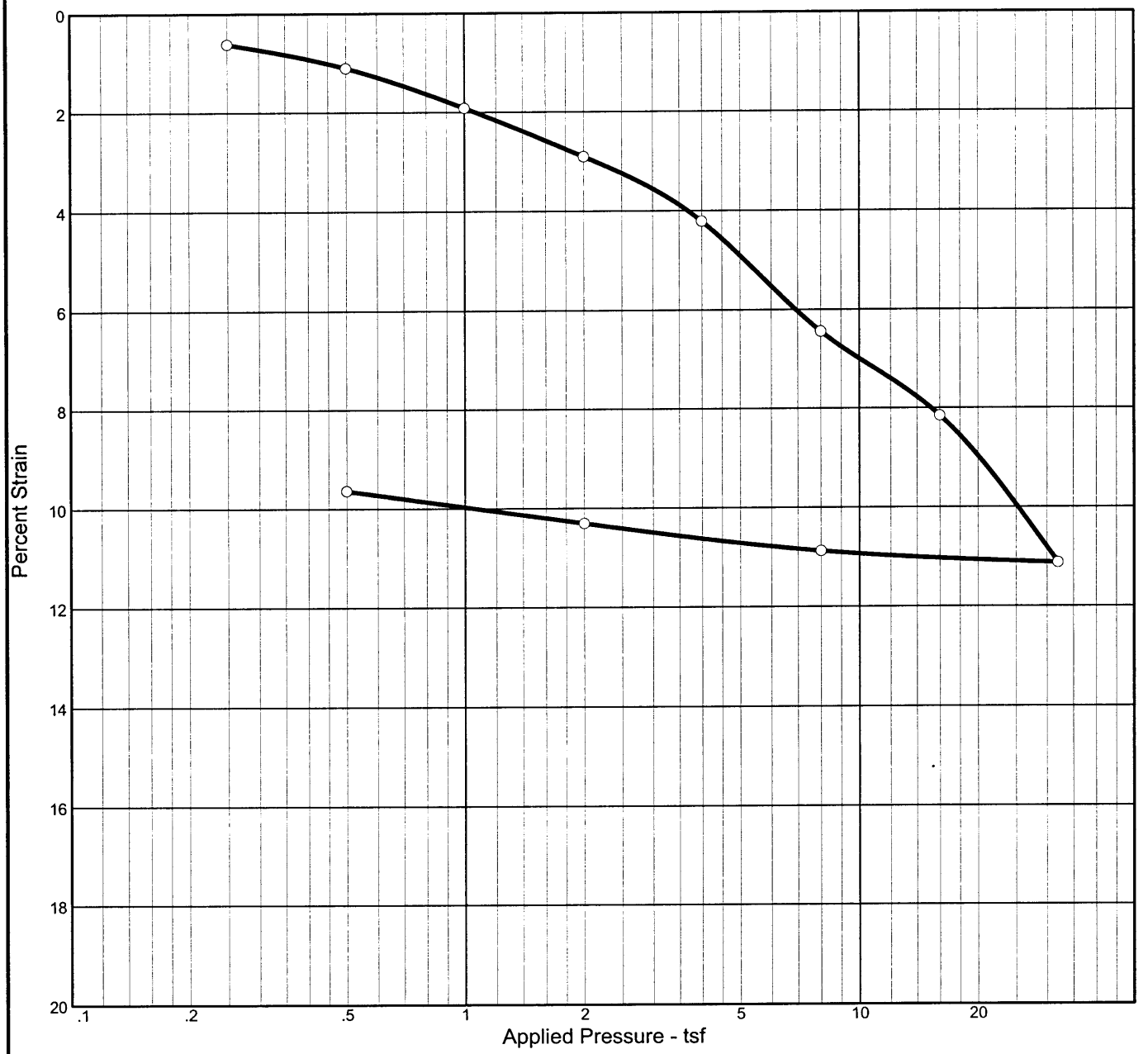
Project : CH2MHILL
Project No. : J-1502
Location :
Date : Thu Feb 13 2003



Symbol	Sample Number	Water Content	Liquid Limit	Plastic Limit	Plasticity Index	Soil Classification
○	COMP-2		40	23	17	(SC) Clayey sand
△	COMP-3		54	22	32	(SC) Clayey sand

Figure 1

CONSOLIDATION TEST REPORT



Natural		Dry Dens. (pcf)	LL	PI	Sp. Gr.	Overburden (tsf)	P_c (tsf)	Initial Void Ratio
Saturation	Moisture							
68.5 %	13.2 %	110.8			2.7		17.13	0.522

MATERIAL DESCRIPTION	USCS	AASHTO

Project No. J-1502 **Client:** CH2M Hill

Project: Handford IDF

Location: Comp-3 12% Bentonite

Remarks:

CONSOLIDATION TEST REPORT

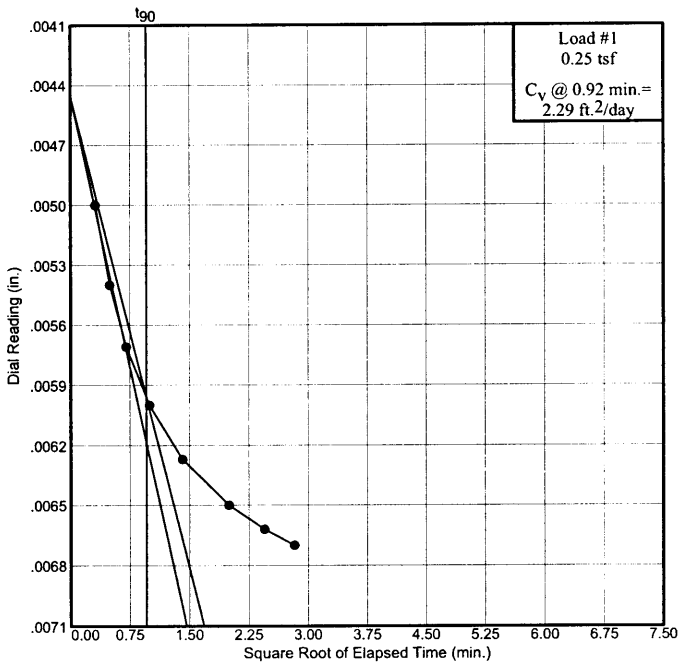
SOIL TECHNOLOGY, INC.

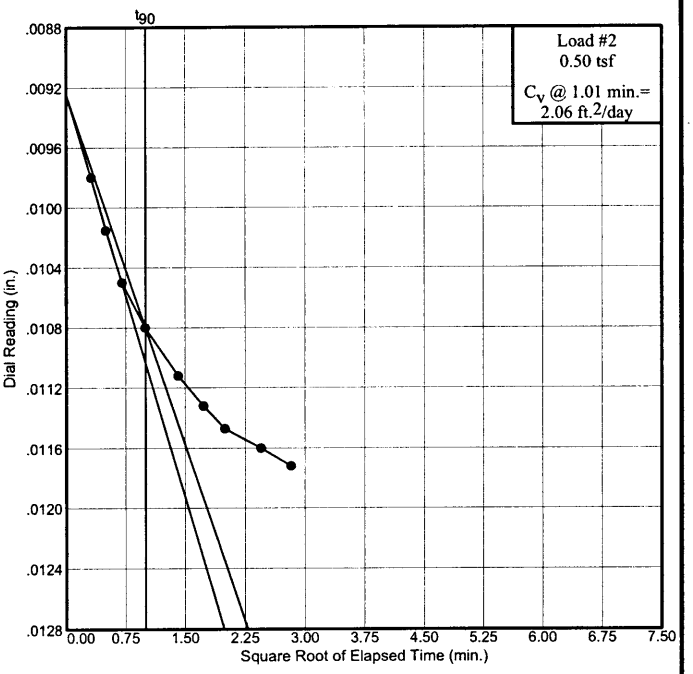
Consol Plot 1

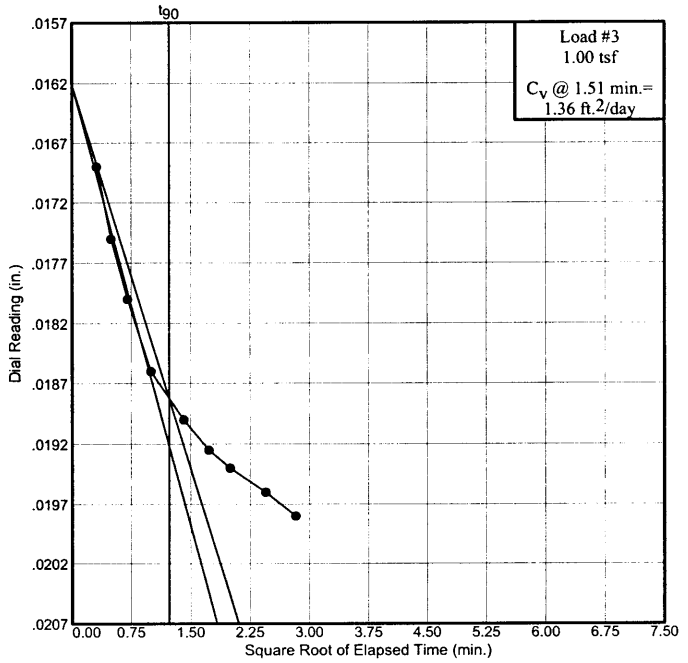
Dial Reading vs. Time

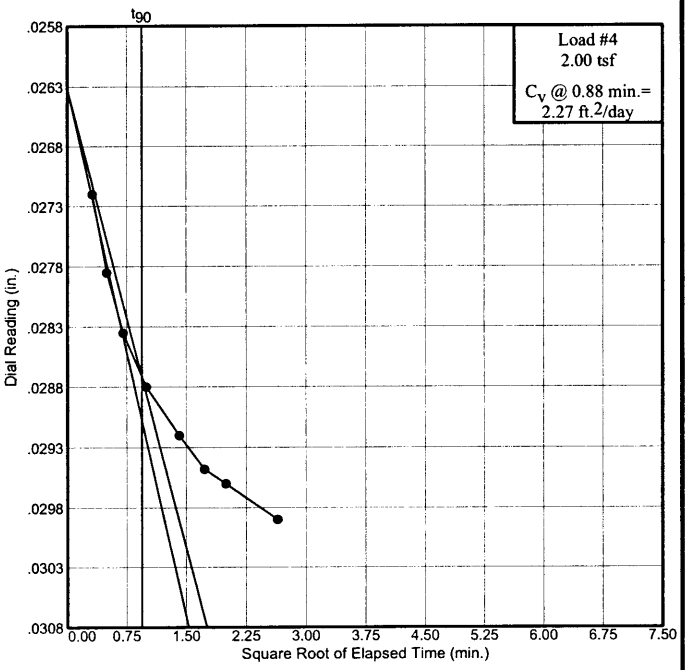
Project No.: J-1502
Project: Handford IDF

Location: Comp-3 12% Bentonite









Dial Reading vs. Time

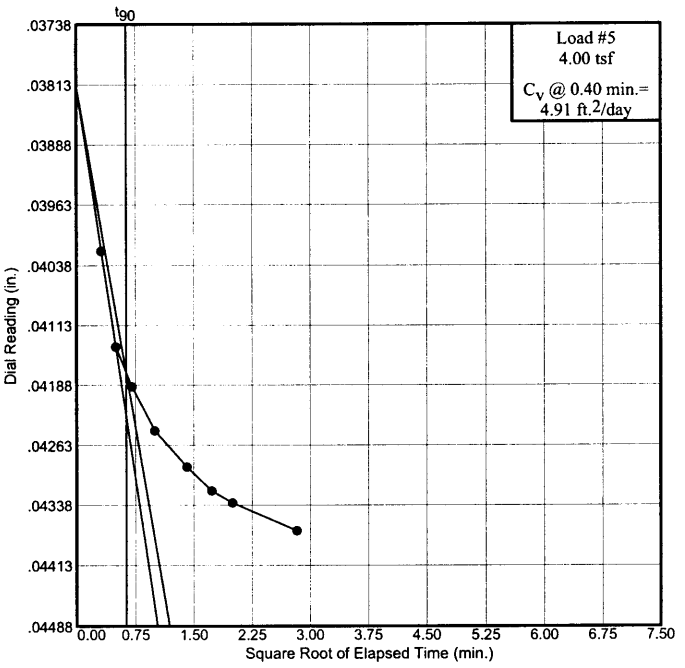
SOIL TECHNOLOGY, INC.

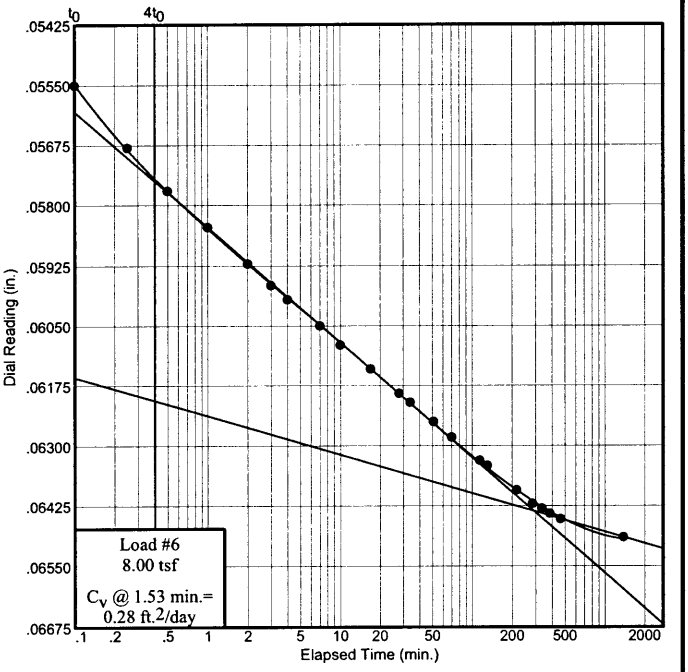
Consol Plot 2

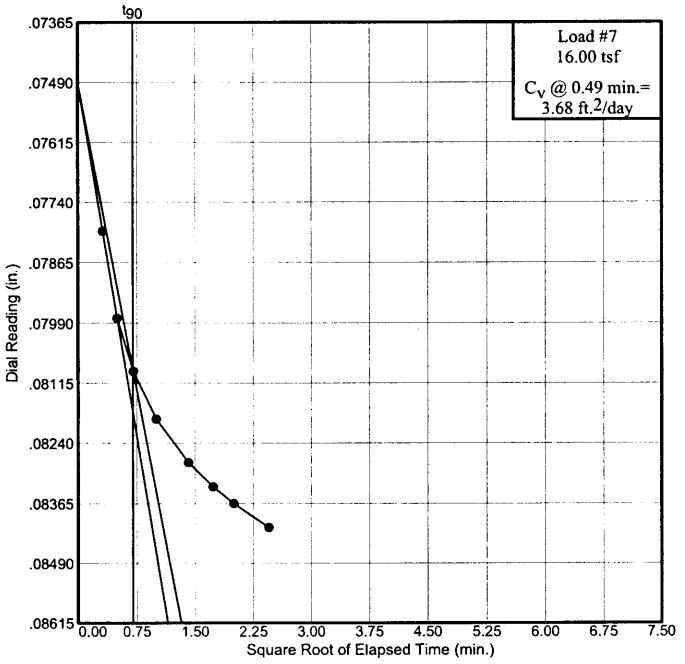
Dial Reading vs. Time

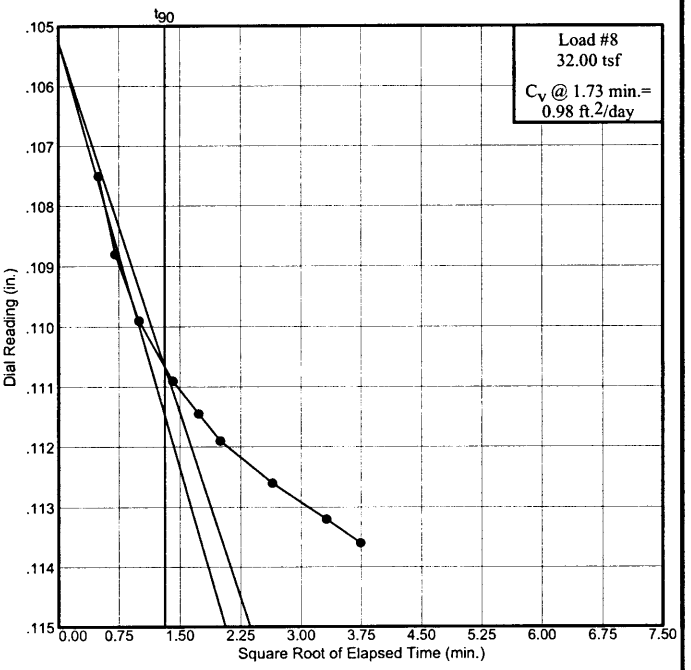
Project No.: J-1502
Project: Handford IDF

Location: Comp-3 12% Bentonite









Dial Reading vs. Time

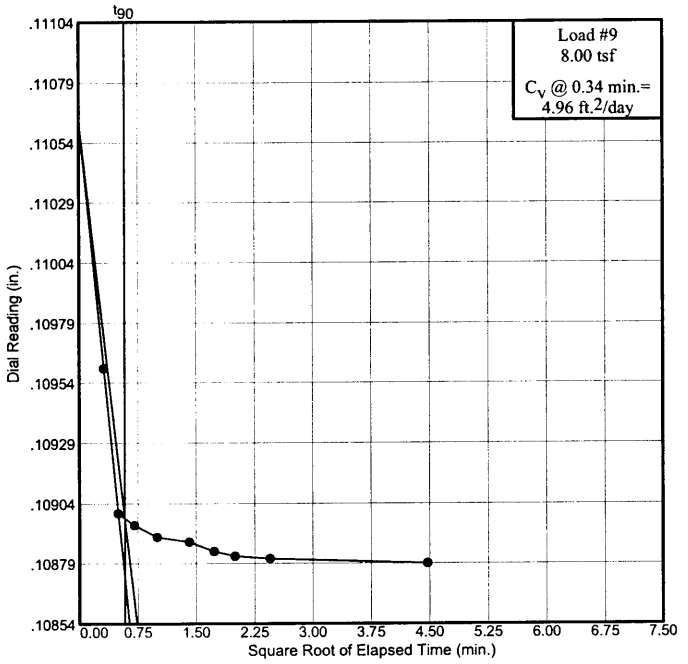
SOIL TECHNOLOGY, INC.

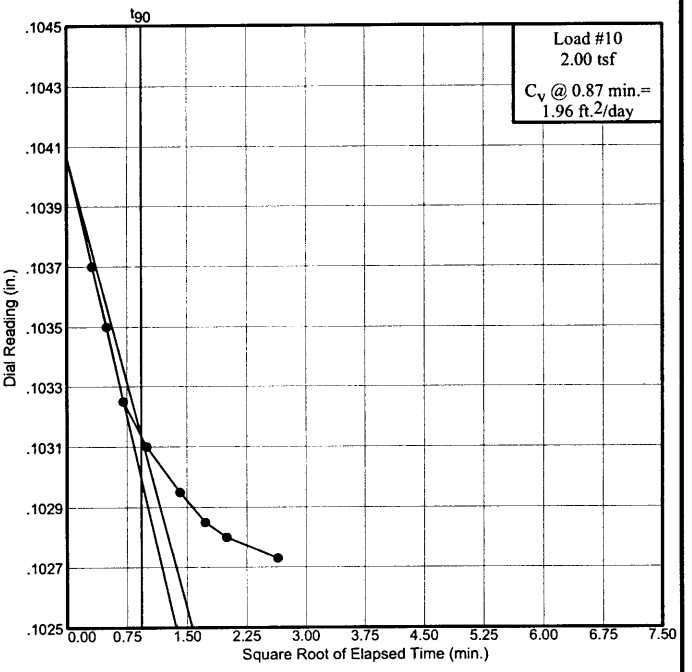
Consol Plot 3

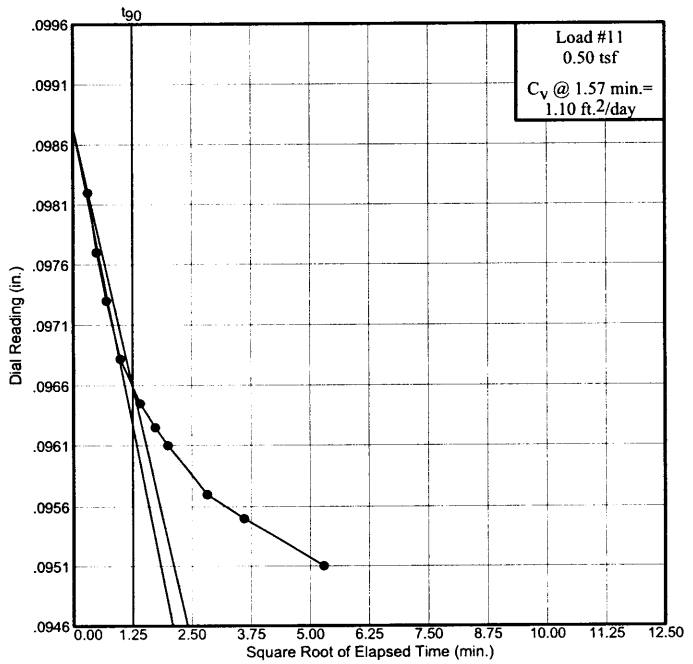
Dial Reading vs. Time

Project No.: J-1502
Project: Handford IDF

Location: Comp-3 12% Bentonite







Dial Reading vs. Time

SOIL TECHNOLOGY, INC.

RPP-18490, Rev. 0

Integrated Disposal Facility (IDF) Detailed Design: Construction Inspection Plan

Prepared for

CH2M HILL Hanford Group

Richland, Washington

April 2004

This report was prepared under the supervision
of a registered professional engineer.

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FIGURES

FIGURE 2-1 CONSTRUCTION INSPECTION PLAN (CIP) ORGANIZATION CHART

ATTACHMENTS

ATTACHMENT 1 IDF CELL 1 CONSTRUCTION QUALITY ASSURANCE PLAN

ATTACHMENT 2 IDF CELL 2 CONSTRUCTION QUALITY ASSURANCE PLAN

ATTACHMENT 3 CQA/CQC TESTING AND INSPECTION LIST

ATTACHMENT 4 TECHNICAL SPECIFICATIONS SUBMITTAL LIST

ATTACHMENT 5 COMPONENT CONSTRUCTION ACCEPTANCE TEST (CAT) PROCEDURES

ATTACHMENT 6 SYSTEM CONSTRUCTION ACCEPTANCE TEST (CAT) PROCEDURES

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Acronyms

CATs	Construction Acceptance Test Procedures (comprised of Component CATs and System CATs)
CIP	Construction Inspection Plan
CM	Construction Manager
CQA	Construction Quality Assurance
CQC	Construction Quality Control
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
FHEU	Fluor Hanford Electrical Utility
FHWU	Fluor Hanford Water Utility
IDF	Integrated Disposal Facility
IQRPE	Independent qualified registered professional engineer
NCR	Non-Conformance Report
NEC	National Electrical Code
ORP	Office of River Protection
PM	Project Manager
QA	Quality Assurance
QC	Quality Control
QCE	Quality Control Engineer
RCRA	Resource Conservation and Recovery Act
SOW	Statement of Work
TFC	Tank Farm Contractor
WAC	Washington Administrative Code

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1 INTRODUCTION

This Construction Inspection Plan (CIP) describes test and inspection activities for constructing the Integrated Disposal Facility (IDF) in the 200 East Area of the Hanford facility in Richland, Washington. The IDF will be constructed in two separate contracts (designated as Schedule A and B), with the following elements:

Schedule A - Site Utilities & Test Pit Excavation

- Extending the existing 13.8KV electrical service power to the IDF project site through installation of a new aerial 13.8 KV electrical power line and pad mounted transformer
- Extending the existing raw water piping system to the IDF Project Site via installation of a new 12-inch raw water piping distribution system and tie-in to the existing 24-inch raw water system
- Excavation of five test pits in varying depths, from 12 to 20 feet

Schedule B - Landfill construction

- Site clearing
- Site excavation
- Subgrade preparation
- Admix soil processing, test pads, and admix liner placement
- Geosynthetics placement
- Leachate collection system construction
- Leachate handling, storage and loading system
- Site power, lighting, and controls
- System instrumentation, controls, and alarms

The CIP describes test and inspections for both Schedules A and B. Schedule A construction will occur prior to Schedule B; Schedule A information included in this CIP is provided for information only.

1.1 Key Terms

Tests and inspections for the IDF will consist of two related but independent processes implemented during construction to verify that the standards of quality identified in the contract documents are met. These processes are construction quality assurance (CQA) and construction quality control (CQC). Definitions of these terms and the identification of parties responsible for each of these processes follow.

Construction Quality Assurance. Refers to a planned system of activities that provide adequate documentation and confidence that a facility is constructed as specified in design and that the materials used in construction are manufactured according to specification. Construction quality assurance generally includes the inspections, verifications, audits, and evaluations of materials and workmanship necessary to determine and document the

quality of the constructed facility. For the IDF, CQA is intended to satisfy the regulatory requirements and guidance established in 40 CFR 264.19, the U.S. Environmental Protection Agency's (EPA) technical guidance document, *Quality Assurance and Quality Control for Waste Containment Facilities* (EPA 1993), and Washington Administrative Code (WAC) 173-303-335. With respect to specific inspection and testing activities, CQA addresses only those activities associated with the soils, geosynthetics, and related liner and leachate collection system piping components for the IDF. CQA is provided by a party who is independent from the Owner (DOE-ORP) any product manufacturer, and the construction general contractor.

Construction Quality Control. Refers to a planned system of actions taken by manufacturers, fabricators, or the construction general contractor to monitor and control the quality of products and work to meet the requirements of the contract documents. Construction quality control includes inspections and testing to directly monitor the quality of all furnished, constructed, and installed components. CQC activities are the responsibility of the construction general contractor. The construction general contractor is required to submit implementing procedures for the CQC program as specified in Section 01400 of the Statement of Work (SOW). Special inspections required by code, such as building or electrical inspections, are part of the CQC program. They are independent of CQA activities.

1.2 Plan Organization

The purpose of the CIP is to identify tests and inspections that will be used by the Tank Farm contractor to guide CQC and CQA activities during construction and to obtain documented confirmation that standards of quality required by the contract documents (RPP-18489 and RPP-19941) are met. This CIP is intended to be implemented by both the CQA certifying engineer and the construction general contractor, with guidance from the IDF construction manager (CM).

The CIP elements are divided into the following separate attachments to provide a clear distinction between the CQA and CQC activities. The attachments provide detailed information regarding the CQA and CQC activities for IDF construction. Section 3 provides a detailed discussion of each of these attachments.

Attachment 1 **IDF Cell 1 Construction Quality Assurance Plan**

Attachment 2 **IDF Cell 2 Construction Quality Assurance Plan**

Attachment 3 **CQA/CQC Testing and Inspection List**

Attachment 4 **Technical Specifications Submittal List**

Attachment 5 **Component Construction Acceptance Test (CAT) Procedures**

Attachment 6 **System Construction Acceptance Test (CAT) Procedures**

2 PROJECT ORGANIZATION

There are numerous organizations that are a part of the CIP implementation. This section describes the anticipated project organization for the IDF construction activities. The following subsections address the organizations involved in the construction, their respective roles in construction activities, and the methods of interactions between organizations.

2.1 Responsibility and Authority

The CIP organization chart for the IDF construction is shown in Figure 2-1. These personnel will be associated with two main entities that include the Tank Farm contractor and its agents (including CQA personnel) and the construction general contractor and its personnel and/or subcontractors. The project team consists of both full-time field personnel and part-time management personnel. The part-time management personnel will be onsite periodically during the IDF construction to monitor progress, attend meetings, resolve disputes, and ensure that the work is implemented in accordance with the construction drawings, technical specifications, CIP, and the RCRA permit. The field personnel will consist of the key personnel onsite during construction. The responsibilities and reporting requirements for each project team member are described in the following sections.

2.1.1 Project Team

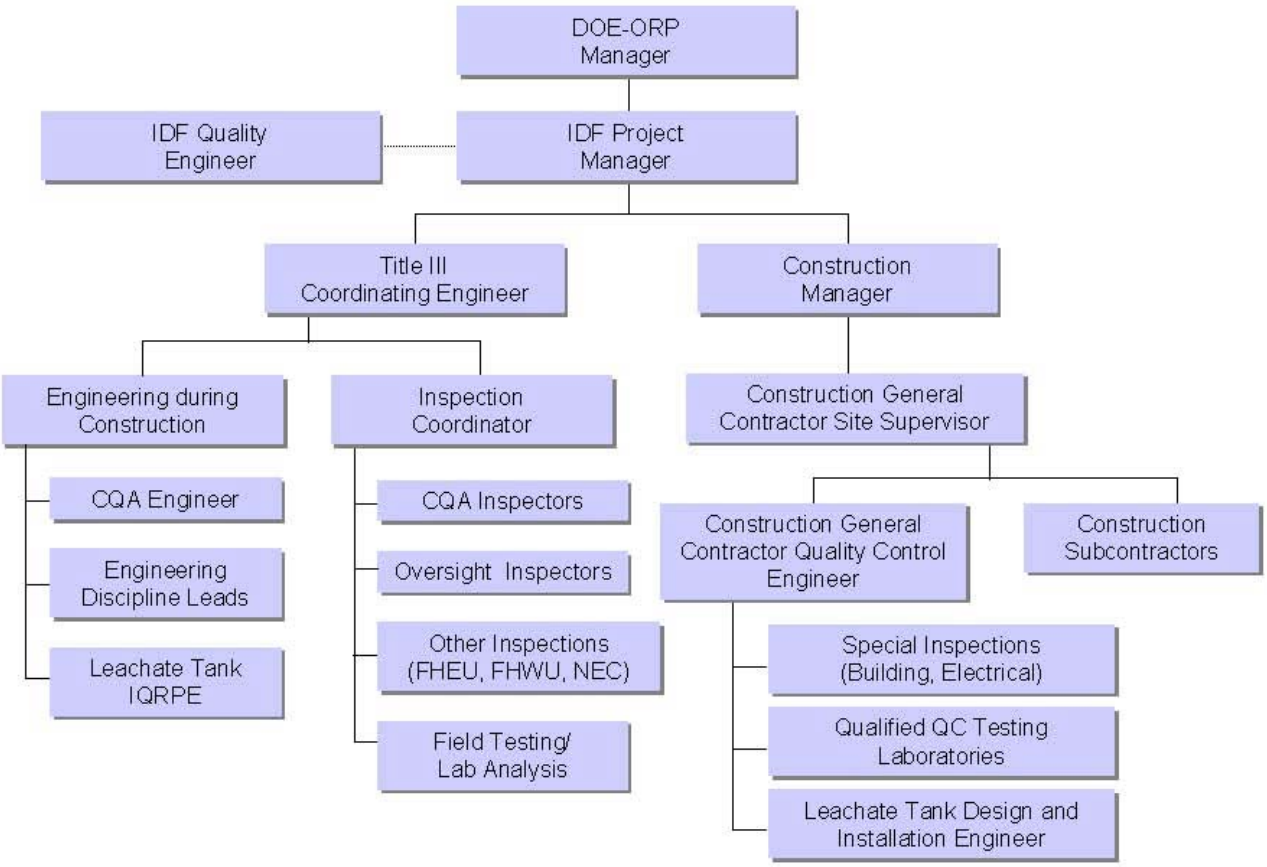
IDF Project Manager (PM)

The IDF PM is an employee or agent of the Tank Farm contractor, has overall responsibility for the IDF construction, and interfaces with the DOE-ORP manager. The IDF PM directs the activities of the IDF project and field team staff, including the CM, design engineer, and the project engineer. Additionally, the IDF PM has overall responsibility for the achievement of quality. Functionally, the IDF PM reviews and approves quality assurance reports submitted by the IDF CQA certifying engineer.

IDF Quality Engineer

The IDF quality engineer is an employee or agent of the Tank Farm contractor and is independent from line management on the project. The IDF quality engineer provides overview and assessment of QA on the project. The IDF quality engineer provides feedback and assessment results to the IDF PM.

FIGURE 2-1
CIP Organization Chart



2.1.2 Field Team

IDF Construction Manager (CM)

The IDF CM is an employee or agent of the Tank Farm contractor and serves as the point of contact between the IDF construction general contractor and the IDF project team. All construction general contractor correspondence and direction flows through the IDF CM. The IDF CM oversees the daily construction field activities and is the onsite representative for the IDF PM. The IDF CM is responsible for arranging inspections provided by the Tank Farm contractor.

Construction General Contractor

The IDF construction general contractor is responsible for implementing the approved design by providing the necessary labor, equipment, materials, and all other resources necessary to construct the IDF. The construction general contractor is responsible for submitting a CQC implementation plan for review and approval by the IDF PM, as specified in Section 01400 of the SOW.

Construction General Contractor Site Supervisor

The site supervisor is an employee or agent of the construction general contractor and is responsible for implementing the IDF construction activities. The site supervisor has overall responsibility for all construction activities related to the IDF, controls day-to-day construction tasks, and is the point of contact for construction general contractor field personnel. The site supervisor ensures that the work is progressing in accordance with approved construction contract documents and the approved schedule.

Construction Subcontractors

Construction subcontractors include specialty companies, retained by the IDF construction general contractor, to perform specific work activities at the IDF such as earth moving, geosynthetic lining installation, piping, and building/tank installation. The construction subcontractors report directly to the construction general contractor site supervisor.

Construction General Contractor Quality Control Engineer

The construction general contractor provides a construction QC engineer (QCE) who supports the site supervisor. The primary responsibility of the construction QCE is to ensure that the work is performed in accordance with the technical specifications and construction drawings. Specific duties of the construction QCE include activities such as preparing construction submittals, field documentation, and interfacing with the CQA certifying engineer, special inspectors, and the IDF CM for other inspections provided or arranged by the Tank Farm contractor.

Special Inspectors

The construction general contractor shall provide for special inspectors, as specified in the contract documents. Special inspectors provide inspection for elements of construction involving codes (i.e., concrete, structural, and electrical inspections). The IDF Detailed Design Technical Specifications and Attachment 3 indicate the construction elements for which these special inspections are required.

Leachate Tank Design and Construction Engineer

The leachate tank subcontractor is required to certify the design and construction of the leachate tanks. The design must be certified by a registered professional engineer (RPE) that the tank design will function as intended. The construction of the tank must be certified by the RPE or the installation inspector that the construction is in accordance with the design.

Title III Coordinating Engineer

The Title III coordinating engineer is an employee or agent of the Tank Farm contractor and is responsible for the execution, documentation, and coordination of CQA and CQC activities for the construction of the IDF as well as coordination of engineering support from the IDF design team. The Title III coordinating engineer reports directly to the IDF PM. Both the CQA certifying engineer and the inspection coordinator will report to the Title III coordinating engineer.

Inspection Coordinator

The inspection coordinator is an employee of the Tank Farm contractor and is responsible for overseeing the inspectors who perform CQA observation and verification activities, and who witness and verify the CQC testing and inspections by the construction general contractor. The inspection coordinator reports to the Title III coordinating engineer. The inspection coordinator also can witness and/or verify testing and observations in accordance with this CIP. The inspection coordinator is responsible for overseeing inspections provided by the Tank Farm contractor and other inspections (as described below).

CQA Inspectors

The CQA inspectors are employees or agents of the Tank Farm contractor and report to the inspection coordinator. The CQA inspector's function is to perform testing and observation, in accordance with the CQA plan, and under the direction of the inspection coordinator and the CQA certifying engineer.

Oversight Inspectors

The oversight inspectors are employees of the Tank Farm contractor and report to the inspection coordinator. The oversight inspectors' function is to witness and/or verify the construction general contractor's CQC testing and inspection, in accordance with this CIP.

Other Inspectors

Specific construction activities require inspections by other parties that will be coordinated by the IDF CM through the inspection coordinator. Parties that will perform other inspections include Fluor Hanford Electrical Utility (FHEU) and Water Utility (FHWU). The

construction general contractor is responsible for coordinating FHEU/FHWU required tests and inspections with the IDF CM. The IDF CM will contact the inspection coordinator for performance of the inspections. FHEU will perform tests and inspections on pad-mounted transformers and high voltage cables (above 600 volts). FHWU will witness leakage testing on the 24-inch raw water piping tie-in.

An NEC inspector will perform NEC-required inspections on electrical equipment and components. The Tank Farm contractor will coordinate the services of the NEC inspector.

The IDF Detailed Design Technical Specifications and Attachment 3 indicate the construction elements for which other inspections are required and the parties responsible for providing these inspections.

Engineering During Construction

Engineering during construction will be staffed by employees or agents of the Tank Farm contractor who prepared the original IDF design, and will provide engineering support to construction activities including such tasks as submittal reviews, responding to contractor requests for information, preparing design changes and documentation, assisting in construction acceptance test evaluations, and other tasks as requested by the Title III coordinating engineer.

CQA Certifying Engineer

The CQA certifying engineer is an employee or agent of the Tank Farm contractor and has the overall responsibility of implementing the CQA plans for Cell 1 (Attachment 1) and Cell 2 (Attachment 2). The CQA certifying engineer directly supervises the CQA monitor, field inspection team, and laboratory technicians, for whom detailed descriptions are provided in Attachments 1 and 2.

Functionally, the CQA certifying engineer submits certified CQA reports to the Title III coordinating engineer for review and approval by the IDF PM. The CQA certifying engineer is a Washington State registered professional engineer, and he has the authority to provide a certification letter that the IDF is constructed in accordance with the approved CQA plans (Attachments 1 and 2), the approved drawings and specifications, and any approved changes. The CQA certifying engineer also has the authority and responsibility to stop work and recommend remedial actions to the IDF PM.

Leachate Tank IQRPE

The leachate tank independent qualified registered professional engineer (IQRPE) is responsible for attesting that the leachate tank system was designed and constructed for its intended use, and that it has sufficient structural integrity and is acceptable for the storing of dangerous waste. The leachate tank IQRPE is an employee or agent of the Tank Farm contractor who will interface with, and review work performed and developed by the construction general contractor's leachate tank design and installation certifying engineer. The leachate tank IQRPE reports to the Title III coordinating engineer.

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3 INSPECTION PLAN ELEMENTS

This section provides a description of the key elements of the CIP, describes CQA and CQC activities that will take place, and describes processes that will be used during construction. CQA and CQC activities associated with the IDF construction are detailed in Attachments 1 through 6. These attachments are:

Attachment 1	**IDF Cell 1 Construction Quality Assurance Plan**
Attachment 2	**IDF Cell 2 Construction Quality Assurance Plan**
Attachment 3	**CQC/CQA Testing and Inspection List**
Attachment 4	**Technical Specifications Submittal List**
Attachment 5	**Component Construction Acceptance Test (CAT) Procedures**
Attachment 6	**System Construction Acceptance Test (CAT) Procedures**

3.1 CQA Plans (Attachments 1 and 2)

Attachments 1 and 2 are the detailed CQA plans for IDF Cell 1 and Cell 2 construction. CQA activities detailed in the CQA plans are the responsibility of the CQA certifying engineer. The CQA plans address only those activities associated with the soils, geosynthetics, and related liner and leachate collection system piping components for the IDF. All CQA activities are associated with Schedule B construction work only.

Cell 1 and Cell 2 CQA plans are very similar, as both cells will have a RCRA C-compliant liner system. The only distinction between the two cells is that the waste placed in the IDF will be segregated into a RCRA-permitted side (Cell 1) and a non-RCRA-permitted side (Cell 2). With respect to the CQA plans, the distinction between Cell 1 and Cell 2 is that test pads for the admix liner will not be constructed and thus not inspected for Cell 2. The CQA certifying engineer will verify that the same or equivalent placement and compaction methods determined from Cell 1 construction test pads are applied to Cell 2 admix liner construction.

3.2 CQC/CQA Testing and Inspections List (Attachment 3)

Attachment 3 summarizes in tabular form the various CQC/CQA responsibilities for testing and inspections during IDF construction. Attachment 3 provides a detailed list of the tests and inspections required in the technical specifications to be performed by CQA personnel, the construction general contractor QC personnel (including special inspections), and the CQC compliance oversight organization including other inspections (i.e., FHEU, FHWU, NEC) coordinated by the IDF CM. Each test and inspection in Attachment 3 is listed by specification section number for ease of reference to the technical specifications. Specific standards for tests cited are provided in the technical specifications. Any reference to standards of any society, institute, association, or governmental agency will pertain to the edition in effect as of the date of this CIP, unless stated otherwise.

Attachment 3 is intended to provide a comprehensive list of all testing and inspection requirements for CQA and CQC personnel during IDF construction. Additional detail for CQA tests and inspection is provided in the CQA plans (Attachments 1 and 2).

The CQA plans do not address tests and inspections for the leachate management system, electrical, instrumentation and control (I&C), and site utilities construction. The primary purpose of Attachment 3 is to provide test and inspection guidance for the construction elements not applicable to the CQA plans.

Attachment 3 identifies each required test and inspection associated with the Schedule A and B construction contracts for the IDF. Schedule A construction will be completed prior to implementation of Schedule B, thus Schedule A tests and inspections are provided for information only. In addition, the list identifies the party responsible for performing each test or inspection, as well as the party responsible for witness or verification of the tests.

In general, the CQA certifying engineer or the construction general contractor has primary responsibility for performing tests and inspections. The CQC compliance oversight organization will witness and/or verify compliance of the tests and inspections. Details on test requirements, standards, and procedures are provided in the technical specifications. Articles titled "Construction Quality Assurance" in the technical specifications are intended for the CQA certifying engineer. Articles titled "Construction Quality Control" indicate inspections, testing, and documentation required by the construction general contractor QC personnel.

With respect to CQC compliance oversight, Section 01400 (Quality Assurance) describes the approach to witnessing tests and inspections by QC personnel for the construction general contractor. Attachment 3 provides a list of tests and inspections for which compliance oversight is required. Attachment 3 also provides the type of verification point for each required test/inspection.

Verification points for compliance oversight inspections are defined as follows:

- Hold (H): Construction inspection requires 24-hour notification for witnessing specific construction features before further construction is allowed to proceed.
- Witness (W): Inspection will be at the option of the compliance oversight organization (CQA or CQC). Work may proceed upon verbal release by the IDF CM or one hour after scheduled time of witnessing. The CQA certifying engineer (for CQA inspections) and the CQC inspection coordinator (for CQC inspections) will be notified eight hours prior to requiring inspection.
- Receiving (R): Receiving inspection requires 24-hour notification for special items of fabrication, equipment, or material scheduled to be delivered to the site or other designated location. Work may proceed upon verbal release by the CQA certifying engineer (for CQA inspections) and the CQC inspection coordinator (for CQC inspections) or completion of receipt inspection at the option of the compliance oversight engineer. Procedures for receipt inspection are provided in Section 3.2.1.

"Hold" or verification points for CQA inspections and testing also are provided in the CQA plans.

3.2.1 Receipt Inspection Procedures

The purpose of this section is to provide a general summary of the minimum requirements and procedures for receiving and controlling purchased materials, equipment, or services as required by the contract documents.

Procurement, receipt, and inspection of construction materials and equipment is the responsibility of the construction general contractor, with verification by the CQA certifying engineer and the CQC compliance oversight organization. Procedures specific to the IDF construction project will be prepared as part of the CQC implementation plan, to be submitted by the construction general contractor.

Procedures to control receipt inspection will include the following, at a minimum:

- Attachment 3 identifies the materials, equipment, or services requiring receipt inspection. Upon delivery to the project site, the general construction contractor will attach secure and visible "Quality Hold for Inspection" tags to each item.
- All items, materials, and equipment that have been tagged will be stored in segregated areas, as identified in the contract documents. Items will be restricted from further use until all construction general contractor, CQA certifying engineer, and CQC compliance oversight inspections are completed.
- Upon inspection if items, materials, or equipment held for inspection, the "Quality Hold for Inspection" tag will be removed and replaced with one of the following, as appropriate:

  a) Acceptance tag
  b) Non-conformance (red) tag
  c) Conditional use tag

- The construction general contractor may utilize only those items tagged as "Accepted" or "Conditional Use."
- Red tagged materials will not be used in construction and will be moved to a segregated area or removed from the site.
- Conditional use tagged materials will be restricted to use for specific conditions identified on the tag.
- Documentation of receipt inspection will be completed, maintained, and stored in a single location, in a secure and protected environment for the full performance period of the construction contract.

3.3 Submittals (Attachment 4)

Detailed procedures for submittals are provided in Section 01300 (Submittals) in the Division 1 General Requirements specifications in the Statement of Work (SOW) for the IDF project.

Attachment 4 provides a table summary of the submittals required for the project, based on the technical specifications (Division 2 through Division 16). It assigns submittals to three categories:

1. Approval Required (AR)
2. Approval Not Required – Information Record (IR)
3. Approval Not Required – Vendor Information (VI).

The construction general contractor will provide the submittals required (listed in Attachment 4) to the IDF PM. Submittals will be provided far enough in advance of scheduled installation dates to allow time for reviews, possible revisions and resubmittals, placing orders, and securing delivery. The construction general contractor will identify, track, and disposition all required vendor data. The IDF PM will respond to each required submittal as stated in the technical specifications.

A master submittal list will be provided as part of the contract documents.

3.4 Construction Acceptance Tests (Attachments 5 and 6)

CQC testing will be performed in coordination with construction acceptance tests (CATs). CATs will be performed by the construction general contractor, under the direction of the compliance oversight organization. The component CATs are intended to provide specific methods to complete a function test on a piece of equipment that is identified in the IDF technical specifications as a CQC test.

Onsite CQC testing is required for each major piping/pump system, instrumentation and control system, and electrical system, as detailed in the technical specifications. CQC tests will be performed to demonstrate that each function is implemented and operational. These tests are perquisites to be performed in advance of facility-wide system CATs. System CATs are then performed to demonstrate proper component hookup and overall system functionality. System CATs are anticipated to be performed in advance of operational readiness testing, to be performed by the future facility operating contractor.

Component CAT procedures are included in Attachment 5. System CAT procedures will be included as Attachment 6.

3.5 Documentation and Reporting

A major function of CQA and CQC inspections is to properly and adequately document and certify the work. This section describes the minimum required documentation. The CQA certifying engineer and compliance oversight engineer may recommend to the IDF CM additional documentation for performing CQA tasks and witnessing CQC tests that are for certification. In addition, the compliance oversight organization, including the CQA certifying engineer, will prepare forms, field data sheets, sample labeling schemes, and chain-of-custody procedures, and submit them to the IDF CM and IDF PM for approval prior to construction.

3.5.1 Inspection Data Sheets

All observed field and laboratory test data will be recorded on an inspection data sheet. At a minimum, each inspection data sheet will include the following information:

- Unique identifying sheet number for cross-referencing and document control
- Description of the inspection activity
- If appropriate, location of inspection activity or location from which the sample was obtained
- Type of inspection activity and/or procedure used (reference to standard method, when appropriate)
- Any recorded observation or test data, with all necessary calculations
- Results of the inspection activity and comparison with specification requirements
- Identification of any personnel involved in the inspection activity
- Signature of the individual(s) performing the compliance oversight activity (either CQA or CQC related)
- Identification of deficiencies and any required reinspections

Forms used for the data sheets will be prepared and submitted to the IDF CM and IDF PM, in accordance with this section. The data sheets will include, but are not limited to, the forms listed below:

- Sample log
- Compaction test result log
- Soil test result summary form
- Equipment calibration log
- Geomembrane Panel Placement and Seaming Log
- Geomembrane Destructive Seam Sampling and Testing Log
- Geosynthetics Material (Roll) Inventory Log
- Piping - Hydrostatic Leak Testing Documentation Form
- Concrete Testing Documentation Form
- Coating Thickness/Adhesion Documentation Form
- Pump(s) Functional Test Documentation Form
- High-Strength Bolt Testing Documentation Form
- Process Instrumentation and Control Systems Operational Readiness and Performance Acceptance Test Forms
- Electrical Testing - Equipment and Materials Inspection Form
- Electrical Testing - Individual Device Test Form
- Electrical Testing - System Test Form

3.5.2 Non-Conformance Reporting

Deficiencies/defects identified by in-process testing may be reworked in accordance with the technical specifications or CQA plans to correct the deficiency without initiating the NCR process (i.e., failed compaction test or failed geomembrane destructive test), and in-

process tests will be tracked by the CQA representative or CQC field inspector until corrected. A non-conformance is considered to be a deficiency in characteristics, documentation, or procedures that renders the quality of an item or activity unacceptable or indeterminate. All deficiencies, defects, damage, or test failures that are not corrected by in-process rework will be considered a non-conformance and will be documented on a Non-Conformance Report (NCR) form. The non-conformance will be referred to the IDF CM, for disposition and initiation of corrective action processes.

All NCR situations will be brought to the attention of the IDF CM for concurrence, prior to initiating the NCR. Upon issuance of the non-conformance report, the IDF CM will notify the IDF design engineer, IDF quality engineer, and IDF PM that the report has issued. Other individuals, as directed by the IDF PM, will participate in NCR disposition, resolution, and corrective action processes, as needed. All documentation relating to NCR situations will be retained in the project quality records.

Specific requirements for non-conformance (deficiency) reporting are provided in Section 01400 (Quality Assurance) of the SOW.

3.5.3 Final Documentation and Certification

All daily inspection summary reports, inspection sheets, problem identification and corrective measures reports, acceptance reports, change orders, NCRs, photographic records, progress reports, construction drawings, construction drawing revisions, and other pertinent documentation will be retained as permanent project quality records.

Requirements for certification by the CQA certifying engineer is provided in the CQA plans.

Documentation and records for CQC testing by the construction general contractor will be submitted to the IDF CM as specified in the contract documents.

3.5.4 Storage of Records

During the construction of the IDF, the compliance oversight engineer (through the CQA certifying engineer and the CQC inspection coordinator) and construction general contractor will be responsible for all CIP documentation. At the completion of the project, all completed project quality records will be routed to the IDF CM, as specified in Section 01720 of the SOW.

4 REFERENCES

40 CFR 264.19. *Code of Federal Regulations*, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, Section 19, "Construction Quality Assurance Program." Office of the Federal Register. July 9, 1999.

CH2M HILL. *IDF Detailed Design: Technical Specification – Final Design Submittal.* RPP-18489, Rev. 0. Prepared for CH2M HILL Hanford Group. February 2004.

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U.S. Environmental Protection Agency, Office of Research and Development. *Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities*, EPA/600/R-93-182. Cincinnati, Ohio. 1993.

Washington Administrative Code (WAC) 173-303-335.

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Integrated Disposal Facility (IDF) Detailed Design Cell 1 Construction Quality Assurance Plan

Prepared for

CH2M HILL Hanford Group

Richland, Washington

April 2004

This report was prepared under the supervision
of a registered professional engineer.

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Acronyms

ASTM	American Society for Testing and Materials
CDN	Composite drainage net
CM	Construction Manager
CQA	Construction Quality Assurance
CQC	Construction Quality Control
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
GCL	Geosynthetic clay liner
GRI	Geosynthetic Research Institute
IDF	Integrated Disposal Facility
LCRS	Leachate collection and removal system
LDS	Leak detection system
NCR	Non-Conformance Report
ORP	Office of River Protection
OSHA	Occupational Safety and Health Administration
PM	Project Manager
QA	Quality assurance
QC	Quality control
RFI	Request for Information
SBL	Soil bentonite admix liner
SLDS	Secondary leak detection system
UCL	Upper control limit
WAC	Washington Administrative Code

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SECTION I–GENERAL

1.1 INTRODUCTION

This Construction Quality Assurance (CQA) Plan describes the quality assurance (QA) activities for constructing Phase I of the Integrated Disposal Facility (IDF) at the Hanford facility in Richland, Washington.

1.1.1 Applicable Units

QA activities will be required during construction of Cell 1 of Phase I to certify that the following construction activities are performed in accordance with the construction documents:

- Construction/preparation of foundation systems for liners
- Construction of dikes or embankments
- Construction of low-permeability soil liners
- Construction of geomembranes
- Construction of leachate collection and removal systems and leak detection systems

This CQA Plan has been prepared to describe the activities that will be performed during construction of the lining system, leachate collection and leak detection systems, and operation layer of Cell 1. This CQA Plan is intended to satisfy the regulatory requirements and guidance established in 40 CFR 264.19, the U.S. Environmental Protection Agency's (EPA) technical guidance document, *Quality Assurance and Quality Control for Waste Containment Facilities* (EPA 1993), and Washington Administrative Code (WAC) 173-303-335.

This CQA Plan will be implemented by a CQA Officer (herein referred to as the CQA certifying engineer), a person familiar with EPA's technical guidance document, *Quality Assurance and Quality Control for Waste Containment Facilities* and this CQA Plan. The CQA certifying engineer will be supported by the number of CQA representatives necessary to implement the requirements in this CQA Plan and to document the work.

1.1.2 Scope

This CQA Plan establishes general administrative and documentation procedures that will be applicable for selected activities of construction. With respect to responsibilities, personnel qualifications, and specific inspection and testing activities, this CQA Plan addresses only those activities associated with the soils, geosynthetics, and related liner and leachate collection system piping components for the IDF.

The CQA requirements are divided into the following sections to provide quick access to CQA requirements for individual liner components:

- Soils CQA
- Geosynthetic Clay Liner CQA
- Geomembrane CQA
- Geotextile CQA
- Composite Drainage Net CQA
- Polyethylene Pipe and Fittings CQA
- CQA Documentation and Certification
- CQA Documentation and Certification

1.2 PROJECT ORGANIZATION

This section describes the anticipated project organization for the IDF construction activities. The following subsections address the organizations involved in the construction, their respective roles in construction activities, and the methods of interactions between organizations.

1.2.1 Responsibility and Authority

The organization chart for the IDF construction is shown in Figure 1-1. These personnel will be associated with two main entities that include the Tank Farm operating contractor and his agents and the construction general contractor and his personnel and/or subcontractors. The project team consists of both full-time field personnel and part-time management personnel. The part-time management personnel will be onsite during the IDF construction periodically to monitor progress, attend meetings, resolve disputes, and ensure that the work is implemented in accordance with the construction drawings, technical specifications, CQA Plan, and the RCRA permit. The field personnel will consist of the key personnel onsite during construction. The solid lines on the organization chart represent project responsibilities such as scope, cost, and schedule. The dashed lines represent the functional responsibilities of staff for QA, design, and management. The responsibilities and reporting requirements for each project team member are described in the following sections.

1.2.1.1 Project Team

When the individuals identified below are designated to perform specific functions described in this CQA Plan, the reference to these individuals includes their designee or an alternate who can function on their behalf. The Department of Energy – Office of River Protection (DOE-ORP) Manager is the owner's representative and is responsible for project funding and overall project scope. The DOE-ORP manager and IDF project manager keep the regulatory agencies informed of IDF construction activities and progress.

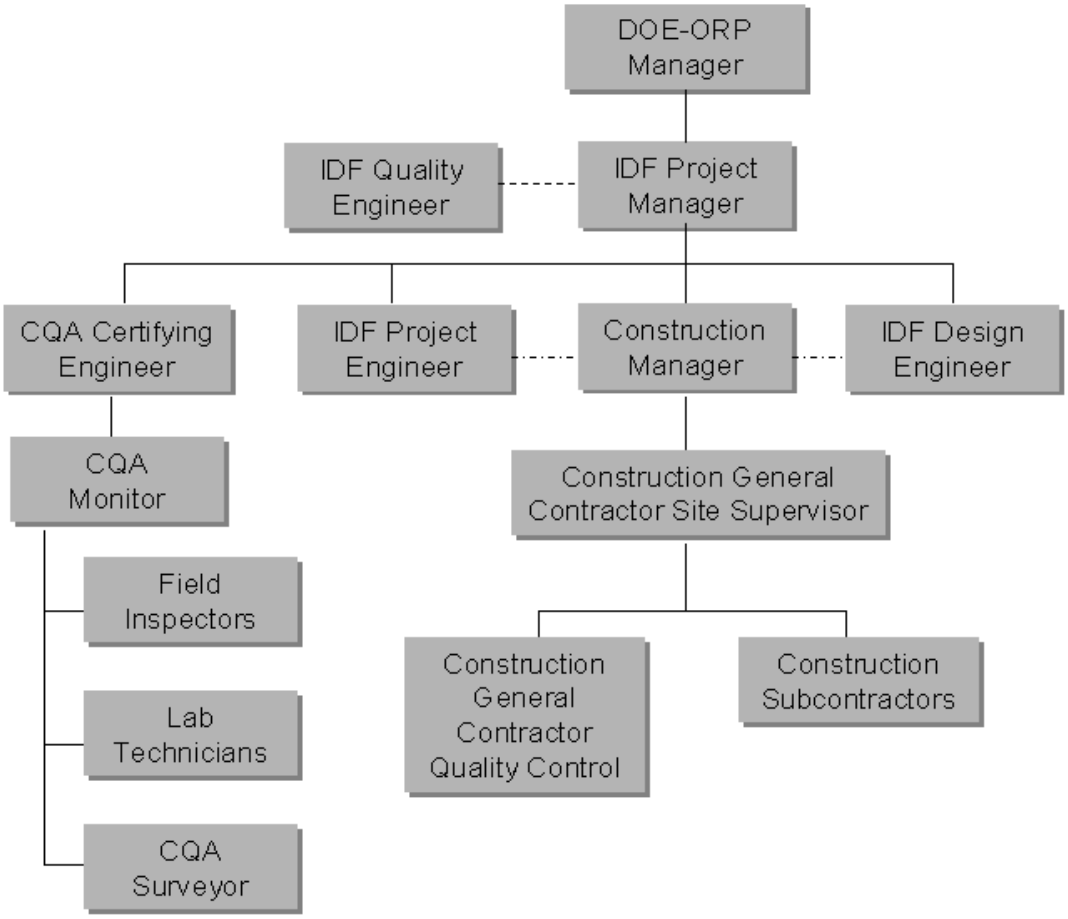
IDF Project Manager (PM)

The IDF PM is an employee or agent of the Tank Farm operating contractor, has overall responsibility for the IDF construction, and interfaces with the DOE-ORP manager. The IDF PM directs the activities of the IDF project and field team staff, including the CM, design engineer, and the project engineer. Additionally, the IDF PM has overall responsibility for the achievement of quality. Functionally, the IDF PM reviews and approves quality assurance reports submitted by the IDF CQA certifying engineer.

IDF Project Engineer

The IDF project engineer is an employee or agent of the Tank Farm operating contractor and is responsible for providing technical support to the IDF project team. The IDF project engineer is supported by the design engineer for reviewing and/or preparing technical documents related to engineering design and analyses.

FIGURE 1-1
QA Organization Chart



IDF Quality Engineer

The IDF quality engineer is an employee or agent of the Tank Farm operating contractor and is independent from line management on the project. The IDF quality engineer provides overview and assessment of QA on the project. The IDF quality engineer provides feedback and assessment results to the IDF PM.

IDF Design Engineer

The IDF design engineer is an employee or agent of the Tank Farm operating contractor is responsible for reviewing and/or preparing technical documents related to the IDF design and construction. The design engineer prepares the construction drawings, technical specifications, and the CQA Plan. The IDF design engineer reports to the IDF PM and supports the IDF project engineer.

1.2.1.2 Field Team

IDF Construction Manager

The IDF CM is an employee or agent of the Tank Farm operating contractor and serves as the point of contact between the IDF construction general contractor and the IDF project team. All construction general contractor correspondence and direction flows through the CM. The CM oversees the daily construction field activities and is the onsite representative for the IDF PM.

CQA Certifying Engineer

The CQA certifying engineer is an employee or agent of the Tank Farm operating contractor who has the overall responsibility of implementing this CQA Plan and directly supervises the CQA monitor, field inspection team, and laboratory technicians. The CQA certifying engineer is responsible for preparation of an implementation plan that addresses how the CQA Plan is to be implemented, and how CQA work is to be performed, tracked, and coordinated, as well as how procedures outlined in this CQA Plan are to be followed. The implementation plan will be submitted to IDF project manager and CM for approval.

Functionally, the CQA certifying engineer submits certified CQA reports to the IDF CM for review and approval by the IDF PM. The CQA certifying engineer is a registered professional engineer in Washington and has the authority to provide a certification letter that the IDF is constructed in accordance with the approved CQA Plan, the approved plans and specifications, and any approved changes. The CQA certifying engineer also has the authority and responsibility to stop work and recommend remedial actions to the IDF PM.

Field Inspector

Field inspectors are employees or agents of the Tank Farm operating contractor and report to the CQA certifying engineer. The field inspector's function is to perform testing and observations, in accordance with this CQA Plan and under the direction of the CQA monitor and CQA certifying engineer.

Soils Laboratory Technicians

Laboratory technicians are employees or agents of the Tank Farm operating contractor and report to the CQA certifying engineer and provide the QA laboratory testing, required by this CQA Plan and as requested by the CQA monitor and CQA certifying engineer.

CQA Surveyor

The CQA surveyor will be an employee or agent of the Tank Farm operating contractor and will be a registered land surveyor in the State of Washington.

CQA Monitor

The CQA monitor is an employee or agent of the Tank Farm operating contractor, reports directly to the CQA certifying engineer, and is a CQA representative, supported by the field inspection team and laboratory technician. The CQA monitor ensures that all CQA tests are performed in accordance with this CQA Plan and accepted procedures.

Construction General Contractor

The IDF construction general contractor is responsible for implementing the approved design by providing the necessary labor, equipment, materials, and all other resources necessary to construct the IDF.

Construction General Contractor Site Supervisor

The site supervisor is an employee or agent of the construction general contractor and is responsible for implementing the IDF construction activities. The site supervisor has overall responsibility for all construction activities related to the IDF, controls day-to-day construction tasks, and is the point of contact for construction general contractor field personnel. The site supervisor ensures the work is progressing in accordance with approved construction contract documents and the approved schedule.

Construction Subcontractors

Construction subcontractors include specialty companies, retained by the IDF construction general contractor, to perform specific work activities at the IDF such as earth moving, geosynthetic lining installation, piping, and building/tank installation. The construction subcontractors report directly to the construction general contractor site supervisor.

Construction General Contractor Quality Control

The construction general contractor provides a construction QC engineer who supports the site supervisor. The primary responsibility of the construction QC engineer is to ensure that the work is performed in accordance with the technical specifications and construction drawings. Specific duties of the construction QC engineer include activities such as preparing construction submittals, field documentation, and interfacing with the CQA certifying engineer.

1.2.2 Project Meetings

The various progress and status meetings that are anticipated to be held throughout the IDF construction are described below. The purpose of the meetings is to discuss work progress, planning, and other issues related to construction. A portion of these meetings can be dedicated to CQA issues, as necessary, to provide an opportunity for the CQA team to express concerns regarding quality, relay test results, and ensure good communication between all organizations involved in the construction of the IDF.

1.2.2.1 Pre-Construction Meeting

A pre-construction meeting will be scheduled prior to beginning construction activities for the IDF. At a minimum, the meeting will be attended by IDF staff including the PM, CM, project engineer, design engineer, as well as the construction general contractor site supervisor, and the CQA certifying engineer. A portion of the meeting will be dedicated to the discussion of QA issues. Suggested CQA topics will include, but not be limited to:

- Reviewing the responsibilities of each organization
- Discussing the authority of agencies and project and field team members to order work stoppages
- Reviewing lines of authority and communication for each organization
- Providing each organization with all relevant CQA documents and supporting information
- Familiarizing each organization with the CQA Plan and its role, relative to the design criteria, plans, and specifications
- Discussing the established procedures or protocol for observations and tests, including sampling strategies
- Discussing the established procedures or protocol for handling construction deficiencies, repairs, and re-testing, including “stop work” conditions
- Reviewing methods for documenting and reporting inspection data
- Reviewing methods for distributing and storing documents and reports
- Reviewing work area security and safety protocol
- Reviewing the proposed project schedule
- Discussing procedures for the location and protection of construction materials and for the prevention of damage of the materials from inclement weather or other adverse events
- Determining action items, assigning actionees, and recording minutes to be transmitted to meeting attendees
- Discussing document control requirements and control of CQA records
- Discussing control and protection of samples

1.2.2.2 Daily Pre-Job Briefing

The construction general contractor will conduct daily pre-job briefings at the work area. The participants will include the construction field personnel, including lower tiered subcontractors and CQA representatives. The primary purpose of these meetings will be to address the day's planned activities. The CQA monitor will discuss CQA activities planned for that day and interface needs with the construction personnel. Suggested CQA topics are:

- Review the work location and activities for the day
- Discuss the construction general contractor's personnel and equipment assignments for the day
- Address scheduling of resources for upcoming work
- Review any new test data
- Discuss any potential construction problems, including unexpected subsurface conditions
- Discuss CQA-planned activities and interface needs

This meeting will be documented and the documentation will be retained on file by the CQA monitor.

1.2.2.3 Construction Progress Meetings

Weekly progress meetings will be held at the site to discuss construction progress. At a minimum, the weekly progress meetings will be attended by the IDF PM, CM, the site supervisor, and the CQA certifying engineer or CQA monitor. The purposes of the meeting are to:

- Review previous activities and accomplishments
- Review claims, change orders, delays, and similar items
- Review planned activities for the upcoming 2-week period
- Finalize resolution of problems from previous meetings
- Discuss potential problems with the work planned for the upcoming 2-week period

Minutes will be recorded and transmitted to meeting attendees and other interested parties.

1.2.2.4 Non-Conformance Meetings

Meetings will be convened as necessary to address non-conformances discovered during inspection. Deficiencies observed during construction by the CQA representatives will be brought to the attention of the IDF CM and CQA certifying engineer and documented using the non-conformance reporting (NCR) procedures outlined in Section 8.1.4. These deficiencies also will be tracked in the CQA representative's field log book until resolution and included in the daily summary report. These documents will include the description of the deficiency and actions taken or to be taken to resolve.

1.2.3 Hold Points

Mandatory hold points will be established for certain key activities. At these points, the IDF construction general contractor will notify the CQA monitor or CQA certifying engineer that the layer or portion of a layer is ready for review. The hold points anticipated for the IDF would be at completion or partial completion of each of the following components:

- Prepared subgrade
- SLDS geomembrane and composite drainage net (CDN)
- SLDS riser pipe
- Soil bentonite admix soil liner
- Secondary GCL
- Secondary geomembrane
- LDS CDN
- LDS piping
- Primary geosynthetic clay liner (GCL)
- Primary geomembrane
- Cushion geotextile
- LCRS piping
- Drain gravel
- Separation geotextile
- Operations layer

On side slopes, a LCRS CDN would substitute for the cushion geotextile, drain gravel, and separation geotextile.

1.3 PERSONNEL QUALIFICATIONS AND TRAINING

This section describes the qualifications and training required for CQA personnel. All documentation relating to qualifications will be maintained with the project CQA records.

1.3.1 CQA Certifying Engineer

The CQA certifying engineer will have landfill construction certification experience. The CQA certifying engineer will, at a minimum, be a registered civil professional engineer in good standing in the State of Washington, possess a bachelor's degree in civil or construction engineering, geotechnical engineering, engineering geology, or a closely related discipline, and have sufficient practical, technical, and managerial experience to successfully direct the CQA activities discussed in this CQA Plan. The CQA certifying engineer's qualifications will be documented by training records and a professional resume showing significant field experience in landfill construction and low permeability soil-bentonite admix liner construction, having directed CQA activities at a minimum of three landfill construction projects or a minimum of 100 acres of combined landfill area certifying experience. The CQA certifying engineer will be familiar with the EPA technical guidance document, *Quality Assurance and Quality Control for Waste Containment Facilities* (EPA 1993). Qualification documentation will be reviewed by the IDF PM and IDF project engineer.

1.3.2 CQA Monitor

At a minimum, the CQA monitor will have a high school diploma and at least five years of construction-related experience, including at least three years of experience conducting CQA monitoring for earthwork construction (including a minimum of three landfill construction projects or a minimum of 50 acres of combined landfill area experience), or a bachelor of science degree from a four-year college or university and at least two years of experience conducting CQA monitoring for earthworks construction (including a minimum of three landfill construction projects). The CQA monitor must be capable of performing work with little or no daily supervision. The CQA monitor will be familiar with the EPA technical guidance document, *Quality Assurance and Quality Control for Waste Containment Facilities* (EPA 1993). Qualifications of the CQA monitor will be documented by training records and a professional resume, reviewed by the IDF PM and CQA certifying engineer.

1.3.3 Field Inspector

At a minimum, the field inspector will have a high school diploma and at least two years of construction-related experience, including at least one year of experience conducting CQA monitoring for earthwork construction, or will have a bachelor of science degree from a four-year college or university and at least six months of experience conducting field inspection for earthworks construction. The field inspector must be capable of routine engineering technician work, under general daily supervision. The field inspector will be familiar with the EPA technical guidance document, *Quality Assurance and Quality Control for Waste Containment Facilities* (EPA 1993). Qualifications of the field inspector will be documented by training records and a professional resume, reviewed by the IDF PM and CQA certifying engineer.

1.3.4 Soils Laboratory Technicians

Laboratory technicians will have at a minimum a high school diploma and at least five years of construction materials laboratory testing related experience, including at least three years of experience performing geotechnical laboratory tests for earthwork construction, including compacted low permeability soil-bentonite admix, or will have a bachelor of science degree from a four-year college or university and at least two years of experience performing geotechnical laboratory tests for earthwork construction, including low permeability soil-bentonite admix. The laboratory technician must be capable of routine laboratory tech work, under general daily supervision. Qualifications of laboratory technicians, including training records and professional resumes, will be reviewed by the IDF PM and CQA certifying engineer.

1.3.5 Geosynthetic Laboratory

The geosynthetic laboratory will be selected by the CQA certifying engineer and will provide the geosynthetic QA conformance testing required by this CQA Plan, as requested by the CQA monitor and/or CQA certifying engineer. The geosynthetics CQA laboratory will be unaffiliated with the materials supplier or manufacturer, or construction general contractor. The geosynthetics CQA laboratory will have at least five years of experience in testing geosynthetics and other relevant liner system components, and will be familiar with American Society for Testing and Materials (ASTM) and other applicable test standards.

1.4 DEFINITIONS RELATING TO CONSTRUCTION QUALITY ASSURANCE

1.4.1 Construction Quality Assurance and Construction Quality Control

Construction Quality Assurance—A planned and systematic pattern of the means and actions designed to provide adequate confidence that items or services meet contractual and regulatory requirements, and will perform satisfactorily in service.

Construction Quality Control (CQC)—Those actions that provide a means to measure and control the characteristics of an item or service to meet contractual and regulatory requirements.

1.4.2 Use of the Terms in This Plan

The definitions used in the context of this CQA Plan are as follows:

- CQA refers to means and actions employed by the CQA representatives to assure conformity of liner system, LCRS, LDS, SLDS, and pipe preparation, production, and installation with this CQA Plan, the technical specifications, and the construction drawings. CQA will be provided by a third party, acting independently from the product manufacturer and construction general contractor.
- CQC refers to those actions taken by manufacturers, suppliers, or construction general contractor, including their designated representatives, to ensure that the materials and the workmanship meet the requirements of the technical specifications and the construction drawings.

1.5 REFERENCES

1.5.1 Applicable Organizations

Organizations whose standards are referenced in the CQA Plan include:

- ASTM—American Society for Testing and Materials
- DOE—Department of Energy
- GRI—Geosynthetic Research Institute
- OSHA—Occupational Safety and Health Administration
- EPA—U.S. Environmental Protection Agency

1.5.2 Applicable Standards

Any reference to standards of any society, institute, association, or governmental agency will pertain to the edition in effect as of the date of this CQA Plan, unless stated otherwise.

Specific test standards for tests cited in the CQA Plan are provided in the technical specifications. These standards may be modified due to technological advances since compilation of the technical specifications. All such modifications are to be approved in accordance with change order procedures described in Section 8.1.5.

1.6 CONSTRUCTION ACTIVITIES AND SUBMITTAL REQUIREMENTS

1.6.1 Construction Activities

This section describes the construction activities and submittal requirements that will be performed by the construction general contractor during the IDF construction. This CQA Plan only addresses selected activities of the Phase I construction.

In general, construction activities will consist of preparing the subgrade, installing the liner system, the leak detection systems (LDS and SLDS), the leachate collection and removal system (LCRS), and operations layer and necessary equipment to complete the landfill for waste acceptance. Construction will consist of these activities:

- Mobilizing construction equipment and personnel
- Vendor data submittals
- Installing sediment and erosion control
- Preparing soil bentonite material
- Excavation, embankment, fine grading of landfill subgrade, and sump construction
- Constructing the secondary leak detection system (SLDS) sump
- Constructing the soil bentonite admix liner (SBL)
- Dust control activities during construction
- Placing the geosynthetics for the secondary liner
- Constructing the leak detection system (LDS)
- Placing the geosynthetics for the primary liner
- Constructing the leachate collection and removal system
- Constructing the operations layer
- Site restoration
- Demobilization

Prior to the start of construction activities, the CQA representatives will review and become familiar with all construction drawings, technical specifications, the CQA Plan, and RCRA permit. The CQA certifying engineer also will be familiar with the most recent construction schedule, so that adequate resources (i.e., laboratory, field testing equipment, staff, and CQA forms), including contingencies (e.g., backup equipment, alternate laboratory, and alternate CQA staff) for CQA activities, will be commensurate with the anticipated construction productivity and work schedule.

1.6.2 Submittal Requirements

The construction general contractor will provide the submittals required (listed in Table 1-1 in this section) to the IDF PM. Submittals will be provided far enough in advance of scheduled installation dates to allow time for reviews, possible revisions and resubmittals, placing orders, and securing delivery. The construction general contractor will identify, track, and disposition all required vendor data. The IDF PM will respond to each required submittal as stated in the technical specifications.

The submittals presented in Table 1-1 will be required as a minimum. A master submittal list will be provided as part of the contract documents.

1.6.3 Receipt Inspection Procedures

Inventory of manufactured materials used in lining system construction is detailed in Sections 3.1.4 (GCL), 4.1.4 (geomembrane), 5.1.4 (geotextiles), 6.1.4 (CDN) and 7.1.4 (polyethylene piping). The purpose of this section is to provide a general summary of the minimum requirements and procedures for receiving and controlling purchased materials, equipment, or services as required by the contract documents.

Procurement, receipt, and inspection of construction materials and equipment are the responsibilities of the construction general contractor, with verification by the CQA certifying engineer and IDF CM. Procedures specific to the IDF Phase I construction project will be prepared as part of the construction quality control (QC) plan, to be submitted by the construction general contractor.

Procedures to control receipt inspection will include the following, at a minimum:

- The contract documents will provide a master submittal list that identifies the materials, equipment, or services requiring receipt inspection. Upon delivery to the project site, the general construction contractor will attach secure and visible "Quality Hold for Inspection" tags to each item.
- All items, materials, and equipment that have been tagged will be stored in segregated areas, as identified in the contract documents. Items will be restricted from further use until all construction general contractor and CQA certifying engineer inspections are completed.
- Upon inspection if items, materials, or equipment held for inspection, the "Quality Hold for Inspection" tag will be removed and replaced with one of the following, as appropriate:
  a) Acceptance tag
  b) Non-conformance (red) tag
  c) Conditional use tag
- The construction general contractor may utilize only those items tagged as "Accepted" or "Conditional Use."
- Red tagged materials will not be used in construction and will be moved to a segregated area or removed from the site.
- Conditional use tagged materials are restricted to use for specific conditions identified on the tag.
- Documentation of receipt inspection will be completed, maintained, and stored in a single location, in a secure and protected environment for the full performance period of the construction contract.

TABLE 1-1
Required Submittals

Submittal	Description	Requirement
Source Quality Control for Imported Materials (structural fill, drain gravel and crushed surfacing)	Gradation tests performed in accordance with ASTM D422 by a qualified independent test laboratory for imported materials on samples taken at place of production prior to shipment. Samples will be taken for gradation testing from every 2,000 tons of prepared materials, in accordance with ASTM D75.	Submitted by the construction general contractor and approved by the IDF PM prior to the shipment of material to the project site.
Geomembrane Installation Plan	Proposed layout drawings for each layer of geomembrane material. Geomembrane layout will show panel configuration, general dimensions, and seam locations.	Submitted by the construction general contractor and approved by the IDF PM prior to the installation of the respective geomembrane liner.
Subgrade surface acceptance	Certification in writing that the surface on which the geomembrane will be installed is acceptable to the installer. A certificate of acceptance will be provided by the construction general contractor to the CQA representative, who will then verify to the CQA certifying engineer that the deployment surface has been accepted immediately prior to commencement of geomembrane installation in the area under consideration.	Certificate signed by the installer and construction general contractor prior to installation of geomembrane over the subgrade.
GCL quality control certifications, test data and properties guarantee	Provide manufacturer's quality control (QC) test data for GCL material to be installed, including: Bentonite – suppliers' name and location, brand name, lot number, dated quality control information from supplier, manufacturer's test data verifying that bentonite meets manufacturer's specifications. GCL – written guarantee that GCL conforms to the technical specification requirements and test certificates for each production lot or 50,000 square feet of GCL material including roll numbers, test methods, and test results verifying compliance with the technical specification requirements for GCL.	Submitted by the construction general contractor prior to installation of the GCL material and approved by the IDF PM.

TABLE 1-1
Required Submittals

Submittal	Description	Requirement
Geomembrane quality control certifications, test data and properties guarantee	QC Testing shall be performed by manufacturer to demonstrate the geomembrane conforms to technical specification requirements. Prior to delivery of any geomembrane material, the manufacturer shall submit all required information listed in the technical specifications (Section 02661). QC Certification: Prior to shipment, the geomembrane manufacturer shall provide a quality control certificate for each roll of geomembrane. The quality control certificate shall be signed by a responsible party employed by the geomembrane manufacturer, such as the production manager. The quality control certificate shall include: 1. Roll numbers and identification, resin lot, and batch numbers. 2. Sampling procedures and results of quality control tests. As a minimum, results shall be given for thickness, asperity, tensile strength, and tear resistance in accordance with methods indicated in the technical specifications. Tests shall be conducted on each production lot of geomembrane or every 50,000 square feet, whichever results in the greater number of tests.	Submitted by the construction general contractor prior to installation of the geomembrane material and approved by the IDF PM.
Geotextile material certifications and test data	Provide manufacturer's QC test data for geotextile material to be installed, including: Geotextile – written guarantee that geotextile conforms to specification requirements, certification that manufacturer continuously inspected geotextile for presence of needles and found it to be needle-free, and test certificates for geotextile material including roll numbers, test methods, and test results verifying compliance with the technical specifications physical properties for geotextile. Frequency of manufacturer's QC testing shall be at the standard rate stated in the manufacturer's QC plan for each required property in the technical specifications.	Submitted by the construction general contractor prior to installation of the geotextile material and approved by the IDF PM.
Composite drainage net material certifications and test data	Provide manufacturer's QC test data for composite drainage net material to be installed, including: Composite drainage net – manufacturer's specification measured using appropriate test methods, written guarantee that composite drainage net conforms to specification requirements, manufacturer's QC test data for the geotextile component as specified above for geotextile, and test certificates for composite drainage net material and geonet component including roll numbers, test methods, and test results verifying compliance with the technical specification requirements for composite drainage net and geonet. Frequency of manufacturer's QC testing shall be at the standard rate stated in the manufacturer's QC plan for each required property in the technical specifications	Submitted by the construction general contractor prior to installation of the composite drainage net material and approved by the IDF PM.

TABLE 1-1
Required Submittals

Submittal	Description	Requirement
Interface Shear Strength test data	Provide data prior to material shipment for the interface friction angle between the textured geomembrane and other materials (including CDN, GCL, and Admix Liner) directly in contact with the geomembrane as specified in Section 02661; and between the CDN and the operations layer as specified in Section 02373 of the technical specifications. Friction angle shall be determined by direct shear testing under fully saturated conditions (ASTM D5321 or D6243 for GCL interface) at low nominal normal loads of both 100, 250, and 500 pounds per square foot (psf), and high nominal normal loads of 2,000, 8,000, and 15,000 psf, except for the CDN/Operations Layer interface which shall be reported at low normal load only. Report results for both peak and large displacement (minimum 2 inches) strength. Perform two interface shear strength tests on each interface under each set of normal loads.	Submitted by the construction general contractor prior to geosynthetic material shipment and reviewed and approved by the IDF PM for conformance with project strength requirements. Allow IDF PM a minimum 20 working days for this evaluation upon receipt of data.
Admix Liner Preparation and Placement Plan	Provide a detailed plan for preparation of the admix material, including a description of the equipment and procedures to be used, personnel qualifications, equipment calibration certificates and methods for monitoring bentonite additions and moisture conditioning. Also provide an admix liner placement plan to specify lift thickness control and to allow for required testing, described in the CQA Plan and technical specifications on the admix liner during placement operations.	Submitted by the construction general contractor prior to start of admix production for approval by IDF PM.
Bentonite QC certificates and test data	Provide bentonite supplier's descriptive data, specification sheets, literature, and other data as necessary to fully demonstrate that the bentonite proposed for use in the admix complies with the requirements of the technical specifications. The manufacturer shall certify that the bentonite furnished complies with these Specifications. A certificate shall be submitted to the CQA Engineer for each railcar or every three truckloads of bentonite delivered.	Submitted by the construction general contractor prior to start of admix production for approval by IDF PM.
Polyethylene Pipe and Fittings	Provide manufacturer's QC test data for piping and fittings that will be installed on the landfill floors and slopes.	Submitted by the construction general contractor prior to installation of the pipe for approval by the IDF PM.

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SECTION II–SOILS CONSTRUCTION QUALITY ASSURANCE

This section discusses the CQA requirements for soil layers including fill placement, subgrade preparation, admix liner, drain gravel, and operations layer.

2.1 FILL PLACEMENT AND SUBGRADE PREPARATION

This section of the CQA Plan addresses the soils components necessary to provide a prepared subgrade for the liner systems and specifies the soils CQA program to be implemented with regard to materials selection and evaluation, laboratory test requirements, field test requirements, and corrective action requirements.

2.1.1 Fill Placement and Compaction

The technical specifications will be followed for the stockpiling, placement, and compaction of earthfill and structural fill. The CQA monitor will monitor the fill placement and compaction to verify and document the following:

- The soil being placed meets the technical specifications requirements for earthfill and structural fill as determined by the test methods and frequencies specified within this CQA Plan and the source quality control submittals.
- The placement surface has been prepared as specified in the technical specifications.
- The compacted lift thickness is in accordance with the requirements of the technical specifications.
- The dry unit weight of the earthfill and structural fill meets specifications as determined by the test methods and frequencies described in Table 2-1 for earthfill and Table 2-2 for structural fill.
- Material placed in permanent stockpiles meets the appropriate specifications for earthfill or structural fill.

2.1.2 Construction Quality Assurance Evaluation

The frequency of soils testing for CQA purposes will conform to the minimum frequencies presented in Table 2-1 for earthfill and Table 2-2 for structural fill. Material properties will be determined from samples collected either immediately after placement or from stockpiles.

Nuclear density meter test methods will be used for the field testing of the in situ dry unit weight of the in-place, compacted fill. Any settlement or other defects in the fill will be backfilled and compacted in accordance with the technical specifications.

Standard count calibrations will be conducted to monitor the aging of the nuclear density gauge sources in accordance with ASTM standards. Sand cone or drive sleeve tests will be

conducted periodically to verify densities using the nuclear density gauge. Oven moisture content tests will be conducted and compared to field moisture content results to determine a field correction factor for moisture. Sand cone or drive sleeve tests and in situ moisture content tests will be performed at the frequencies specified in Tables 2-1 and 2-2.

If an in-place density test result fails to meet specifications, a confirmatory test will be performed immediately adjacent to the failed test. If the confirmatory test meets or exceeds specifications, a second confirmatory test will be performed at a second location immediately next to the failed test. If the second confirmatory test also meets or exceeds specifications, the area will be declared as meeting project specifications and the confirmatory tests will be reported. In the event that either confirmatory test fails to meet specifications, a CQA representative will determine the extent and nature of the defect by observations and/or additional testing, as necessary, to identify the limits of the area that does not meet project specifications.

If a defective area is discovered in the fill, a CQA representative will determine the extent and nature of the defect. If the defect is indicated by an unsatisfactory test result, the CQA representative will determine the extent of the defective area by additional tests, observations, a review of records, or other means that the CQA representative deems appropriate. If the defect is related to adverse site conditions, such as excessively wet soils or surface desiccation, the CQA representative will define the limits and nature of the defect by testing or observation. After the extent and nature of a defect is determined and remedied by the construction general contractor, the CQA representative will verify that the deficiency has been corrected by re-testing repaired areas before any additional work is performed by the construction general contractor in the area of the deficiency. All confirmatory tests, failing tests, and re-tests will be recorded in the CQA representative's field book or compaction testing form. The approximate location and elevation of each test will be recorded.

The CQA representative will document fill placement and compaction as determined by the test methods and frequency prescribed by this CQA Plan and will report any non-conformance in accordance with the non-conformance reporting procedures outlined in Section 8.1.4.

2.2 PREPARED SUBGRADE

The CQA representative will verify and document that the prepared subgrade is constructed to the elevations and grades shown in the construction drawings, with subgrade meeting the requirements of the technical specifications as determined by the test methods and frequencies specified within this CQA Plan.

Upon completion of the excavation of the landfill, the CQA monitor will perform the following tasks:

- Inspect the subgrade on the side slopes and base of the landfill and note areas of weak or excessively weathered subgrade materials
- Observe completion of excavation and subgrade compaction prior to foundation, fill, or liner placement
- Observe the proof rolling of the base of the landfill and note areas that exhibit excessive rutting, heaving, or softening

- Observe that the surface of the subgrade is free of debris, wet and soft areas, standing water, vegetation, mud, ice, or frozen material
- Observe any excavation and backfilling operations associated with unsuitable material found in the prepared subgrade
- Verify that a survey has been conducted to further verify that the subgrade grades and elevations conform to the construction drawings
- Verify that the prepared subgrade material meets the requirements of the technical specifications as determined by the CQA testing methods and frequency in Table 2-3
- Verify that sampling points in the prepared subgrade are plugged or backfilled so that the prepared subgrade meets the technical specifications
- Document the location and volume of any unsuitable material removed from the prepared subgrade and report any non-conformance with the technical specifications in accordance with the non-conformance reporting procedures in Section 8.1.4

2.2.1 Layer Completion Certification

The construction general contractor will be required to notify the CQA representative when an area of prepared subgrade is complete prior to constructing the overlying layer. The construction general contractor can proceed with the overlying layer upon acceptance of the area of prepared subgrade by the CQA representative. The CQA certifying engineer will provide a certificate of layer completion to the construction general contractor and the IDF project engineer, certifying that the area is complete.

2.3 SOIL BENTONITE ADMIX LINER AND TEST PADS

The soil bentonite admix liner (SBL) is composed of a mixture of base soil and bentonite material. Two SBL test pads will include both a horizontal and a sloped test pad. The horizontal test pad will be constructed by using the same compaction methods as that used for the production SBL, to ensure the SBL is constructed to meet the minimum hydraulic conductivity requirements. The sloped test pad will be constructed on a sloping surface to verify that compaction methods (determined during the horizontal test pad) will be adequate for the side slopes of the landfill. If necessary, the technical specifications and/or CQA Plan may be modified, based on the results of the test pads.

2.3.1 Test Pads

Test pads will be constructed by the construction general contractor to determine acceptable placement and compaction methods to produce a low permeable SBL on a horizontal surface and on a 3H:1V side slope that satisfies the performance requirements of the technical specifications.

In addition, the mixing of the base soil and bentonite admixture using the pugmill will be tested to ensure adequate control of the ratio of admixture components as well as the homogeneity of the completed SBL mixture.

2.3.1.1 Construction Quality Assurance Evaluation

During test pad construction, the CQA representative will continuously observe and document the construction of the test pad. These guidelines will be followed to ensure that the test pad accurately represents the performance of the full-scale facility:

- Construction of the test pad will use the same soil material, design specifications, equipment, and procedures as proposed for the full-scale facility.
- The test pad length, width, and depth will be as required by the technical specifications and for the in-situ hydraulic conductivity test spacing.
- The number of lifts used to construct the test pad will be as required by the technical specifications.

The test pad will be constructed to allow determination of the relationship among density, moisture content, and method of compaction. Field variables can affect this relationship and must be carefully measured and controlled, both in the test pad and during construction of the full-scale liner. At a minimum, the following will be observed and documented:

- Track weight of base soil and bentonite during mixing operations
- Mixing operation homogeneity
- Test pad configuration and dimensions
- Compaction equipment type, configuration, and weight
- Number of passes and speed of the compaction equipment
- Uncompacted and compacted lift thickness
- Weather conditions, including ambient temperature, humidity, wind speed and direction, and precipitation

The CQA representative will provide the necessary surveying and/or reference grid points for adequately and expeditiously determining the elevation and dimensions of the test pad, including each lift.

The CQA representative will be responsible for all testing, surveying, and documentation necessary to verify that the test pad performs in accordance with the technical specifications, and that the methods, equipment, and materials used can achieve the same results or better during full-scale construction.

Testing methods and frequencies will be as indicated in Table 2-4. Additional tests may be conducted at the direction of the CQA certifying engineer. All tests will be conducted in accordance with the methods and procedures specified in Table 2-4. Tests are separately identified in Table 2-4 which are intended to provide the following:

- Information Only, for use in evaluating overall methods , materials, or equipment
- Pass/Fail, that have criteria established in the technical specifications which must be met
- Calibration and Check, for use in calibrating instruments

The CQA certifying engineer will compare the results of the test pad constructed on the level surface with the results of the test pad on the side slopes. The CQA certifying engineer will recommend changes to compaction methods, if necessary, to the IDF project engineer. The CQA certifying engineer will prepare an interim report which summarizes the construction and testing of the test pads.

It is important to note that an acceptable zone has been established in the technical specifications for the allowable moisture content and density ranges that are applicable for the SBL admix to meet minimum permeability requirements. This zone may be adjusted as a result of the test pad data obtained during construction to reflect specific conditions observed based on the construction general contractor's proposed blending, placement, and compaction methods. With the range of placement moisture content and density allowed with this approach, minimum compaction effort (i.e., the number of passes a piece of compaction equipment needs to bring the admix into the allowable moisture/density zone) will vary based on material conditions and placement location. Minimum compaction effort recommendations will be developed by the CQA certifying engineer for application to both bottom slope and side-slope admix construction based on test pad results. However, these minimums should be considered as guidelines only and may need to be adjusted based on changes to admix properties (primarily moisture content), site conditions, and compaction location as needed to bring the admix into the required acceptable zone for compaction.

2.3.2 Soil Bentonite Admix Liner

The CQA team will verify and document that the SBL is placed to the elevations, grades, and thicknesses shown in the construction drawings, with bentonite-amended material meeting the requirements of the technical specifications as determined by the test methods and frequencies specified within this CQA Plan.

2.3.2.1 Construction Quality Assurance Evaluation

CQA testing will be performed during processing and placement of the SBL. The CQA team will conduct the processing and placement tests for the SBL as specified in Table 2-5. The maximum allowable percentage of failing tests is specified in Table 2-6.

Processing

The construction general contractor shall process and condition admix material using a central type pugmill plant as described in the technical specifications. Prior to amending the base soil with bentonite, a CQA representative will verify and document the following:

- Equipment and methods are the same or equivalent as determined from the test pad studies.
- All submittals have been reviewed and approved.
- The base soil source area (either onsite excavation or borrow area) has been approved by the design engineer, IDF PM, or IDF project engineer.
- The mixing equipment is suitable for amending base soils with bentonite.
- The base soil does not contain rocks with dimensions in excess of those required by the technical specifications.

During processing, the CQA representative will verify and document the following:

- The bentonite is in conformance with the technical specifications.
- Close observation of the base soil excavation and processing is performed by the field inspector.

- The processed SBL material meets the requirements of the technical specifications as determined by the CQA testing methods and frequency in Table 2-5.
- The moisture content and consistency of base soil allow bentonite to be mixed uniformly.
- Bentonite amendments are mixed uniformly with the base soil.
- The processed SBL material is stored, protected, and allowed to cure in accordance with the conditions and minimum requirements of the technical specifications.
- Calibration of the pugmill operation feed rate controls for bentonite, base soil and water.
- The bentonite is mixed at the required application rate, established by the technical specifications as determined by the CQA testing methods and frequency in Table 2-5.

The CQA representative will document the properties of the processed soil bentonite material, as determined by the test methods and frequency prescribed by this CQA Plan, and will report any non-conformance with the technical specifications, following procedures outlined in Section 8.1.4.

The CQA representative will observe processing activities including base soil excavation, bentonite blending, and moisture conditioning.

The CQA representative will monitor the excavation of base soil from the approved borrow source or onsite excavations. Deleterious base soil or base soil not meeting the technical specifications will be identified and reported to the CQA certifying engineer and not allowed in the processing area.

CQA tests will be performed on the raw bentonite used in the SBL to verify conformance to the technical specifications. The CQA representative will collect samples of raw bentonite delivered to the site for testing. The CQA laboratory technician will conduct free swell, and grain size tests of the bentonite in accordance with Table 2-5. If the test results of a sample fail to meet specifications, a confirmatory test will be performed immediately subsequent to the failed test. If the confirmatory test meets or exceeds specifications, a second confirmatory test will be performed. If the second confirmatory test also meets or exceeds specifications, the bentonite will be declared as meeting project specifications and the confirmatory tests will be reported. In the event that either confirmatory test fails to meet specifications, the bentonite will be rejected and removed from the site.

The CQA representative will observe mixing and test the bentonite-amended soil, prior to placing it in the landfill.

Placement

Prior to the placement of the SBL, the CQA representative will verify and document the following:

- The test pads have been constructed with the approved liner material and production scale equipment to confirm placement and compaction procedures produce the required low-permeability admix for both on a horizontal surface and on a 3H:1V side slope.
- All or an approved portion of the prepared subgrade meets specifications as determined by the test requirements of this CQA Plan and the CQA certifying engineer has issued the completion certificate.

- The SBL material is free of roots, stumps, vegetation, or any other type of deleterious material that may impact the performance of the placed SBL.
- The SBL material does not contain stones with dimensions in excess of those required by the technical specifications.
- The SBL material meets or exceeds the requirements of the technical specifications as determined by the CQA testing methods and frequency in Table 2-5.
- The moisture content of the SBL material is uniform.

During placement and compaction of the SBL, the CQA Team will verify and document the following:

- Close observation of the placement and compaction of SBL material with earthmoving equipment is performed by the field inspectors. Inspectors to verify that means and methods are the same as those approved in the test pad process.
- The SBL material meets the requirements of the technical specifications as determined by the CQA testing methods and frequency in Table 2-5 and is within the maximum allowable failure rates in Table 2-6.
- The SBL is placed in accordance with the conditions and minimum requirements of the technical specifications.
- Each lift is compacted to the required thickness and minimum dry unit weight within the range of moisture contents established by the technical specifications as determined by the CQA testing methods and frequency in Table 2-5.
- Shelby tube samples are collected for laboratory permeability testing at the frequency specified in Table 2-5.
- Penetrations in the SBL at testing and sampling locations are repaired in accordance with the technical specifications.
- The SBL is maintained until it is covered by the geomembrane liner in accordance with the technical specifications.
- In areas of inaccessibility by the compactor, in areas of nonstandard SBL placement, and/or in areas of different compaction methods, more frequent testing will be performed due to thinner lift thicknesses to achieve equivalent compactive effort. Each lift, no matter how thin, will be tested for density and moisture in accordance with Table 2-5.

The CQA representative will document the properties of the SBL as determined by the test methods and frequency prescribed by this CQA Plan and will report any non-conformance in accordance with the non-conformance reporting, as outlined in Section 8.1.4.

The CQA representatives will collect samples immediately after a loose lift of SBL materials has been placed for property tests, prior to compaction. Once compacted, nuclear density gauge test methods will be used for testing the in situ compacted dry unit weight and moisture content of the SBL. Standard count calibration and moisture content tests will be used to calibrate the reading of the nuclear density gauge. Standard count calibration and in situ moisture content tests, using the oven dry method, will be performed at the

frequencies specified in Table 2-5. The results of the oven dry moisture content tests will be compared with the field moisture content results to determine a field moisture correction factor. The CQA representative will adjust the field moisture correction factor as test data is collected (i.e., moving average). The CQA representative will collect Shelby tube samples of the SBL for laboratory permeability tests as specified in Table 2-5.

If in-place density test results fail to meet specifications, a confirmatory test will be performed immediately adjacent to (within 3 ft of) the failed test. If the confirmatory test meets or exceeds specifications, a second confirmatory test will be performed at a second location immediately next to (within 3 ft of) the failed test. If the second confirmatory test also meets or exceeds specifications, the area will be declared as meeting project specifications and the confirmatory tests will be reported. In the event that either confirmatory test fails to meet specifications, additional testing will be performed to identify the limits of the area that does not meet project specifications. All confirmatory tests, failing tests, and re-tests will be recorded in the CQA representative's field book or compaction testing form. The approximate location and elevation of each test will be recorded.

Rapid laboratory permeability tests, such as the constant volume tests, will be used when possible to determine permeability. Once the sample has achieved the specified permeability, the test result will be reported immediately to the CQA certifying engineer. The number of failing tests will be less than the maximum percentage of failing tests specified in Table 2-6. The maximum percentage of failing tests are anticipated to cover laboratory or field recording mistakes, math errors, or other unknown circumstances that are not discovered until after the layer is covered with the succeeding layer(s). Otherwise, all failed tests will be corrected in the field as they are observed.

If a defective area is discovered in the SBL other than a failed in-place density test, the CQA representative will determine the extent and nature of the defect. If the defect is indicated by an unsatisfactory test result, the CQA representative will determine the extent of the defective area by additional tests, observations, a review of records, or other means that the CQA representative deems appropriate. If the defect is related to adverse site conditions, such as excessively wet soils or surface desiccation, the CQA representative will define the limits and nature of the defect by testing or observation. After the extent and nature of a defect is determined and remedied by the construction general contractor, the CQA representative will verify that the deficiency has been corrected by re-testing repaired areas before any additional work is performed by the construction general contractor in the area of the deficiency.

The testing frequency during the SBL construction may be increased or modified at the discretion of the CQA certifying engineer, when visual observations of construction performance indicate potential problems or when field experience with the proposed SBL material have been obtained.

During construction, the frequency of testing may be increased by the CQA representative during adverse weather conditions, if equipment breaks down, at the start and finish of grading, if the material fails to meet the requirements of the technical specifications, or if the extent of the work area is reduced.

The construction general contractor will repair all penetrations in the SBL resulting from sampling and other CQA activities, in accordance with the technical specifications. These perforations will be identified to the construction general contractor by the CQA representative. All repairs will be inspected by the CQA representative.

The construction general contractor will be required to use all means necessary to protect all prior work as well as all materials and completed work of other sections. In the event of damage, the construction general contractor will be required to immediately make all repairs and replacements necessary. The CQA representative will verify and document that all damages are repaired.

2.3.2.2 Layer Completion Certification

The construction general contractor will be required to notify the CQA representative when an area of SBL is complete, prior to constructing the overlying layer. The construction general contractor may begin placement of the overlying layer after acceptance of the SBL by the CQA certifying engineer. The CQA certifying engineer will provide a certificate of layer completion to the construction general contractor and the IDF project engineer, certifying that the area is complete.

The CQA certifying engineer will ensure all CQA tests are complete and that all defective areas have been repaired and re-tested in accordance with this CQA Plan and the technical specifications. The certificate of layer completion will indicate that the SBL meets the low permeability requirement, based on laboratory tests and the thickness of the SBL meeting the minimum requirement specified in the technical specifications.

2.4 DRAIN GRAVEL

2.4.1 Conformance Evaluation

No CQA conformance material testing is planned for the drain gravel. Construction general contractor is required to submit gradation test results demonstrating conformance with required material properties as part of source quality control, in accordance with the technical specifications.

2.4.2 Placement and Compaction

The CQA representative will verify and document that the drain gravel is constructed to the elevations, grades, and thicknesses shown in the construction drawings, with material meeting the requirements of the technical specifications as determined by the test methods and frequencies specified within this CQA Plan.

Prior to the placement of the drain gravel, the CQA representative will verify and document that:

- The underlying geosynthetic layers are free of holes, tears, excessive wrinkles, or foreign objects.
- All work on underlying layers is complete and accepted by the CQA certifying engineer.

During placement and compaction of the drain gravel, the CQA representative will verify and document the following:

- Drain gravel material satisfies the requirements of the technical specifications as determined by the source quality control submittals.
- Drain gravel material is non-angular and free of material that could damage the underlying liner materials.
- Drain gravel material is spread during cooler portions of the day, unless otherwise approved by the CQA certifying engineer.
- Spreading and hauling equipment and operations are in compliance with material thickness and operations requirements, given in the technical specifications.
- If excessive wrinkles begin to develop in the underlying geosynthetics during gravel or sand placement or spreading, the wrinkles are worked out prior to continued placement operations.
- The drain gravel is placed in a manner that will not damage underlying geosynthetics, will minimize slippage of geosynthetic layers, and will not provide excess tensile stress on the geosynthetics, in accordance with the technical specifications.
- Close observation of the placement and compaction of drain gravel with earth moving equipment is performed.

2.4.3 Construction Quality Assurance Evaluation

No density tests will be conducted on the drain gravel. If the CQA representative suspects damage to pipes or underlying geosynthetic, the construction general contractor will be required to expose the potentially damaged materials and repair any observed damage.

2.4.4 Layer Completion Certification

The construction general contractor will be required to notify the CQA representative when an area of the LCRS or LDS drain gravel is complete, prior to constructing the overlying layer. The construction general contractor may begin placing the overlying layer when the drain gravel is accepted by the CQA certifying engineer. The CQA certifying engineer will provide a certificate of layer completion to the construction general contractor and the IDF project engineer, certifying that the area is complete.

2.5 OPERATIONS LAYER

The CQA representative will verify and document that the operations layer, including the operations layer material placed in the SLDS sump area, is constructed to the elevations, grades, and thicknesses shown in the construction drawings, with material meeting the requirements of the technical specifications as determined by the test methods and frequencies specified within this CQA Plan.

Prior to the placement of the operations layer, the CQA representative will verify and document the following:

- The underlying geosynthetic layer is free of holes, tears, excessive wrinkles, or foreign objects.
- All work on underlying layers is complete and accepted by the CQA certifying engineer.

During placement of the operations layer, the CQA representative will verify and document that:

- The soil is suitable and satisfies the requirements of the technical specifications as determined by the test methods and frequencies prescribed in Table 2-7.
- The operations soil is placed in accordance with the technical specifications and construction drawings.
- The lift thicknesses and total thickness of the operations layer agree with the requirements of the construction drawings.
- If excessive wrinkles begin to develop in the underlying geosynthetics during material placement or spreading, the wrinkles are worked out prior to continued placement operations.
- The operations layer is placed in a manner that will not damage underlying geosynthetics, will minimize slippage of geosynthetic layers, and will not provide excess tensile stress on the geosynthetics, in accordance with the technical specifications.
- Spreading and hauling equipment and operations are in compliance with material thickness and operations requirements given in the technical specifications.
- The operations layer is placed on the side slopes to the limits shown in the construction drawings.
- No operations layer material is placed or compacted during periods of unfavorable weather conditions, such as after heavy rains or snow, in accordance with requirements given in the technical specifications.

2.5.1 Conformance Evaluation

The test methods and frequencies for CQA conformance testing for the operations layer are specified in Table 2-7.

If damage to underlying geosynthetics is suspected, the CQA representative will require that the overlying operations layer material be removed to expose the geosynthetics.

The construction general contractor will be required to use all means necessary to protect all prior work, as well as all materials and completed work of other sections. In the event of damage, the construction general contractor will be required to immediately make all repairs and replacements necessary. The CQA representative will verify and document that all damages are repaired.

2.5.2 Layer Completion Certification

The construction general contractor will be required to notify the CQA representative when an area of the operations layer is complete. The CQA certifying engineer will provide a certificate of layer completion to the construction general contractor and the IDF project engineer, certifying that the area is complete.

2.6 SOIL SURVEYING

A survey will be performed by or under the direction of a professional land surveyor registered in the State of Washington. The surveyor will independently survey the elevations and grades of the soil layers including, but not limited to:

- Top of prepared subgrade
- Top of SBL
- Top of LCRS drain gravel
- Top of operations layer

Surveys will be performed on the base and side slopes of the landfill, to confirm that the grades and elevations in the field agree with those shown in the construction drawings and with the minimum acceptable tolerances required in the technical specifications. The results of the survey, conducted by the surveyor, will be compiled in a report signed by the surveyor and the CQA certifying engineer.

The surveyor will be required to survey each soil layer of the liner system for the IDF landfill, in accordance with the requirements of this CQA Plan. A record drawing or tabular listing of surveyed points will be submitted to the CQA certifying engineer by the surveyor before the placement of the next liner system layer. The surveys will be conducted at a 50-ft grid across the entire area of the survey. The survey will include, but not be limited to, the following features of the landfill:

- Toe of slope
- Crest of slope
- Grade breaks
- Anchor trench
- SLDS, LDS and LCRS sumps

TABLE 2-1
Minimum Frequency of Testing for CQA Evaluation of Earthfill

Test	Frequency	Standard Test Method
Material Properties		
Standard proctor or maximum index density for free-draining soil	1 per 20,000 yd^3 (minimum 1 per source or soil type)	ASTM D698 or ASTM D4253
Placement		
In-place wet unit weight	1 per 5,000 ft^2 per lift	ASTM D2922, D1556
In-place moisture content	1 per 5,000 ft^2 per lift	ASTM D3017, D2216
Standard count calibration	1 per day of fill placement	ASTM D3017/D2922
Oven moisture contents (in situ moisture content)	1 per day of fill placement	ASTM D2216

TABLE 2-2
Minimum Frequency of Testing for CQA Evaluation of Structural Fill

Test	Frequency	Standard Test Method
Material Properties		
Standard proctor or maximum index density for free-draining soil	1 per 2,000 tons (minimum 1 per source or soil type)	ASTM 698 or ASTM 4253
Placement		
In place moisture content	1 per 2,500 ft^2 per lift	ASTM D3017, D2216
In place dry unit weight	1 per 2,500 ft^2 per lift	ASTM D2922, D1556
Standard count calibration	1 per day of fill placement	ASTM D3017/D2922
Oven moisture contents (in situ moisture content)	1 per day of fill placement	ASTM D2216

TABLE 2-3
Minimum Frequency of Testing for CQA Evaluation of Prepared Subgrade

Test	Frequency	Standard Test Method
Material Properties[a]		
Standard proctor or maximum index density for free-draining soil	1 per 250,000 ft^2 (minimum 1 per source or soil type)	ASTM 698 or ASTM 4253
In Place[b]		
In-place wet unit weight	4 per acre (approx. 1 per 10,000 ft^2)	ASTM D2922, D1556
In-place moisture content	4 per acre (approx. 1 per 10,000 ft^2)	ASTM D3017, D2216
Standard count calibration	1 per day when in place tests are performed	ASTM D3017/D2922
Concrete block calibration	1 per day when in place tests are performed	ASTM D3017/D2922
Over moisture content (in situ moisture content)	1 per day when in place tests are performed	ASTM D2216

a. Prior to subgrade excavation.
b. After reaching subgrade elevation.

TABLE 2-4
Test Pad Testing Methods and Minimum Frequency

Test	Frequency	Standard Test Method
Material Property		
Natural moisture content [a]	4 per each Base Soil type per test pad	ASTM D2216
Particle size distribution [b]	4 per each Base Soil type per test pad	ASTM D422
Standard proctor [a]	4 per each Base Soil type per test pad	ASTM D698
Bentonite dry fineness [b]	1 per test pad	Technical specification
Bentonite high swelling [b]	1 per test pad	Technical specification
Processing [b]		
Bentonite/Base Soil application rate	1 per working day of admix processing during test pad construction	Measure weight of base soil and bentonite entering pugmill during a given period of time
Maximum clod size	Periodic monitoring	Observation
Curing	1 per 12 hours	Observation
Pre Compaction [a]		
Lift thickness	1 per lift	Field measurement
Percent fines	1 per lift	ASTM D1140
Percent gravel	1 per lift	ASTM D422
Atterberg limits	1 per lift	ASTM D4318
Placement	Periodic monitoring	Observation
Post Compaction		
Lift thickness [b]	4 per lift	Field measurement
In-place moisture content [b]	4 per lift	ASTM D3017
In-place dry unit weight [b]	4 per lift	ASTM D2922
Shelby tube samples [b] (laboratory permeability)	1 per lift	ASTM D1587/ASTM D5084[c,d]
Number of passes [a]	Monitor each lift	Observation
Boutwell permeameter test [b]	5 for the horizontal test pad only	ASTM D6391, first stage only
Calibration and Check [e]		
Standard count calibration	1 per day of fill placement	ASTM D3017/D2922
Oven moisture contents (in situ moisture content)	1 per lift	ASTM D2216
In-place dry unit weight	1 per lift	ASTM D1556, D2167, or D2937

Notes:
a. Tests for information only
b. Pass/fail tests
c. The average effective confining stress will be 5 psi.
d. Rapid turnaround tests (Method F–Constant Volume) will be used when possible.
e. Calibration check tests

TABLE 2-5
Minimum Frequency of Testing for CQA Evaluation of SBL

Test	Frequency	Standard Test Method
Bentonite		
Dry fineness	1 per lot	Technical specification [a]
High swelling	1 per lot	Technical specification
Processing		
Base soil excavation	Periodic monitoring	Observation
Base soil natural moisture content	1 per working day of hauling base material or per material color/consistency change	ASTM D2216
Base soil grain size	1 per working day of hauling base material or per material color/consistency change	ASTM D422
Bentonite/Base Soil application rate	1 per working day of admix processing	Measure weight of base soil and bentonite entering pugmill during a given period of time
Maximum clod size	Periodic monitoring	Observation
Curing [c]	1 per 12 hours	Observation
Pre-Compaction		
Lift thickness [d]	1 per 2,500 ft^2 per lift	Field measurement
Percent fines	1 per 1,000 yd^3 (minimum of 1 per day of placement)	ASTM D1140
Percent gravel	1 per 1,000 yd^3 (minimum of 1 per day of placement)	ASTM D422
Atterberg limits	1 per 1,000 yd^3 (minimum of 1 per day of placement)	ASTM D4318
Placement	Periodic monitoring	Observation
Post Compaction		
Lift thickness	5 per acre per lift	Full measurement
In place moisture content	5 per acre per lift	ASTM D3017
In place dry unit weight	5 per acre per lift	ASTM D2922
Shelby tube samples (laboratory permeability)	1 per acre per lift	ASTM D1587/ ASTM D5084 [e, f]
Number of passes [g]	Observe 1 per acre per lift	Observation
Construction oversight	Periodic monitoring	Observation
Calibration and Check		
Oven moisture content (per each nuclear gauge)	1 per 10 nuclear gauge moisture contents	ASTM D2216
Standard count calibration (per each nuclear gauge)	1 per day of placement	ASTM D2922/ASTM D3017

a. The test method is described in the technical specification.
b. Not used.
c. Curing is stockpiling the SBL material for 12 hours to allow the bentonite to hydrate.
d. A loose lift thickness is such that the compacted thickness is 6 inches or less.
e. The average effective confining stress will be 5 psi.
f. Rapid turnaround tests (Method F – Constant Volume) will be used when possible.
g. A single pass is defined as forward and back.

TABLE 2-6
Maximum Allowable Percentage of Failed Tests for CQA Evaluation of SBL

Test	Maximum percentage
Percent gravel	5 percent not concentrated in one lift or one area
Clod size	10 percent not concentrated in one lift or one area
In place moisture content	3 percent not concentrated in one lift or one area, and no water content less than 2 percent or more than 3 percent of the specified value
In place dry unit weight	3 percent not concentrated in one lift or one area, and no dry unit weight less than 5 pounds per cubic foot (pcf) below the specified value
Shelby tube samples (laboratory permeability)	5 percent not concentrated in one lift or one area

TABLE 2-7
Minimum Frequency of Testing for CQA Evaluation of Operations Layer

Test	Frequency	Standard Test Method
Material Properties		
Standard proctor or maximum index density for free-draining soil	1 per 20,000 yd^3 (minimum 1 per source or soil type)	ASTM D698 or ASTM D4253
Sieve analysis	1 per 10,000 yd^3 placed (minimum 1 per source)	ASTM D422
In-Place (Outside edge of liner only)		
In-place wet unit weight	1 per 5,000 ft^2 per lift	ASTM D2922, D1556
In-place moisture content	1 per 5,000 ft^2 per lift	ASTM D3017, D2216
In-Place (SLDS sump)		
In-place wet unit weight	2 per lift	ASTM D2922, D1556
In-place moisture content	2 per lift	ASTM D3017, D2216

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SECTION III–GEOSYNTHETIC CLAY LINER CONSTRUCTION QUALITY ASSURANCE

3.1 GEOSYNTHETIC CLAY LINER MANUFACTURE AND DELIVERY

3.1.1 Labeling

The CQA representative will verify and document that the GCL manufacturer has labeled each roll of GCL and includes the information required by the technical specifications. The CQA representative will examine GCL rolls upon delivery and deviation from the above requirements will be reported to the CQA certifying engineer prior to installation of the GCL.

3.1.2 Transportation and Handling

The CQA representative will observe and document that the type of GCL handling equipment used by the installer minimizes damage to the material. Upon delivery at the site, the CQA representative will conduct a visual inspection of all rolls for defects and for damage. This examination will be conducted without unrolling rolls unless visible defects or damages are found. The CQA representative will indicate to the CQA certifying engineer:

- Any rolls that need to be unrolled to allow for their inspection
- Any rolls, or portions thereof, that need to be rejected and removed from the site because they have severe flaws
- Any rolls that include minor repairable flaws

3.1.3 Storage

The CQA representative will verify and document that storage of the GCL is in accordance with the technical specifications.

3.1.4 Inventory

All geosynthetic materials that arrive onsite will be inventoried. The inventory will include the specific roll numbers delivered with each shipment. The inventory will be compared to the QC testing information, supplied by the manufacturer to ensure that the material tested is the same material that was delivered to the site. Material for which QC testing data has been supplied will be sampled for conformance testing. Conformance samples may be obtained by the CQA representative at the manufacturing plant or taken upon delivery of the material to the site by a CQA representative. As shipments arrive at the site, a CQA representative will monitor the unloading operations and will inventory the material. Rolls selected for conformance testing will be set aside for sampling as soon as possible.

The CQA representative will record the following information, at a minimum, for each roll:

- **Manufacturer–**Indicate the manufacturer of the material that is being inventoried, that may not be the same as the installer
- **Date of Inventory–**Date that the material was inventoried
- **Date of Delivery–**Enter date when the truck arrived onsite, if known
- **Truck Type–**Indicate type of truck used for shipping geosynthetics (covered or uncovered flatbed, box trailer)
- **Bill of Lading Number–**If the bill-of-lading is available, indicate number and date (also attach copy to inventory form)
- **CQA Representative–**Indicate name of CQA representative performing inventory
- **Unloading Equipment–**Indicate the type and model number of the equipment unloading the geosynthetic material; also note any special attachments that are used to unload the material (stinger, straps, forks)
- **Weather Conditions–**Describe the weather conditions, including temperature, wind, cloud cover, and precipitation during unloading and conformance sampling operation
- **Material Type–**Indicate type of geosynthetic material
- **Roll Number–**Indicate each roll number that is written on the roll (The roll numbers contain a variety of information regarding the material and the manufacturing process.)
- **Lot Number**–Lot number
- **Roll (L × W)–**Indicate the roll width as written on the roll label; if two materials are bonded together (i.e., geonet/geotextile), obtain measurements for both materials
- **Area (square feet)–**Indicate the total square footage of the roll
- **Damage Remarks–**Document any visible damage to the roll; if possible, indicate if damage was present prior to unloading or if it occurred during unloading

The CQA representative will immediately notify the IDF CM if a nonconforming or conditional use tag is attached to any of the inventoried items.

Items that are restricted from further use until the inspections have been completed will be clearly delineated by the CQA representative. Accepted materials will be kept separate or clearly delineated from inventoried and approved items, to the extent possible. The CQA representative will be responsible for coordinating with the construction general contractor during material delivery, so that the material is not moved more than necessary after it is unloaded and damage due to handling is minimized.

The CQA representative will perform the inventory immediately after the material arrives on the site to avoid delaying construction. The CQA representative will be responsible for verifying that only accepted material is installed at the IDF landfill and that all inventories and inspections are documented and maintained.

3.1.5 Quality Assurance Conformance Testing

Either at the manufacturer's plant or upon delivery of the rolls of GCL, the CQA representative will ensure that samples are removed at the specified frequency and forwarded to the Geosynthetics CQA Laboratory for testing, to verify and document conformance with the technical specifications.

Conformance samples will be taken across the entire width of the roll and will not include the first 3 feet along the length of the roll. Unless otherwise specified, samples will be 1.5 feet (minimum) long by the roll width. The CQA representative will mark the machine direction on the samples with an arrow.

Unless otherwise specified, samples will be taken at a rate of one per lot or one per 50,000 square feet, whichever is greater. These samples will be tested for:

- Index Flux (ASTM D5887)
- Bentonite Mass per Unit Area (ASTM D5993)
- Bentonite Swell Index Test (ASTM D5890)

The test will be conducted in accordance with the test procedure presented in the technical specifications.

The CQA representative will examine all results from laboratory conformance testing and compare the results to the specifications presented in the technical specifications. In addition, the CQA representative will report any non-conformance to the CQA certifying engineer as soon as practical after the test results become available.

The following procedure will apply whenever a sample fails a conformance test that is conducted by the Geosynthetics CQA Laboratory:

- The construction general contractor will be required to replace the roll (or rolls) of GCL not in conformance with the specifications with a roll that meets the requirements of the technical specifications.

- The CQA representative will ensure that conformance samples are removed for testing by the Geosynthetics CQA Laboratory from the closest numerical roll on both sides of the roll from which the failing sample was obtained. These two samples must pass the above conformance tests. If either of these samples fails to meet the requirements, samples will be collected from the five numerically closest untested rolls on both sides of the failed samples and tested by the Geosynthetics CQA Laboratory. These ten samples must pass the above conformance tests. If any of these samples fail, a sample from every roll of GCL onsite and a sample from every roll that is subsequently delivered from the same manufacturer must be conformance tested by the Geosynthetics CQA Laboratory until the manufacturer has thoroughly demonstrated compliance with the above requirements to the sole satisfaction of the CQA certifying engineer. The costs of all such tests are to be borne by the construction general contractor.

- The CQA representative will document actions taken in conjunction with conformance test failures as outlined in Section 8.1.4 and report all actions to the CQA certifying officer.

3.2 GEOSYNTHETIC CLAY LINER INSTALLATION

3.2.1 Surface Preparation

For fill surfaces that will underlay a GCL layer, the CQA representative will verify and document the following:

- The surface of the fill does not contain holes, ruts, protrusions, or other surface irregularities in excess of those dimensions specified by the technical specifications.
- The surface of the fill has been compacted to form a firm, stable base.
- The surface of the fill is free of any type of deleterious material that may cause damage to GCL, including debris, organic material, frozen soil, ice, and rocks.
- The surface of the fill is free of standing water or excessive moisture.
- The construction general contractor has certified in writing that the surface on which the GCL will be installed is acceptable.

The subgrade surface will be inspected immediately prior to commencement of GCL installation. If any change in the surface requires repair work, in accordance with the technical specifications, the construction general contractor will be responsible for repairing the fill surface.

A certificate of subgrade surface acceptance will be required from the construction general contractor. The CQA representative will verify that the subgrade is accepted by the GCL installer, immediately prior to commencement of GCL installation.

After the surface on which the GCL is to be installed has been accepted by the construction general contractor, it will be the CQA representative's responsibility to indicate to the CQA certifying engineer any change in the underlying layer that may, in accordance with the technical specifications, require repair work. If the CQA certifying engineer requires that repair work be done, it will be the responsibility of the construction general contractor to repair the underlying layer.

3.2.2 Anchor Trenches and Sumps

Prior to placement of geosynthetics in the anchor trenches or sumps, the CQA representative will verify and document the following:

- The sumps and anchor trenches are excavated to the grades and dimensions shown in the construction drawings. Any anomalies in the soil encountered during excavation will be brought to the attention of the IDF project engineer and removed as directed.
- The anchor trench excavation surface is prepared for installation of geosynthetics, with rounded corners, and free of loose soil or deleterious material.

After geosynthetics deployment into the anchor trench is complete, the CQA representative will verify and document that the backfill for the geosynthetic anchor trenches is placed and compacted in accordance with the technical specifications.

3.2.3 Geosynthetic Clay Liner Deployment

3.2.3.1 Field Panel Identification

A field panel is the unit area of GCL that is to be placed in the field (i.e., a field panel is a roll or a portion of roll cut in the field).

The CQA representative will track the placement location of each GCL panel by assigning an identification code (number or letter-number) or by an equivalent tracking method. The identification method will be agreed upon by the CQA certifying engineer and the construction general contractor. This field panel identification scheme will be as simple and logical as possible. (Note: manufacturing plant roll numbers are usually cumbersome and are not related to location in the field.) It will be the responsibility of the construction general contractor to ensure that each field panel placed is marked with the manufacturing plant roll number. The roll number will be marked in the center of the panel in a color to allow for easy inspection.

The CQA representative will establish a table or chart showing correspondence between manufacturing plant roll numbers and field panel identification codes. The field panel identification code will be used for all CQA records.

3.2.3.2 Field Panel Placement

Installation Schedule

The CQA representative will evaluate significant changes in the schedule, proposed by the construction general contractor, and will advise the CQA certifying engineer on the acceptability of that change. The CQA representative will verify and document that the condition of the underlying layer has not changed detrimentally during installation. Any damage to the surface of the underlying layer will be repaired by the construction general contractor, in accordance with the technical specifications.

Weather Conditions

The CQA representative will verify and document that GCL is not placed during inclement weather conditions, as specified in the technical specifications. Additionally, the CQA monitor will verify and document that the existing underlying layer has not been damaged by weather conditions.

Damage

The CQA representative will visually observe each panel, after placement, for damage. The CQA representative will inform the construction general contractor which panels, or portions of panels, are rejected, repaired, or accepted. Damaged panels or portions of damaged panels that have been rejected by the CQA representative will be marked, and their removal from the work area will be documented by the CQA representative.

Seam Overlap and Bentonite Seal

The construction general contractor will observe and document that the seam overlaps and bentonite material placed between panels, if required, along the seams meets specification guidelines. The CQA representative will verify overlap width and will observe bentonite seal placement.

3.2.3.3 Field Panel Protection

The CQA representative will observe and document that the GCL is completely covered with geomembrane or protective plastic cover at the end of each workday and protected from damage and hydration due to weather. The CQA representative will verify and document that equipment does not operate directly on the GCL and that a smooth rub sheet is used to maneuver textured geomembrane over the GCL to prevent damage to the GCL.

3.2.4 Defects and Repairs

Any defects and subsequent repairs will be documented, using NCR procedures outlined in Section 8.1.4.

3.2.4.1 Identification

All seams and non-seam areas of the GCL will be inspected by the CQA representative for evidence of defects, holes, contamination of geotextiles, displaced panels, premature hydration, and any sign of contamination by foreign matter. The CQA representative will observe and document repair procedures described below.

3.2.4.2 Repair Procedures

Prior to cover material placement, damage to the GCL will be identified and repaired by the installer.

Rip and Tear Repair (Flat Surfaces)
Rips or tears may be repaired by completely exposing the affected area, removing all foreign objects or soil, and by then placing a patch cut from unused GCL over the damage (damaged material may be left in place), with a minimum overlap of 12 inches on all edges.

Accessory bentonite will be placed between the patch edges and the repaired material at a rate of a quarter pound per lineal foot of edge, spread in a continuous 6 inch fillet.

Rip and Tear Repair (Slopes)
Damaged GCL material on slopes will be repaired by the same procedures as described above, however, the overlapped edges of the patch need to be wide enough to ensure the patch will keep its position during backfill or cover operations.

Displaced Panels
Displaced panels will be adjusted to the correct position and orientation. The adjusted panel will then be inspected for any geotextile damage or bentonite loss. Damage will be repaired by the above described procedure.

Premature Hydration
If the GCL is subjected to premature hydration, the construction general contractor will notify the CQA certifying engineer for a site-specific determination as to whether the material is acceptable or if alternative measures must be taken to ensure the quality of the design dependent upon the degree of damage.

SECTION IV–GEOMEMBRANE CONSTRUCTION QUALITY ASSURANCE

4.1 GEOMEMBRANE MATERIAL

4.1.1 Labeling

The CQA representative will verify and document that the geomembrane manufacturer has labeled each roll of geomembrane and includes the information required by the technical specifications. The CQA representative will examine geomembrane rolls upon delivery and deviation from the requirements will be reported to the CQA certifying engineer, prior to installation of the geomembrane.

4.1.2 Transportation and Handling

Upon delivery at the site, the CQA representative will conduct a visual inspection of all rolls for defects and damage. This examination will be conducted without unrolling rolls unless visible defects or damage are found. The CQA representative will indicate the following to the CQA certifying engineer:

- Any rolls that need to be unrolled to allow for their inspection
- Any rolls, or portions thereof, that need to be rejected and removed from the site because they have severe flaws
- Any rolls that include minor repairable flaws

4.1.3 Storage

The CQA representative will verify and document that storage of the geomembrane is in accordance with the technical specifications.

4.1.4 Inventory

All geosynthetic materials that arrive onsite will be inventoried in accordance with the technical specifications. The inventory will include the specific roll numbers delivered with each shipment. The inventory will be compared to the QC testing information supplied by the manufacturer to ensure that the material tested is the same material that was delivered to the site. Material for which QC testing data has been supplied will be sampled for conformance testing. Conformance samples may be obtained by the CQA representative at the manufacturing plant or taken upon delivery of the material to the site by a CQA representative. As shipments arrive at the site, a CQA representative will monitor the unloading operations and will inventory the material. Rolls selected for conformance testing will be set aside for sampling as soon as possible.

The CQA representative will record the following information, at a minimum, for each roll:

- **Manufacturer–**indicate the manufacturer of the material that is being inventoried, that may not be the same as the installer
- **Date of Inventory–**Date that the material was inventoried
- **Date of Delivery–**Enter date when the truck arrived onsite, if known
- **Truck Type–**Indicate type of truck used for shipping geosynthetics (covered or uncovered flatbed, box trailer)
- **Bill-of-Lading Number–**If the bill-of-lading is available, indicate number and date (also attach copy to inventory form)
- **CQA Representative–**Indicate name of CQA representative performing inventory
- **Unloading Equipment–**Indicate the type and model number of the equipment unloading the geosynthetic material; also note any special attachments that are used to unload the material (stinger, straps, forks)
- **Weather Conditions–**Describe the weather conditions, including temperature, wind, cloud cover, and precipitation during unloading and conformance sampling operation
- **Material Type–**Indicate type of geosynthetic material (HDPE, geotextile, or geonet)
- **Roll Number–**Indicate each roll number that is indicated on the roll (The roll numbers contain a variety of information regarding the material and the manufacture process.)
- **Lot Number–**Lot number as indicated
- **Roll (L × W)–**Indicate the roll width as indicated on the roll label; if two materials are bonded together (i.e., geonet/geotextile), obtain measurements for both materials
- **Area (square feet)–**Indicate the total square footage of the roll
- **Damage Remarks–**Document any visible damage to the roll; if possible, indicate if damage was present prior to unloading or if it occurred during unloading

Items that are restricted from further use until the inspections have been completed will be clearly delineated by the CQA representative. Accepted materials will be kept separate or clearly delineated from inventoried and approved items to the extent possible. The CQA representative will be responsible for coordinating with the construction general contractor during material delivery, so that the material is not moved more than necessary after it is unloaded and damage due to handling is minimized.

The CQA representative will perform the inventory immediately after the material arrives onsite to avoid delaying construction. The CQA representative will be responsible for verifying that only accepted material is installed at the IDF landfill, and that all inventories and inspections are documented and maintained.

4.1.5 Quality Assurance Conformance Testing

Either at the manufacturer's plant or upon delivery of the rolls of geomembrane, the CQA representative will ensure that samples are removed at the specified frequency and forwarded to the Geosynthetics CQA Laboratory for testing to verify and document conformance with the technical specifications.

Conformance samples will be taken by the CQA representative across the entire width of the roll and will not include the first 3 feet. Unless otherwise specified, samples will be 3 feet (minimum) long by the roll width. The CQA representative will mark the direction of the machine used to cut the samples with an arrow.

Unless otherwise specified, samples will be taken at a rate of one per lot or one per 50,000 square feet, whichever is greater. These samples will be tested for:

- Thickness (ASTM D5199 or D5994)
- Tensile characteristics (yield strength and elongation at yield, ASTM D638)
- Asperity (GRI GM-12)
- Puncture resistance (ASTM D4833)

Test will be conducted in accordance with the test procedure presented in the technical specifications. The CQA representative will examine all results from laboratory conformance testing and will report any non-conformance after the test results become available. The following procedure will apply whenever a sample fails a conformance test that is conducted by the CQA representative:

- The construction general contractor will be required to replace the roll (or rolls) of geomembrane in non-conformance with the technical specifications with a roll that meets the technical specifications.

- The CQA certifying engineer will ensure that conformance samples are removed for testing by the Geosynthetics CQA Laboratory from the closest numerical roll on both sides of the failed roll. These two samples must pass the above conformance tests. If either of these samples fail, samples will be collected from the five numerically closest untested rolls on both sides of the failed sample and tested by the Geosynthetics CQA Laboratory. These ten samples must pass the above conformance tests. If any of these samples fail, a sample from every roll of geomembrane onsite and every roll subsequently delivered from the same manufacturer must be conformance tested by the Geosynthetics CQA Laboratory, until the manufacturer has thoroughly demonstrated compliance with the above requirements to the sole satisfaction of the CQA certifying engineer. The costs of all such tests are to be borne by the construction general contractor.

4.1.6 Manufacturing Plant Site Visit

The manufacturer shall allow the CQA certifying engineer or his designated representative to visit the manufacturing plant, if the CQA certifying engineer so chooses. If possible, the visit shall be prior to or during the manufacturing of the geomembrane rolls for the specific project. The CQA Engineer or his designated representative shall review the manufacturing process, quality control, laboratory facilities, and testing procedures as described in the technical specifications (see Section 02661).

4.2 GEOMEMBRANE INSTALLATION

4.2.1 Surface Preparation

For SBL surfaces that will underlay a geomembrane layer, the CQA representative will verify and document the following:

- The surface of the subgrade or SBL does not contain holes, depressions, or protrusions in excess of those dimensions specified by the technical specifications.
- The surface of the subgrade or SBL has been rolled with a smooth-drum roller to form a firm stable base without ridges, wheel ruts, and surface irregularities.
- The surface of the subgrade or SBL is free of any type of deleterious material that may cause damage to geomembrane.
- The construction general contractor has certified in writing that the surface on which the geomembrane will be installed is acceptable.

The subgrade and SBL surface will be inspected immediately prior to commencement of geomembrane installation. If any change in the surface requires repair work, in accordance with the technical specifications, the construction general contractor will be responsible for repairing the surface. A certificate of subgrade surface acceptance will be required from the construction general contractor. The CQA representative will verify that the subgrade is accepted by the geomembrane installer immediately prior to commencement of geomembrane installation.

After the surface on which the geomembrane is to be installed has been accepted by the construction general contractor, it will be the CQA representative's responsibility to indicate to the CQA certifying engineer any change in the underlying layer that may, in accordance with the technical specifications, require repair work. If the CQA certifying engineer requires that repair work be done, it will be the responsibility of the construction general contractor to repair the underlying layer.

4.2.2 Anchor Trenches and Sumps

Prior to placement of geosynthetics in the anchor trenches or sumps, the CQA representative will verify and document the following:

- The excavation of the sumps and anchor trenches is performed in accordance with the technical specifications. Any anomalies in the soil encountered during excavation will be brought to the attention of the IDF project engineer and removed as directed.

- The anchor trench excavation surface is prepared for installation of geosynthetics with rounded corners and is free of loose soil or deleterious material.

After geosynthetics deployment into the anchor trench is complete, the CQA representative will verify and document that the backfill for the geosynthetic anchor trenches is placed and compacted in accordance with the technical specifications and construction drawings.

4.2.3 Geomembrane Deployment

4.2.3.1 Layout Drawing

The construction general contractor will be required to produce layout drawings that show the geomembrane panel configuration, dimensions, details, and seam locations. The layout drawings must be approved by the CQA certifying engineer, prior to the installation of the geomembrane.

4.2.3.2 Field Panel Identification

A field panel is the unit area of geomembrane that is to be seamed in the field (i.e., a field panel is a roll or a portion of roll cut in the field).

The CQA representative will verify that each field panel is given an identification code (number or letter-number) consistent with the layout plan. This identification code will be agreed upon by the CQA representative and the construction general contractor. This field panel identification code will be as simple and logical as possible. (Note: manufacturing plant roll numbers are usually cumbersome and are not related to location in the field.) It will be the responsibility of the construction general contractor to ensure that each field panel placed is marked with the manufacturing plant roll number. The roll number will be marked in the center of the panel in a color to allow for easy inspection.

The CQA representative will establish a table or chart showing correspondence between manufacturing plant roll numbers and field panel identification codes. The field panel identification code will be used for all CQA records.

4.2.3.3 Field Panel Placement

Location

The CQA representative will verify and document that field panels are installed at the locations and positions indicated in the construction general contractor's layout plan, as approved or modified by the CQA certifying engineer.

Installation Schedule

The CQA representative will evaluate significant changes in the schedule, proposed by the construction general contractor, and will advise the CQA certifying engineer on the acceptability of that change. The CQA representative will verify and document that the condition of the underlying layer has not changed detrimentally during installation. Any damage to the surface of the underlying layer will be repaired by the construction general contractor in accordance with the technical specifications.

The CQA representative will record the identification code, location, and date of installation of each field panel.

Weather Conditions

The CQA representative will verify and document that geomembrane is not placed during inclement weather conditions, as specified in the technical specifications. Additionally, the CQA representative will verify and document that the underlying layer has not been damaged by weather conditions.

Damage

The CQA representatives will visually observe each panel, after placement and prior to seaming, for damage (e.g., holes, blisters, and creases). The CQA representative will inform the construction general contractor which panels, or portions of panels, need to be rejected, repaired, or accepted. Damaged panels or portions of damaged panels that have been rejected by the CQA certifying engineer will be marked, and their removal from the work area will be documented by the CQA representative, using the NCR procedures outlined in Section 8.1.4.

4.2.4 Field Seaming

4.2.4.1 Seam Layout

The CQA certifying engineer will verify and document that the seam layout shown in the panel layout drawing is consistent with the technical specifications. A seam numbering system compatible with the panel numbering system will be agreed upon by the construction general contractor and CQA certifying engineer.

4.2.4.2 Seaming Equipment and Products

Processes approved by the technical specifications for field seaming are extrusion seaming; and fusion seaming. Proposed alternate processes will be required to be documented and submitted to the CQA certifying engineer for approval. The construction general contractor will be required to use a pyrometer to ensure that accurate temperatures of the extrudate and seamer nozzle are being achieved.

The extrusion seaming apparatus will be equipped with gauges, indicating the temperatures of the extrudate and nozzle. The construction general contractor will be required to provide to the CQA certifying engineer the manufacturer's certification that the extrudate is compatible with the geomembrane material and is comprised of the same resin as the geomembrane.

The CQA representative will log ambient temperatures, seaming apparatus temperatures, and extrudate temperatures or fusion seaming apparatus speeds. Ambient temperatures will be measured to verify compliance with the technical specifications.

4.2.4.3 Seam Preparation

The CQA certifying engineer will verify and document the following:

- Prior to seaming, the seam area is clean and free of moisture, dust, dirt, debris, and foreign material.
- Preparation of seams is in accordance with the technical specifications.

4.2.4.4 Weather Conditions for Seaming

The CQA representative will verify and document that weather conditions for seaming are within the limits specified in the technical specifications.

4.2.4.5 Trial Seams

The construction general contractor will be required to make trial seams on fragment pieces of geomembrane liner to verify that seaming conditions are adequate. The construction general contractor will be required to make and test trial seams at the frequency and in accordance with the methods specified in the technical specifications.

The CQA representative will observe all trial seam procedures. The trial seam samples will be assigned a number and marked accordingly by the CQA representative, along with the date, hour, ambient temperature, number of seaming unit, name of seamer, and pass or fail description. A sample of the trial seam will be retained by the CQA team until the construction of the liner is complete and the liner has been accepted by the CQA certifying engineer.

4.2.4.6 Nondestructive Seam Continuity Testing

Except as otherwise noted in the technical specifications, the construction general contractor will nondestructively test all field seams over their full length, in accordance with the technical specifications. The purpose of nondestructive tests is to check the continuity of seams. Continuity testing will be carried out as the seaming work progresses, not at the completion of all field seaming. Nondestructive testing will not be permitted before sunrise or after sunset unless the construction general contractor demonstrates to the CQA certifying engineer that the construction general contractor has the capabilities to perform continuity testing under reduced light conditions. The CQA representative will perform the following tasks:

- Observe the continuity testing
- Record location, date, test unit number, name of tester, and outcome of all testing
- Document and inform the construction general contractor of any required repairs

The construction general contractor will be required to complete any required repairs, in accordance with the technical specifications. The CQA representative will perform the following tasks:

- Observe the repair and re-testing of the repair
- Mark on the geomembrane that the repair has been made
- Document the results

The CQA representative will verify and document the procedures specified in the technical specifications where seams cannot be nondestructively tested. The location, date of visual observation, name of tester, and outcome of the test or observation will be recorded by the CQA representative and reported to the CQA certifying engineer.

4.2.4.7 Destructive Seam Testing

Concept

Destructive seam tests will be performed at selected locations. The purpose of these tests is to evaluate seam strength and integrity. Seam strength testing will be done as the seaming work progresses, not at the completion of all field seaming.

Location and Frequency

The CQA representative will select locations where seam samples will be cut out for laboratory testing at the frequency specified in the technical specifications (see Section 02661). In general, destructive tests will be located in non-critical areas, such as seam run-out areas or near three-panel intersections or other areas that will require a patch anyway. In addition, because extrusion welding may be limited on a daily basis, extrusion destructive samples may be welded after passing a trial seam on scrap material not used for construction. However, when significant lengths (greater than 100 feet) of seams or caps are extrusion welded, a destructive test of the weld will be taken.

Control charts will be used to track the performance of each welding machine and technician to allow for biased sampling, according to performance. An upper control limit (UCL) will be established to statistically identify the sources of test failures. Machines and technicians whose failure rates exceed the UCL will then be identified and destructively tested at twice the original frequency (one per 250 feet of seam length) to better monitor their performance. Once the failure rate drops back into compliance with the UCL, the original testing frequency will be reinstated. Machines and technicians whose failure notes are below the UCL will be identified to decrease the original frequency, as approved by the CQA certifying engineer.

The UCL is established based on the failure rate for all destructive tests plus three standard deviations with a ceiling of 3.5 percent. The ceiling is the maximum failure rate determined to be acceptable, as agreed upon jointly by the construction general contractor and CQA certifying engineer. The initial UCL will be calculated once a single machine or technician fails two destructive tests and will typically be updated daily with the most recent destructive testing results. Destructive tests tracking a failed destructive will not be included in the calculation of the failure rates.

Additional destructive test locations may be required during seaming operations. The necessity for such additional sampling and testing will be determined by CQA representatives and will be implemented when there is cause to suspect the presence of excess crystallinity, contamination, offset welds, or any other reason to suspect potentially defective seams. The location selection of the additional testing will be based on the CQA representative's judgment and observation of a suspected problem.

The construction general contractor will not be informed in advance of the locations where the seam samples will be taken.

Sampling Procedure

The construction general contractor will be required to cut samples, as directed by the CQA representative as the seaming progresses, in order to have laboratory test results before the geomembrane is covered by another material. The CQA representative will perform the following tasks:

- Observe sample cutting
- Assign a number to each sample and mark it accordingly
- Record the sample number and location on the panel layout drawing
- Record the reason for taking the sample at this location (e.g., routine testing, suspicious feature of the geomembrane)

All holes in the geomembrane resulting from destructive seam sampling will be covered by the construction general contractor immediately after sampling and will be repaired in accordance with the repair procedures described in the technical specifications. The continuity of the new seams in the repaired area will be nondestructively tested, according to the technical specifications.

Size of Samples

At a given sampling location, two types of samples will be taken by the construction general contractor. First, two specimens for field testing will be taken. Each of these specimens will be 1 inch wide by 6 to 12 inches long, with the seam centered parallel to the width. The distance between these two specimens will be approximately 42 inches. If both specimens pass the field test described in the technical specifications, a sample for laboratory testing will be taken.

The sample for laboratory testing will be required to be taken between the two specimens for field testing. The destructive sample will be 12 inches wide by 42 inches long, with the seam centered lengthwise. The sample will be cut into three parts and distributed as follows:

- One portion to the construction general contractor, 12 inches long
- One portion to the IDF CM for archive storage, 12 inches long
- One portion to the CQA certifying engineer for CQA Laboratory testing, 18 inches long

Final determination of the sample sizes will be made at the preconstruction meeting.

Field Testing

The two 1-inch-wide specimens, as specified above, will be required to be tested in the field by the CQA representative by tensiometer for peel and shear and need to not fail in the seam. If any field test sample fails to pass, the procedures outlined in the technical specifications will be followed.

The CQA representative will mark all samples and portions with their number, date, and time.

Geosynthetic Construction Quality Assurance Laboratory Testing

Laboratory destructive test samples will be packaged and shipped to the Geosynthetics CQA Laboratory by the CQA representative in a manner that will not damage the test sample. The CQA representative will store the archive samples until the completion of the project.

Testing will include "Shear Strength" and "Peel Strength" (ASTM D6392) with 1-inch-wide strip, tested at 2 inches per minute. The minimum acceptable values to be obtained in these tests are those indicated in the technical specifications. At least five specimens will be tested for each test method. Specimens will be selected alternately by test from the samples (i.e., peel, shear, peel, shear). At least four out of five of the specimens for each test must pass.

The laboratory will provide test results verbally to the CQA certifying engineer in a timely manner after they receive and test the samples. The CQA certifying engineer will review laboratory test results as soon as they become available and will inform the CQA certifying engineer of the test results.

Procedures for Destructive Test Failure

The procedures specified in the technical specifications will be required whenever a sample fails a destructive test, whether that test is conducted by the Geosynthetics CQA Laboratory or by field tensiometer. The CQA certifying engineer will verify and document that one of the options specified in the technical specifications is followed. The CQA representative will document all actions taken in conjunction with destructive test failures, including preparation of NCRs, as outlined in Section 8.1.4.

4.2.5 Defects and Repairs

4.2.5.1 Identification

All seams and non-seam areas of the geomembrane will be inspected by the CQA representative for evidence of defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. Because light reflected by the geomembrane helps to detect defects, the surface of the geomembrane will be required to be clean at the time of examination. The geomembrane surface will be required to be swept or washed by the construction general contractor if the amount of dust or mud inhibits examination.

4.2.5.2 Evaluation

Each suspect location both in seam and non-seam areas will be required to be either non-destructively tested using the methods described in the technical specifications, or repaired as appropriate as determined by the CQA certifying engineer. Each location that fails the non-destructive testing will be marked by the CQA representative and will be required to be repaired by the construction general contractor. Materials will not be placed over geomembrane locations that have been repaired until the CQA representative has approved the repair.

4.2.5.3 Large Wrinkles

When seaming of the geomembrane is completed (or when seaming of a large area of the geomembrane is completed) and prior to placing overlying materials, the CQA representative will visually inspect the geomembrane for wrinkles. Based on the requirements of the technical specifications, the CQA representative will indicate to the

construction general contractor which wrinkles, if any, are to be cut, overlapped, and seamed to remove the wrinkle. The seam thus produced will be tested like any other seam.

4.2.5.4 Repair Procedures

Any portion of the geomembrane either exhibiting a flaw or failing a destructive or nondestructive test will be repaired by the construction general contractor in accordance with the applicable method specified in the technical specifications. An NCR will be prepared to document all flaws and failed tests, as outlined in Section 8.1.4. Each repair will be located and logged by the CQA representative.

4.2.5.5 Testing of Repairs

Each repair will be non-destructively tested, using the methods described in the technical specifications as appropriate. Repairs that pass the non-destructive test will be considered adequate. Large caps may be of sufficient extent to require destructive testing, at the discretion of the CQA certifying engineer. Failed tests will require the repair to be redone and re-tested until passing test results are obtained. The CQA representative will observe the non-destructive testing of repairs and will document the date of the repair and test outcome.

4.2.6 Appurtenances

The CQA representative will verify and document the following:

- Installation of the geomembrane around, and connection of geomembrane to, appurtenances have been made according to the technical specifications or manufacturer's recommendations.
- Extreme care is taken while seaming around appurtenances, since neither non-destructive nor destructive testing may be feasible in these areas.
- The geomembrane has not been visibly damaged while being connected to appurtenances.

The CQA representative will inform the CQA certifying engineer if the above conditions are not fulfilled.

4.3 GEOMEMBRANE PANEL LAYOUT SURVEY

A survey will be performed by or under the direction of a professional land surveyor registered in the State of Washington. The surveyor will independently survey the elevations and location of each panel intersection and destructive sample. The results of the survey conducted by the surveyor will be compiled in a report signed by the surveyor and the CQA certifying engineer.

The surveyor will be required to survey each geomembrane panel intersection and destructive sample location for the IDF landfill, in accordance with the requirements of this CQA Plan. A record drawing will be submitted to the CQA certifying engineer by the surveyor. The survey will include enough information to confirm that the geomembrane layout is in accordance with the panel layout and include, but not be limited to, the following information:

- Geomembrane panel intersections
- Destructive sample location and identification
- Edge of geomembrane liner
- Panel identification numbers

Each geomembrane layer will be surveyed including, but not be limited to:

- Secondary leak detection system geomembrane
- Secondary geomembrane
- Primary geomembrane

4.4 LAYER COMPLETION CERTIFICATION

The construction general contractor will be required to notify the CQA representative when an area of geomembrane is complete, prior to constructing the overlying layer. The construction general contractor may place overlying layer after acceptance of geomembrane layer by the CQA Certifying Engineer. The CQA certifying engineer will provide a certificate of layer completion to the construction general contractor and the IDF project engineer, certifying that all CQA tests are complete and all defects have been repaired and tested.

SECTION V–GEOTEXTILE CONSTRUCTION QUALITY ASSURANCE

5.1 GEOTEXTILE MATERIAL AND INSTALLATION

5.1.1 Labeling

The CQA representative will verify and document that the geotextile manufacturer has labeled all rolls of geotextile with the information specified in the technical specifications. The CQA representative will examine rolls upon delivery, and any deviation from the requirements will be reported to the CQA certifying engineer. Geotextile rolls that are not labeled or that have illegible labels will be removed and disposed by the construction general contractor.

5.1.2 Transportation and Handling

The CQA representative will observe rolls of geotextile upon delivery at the site, and any deviation from the transportation and handling requirements specified in the technical specifications will be reported to the CQA certifying engineer. Any damaged rolls will be rejected by the CQA certifying engineer and required to be repaired or replaced by the construction general contractor.

5.1.3 Storage

The CQA representative will verify and document that storage of the geotextile is in accordance with the technical specifications.

5.1.4 Inventory

All geotextile materials that arrive onsite will be inventoried. The inventory will include the specific roll numbers delivered with each shipment. The inventory will be compared to the QC testing information, supplied by the manufacturer to ensure that the material tested is the same material that was delivered to the site. Material for which QC testing data has been supplied will be sampled for conformance testing. Conformance samples may be obtained by the CQA representative at the manufacturing plant or taken upon delivery of the material to the site by a CQA representative.

As shipments arrive at the site, a CQA representative will monitor the unloading operations and will inventory the material. Rolls selected for conformance testing will be set aside for sampling as soon as possible.

The CQA representative will record the following information, at a minimum, for each roll:

- **Manufacturer–**Indicate the manufacturer of the material that is being inventoried, that may not be the same as the installer
- **Date of Inventory–**Date that the material was inventoried
- **Date of Delivery–**Enter date when the truck arrived onsite, if known
- **Truck Type–**Indicate type of truck used for shipping geosynthetics (covered or uncovered flatbed, box trailer)
- **Bill-of-Lading Number–**If the bill-of-lading is available, indicate number and date (also attach copy to inventory form)
- **CQA Representative–**Indicate name of CQA representative performing inventory
- **Unloading Equipment–**Indicate the type and model number of the equipment unloading the geosynthetic material; also note any special attachments that are used to unload the material (stinger, straps, forks)
- **Weather Conditions–**Describe the weather conditions, including temperature, wind, cloud cover, and precipitation during unloading and conformance sampling operation
- **Material Type–**Indicate type of geosynthetic material
- **Roll Number–**Indicate each roll number that is indicated on the roll
- **Lot Number**–Lot number
- **Roll (L × W)–**Indicate the roll width as indicated on the roll label; if two materials are bonded together (i.e., geonet/geotextile), obtain measurements for both materials
- **Area (square feet)–**Indicate the total square footage of the roll
- **Damage Remarks–**Document any visible damage to the roll; if possible, indicate if damage was present prior to unloading or if it occurred during unloading

Items that are restricted from further use until the inspections have been completed will be clearly delineated by the CQA representative. Accepted materials will be kept separate or clearly delineated from inventoried and approved items to the extent possible. The CQA representative will coordinate with the construction general contractor during material delivery so that the material is not moved more than necessary after it is unloaded and damage due to handling is minimized.

The CQA representative will perform the inventory immediately after the material arrives onsite to avoid delaying construction. The CQA representative will be responsible for verifying that only accepted material is installed at the IDF landfill and that all inventories and inspections are documented and maintained.

5.1.5 Conformance Testing

Either at the manufacturer's factory or upon delivery of the geotextile rolls, the CQA representative will ensure that samples are removed and forwarded to the Geosynthetics CQA Laboratory for testing to verify and document conformance with the requirements of the technical specifications. Conformance samples will be taken across the entire width of the roll and will not include the first 3 feet along the edge of the roll. Unless otherwise specified, samples will be 3 feet (minimum) long by the roll width. The CQA representative will mark the machine direction on the samples with an arrow.

Samples will be taken at a rate of one per material lot or one per 50,000 square foot, whichever is greater. These samples will be tested for the following:

- Permittivity (ASTM D4491, Type 1 only)
- Grab strength (ASTM D4632)
- Tear strength (ASTM D4533)
- Puncture strength (ASTM D4833)

The CQA representative will examine all results of laboratory conformance testing and report any non-conformance to the CQA certifying engineer as soon as results become available. The following procedure will apply whenever a sample fails a conformance test that is conducted by the Geosynthetics CQA Laboratory:

- The construction general contractor will replace the roll (or rolls) of geotextile not in conformance with the specifications with a roll that meets the requirements of the technical specifications.

- The CQA representative will ensure that conformance samples are removed for testing by the Geosynthetics CQA Laboratory from the closest numerical roll on both sides of the roll from which the failing sample was obtained. These two samples must pass the above conformance tests. If either of these samples fail to meet the requirements, samples will be collected from the five numerically closest untested rolls on both sides of the failed sample and tested by the Geosynthetics CQA Laboratory. These ten samples must pass the above conformance tests. If any of these samples fail, a sample from every roll of geotextile onsite and a sample from every roll that is subsequently delivered from the same manufacturer must be conformance tested by the Geosynthetics CQA Laboratory, until the manufacturer has thoroughly demonstrated compliance with the above requirements to the sole satisfaction of the CQA certifying engineer. The cost of all such tests are to be borne by the construction general contractor.

The CQA representative will document actions taken in conjunction with conformance test failures and report all actions taken to the CQA certifying engineer. Failed tests will be documented using NCR procedures, outlined in Section 8.1.4.

5.1.6 Deployment

The construction general contractor will be required to handle all geotextile material in such a manner as to ensure that it is not damaged in any way.

It will be the CQA representative's responsibility to indicate to the CQA certifying engineer any change in the underlying layer that may, in accordance with the technical specifications, require repair work. If the CQA certifying engineer requires that repair work be done, it will be the responsibility of the construction general contractor to repair the underlying layer.

The CQA representative will verify and document compliance with the following:

- Just prior to geotextile placement, the layer that underlies the geotextile, if it is a geosynthetic, is clean and free of excessive amounts of dust, dirt, stones, rocks, or other obstructions that could potentially damage the liner system.
- In the presence of excessive wind, the geotextile is weighted with sandbags (or equivalent weight approved by the CQA representative).
- Geotextile is kept under tension to minimize the presence of wrinkles in the geotextile. If necessary, the geotextile is positioned by hand after being unrolled to minimize wrinkles.
- Geotextile is cut using a geotextile cutter approved by the geotextile manufacturer and the CQA representative. If in place, special care is taken to protect other materials (such as underlying geosynthetics) from damage that could be caused by the cutting of the geotextiles.
- The construction general contractor takes any necessary precautions to prevent damage to the underlying layers during placement of the geotextile.
- During placement of geotextile, care is taken not to entrap stones, excessive dust, or moisture that could damage the underlying layers, generate clogging of drains or filters, or hamper subsequent seaming.
- Geotextile is not left exposed for an excess of 14 days after placement, to prevent damage from exposure to ultraviolet radiation (sunlight). If the geotextile is exposed for more than 14 days, a temporary cover may be deployed for the duration of the delay or samples may be submitted to an independent testing laboratory to ensure that detrimental levels of UV degradation have not occurred. Test results shall be submitted to CQA certifying engineer for review and approval. Detrimental level of UV degradation is defined in the technical specifications (see Section 02371).

The CQA representative will document any non compliance with the above requirements and report them to the CQA certifying engineer.

5.1.7 Seams and Overlaps

The CQA representative will verify and document that all geotextile seams are oriented and overlapped, in accordance with the technical specifications. The construction general contractor will be required to pay close attention at seams to ensure that no protective soil layer material could be inadvertently placed beneath the geotextile.

5.1.8 Repair

The CQA representative will verify and document that any holes or tears in the geotextile are repaired, in accordance with the requirements of the technical specifications. The CQA representative will document any noncompliance with the above requirements and report it to the CQA certifying engineer.

SECTION VI–COMPOSITE DRAINAGE NET CONSTRUCTION QUALITY ASSURANCE

6.1 COMPOSITE DRAINAGE NET MATERIAL AND INSTALLATION

6.1.1 Labeling

The CQA representative will verify and document that the composite drainage net manufacturer has labeled all rolls of composite drainage net as specified in the technical specifications. The CQA representative will examine rolls upon delivery, and any deviation from the above requirements will be reported to the CQA certifying engineer prior to installation of the composite drainage net.

6.1.2 Transportation and Handling

The CQA representative will observe rolls of composite drainage net upon delivery at the site, and any deviation from the requirements of the technical specifications will be reported to the CQA certifying engineer. Any damaged rolls will be rejected by the CQA representative and be required to be repaired or replaced by the construction general contractor.

6.1.3 Storage

The CQA representative will verify and document that the storage of the composite drainage net is in accordance with the technical specifications.

6.1.4 Inventory

All CDN that arrive onsite will be inventoried. The inventory will record the specific roll numbers delivered with each shipment. The inventory will be compared to the QC testing information supplied by the manufacturer, to ensure that the material tested is the same material that was delivered to the site. Material for which QC testing data has been supplied will be sampled for conformance testing. Conformance samples may be obtained by the CQA representative at the manufacturing plant or taken upon delivery of the material to the site by a CQA representative.

As shipments arrive at the site, a CQA representative will monitor the unloading operations and will inventory the material. Rolls selected for conformance testing will be set aside for sampling as soon as possible.

The CQA representative will record the following information, at a minimum, for each roll:

- **Manufacturer–**Indicate the manufacturer of the material that is being inventoried, that may not be the same as the installer
- **Date of Inventory–**Date that the material was inventoried
- **Date of Delivery–**Enter date when the truck arrived onsite, if known
- **Truck Type–**Indicate type of truck used for shipping geosynthetics (covered or uncovered flatbed, box trailer)
- **Bill-of-Lading Number–**If the bill-of-lading is available, indicate number and date (also attach copy to inventory form)
- **CQA Representative–**Indicate name of CQA representative performing inventory
- **Unloading Equipment–**Indicate the type and model number of the equipment unloading the geosynthetic material; also note any special attachments that are used to unload the material (stinger, straps, forks)
- **Weather Conditions–**Describe the weather conditions, including temperature, wind, cloud cover, and precipitation during unloading and conformance sampling operation
- **Material Type–**Indicate type of geosynthetic material (high-density polyethylene, geotextile, or geonet)
- **Roll Number–**Indicate each roll number that is written on the roll
- **Lot Number–**Lot number as indicated
- **Roll (L × W)–**Indicate the roll width as indicated on the roll label; if two materials are bonded together (i.e., geonet/geotextile), obtain measurements for both materials
- **Area (square feet)–**Indicate the total square footage of the roll
- **Damage Remarks–**Document any visible damage to the roll; if possible, indicate if damage was present prior to unloading or if it occurred during unloading

Items that are restricted from further use until the inspections have been completed will be clearly delineated by the CQA representative. Accepted materials will be kept separate or clearly delineated from inventoried and approved items to the extent possible. The CQA representative will coordinate with the construction general contractor during material delivery so that the material is not moved more than necessary after it is unloaded and damage due to handling is minimized.

The CQA representative will perform the inventory immediately after the material arrives onsite to avoid delaying construction. The CQA representative will be responsible for verifying that only accepted material is installed at the IDF landfill and that all inventories and inspections are documented and maintained.

6.1.5 Conformance Testing

Either at the manufacturer's plant or upon delivery of the composite drainage net rolls, the CQA representative will ensure that samples are removed and forwarded to the Geosynthetics CQA Laboratory for testing, to verify and document conformance with the requirements of the technical specifications.

Conformance samples will be taken across the entire width of the roll and will not include the first 3 feet. Unless otherwise specified, samples will be 3 feet long (minimum) by the roll width. The CQA representative will mark the machine direction on the samples with an arrow.

Samples will be taken at a rate of one per lot or one per 50,000 square feet, except as noted otherwise below, whichever is greater. The geonets will be tested for the following:

- Polymer specific gravity (ASTM D1505)
- Thickness (ASTM D5199)
- Nominal transmissivity (ASTM D4716 – one per production lot)

The composite drainage nets will be tested for the following:

- Adhesion (GRI-GC7 or ASTM D413)
- Transmissivity (ASTM D4716 – one per production lot)

The CQA representative will examine all results from laboratory conformance testing and will report any non-conformance to the CQA certifying engineer as soon as the results become available.

The following procedure will apply whenever a sample fails a conformance test that is conducted by the Geosynthetics CQA Laboratory:

- The construction general contractor will be required to replace the roll (or rolls) of composite drainage net not in conformance with the specifications with a roll that meets the requirements of the technical specifications.

- The CQA representative will ensure that conformance samples are removed for testing by the Geosynthetics CQA Laboratory from the closest numerical roll on both sides of the failed roll. These two samples must pass the above conformance tests. If either of these samples fail, samples will be collected from the five numerically closest untested rolls on both sides of the failed sample and tested by the Geosynthetics CQA Laboratory. These ten samples must pass the above conformance tests. If any of these samples fail, a sample from every roll of composite drainage net onsite and a sample from every roll that is subsequently delivered from the same manufacturer must be conformance tested by the Geosynthetics CQA Laboratory, until the manufacturer has thoroughly demonstrated compliance with the above requirements to the sole satisfaction of the CQA certifying engineer. The cost of such tests is to be borne by the construction general contractor.

The CQA representative will document actions taken in conjunction with conformance test failures and report all actions to the CQA certifying engineer. Failed tests will be documented using NCR procedures, outlined in Section 8.1.4.

6.1.6 Deployment

The construction general contractor will be required to handle all composite drainage net in such a manner as to ensure that it is not damaged.

The construction general contractor (responsible for composite drainage net installation) will be required to certify in writing that the surface on which the composite drainage net will be installed is complete and acceptable. A certificate of partial completion will be given by the construction general contractor to the CQA representative, who will then verify to the CQA certifying engineer that the deployment surface is complete, prior to commencement of composite drainage net installation.

After the surface on which the composite drainage net is to be installed has been accepted by the construction general contractor, the CQA representative will have responsibility to indicate to the CQA certifying engineer any change in the underlying layer that may, in accordance with the technical specifications, require repair work. If the CQA certifying engineer requires that repair work be done, it will be the responsibility of the construction general contractor to repair the underlying layer.

The CQA representative will verify and document compliance with the following:

- Just prior to composite drainage net placement, the layer that will underlie the composite drainage net is clean and free of excessive amounts of dust, dirt, stones, rocks, or other obstructions that could potentially damage the underlying layers or clog the drainage system.
- In the presence of excessive wind, the composite drainage net is weighted with sandbags (or equivalent weight approved by the CQA certifying engineer).
- Composite drainage net is kept under tension to minimize the presence of wrinkles in the composite drainage net. If necessary, the composite drainage net is positioned by hand after being unrolled, to minimize wrinkles.
- Composite drainage net is cut using a composite drainage net cutter, approved by the composite drainage net manufacturer and the CQA representative. If in place, special care is taken to protect other materials from damage that could be caused by the cutting of the composite drainage net.
- The construction general contractor takes all necessary precautions to prevent damage to the underlying layers during placement of the composite drainage net.
- Composite drainage net is not welded to geomembranes.
- During placement of clean composite drainage net, care is taken not to entrap stones, excessive dust, or moisture that could damage the underlying geomembrane, generate clogging of drains or filters, or hamper subsequent seaming.
- A visual examination of the composite drainage net is carried out over the entire surface, after installation, to ensure that no potentially harmful foreign objects, such as needles, are present.

- Composite drainage net is not left exposed for an excess of 14 days after placement, to prevent damage from exposure to ultraviolet radiation (sunlight).

The CQA representative will document any noncompliance with the above requirements and report it to the CQA certifying engineer.

6.1.7 Seams and Overlaps

The components of the composite drainage net (e.g., geotextile-geonet-geotextile) are not bonded together at the ends and edges of the rolls. The CQA representative will document that the composite drainage net is overlapped and secured in accordance with the technical specifications.

6.1.8 Repair

The CQA representative will verify that any holes or tears in the composite drainage net are repaired, in accordance with the technical specifications. The CQA representative will observe any repair, document any noncompliance with the above requirements, and report the noncompliance to the CQA certifying engineer. Repair areas will be documented using NCR procedures, outlined in Section 8.1.4.

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SECTION VII–POLYETHYLENE PIPE AND FITTINGS CONSTRUCTION QUALITY ASSURANCE

7.1 PIPE AND FITTINGS

The CQA representative will monitor the placement of the LCRS, LDS and SLDS pipe, located on the IDF landfill floor and on the landfill slopes.

7.1.1 Labeling

The CQA representative will verify that the pipe is labeled with the information specified in the technical specifications. Any deviations from the labeling requirements will be reported to the CQA certifying engineer prior to pipe installation.

7.1.2 Transportation and Handling

The CQA representative will verify and document that the pipe and fittings are handled in accordance with the technical specifications. The CQA representative will visually inspect the pipe upon delivery at the site, and any deviations from the requirements of the technical specifications will be reported to the CQA certifying engineer.

7.1.3 Storage

The CQA representative will verify and document that storage of the pipe and fittings is in accordance with the technical specifications.

7.1.4 Inventory

The CQA representative will inventory the polyethylene piping and fitting, delivered to the site that will be installed at the bottom and on the slopes of the landfill. The CQA representative will perform the following tasks:

- Verify the material for conformance with the technical specifications and construction drawings
- Verify slot dimensions for conformance with the technical specifications
- Check the material for damage, mishandling, and adverse exposure

Items that are restricted from further use until the inspections have been completed will be clearly delineated by the CQA representative. Accepted materials will be kept separate from inventoried and approved items, to the extent possible. The CQA representative will be responsible for coordinating with the construction general contractor during material delivery, to limit the material being moved more than necessary after it is unloaded and thereby minimizing damage due to handling.

The CQA representative will perform the inventory immediately after the material arrives onsite to avoid delaying construction. The CQA representative will be responsible for verifying that only accepted material is installed at the IDF landfill, and that all inventories and inspections are documented and maintained.

7.1.5 Conformance Testing

No conformance testing will be conducted on the materials delivered to the site.

7.1.6 Handling and Laying

The CQA representative will verify and document that the pipe is installed at the specified locations, grades, and angles, and that placement of backfill around and over the pipe is conducted in accordance with the requirements of the technical specifications and in a manner intended to prevent damage to the pipe.

The pipe and fittings will be carefully examined before installation by the CQA representative. The CQA representative will verify and document that cracks, damage, or defects are not present in the pipe and fittings in excess of that allowed by the technical specifications.

The CQA representative will also note the condition of the interior of pipes and fittings. Foreign material will be removed from the pipe interior before it is moved into final position. No pipe will be permitted to be placed until the CQA representative has observed the condition of the pipe. The CQA representative will document any deviation from the requirements and report it to the CQA certifying engineer.

7.1.7 Joints and Connections

Lengths of pipe will be required to be assembled into suitable installation lengths by the butt-fusion process. Butt-fusion refers to the butt-joining of the pipe by softening the aligned faces of the pipe ends in a suitable apparatus and pressing them together under controlled pressure. The CQA representative will spot-monitor butt-fusion welding operations to ensure that the construction general contractor follows the technical specifications for both slotted and solid pipes. The CQA representative will verify that internal weld beads have been removed from the horizontal and side slope sections of the LCRS, LDS, and SLDS riser pipes. The CQA representative will document any noncompliance with the requirements and report it to the CQA certifying engineer.

7.1.8 Surveying

A survey will be performed by or under the direction of a professional land surveyor registered in the State of Washington. The surveyor will independently survey the final elevation and alignment of the top of the pipe and fittings. Surveys will be performed on all pipe locations within the footprint of the landfill to confirm that the alignment and elevations in the field agree with those shown in the construction drawings. The results of the survey will be compiled in a report signed by the surveyor and the CQA certifying engineer.

The surveyor will be required to survey each pipe location within the IDF landfill, in accordance with the requirements of this CQA Plan. A record drawing will be submitted to the CQA certifying engineer by the surveyor before placement of the next liner system layer. The surveys will be conducted every 50 feet along the pipe alignment and appurtenances. The survey will include enough information to confirm that the following features of the landfill piping are constructed in accordance with the construction drawings:

- Beginning and end top of pipe elevations
- Connection location
- Grade breaks
- Riser pipes
- Sump extensions

The piping that will be surveyed will include, but not be limited to, the following:

- SLDS piping
- LDS piping
- LCRS piping

The CQA certifying engineer will approve the survey results for each layer before the subsequent component of the lining system is constructed.

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SECTION VIII–CONSTRUCTION QUALITY ASSURANCE DOCUMENTATION AND CERTIFICATION

8.1 DOCUMENTATION AND CERTIFICATION

A major function of CQA is to properly and adequately document and certify the work. This section describes the minimum required documentation. The CQA certifying engineer may recommend to the IDF CM additional documentation for performing CQA tasks that are for certification. In addition, the CQA certifying engineer will prepare forms, field data sheets, sample labeling schemes, and chain-of-custody procedures and submit them to the IDF CM and IDF PM for approval, prior to construction.

8.1.1 Daily Reports

Daily reports will be completed by the CQA representatives when they are onsite. All CQA personnel will be assigned field books by the CQA certifying engineer that will be labeled with a unique number. The CQA representatives, including the CQA certifying engineer, will record all field observations and the results of field tests in their assigned field book. When not in use, all field books will be left in the field records file. After each book is filled (or at the end of the project), the field book will be returned to the CQA certifying engineer and routed to the project files.

Each page of the field book will be numbered, dated, and initialed by CQA personnel. At the start of a new work shift, CQA personnel will list the following information at the top of the page:

- Job name
- Job number
- Date
- Name
- Weather conditions
- Page number (if pages are not pre-numbered)

The remaining individual entries will be prefaced by an indication of the time at which they occurred. If the results of test data are being recorded on separate sheets, it will be noted in the field book. Entries in the field book will include, but not be limited to, the following information:

- Reports on any meetings held and their results
- Equipment and personnel being used in each location, including construction general contractors

- Descriptions of areas being observed and documented
- Descriptions of materials delivered to the site, including any quality verification (vendor certification) documentation
- Descriptions of materials incorporated into construction
- Calibrations, or recalibrations, of test equipment, including actions taken as a result of recalibration
- Decisions made regarding use of material and/or corrective actions to be taken in instances of substandard quality
- Unique identifying sheet numbers of inspection data sheets and/or problem reporting and corrective measures reports used to substantiate the decisions described in the preceding item

At the end of each day, the field CQA monitor will summarize the day's activities on a daily field monitoring report form. The field report will include a brief summary of the day's activities and highlight any unresolved issues that must be addressed by the CQA certifying engineer or by CQA representatives the following day.

The daily field monitoring report will be filled out in triplicate. The CQA monitor will attach three copies of the field book notes for that day. The three copies will be distributed as follows:

- Original will be filed in field office
- One copy will be transmitted to the CQA certifying engineer
- One copy will be transmitted to the IDF CM

The CQA certifying engineer will review and initial each summary field report before distributing to the project quality records and the IDF CM.

8.1.2 Inspection Data Sheets

All observed field and laboratory test data will be recorded on an inspection data sheet. At a minimum, each inspection data sheet will include the following information:

- Unique identifying sheet number for cross-referencing and document control
- Description of the inspection activity
- If appropriate, location of inspection activity or location from which the sample was obtained
- Type of inspection activity and/or procedure used (reference to standard method when appropriate)
- Any recorded observation or test data, with all necessary calculations
- Results of the inspection activity and comparison with specification requirements
- Identification of any personnel involved in the inspection activity

- Signature of the individual(s) performing the CQA representative activity and concurrence by the CQA certifying engineer
- Identification of deficiencies and any required reinspections

Forms used for the data sheets will be prepared and submitted to the IDF CM and IDF PM in accordance with this section. The data sheets will include, but are not limited to, the forms listed below:

- Sample log
- Compaction test result log
- Soil test result summary form
- Equipment calibration log

8.1.3 Record Drawing Maintenance

The construction general contractor will maintain a complete set of construction drawings labeled "Red-Line" as-built drawings. At the completion of the project, the as-built drawings pertaining to the work certified under this CQA Plan will be produced in electronic format and submitted to the CQA certifying engineer. The CQA certifying engineer will review the completed set of as-built drawings and certify the drawing set as the record drawings for the IDF.

8.1.4 Non-Conformance Reporting

Deficiencies/defects identified by in-process testing may be reworked in accordance with the technical specifications or CQA Plan to correct the deficiency without initiating the NCR process (i.e., failed compaction test or failed geomembrane destructive test), and in-process tests will be tracked by the CQA representative until it is corrected. A non-conformance is considered to be a deficiency in characteristics, documentation, or procedures that renders the quality of an item or activity unacceptable or indeterminate. All deficiencies, defects, damage, or test failures that are not corrected by in-process rework will be considered a non-conformance and will be documented on a Non-Conformance Report (NCR) form. The non-conformance will be referred to the IDF CM, for disposition and initiation of corrective action processes.

All NCR situations will be brought to the attention of the IDF CM for concurrence, prior to initiating the NCR. Upon issuance of the non-conformance report, the IDF CM will notify the IDF design engineer, IDF quality engineer, and IDF PM that the report has issued. Other individuals, as directed by the IDF PM, will participate in NCR disposition, resolution, and corrective action processes as needed. All documentation relating to NCR situations will be retained in the project quality records.

8.1.5 Resolution of Contract Document Questions and Clarifications

Request for Information (RFI) forms will be provided to the CQA certifying engineer for the purpose of submitting written requests to the IDF CM, for assistance in understanding the design intent of the contract documents. The CM will determine whether the IDF design engineer's technical support staff will address the RFI.

RFIs initiated by the construction general contractor will be addressed by the IDF project engineer and CM, not by the CQA certifying engineer, and are not in the scope of the CQA Plan.

Any RFIs that result in contract document changes will be incorporated by the IDF CM and PM, following the procedures outlined in Section 8.1.6.

8.1.6 Construction Change Order and Contract Document Changes

Requests for changes to the technical specifications or construction drawings will be referred to the IDF CM and initiated as a change order. All change orders and resulting design changes will be approved by the appropriate project team member prior to implementation, as outlined in procedure HNF-IP-0842, Volume 4., Section 4.29 (Engineering Document Change Control Requirements). Requests for modifications to the CQA Plan will also be made by completing a change order to the IDF CM and procurement agent, with copies to the IDF quality engineer and IDF project engineer.

If, during the course of construction, questions arise regarding interpretation of the plans and/or specifications, the IDF CM will be contacted by the CQA certifying engineer. Any clarification of the construction drawings will be documented by a change order, if necessary, or by telephone conversation records or meeting minutes, and routed to the IDF design engineer, IDF CM, and IDF PM. The change order will also be routed to the project files.

8.1.7 Progress Reports

The CQA certifying engineer will prepare a summary progress report each week, or at time intervals established at the pre-construction meeting. At a minimum, this report will include the following information:

- A unique identifying sheet number for cross-referencing and document control
- The date, project name, location, and other information
- A summary of work activities accomplished during the progress reporting period
- Identification of areas or items inspected and/or tested during the reporting period that are addressed by the report
- A summary of the quality characteristics being evaluated, with appropriate cross-references to technical specifications and/or construction drawings
- References to the technical specifications or construction drawings defining the acceptance criteria for each inspected characteristic
- A summary of inspection and test results, failures, and re-tests
- A summary of construction situations, deficiencies, and/or defects occurring during the progress reporting period
- A summary of other problem resolutions and dispositions
- The signature of the CQA certifying engineer

The progress report will be submitted to the IDF PM no more than two days after the last reporting day in the progress report. Copies will also be submitted to the IDF PM, IDF quality engineer, and construction general contractor.

8.1.8 Final Documentation and Certification

All daily inspection summary reports, inspection sheets, problem identification and corrective measures reports, acceptance reports, change orders, NCRs, photographic records, progress reports, construction drawings, construction drawing revisions, and other pertinent documentation will be retained as permanent project quality records. At the completion of the project, a final CQA report that incorporates all such information, along with as-built drawings, will be prepared by the CQA certifying engineer and submitted to the IDF PM. The CQA certifying engineer will prepare an interim report for construction and testing of the test pads. A final CQA report and certification letter will be completed at the end of the construction that will fulfill the CQA certification requirements specified in WAC 173-303-335(4).

The CQA certifying engineer will coordinate the completion of the as-built record drawings that will be generated by a land surveyor licensed in the State of Washington. The as-built records will include scale drawings depicting depths, plan dimensions, elevations, fill thicknesses, and geosynthetic panel layouts. The report will include documentation of each construction component monitored by CQA personnel and will be signed, stamped, and certified by the CQA certifying engineer.

8.1.9 Storage of Records

During the construction of the IDF, the CQA certifying engineer will be responsible for all CQA documents. This includes the CQA certifying engineer's copy of the design criteria, plans, procedures, and specifications; the CQA Plan; and the originals of all the data sheets and reports. The field records will be kept in lockable, metal cabinets or on metal shelving within a facility, protected by a fire alarm and/or a communication system that provides fire department response and/or fire suppression systems; or, in an Underwriters Laboratory-listed, one-hour fire-rated cabinet. At the completion of the project, all completed documents will be routed to the project quality records.

8.1.10 Storage of Archive Construction Material Samples

The CQA certifying engineer will be responsible for storing construction material samples collected during the duration of the project.

The CQA certifying engineer will coordinate with the IDF PM and IDF CM on which samples will be archived at the completion of the project. All samples will be kept in small containers (i.e., 5-gallon plastic buckets). Each container will be labeled with the following information:

- Project name
- Date
- Sample I.D.
- Material type
- Point of contact

Control and protection of samples will be accomplished through the use of an index listing of samples. This index will identify each sample gathered and include the same information required for the sample containers. It will also identify where the sample is stored and person responsible for the sample storage, thus providing a documented record of each sample and methodology for verifying that all samples are available in storage and that no samples have been misplaced.

All samples will be stored neatly in a cool, dry location, approved by the CQA certifying engineer. The CQA certifying engineer will coordinate with the IDF PM and IDF CM to determine which sample will be archived at the project completion.

SECTION IX–REFERENCES

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Geosynthetic Research Institute (GRI). "Standard Test Method for Asperity Measurement of Textured Geomembranes Using a Depth Gage," Test Method GM12. Philadelphia, Pennsylvania. 2000.

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Integrated Disposal Facility (IDF) Detailed Design Cell 2 Construction Quality Assurance Plan

Prepared for

CH2M HILL Hanford Group

Richland, Washington

April 2004

CH2MHILL

This report was prepared under the supervision
of a registered professional engineer.

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Acronyms

ASTM	American Society for Testing and Materials
CDN	Composite drainage net
CM	Construction Manager
CQA	Construction Quality Assurance
CQC	Construction Quality Control
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
GCL	Geosynthetic clay liner
GRI	Geosynthetic Research Institute
IDF	Integrated Disposal Facility
LCRS	Leachate collection and removal system
LDS	Leak detection system
NCR	Non-Conformance Report
ORP	Office of River Protection
OSHA	Occupational Safety and Health Administration
PM	Project Manager
QA	Quality assurance
QC	Quality control
RFI	Request for Information
SBL	Soil bentonite admix liner
SLDS	Secondary leak detection system
UCL	Upper control limit
WAC	Washington Administrative Code

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SECTION I–GENERAL

1.1 INTRODUCTION

This Construction Quality Assurance (CQA) Plan describes the quality assurance (QA) activities for constructing Cell 2 of Phase I of the Integrated Disposal Facility (IDF) at the Hanford facility in Richland, Washington.

1.1.1 Applicable Units

QA activities will be required during construction of Cell 2 of Phase I to certify that the following construction activities are performed in accordance with the construction documents:

- Construction/preparation of foundation systems for liners
- Construction of dikes or embankments
- Construction of low-permeability soil liners
- Construction of geomembranes
- Construction of leachate collection and removal systems and leak detection systems

This CQA Plan has been prepared to describe the activities that will be performed during construction of the lining system, leachate collection and leak detection systems, and operation layer of Cell 2. This CQA Plan is intended to satisfy the regulatory requirements and guidance established in 40 CFR 264.19, the U.S. Environmental Protection Agency's (EPA) technical guidance document, *Quality Assurance and Quality Control for Waste Containment Facilities* (EPA 1993), and Washington Administrative Code (WAC) 173-303-335.

This CQA Plan is intended to be implemented by a CQA Officer (herein referred to as the CQA certifying engineer), familiar with EPA's technical guidance document, *Quality Assurance and Quality Control for Waste Containment Facilities* and this CQA Plan. The CQA certifying engineer will be supported by the number of CQA representatives necessary to implement the requirements in this CQA Plan and document the work.

1.1.2 Scope

This CQA Plan establishes general administrative and documentation procedures that will be applicable for selected activities of construction. With respect to responsibilities, personnel qualifications, and specific inspection and testing activities, this CQA Plan addresses only those activities associated with the soils, geosynthetics, and related liner and leachate collection system piping components for the IDF.

The CQA requirements are divided into the following sections to provide quick access to CQA requirements for individual liner components:

- Soils CQA
- Geosynthetic Clay Liner CQA
- Geomembrane CQA
- Geotextile CQA
- Composite Drainage Net CQA
- Polyethylene Pipe and Fittings CQA
- CQA Documentation and Certification

1.2 PROJECT ORGANIZATION

This section describes the anticipated project organization for the IDF construction activities. The following subsections address the organizations involved in the construction, their respective roles in construction activities, and the methods of interactions between organizations.

1.2.1 Responsibility and Authority

The organization chart for the IDF construction is shown in Figure 1-1. These personnel will be associated with two main entities that include the Tank Farm operating contractor and his agents and the construction general contractor and his personnel and/or subcontractors. The project team consists of both full-time field personnel and part-time management personnel. The part-time management personnel will be onsite during the IDF construction periodically to monitor progress, attend meetings, resolve disputes, and ensure that the work is implemented in accordance with the construction drawings, technical specifications, CQA Plan, and the RCRA permit. The field personnel will consist of the key personnel onsite during construction. The solid lines on the organization chart represent project responsibilities such as scope, cost, and schedule. The dashed lines represent the functional responsibilities of staff for QA, design, and management. The responsibilities and reporting requirements for each project team member are described in the following sections.

1.2.1.1 Project Team

When the individuals identified below are designated to perform specific functions described in this CQA Plan, the reference to these individuals includes their designee or an alternate who can function on their behalf. The Department of Energy – Office of River Protection (DOE-ORP) Manager is the owner's representative and is responsible for project funding and overall project scope. The DOE-ORP manager and IDF project manager keep the regulatory agencies informed of IDF construction activities and progress.

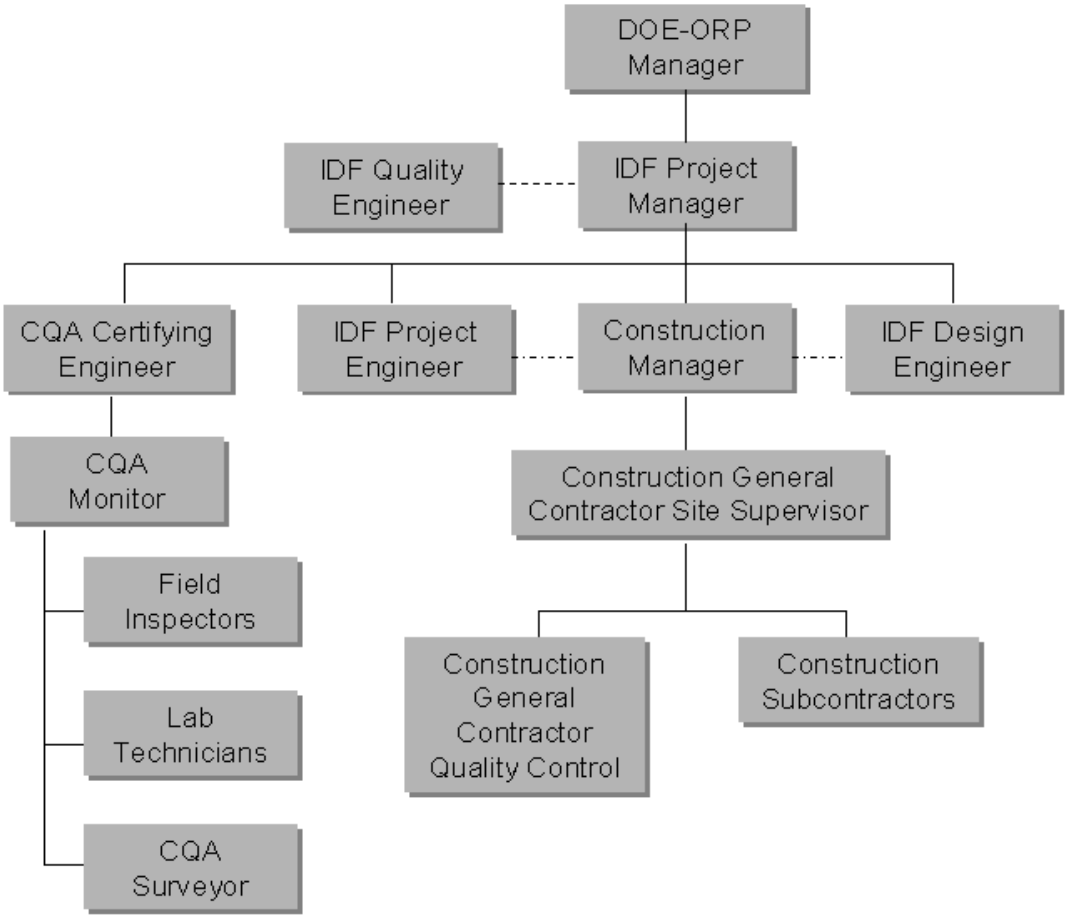
IDF Project Manager (PM)

The IDF PM is an employee or agent of the Tank Farm operating contractor, has overall responsibility for the IDF construction, and interfaces with the DOE-ORP manager. The IDF PM directs the activities of the IDF project and field team staff, including the CM, design engineer, and the project engineer. Additionally, the IDF PM has overall responsibility for the achievement of quality. Functionally, the IDF PM reviews and approves quality assurance reports submitted by the IDF CQA certifying engineer.

IDF Project Engineer

The IDF project engineer is an employee or agent of the Tank Farm operating contractor and is responsible for providing technical support to the IDF project team. The IDF project engineer is supported by the design engineer for reviewing and/or preparing technical documents related to engineering design and analyses.

FIGURE 1-1
QA Organization Chart



IDF Quality Engineer

The IDF quality engineer is an employee or agent of the Tank Farm operating contractor and is independent from line management on the project. The IDF quality engineer provides overview and assessment of QA on the project. The IDF quality engineer provides feedback and assessment results to the IDF PM.

IDF Design Engineer

The IDF design engineer is an employee or agent of the Tank Farm operating contractor is responsible for reviewing and/or preparing technical documents related to the IDF design and construction. The design engineer prepares the construction drawings, technical specifications, and the CQA Plan. The IDF design engineer reports to the IDF PM and supports the IDF project engineer.

1.2.1.2 Field Team

IDF Construction Manager

The IDF CM is an employee or agent of the Tank Farm operating contractor and serves as the point of contact between the IDF construction general contractor and the IDF project team. All construction general contractor correspondence and direction flows through the CM. The CM oversees the daily construction field activities and is the onsite representative for the IDF PM.

CQA Certifying Engineer

The CQA certifying engineer is an employee or agent of the Tank Farm operating contractor who has the overall responsibility of implementing this CQA Plan and directly supervises the CQA monitor, field inspection team, and laboratory technicians. The CQA certifying engineer is responsible for preparation of an implementation plan that addresses how the CQA Plan is to be implemented, and how CQA work is to be performed, tracked, and coordinated, as well as how procedures outlined in this CQA Plan are to be followed. The implementation plan will be submitted to IDF project manager and CM for approval.

Functionally, the CQA certifying engineer submits certified CQA reports to the IDF CM for review and approval by the IDF PM. The CQA certifying engineer is a registered professional engineer in Washington and has the authority to provide a certification letter that the IDF is constructed in accordance with the approved CQA Plan, the approved plans and specifications, and any approved changes. The CQA certifying engineer also has the authority and responsibility to stop work and recommend remedial actions to the IDF PM.

Field Inspector

Field inspectors are employees or agents of the Tank Farm operating contractor and report to the CQA certifying engineer. The field inspector's function is to perform testing and observations, in accordance with this CQA Plan and under the direction of the CQA monitor and CQA certifying engineer.

Soils Laboratory Technicians

Laboratory technicians are employees or agents of the Tank Farm operating contractor and report to the CQA certifying engineer and provide the QA laboratory testing, required by this CQA Plan and as requested by the CQA monitor and CQA certifying engineer.

CQA Surveyor

The CQA surveyor will be an employee or agent of the Tank Farm operating contractor and will be a registered land surveyor in the State of Washington.

CQA Monitor

The CQA monitor is an employee or agent of the Tank Farm operating contractor, reports directly to the CQA certifying engineer, and is a CQA representative, supported by the field inspection team and laboratory technician. The CQA monitor ensures that all CQA tests are performed in accordance with this CQA Plan and accepted procedures.

Construction General Contractor

The IDF construction general contractor is responsible for implementing the approved design by providing the necessary labor, equipment, materials, and all other resources necessary to construct the IDF.

Construction General Contractor Site Supervisor

The site supervisor is an employee or agent of the construction general contractor and is responsible for implementing the IDF construction activities. The site supervisor has overall responsibility for all construction activities related to the IDF, controls day-to-day construction tasks, and is the point of contact for construction general contractor field personnel. The site supervisor ensures the work is progressing in accordance with approved construction contract documents and the approved schedule.

Construction Subcontractors

Construction subcontractors include specialty companies, retained by the IDF construction general contractor, to perform specific work activities at the IDF such as earth moving, geosynthetic lining installation, piping, and building/tank installation. The construction subcontractors report directly to the construction general contractor site supervisor.

Construction General Contractor Quality Control

The construction general contractor provides a construction QC engineer who supports the site supervisor. The primary responsibility of the construction QC engineer is to ensure that the work is performed in accordance with the technical specifications and construction drawings. Specific duties of the construction QC engineer include activities such as preparing construction submittals, field documentation, and interfacing with the CQA certifying engineer.

1.2.2 Project Meetings

The various progress and status meetings that are anticipated to be held throughout the IDF construction are described below. The purpose of the meetings is to discuss work progress,

planning, and other issues related to construction. A portion of these meetings can be dedicated to CQA issues, as necessary, to provide an opportunity for the CQA team to express concerns regarding quality, relay test results, and ensure good communication between all organizations involved in the construction of the IDF.

1.2.2.1 Pre-Construction Meeting

A pre-construction meeting will be scheduled prior to beginning construction activities for the IDF. At a minimum, the meeting will be attended by IDF staff including the PM, CM, project engineer, design engineer, as well as the construction general contractor site supervisor, and the CQA certifying engineer. A portion of the meeting will be dedicated to the discussion of QA issues. Suggested CQA topics will include, but not be limited to:

- Reviewing the responsibilities of each organization
- Discussing the authority of agencies and project and field team members to order work stoppages
- Reviewing lines of authority and communication for each organization
- Providing each organization with all relevant CQA documents and supporting information
- Familiarizing each organization with the CQA Plan and its role, relative to the design criteria, plans, and specifications
- Discussing the established procedures or protocol for observations and tests, including sampling strategies
- Discussing the established procedures or protocol for handling construction deficiencies, repairs, and re-testing, including "stop work" conditions
- Reviewing methods for documenting and reporting inspection data
- Reviewing methods for distributing and storing documents and reports
- Reviewing work area security and safety protocol
- Reviewing the proposed project schedule
- Discussing procedures for the location and protection of construction materials and for the prevention of damage of the materials from inclement weather or other adverse events
- Determining action items, assigning actionees, and recording minutes to be transmitted to meeting attendees
- Discussing document control requirements and control of CQA records
- Discussing control and protection of samples

1.2.2.2 Daily Pre-Job Briefing

The construction general contractor will conduct daily pre-job briefings at the work area. The participants will include the construction field personnel, including lower tiered subcontractors and CQA representatives. The primary purpose of these meetings will be to address the day's planned activities. The CQA monitor will discuss CQA activities planned for that day and interface needs with the construction personnel. Suggested CQA topics are:

- Review the work location and activities for the day
- Discuss the construction general contractor's personnel and equipment assignments for the day
- Address scheduling of resources for upcoming work
- Review any new test data
- Discuss any potential construction problems, including unexpected subsurface conditions
- Discuss CQA-planned activities and interface needs

This meeting will be documented and the documentation will be retained on file by the CQA monitor.

1.2.2.3 Construction Progress Meetings

Weekly progress meetings will be held at the site to discuss construction progress. At a minimum, the weekly progress meetings will be attended by the IDF PM, CM, the site supervisor, and the CQA certifying engineer or CQA monitor. The purposes of the meeting are to:

- Review previous activities and accomplishments
- Review claims, change orders, delays, and similar items
- Review planned activities for the upcoming 2-week period
- Finalize resolution of problems from previous meetings
- Discuss potential problems with the work planned for the upcoming 2-week period

Minutes will be recorded and transmitted to meeting attendees and other interested parties.

1.2.2.4 Non-Conformance Meetings

Meetings will be convened as necessary to address non-conformances discovered during inspection. Deficiencies observed during construction by the CQA representatives will be brought to the attention of the IDF CM and CQA certifying engineer and documented using the non-conformance reporting (NCR) procedures outlined in Section 8.1.4. These deficiencies also will be tracked in the CQA representative's field log book until resolution and included in the daily summary report. These documents will include the description of the deficiency and actions taken or to be taken to resolve.

1.2.3 Hold Points

Mandatory hold points will be established for certain key activities. At these points, the IDF construction general contractor will notify the CQA monitor or CQA certifying engineer that the layer or portion of a layer is ready for review. The hold points anticipated for the IDF would be at completion or partial completion of each of the following components:

- Prepared subgrade
- SLDS geomembrane and composite drainage net (CDN)
- SLDS riser pipe
- Soil Bentonite Admix soil liner
- Secondary GCL
- Secondary geomembrane
- LDS CDN

- LDS piping
- Primary geosynthetic clay liner (GCL)
- Primary geomembrane
- Cushion geotextile
- LCRS piping
- Drain gravel
- Separation geotextile
- Operations layer

On side slopes, a LCRS CDN would substitute for the cushion geotextile, drain gravel, and separation geotextile.

1.3 PERSONNEL QUALIFICATIONS AND TRAINING

This section describes the qualifications and training required for CQA personnel. All documentation relating to qualifications will be maintained with the project CQA records.

1.3.1 CQA Certifying Engineer

The CQA certifying engineer will have landfill construction certification experience. The CQA certifying engineer will, at a minimum, be a registered civil professional engineer in good standing in the State of Washington, possess a bachelor's degree in civil or construction engineering, geotechnical engineering, engineering geology, or a closely related discipline, and will have sufficient practical, technical, and managerial experience to successfully direct the CQA activities discussed in this CQA Plan. The CQA certifying engineer's qualifications will be documented by training records and a professional resume showing significant field experience in landfill construction and low permeability soil-bentonite admix liner construction, having directed CQA activities at a minimum of three landfill construction projects or a minimum of 100 acres of combined landfill area certifying experience. The CQA certifying engineer will be familiar with the EPA technical guidance document, *Quality Assurance and Quality Control for Waste Containment Facilities* (EPA 1993). Qualification documentation will be reviewed by the IDF PM and IDF project engineer.

1.3.2 CQA Monitor

At a minimum, the CQA monitor will have a high school diploma and at least five years of construction-related experience, including at least three years of experience in conducting CQA monitoring for earthwork construction (including a minimum of three landfill construction projects or a minimum of 50 acres of combined landfill area experience), or a bachelor of science degree from a four-year college or university and at least two years of experience conducting CQA monitoring for earthworks construction (including a minimum of three landfill construction projects). The CQA monitor must be capable of performing work with little or no daily supervision. The CQA monitor will be familiar with the EPA technical guidance document, *Quality Assurance and Quality Control for Waste Containment Facilities* (EPA 1993). Qualifications of the CQA monitor will be documented by training records and a professional resume, reviewed by the IDF PM and CQA certifying engineer.

1.3.3 Field Inspector

At a minimum, the field inspector will have a high school diploma and at least two years of construction-related experience, including at least one year of experience conducting CQA monitoring for earthwork construction, or will have a bachelor of science degree from a four-year college or university and at least six months of experience conducting field inspection for earthworks construction. The field inspector must be capable of routine engineering technician work, under general daily supervision. The field inspector will be familiar with the EPA technical guidance document, *Quality Assurance and Quality Control for Waste Containment Facilities* (EPA 1993). Qualifications of the field inspector will be documented by training records and a professional resume, reviewed by the IDF PM and CQA certifying engineer.

1.3.4 Soils Laboratory Technicians

Laboratory technicians will have at a minimum a high school diploma and at least five years of construction materials laboratory testing related experience, including at least three years of experience performing geotechnical laboratory tests for earthwork construction, including compacted low permeability soil-bentonite admix, or will have a bachelor of science degree from a four-year college or university and at least two years of experience performing geotechnical laboratory tests for earthwork construction, including low permeability soil-bentonite admix. The laboratory technician must be capable of routine laboratory tech work, under general daily supervision. Qualifications of laboratory technicians, including training records and professional resumes, will be reviewed by the IDF PM and CQA certifying engineer.

1.3.5 Geosynthetic Laboratory

The geosynthetic laboratory will be selected by the CQA certifying engineer and will provide the geosynthetic QA conformance testing required by this CQA Plan, as requested by the CQA monitor and/or CQA certifying engineer. The geosynthetics CQA laboratory will be unaffiliated with the materials supplier or manufacturer, or construction general contractor. The geosynthetics CQA laboratory will have at least five years of experience in testing geosynthetics and other relevant liner system components, and will be familiar with American Society for Testing and Materials (ASTM) and other applicable test standards.

1.4 DEFINITIONS RELATING TO CONSTRUCTION QUALITY ASSURANCE

1.4.1 Construction Quality Assurance and Construction Quality Control

Construction Quality Assurance—A planned and systematic pattern of the means and actions designed to provide adequate confidence that items or services meet contractual and regulatory requirements, and will perform satisfactorily in service.

Construction Quality Control (CQC)—Those actions that provide a means to measure and control the characteristics of an item or service to meet contractual and regulatory requirements.

1.4.2 Use of the Terms in This Plan

The definitions used in the context of this CQA Plan are as follows:

- CQA refers to means and actions employed by the CQA representatives to assure conformity of liner system, LCRS, LDS, SLDS, and pipe preparation, production, and installation with this CQA Plan, the technical specifications, and the construction drawings. CQA is provided by a party that is independent from the product manufacturer and construction general contractor.
- CQC refers to those actions taken by manufacturers, suppliers, or construction general contractor, including their designated representatives, to ensure that the materials and the workmanship meet the requirements of the technical specifications and the construction drawings.

1.5 REFERENCES

1.5.1 Applicable Organizations

Organizations whose standards are referenced in the CQA Plan include:

- ASTM—American Society for Testing and Materials
- DOE—Department of Energy
- GRI—Geosynthetic Research Institute
- OSHA—Occupational Safety and Health Administration
- EPA—U.S. Environmental Protection Agency

1.5.2 Applicable Standards

Any reference to standards of any society, institute, association, or governmental agency will pertain to the edition in effect as of the date of this CQA Plan, unless stated otherwise.

Specific test standards for tests cited in the CQA Plan are provided in the technical specifications. These standards may be modified due to technological advances since compilation of the technical specifications. All such modifications are to be approved in accordance with change order procedures described in Section 8.1.5.

1.6 CONSTRUCTION ACTIVITIES AND SUBMITTAL REQUIREMENTS

1.6.1 Construction Activities

This section describes the construction activities and submittal requirements that will be performed by the construction general contractor during the IDF construction. This CQA Plan only addresses selected activities of the Phase I construction.

In general, construction activities will consist of preparing the subgrade, installing the liner system, the leak detection systems (LDS and SLDS), the leachate collection and removal system (LCRS), and operations layer and necessary equipment to complete the landfill for waste acceptance. Construction will consist of these activities:

- Mobilizing construction equipment and personnel
- Vendor data submittals
- Installing sediment and erosion control
- Preparing soil bentonite material
- Excavation, embankment, fine grading of landfill subgrade, and sump construction
- Constructing the secondary leak detection system (SLDS) sump
- Constructing the soil bentonite admix liner (SBL)
- Dust control activities during construction
- Placing the geosynthetics for the secondary liner
- Constructing the leak detection system (LDS)
- Placing the geosynthetics for the primary liner
- Constructing the leachate collection and removal system
- Constructing the operations layer
- Site restoration
- Demobilization

Prior to the start of construction activities, the CQA representatives will review and become familiar with all construction drawings, technical specifications, the CQA Plan, and RCRA permit. The CQA certifying engineer also will be familiar with the most recent construction schedule, so that adequate resources (i.e., laboratory, field testing equipment, staff, and CQA forms) including contingencies (e.g., backup equipment, alternate laboratory, and alternate CQA staff) for CQA activities will be commensurate with the anticipated construction productivity and work schedule.

1.6.2 Submittal Requirements

The construction general contractor will provide the submittals required (listed in Table 1-1 in this section) to the IDF PM. Submittals will be provided far enough in advance of scheduled installation dates to allow time for reviews, possible revisions and resubmittals, placing orders, and securing delivery. The construction general contractor will identify, track, and disposition all required vendor data. The IDF PM will respond to each required submittal as stated in the technical specifications.

The submittals presented in Table 1-1 will be required as a minimum. A master submittal list will be provided as part of the contract documents.

1.6.3 Receipt Inspection Procedures

Inventory of manufactured materials used in lining system construction is detailed in Sections 3.1.4 (GCL), 4.1.4 (geomembrane), 5.1.4 (geotextiles), 6.1.4 (CDN) and 7.1.4 (polyethylene piping). The purpose of this section is to provide a general summary of the minimum requirements and procedures for receiving and controlling purchased materials, equipment, or services as required by the contract documents.

Procurement, receipt, and inspection of construction materials and equipment is the responsibility of the construction general contractor, with verification by the CQA certifying engineer and IDF CM. Procedures specific to the IDF Phase I construction project will be prepared as part of the construction quality control (QC) plan, to be submitted by the construction general contractor.

Procedures to control receipt inspection will include the following, at a minimum:

- The contract documents will provide a master submittal list that identifies the materials, equipment, or services requiring receipt inspection. Upon delivery to the project site, the general construction contractor will attach secure and visible "Quality Hold for Inspection" tags to each item.
- All items, materials, and equipment that have been tagged will be stored in segregated areas, as identified in the contract documents. Items will be restricted from further use until all construction general contractor and CQA certifying engineer inspections are completed.
- Upon inspection if items, materials, or equipment held for inspection, the "Quality Hold for Inspection" tag will be removed and replaced with one of the following, as appropriate:
  a) Acceptance tag
  b) Non-conformance (red) tag
  c) Conditional use tag
- The construction general contractor may utilize only those items tagged as "Accepted" or "Conditional Use."
- Red tagged materials will not be used in construction and will be moved to a segregated area or removed from the site.
- Conditional use tagged materials are restricted to use for specific conditions identified on the tag.
- Documentation of receipt inspection will be completed, maintained, and stored in a single location, in a secure and protected environment for the full performance period of the construction contract.

TABLE 1-1
Required Submittals

Submittal	Description	Requirement
Source Quality Control for Imported Materials (structural fill, drain gravel and crushed surfacing)	Gradation tests performed in accordance with ASTM D422 by a qualified independent test laboratory for imported materials on samples taken at place of production prior to shipment. Samples will be taken for gradation testing from every 2,000 tons of prepared materials, in accordance with ASTM D75.	Submitted by the construction general contractor and approved by the IDF PM prior to the shipment of material to the project site.
Geomembrane Installation Plan	Proposed layout drawings for each layer of geomembrane material. Geomembrane layout will show panel configuration, general dimensions, and seam locations.	Submitted by the construction general contractor and approved by the IDF PM prior to the installation of the respective geomembrane liner.
Subgrade surface acceptance	Certification in writing that the surface on which the geomembrane will be installed is acceptable to the installer. A certificate of acceptance will be provided by the construction general contractor to the CQA representative, who will then verify to the CQA certifying engineer that the deployment surface has been accepted immediately prior to commencement of geomembrane installation in the area under consideration.	Certificate signed by the installer and construction general contractor prior to installation of geomembrane over the subgrade.
GCL quality control certifications, test data and properties guarantee	Provide manufacturers' quality control (QC) test data for GCL material to be installed, including: Bentonite – suppliers' name and location, brand name, lot number, dated quality control information from supplier, manufacturers' test data verifying that bentonite meets manufacturers' specifications. GCL – written guarantee that GCL conforms to the technical specification requirements and test certificates for each production lot or 50,000 square feet of GCL material including roll numbers, test methods, and test results verifying compliance with the technical specification requirements for GCL.	Submitted by the construction general contractor prior to installation of the GCL material and approved by the IDF PM.

TABLE 1-1
Required Submittals

Submittal	Description	Requirement
Geomembrane quality control certifications, test data and properties guarantee	QC Testing shall be performed by manufacturer to demonstrate the geomembrane conforms to technical specification requirements. Prior to delivery of any geomembrane material, the manufacturer shall submit all required information listed in the technical specifications (Section 02661). QC Certification: Prior to shipment, the geomembrane manufacturer shall provide a quality control certificate for each roll of geomembrane. The quality control certificate shall be signed by a responsible party employed by the geomembrane manufacturer, such as the production manager. The quality control certificate shall include: 1. Roll numbers and identification, resin lot, and batch numbers. 2. Sampling procedures and results of quality control tests. As a minimum, results shall be given for thickness, asperity, tensile strength, and tear resistance in accordance with methods indicated in the technical specifications. Tests shall be conducted on each production lot of geomembrane or every 50,000 square feet, whichever results in the greater number of tests.	Submitted by the construction general contractor prior to installation of the geomembrane material and approved by the IDF PM.
Geotextile material certifications and test data	Provide manufacturers' QC test data for geotextile material to be installed, including: Geotextile – written guarantee that geotextile conforms to specification requirements, certification that manufacturer continuously inspected geotextile for presence of needles and found it to be needle-free, and test certificates for geotextile material including roll numbers, test methods, and test results verifying compliance with the technical specifications physical properties for geotextile. Frequency of manufacturer's QC testing shall be at the standard rate stated in the manufacturer's QC plan for each required property in the technical specifications.	Submitted by the construction general contractor prior to installation of the geotextile material and approved by the IDF PM.
Composite drainage net material certifications and test data	Provide manufacturers' QC test data for composite drainage net material to be installed, including: Composite drainage net – manufacturers' specification measured using appropriate test methods, written guarantee that composite drainage net conforms to specification requirements, manufacturers' QC test data for the geotextile component as specified above for geotextile, and test certificates for composite drainage net material and geonet component including roll numbers, test methods, and test results verifying compliance with the technical specification requirements for composite drainage net and geonet. Frequency of manufacturer's QC testing shall be at the standard rate stated in the manufacturer's QC plan for each required property in the technical specifications	Submitted by the construction general contractor prior to installation of the composite drainage net material and approved by the IDF PM.

TABLE 1-1
Required Submittals

Submittal	Description	Requirement
Interface Shear Strength test data	Provide data prior to material shipment for the interface friction angle between the textured geomembrane and other materials (including CDN, GCL, and Admix Liner) directly in contact with the geomembrane as specified in Section 02661; and between the CDN and the operations layer as specified in Section 02373 of the technical specifications. Friction angle shall be determined by direct shear testing under fully saturated conditions (ASTM D5321 or D6243 for GCL interface) at low nominal normal loads of both 100, 250, and 500 pounds per square foot (psf), and high nominal normal loads of 2,000, 8,000, and 15,000 psf, except for the CDN/Operations Layer interface which shall be reported at low normal load only. Report results for both peak and large displacement (minimum 2 inches) strength. Perform two interface shear strength tests on each interface under each set of normal loads.	Submitted by the construction general contractor prior to geosynthetic material shipment and reviewed and approved by the IDF PM for conformance with project strength requirements. Allow IDF PM a minimum 20 working days for this evaluation upon receipt of data.
Admix Liner Preparation and Placement Plan	Provide a detailed plan for preparation of the admix material, including a description of the equipment and procedures to be used, personnel qualifications, equipment calibration certificates and methods for monitoring bentonite additions and moisture conditioning. Also provide an admix liner placement plan to specify lift thickness control and to allow for required testing, described in the CQA Plan and technical specifications on the admix liner during placement operations.	Submitted by the construction general contractor prior to start of admix production for approval by IDF PM.
Bentonite QC certificates and test data	Provide bentonite supplier's descriptive data, specification sheets, literature, and other data as necessary to fully demonstrate that the bentonite proposed for use in the admix complies with the requirements of the technical specifications. The manufacturer shall certify that the bentonite furnished complies with these Specifications. A certificate shall be submitted to the CQA Engineer for each railcar or every three truckloads of bentonite delivered.	Submitted by the construction general contractor prior to start of admix production for approval by IDF PM.
Polyethylene Pipe and Fittings	Provide manufacturers' QC test data for piping and fittings that will be installed on the landfill floors and slopes.	Submitted by the construction general contractor prior to installation of the pipe for approval by the IDF PM.

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SECTION II–SOILS CONSTRUCTION QUALITY ASSURANCE

This section discusses the CQA requirements for soil layers including fill placement, subgrade preparation, admix liner, drain gravel, and operations layer.

2.1 FILL PLACEMENT AND SUBGRADE PREPARATION

This section of the CQA Plan addresses the soils components necessary to provide a prepared subgrade for the liner systems and specifies the soils CQA program to be implemented with regard to materials selection and evaluation, laboratory test requirements, field test requirements, and corrective action requirements.

2.1.1 Fill Placement and Compaction

The technical specifications will be followed for the stockpiling, placement, and compaction of earthfill and structural fill. The CQA monitor will monitor the fill placement and compaction to verify and document the following:

- The soil being placed meets the technical specifications requirements for earthfill and structural fill as determined by the test methods and frequencies specified within this CQA Plan and the source quality control submittals.
- The placement surface has been prepared as specified in the technical specifications.
- The compacted lift thickness is in accordance with the requirements of the technical specifications.
- The dry unit weight of the earthfill and structural fill meets specifications as determined by the test methods and frequencies described in Table 2-1 for earthfill and Table 2-2 for structural fill.
- Material placed in permanent stockpiles meets the appropriate specifications for earthfill or structural fill.

2.1.2 Construction Quality Assurance Evaluation

The frequency of soils testing for CQA purposes will conform to the minimum frequencies presented in Table 2-1 for earthfill and Table 2-2 for structural fill. Material properties will be determined from samples collected either immediately after placement or from stockpiles.

Nuclear density meter test methods will be used for the field testing of the in situ dry unit weight of the in-place, compacted fill. Any settlement or other defects in the fill will be backfilled and compacted in accordance with the technical specifications.

Standard count calibrations will be conducted to monitor the aging of the nuclear density gauge sources in accordance with ASTM standards. Sand cone or drive sleeve tests will be

conducted periodically to verify densities using the nuclear density gauge. Oven moisture content tests will be conducted and compared to field moisture content results to determine a field correction factor for moisture. Sand cone or drive sleeve tests and in situ moisture content tests will be performed at the frequencies specified in Tables 2-1 and 2-2.

If an in-place density test result fails to meet specifications, a confirmatory test will be performed immediately adjacent to the failed test. If the confirmatory test meets or exceeds specifications, a second confirmatory test will be performed at a second location immediately next to the failed test. If the second confirmatory test also meets or exceeds specifications, the area will be declared as meeting project specifications and the confirmatory tests will be reported. In the event that either confirmatory test fails to meet specifications, a CQA representative will determine the extent and nature of the defect by observations and/or additional testing, as necessary, to identify the limits of the area that does not meet project specifications.

If a defective area is discovered in the fill, a CQA representative will determine the extent and nature of the defect. If the defect is indicated by an unsatisfactory test result, the CQA representative will determine the extent of the defective area by additional tests, observations, a review of records, or other means that the CQA representative deems appropriate. If the defect is related to adverse site conditions, such as excessively wet soils or surface desiccation, the CQA representative will define the limits and nature of the defect by testing or observation. After the extent and nature of a defect is determined and remedied by the construction general contractor, the CQA representative will verify that the deficiency has been corrected by re-testing repaired areas before any additional work is performed by the construction general contractor in the area of the deficiency. All confirmatory tests, failing tests, and re-tests will be recorded in the CQA representative's field book or compaction testing form. The approximate location and elevation of each test will be recorded.

The CQA representative will document fill placement and compaction as determined by the test methods and frequency prescribed by this CQA Plan and will report any non-conformance in accordance with the non-conformance reporting procedures outlined in Section 8.1.4.

2.2 PREPARED SUBGRADE

The CQA representative will verify and document that the prepared subgrade is constructed to the elevations and grades shown in the construction drawings, with subgrade meeting the requirements of the technical specifications as determined by the test methods and frequencies specified within this CQA Plan.

Upon completion of the excavation of the landfill, the CQA monitor will perform the following tasks:

- Inspect the subgrade on the side slopes and base of the landfill and note areas of weak or excessively weathered subgrade materials
- Observe completion of excavation and subgrade compaction prior to foundation, fill, or liner placement.
- Observe the proof rolling of the base of the landfill and note areas that exhibit excessive rutting, heaving, or softening

- Observe that the surface of the subgrade is free of debris, wet and soft areas, standing water, vegetation, mud, ice, or frozen material
- Observe any excavation and backfilling operations associated with unsuitable material found in the prepared subgrade
- Verify that a survey has been conducted to further verify that the subgrade grades and elevations conform to the construction drawings
- Verify that the prepared subgrade material meets the requirements of the technical specifications as determined by the CQA testing methods and frequency in Table 2-3
- Verify that sampling points in the prepared subgrade are plugged or backfilled so that the prepared subgrade meets the technical specifications
- Document the location and volume of any unsuitable material removed from the prepared subgrade and report any non-conformance with the technical specifications in accordance with the non-conformance reporting procedures in Section 8.1.4.

2.2.1 Layer Completion Certification

The construction general contractor will be required to notify the CQA representative when an area of prepared subgrade is complete prior to constructing the overlying layer. The construction general contractor can proceed with the overlying layer upon acceptance of the area of prepared subgrade by the CQA representative. The CQA certifying engineer will provide a certificate of layer completion to the construction general contractor and the IDF project engineer, certifying that the area is complete.

2.3 SOIL BENTONITE ADMIX LINER AND TEST PADS

2.3.1 Test Pads

During cell construction, two soil bentonite admix liner (SBL) test pads were constructed by the construction general contractor to determine acceptable placement and compaction methods to produce a low permeable SBL on a horizontal surface and on a 3H:1V side slope that achieved the performance requirements of the technical specifications.

Test pads will not be constructed for Cell 2 construction. CQA certifying engineer will verify that the same or equivalent placement and compaction methods determined from Cell 1 construction test pads are applied to Cell 2 SBL construction.

2.3.2 Soil Bentonite Admix Liner

The CQA team will verify and document that the SBL is placed to the elevations, grades, and thicknesses shown in the construction drawings, with bentonite-amended material meeting the requirements of the technical specifications as determined by the test methods and frequencies specified within this CQA Plan.

2.3.2.1 Construction Quality Assurance Evaluation

CQA testing will be performed during processing and placement of the SBL. The CQA team will conduct the processing and placement tests for the SBL as specified in Table 2-4. The maximum allowable percentage of failing tests is specified in Table 2-5.

Processing

The construction general contractor shall process and condition admix material using a central type pugmill plant as described in the technical specifications. Prior to amending the base soil with bentonite, a CQA representative will verify and document the following:

- Equipment and methods are the same or equivalent as determined from the test pad studies performed during Cell 1 CQA.
- All submittals have been reviewed and approved.
- The base soil source area (either onsite excavation or borrow area) has been approved by the design engineer, IDF PM, or IDF project engineer.
- The mixing equipment is suitable for amending base soils with bentonite.
- The base soil does not contain rocks with dimensions in excess of those required by the technical specifications.

During processing, the CQA representative will verify and document the following:

- The bentonite is in conformance with the technical specifications.
- Close observation of the base soil excavation and processing is performed by the field inspector.
- The processed SBL material meets the requirements of the technical specifications as determined by the CQA testing methods and frequency in Table 2-4.
- The moisture content and consistency of base soil allow bentonite to be mixed uniformly.
- Bentonite amendments are mixed uniformly with the base soil.
- The processed SBL material is stored, protected, and allowed to cure in accordance with the conditions and minimum requirements of the technical specifications.
- Calibration of the pugmill operation feed rate controls for bentonite, base soil and water.
- The bentonite is mixed at the required application rate, established by the technical specifications as determined by the CQA testing methods and frequency in Table 2-4.

The CQA representative will document the properties of the processed soil bentonite material, as determined by the test methods and frequency prescribed by this CQA Plan, and will report any non-conformance with the technical specifications, following procedures outlined in Section 8.1.4.

The CQA representative will observe processing activities including base soil excavation, bentonite blending, and moisture conditioning.

The CQA representative will monitor the excavation of base soil from the approved borrow source or onsite excavations. Deleterious base soil or base soil not meeting the technical specifications will be identified and reported to the CQA certifying engineer and not allowed in the processing area.

CQA tests will be performed on the raw bentonite used in the SBL to verify conformance to the technical specifications. The CQA representative will collect samples of raw bentonite delivered to the site for testing. The CQA laboratory technician will conduct free swell, and grain size tests of the bentonite in accordance with Table 2-4. If the test results of a sample fail to meet specifications, a confirmatory test will be performed immediately subsequent to the failed test. If the confirmatory test meets or exceeds specifications, a second confirmatory test will be performed. If the second confirmatory test also meets or exceeds specifications, the bentonite will be declared as meeting project specifications and the confirmatory tests will be reported. In the event that either confirmatory test fails to meet specifications, the bentonite will be rejected and removed from the site.

The CQA representative will observe mixing and test the bentonite-amended soil, prior to placing it in the landfill.

Placement

Prior to the placement of the SBL, the CQA representative will verify and document the following:

- Based on the results of Cell 1 test pads construction, confirm placement and compaction procedures produce the required low-permeability admix for both on a horizontal surface and on a 3H:1V side slope.
- All or an approved portion of the prepared subgrade meets specifications as determined by the test requirements of this CQA Plan and the CQA certifying engineer has issued the completion certificate.
- The SBL material is free of roots, stumps, vegetation, or any other type of deleterious material that may impact the performance of the placed SBL.
- The SBL material does not contain stones with dimensions in excess of those required by the technical specifications.
- The SBL material meets or exceeds the requirements of the technical specifications as determined by the CQA testing methods and frequency in Table 2-4.
- The moisture content of the SBL material is uniform.

During placement and compaction of the SBL, the CQA Team will verify and document the following:

- Close observation of the placement and compaction of SBL material with earthmoving equipment is performed by the field inspectors. Inspectors to verify that means and methods are the same as those approved in the Cell 1test pad process.
- The SBL material meets the requirements of the technical specifications as determined by the CQA testing methods and frequency in Table 2-4 and is within the maximum allowable failure rates in Table 2-5.
- The SBL is placed in accordance with the conditions and minimum requirements of the technical specifications.
- Each lift is compacted to the required thickness and minimum dry unit weight within the range of moisture contents established by the technical specifications as determined by the CQA testing methods and frequency in Table 2-4.

- Shelby tube samples are collected for laboratory permeability testing at the frequency specified in Table 2-4.
- Penetrations in the SBL at testing and sampling locations are repaired in accordance with the technical specifications.
- The SBL is maintained until it is covered by the geomembrane liner in accordance with the technical specifications.
- In areas of inaccessibility by the compactor, in areas of nonstandard SBL placement, and/or in areas of different compaction methods, more frequent testing will be performed due to thinner lift thicknesses to achieve equivalent compactive effort. Each lift, no matter how thin, will be tested for density and moisture in accordance with Table 2-4.

The CQA representative will document the properties of the SBL as determined by the test methods and frequency prescribed by this CQA Plan and will report any non-conformance in accordance with the non-conformance reporting, as outlined in Section 8.1.4.

The CQA representatives will collect samples immediately after a loose lift of SBL materials has been placed for property tests, prior to compaction. Once compacted, nuclear density gauge test methods will be used for testing the in situ compacted dry unit weight and moisture content of the SBL. Standard count calibration and moisture content tests will be used to calibrate the reading of the nuclear density gauge. Standard count calibration and in situ moisture content tests, using the oven dry method, will be performed at the frequencies specified in Table 2-4. The results of the oven dry moisture content tests will be compared with the field moisture content results to determine a field moisture correction factor. The CQA representative will adjust the field moisture correction factor as test data is collected (i.e., moving average). The CQA representative will collect Shelby tube samples of the SBL for laboratory permeability tests as specified in Table 2-4.

If in-place density test results fail to meet specifications, a confirmatory test will be performed immediately adjacent to (within 3 ft of) the failed test. If the confirmatory test meets or exceeds specifications, a second confirmatory test will be performed at a second location immediately next to (within 3 ft of) the failed test. If the second confirmatory test also meets or exceeds specifications, the area will be declared as meeting project specifications and the confirmatory tests will be reported. In the event that either confirmatory test fails to meet specifications, additional testing will be performed to identify the limits of the area that does not meet project specifications. All confirmatory tests, failing tests, and re-tests will be recorded in the CQA representative's field book or compaction testing form. The approximate location and elevation of each test will be recorded.

Rapid laboratory permeability tests, such as the constant volume tests, will be used when possible to determine permeability. Once the sample has achieved the specified permeability, the test result will be reported immediately to the CQA certifying engineer. The number of failing tests will be less than the maximum percentage of failing tests specified in Table 2-5. The maximum percentage of failing tests are anticipated to cover laboratory or field recording mistakes, math errors, or other unknown circumstances that are not discovered until after the layer is covered with the succeeding layer(s). Otherwise, all failed tests will be corrected in the field as they are observed.

If a defective area is discovered in the SBL other than a failed in-place density test, the CQA representative will determine the extent and nature of the defect. If the defect is indicated by an unsatisfactory test result, the CQA representative will determine the extent of the defective area by additional tests, observations, a review of records, or other means that the CQA representative deems appropriate. If the defect is related to adverse site conditions, such as excessively wet soils or surface desiccation, the CQA representative will define the limits and nature of the defect by testing or observation. After the extent and nature of a defect is determined and remedied by the construction general contractor, the CQA representative will verify that the deficiency has been corrected by re-testing repaired areas before any additional work is performed by the construction general contractor in the area of the deficiency.

The testing frequency during the SBL construction may be increased or modified at the discretion of the CQA certifying engineer, when visual observations of construction performance indicate potential problems or when field experience with the proposed SBL material have been obtained.

During construction, the frequency of testing may be increased by the CQA representative during adverse weather conditions, if equipment breaks down, at the start and finish of grading, if the material fails to meet the requirements of the technical specifications, or if the extent of the work area is reduced.

The construction general contractor will repair all penetrations in the SBL resulting from sampling and other CQA activities, in accordance with the technical specifications. These perforations will be identified to the construction general contractor by the CQA representative. All repairs will be inspected by the CQA representative.

The construction general contractor will be required to use all means necessary to protect all prior work as well as all materials and completed work of other sections. In the event of damage, the construction general contractor will be required to immediately make all repairs and replacements necessary. The CQA representative will verify and document that all damages are repaired.

2.3.2.2 Layer Completion Certification

The construction general contractor will be required to notify the CQA representative when an area of SBL is complete, prior to constructing the overlying layer. The construction general contractor may begin placement of the overlying layer after acceptance of the SBL by the CQA certifying engineer. The CQA certifying engineer will provide a certificate of layer completion to the construction general contractor and the IDF project engineer, certifying that the area is complete.

The CQA certifying engineer will ensure all CQA tests are complete and that all defective areas have been repaired and re-tested in accordance with this CQA Plan and the technical specifications. The certificate of layer completion will indicate that the SBL meets the low permeability requirement, based on laboratory tests and the thickness of the SBL meeting the minimum requirement specified in the technical specifications.

2.4 DRAIN GRAVEL

2.4.1 Conformance Evaluation

No CQA conformance material testing is planned for the drain gravel. Construction general contractor is required to submit gradation test results demonstrating conformance with required material properties as part of source quality control, in accordance with the technical specifications.

2.4.2 Placement and Compaction

The CQA representative will verify and document that the drain gravel is constructed to the elevations, grades, and thicknesses shown in the construction drawings, with material meeting the requirements of the technical specifications as determined by the test methods and frequencies specified within this CQA Plan.

Prior to the placement of the drain gravel, the CQA representative will verify and document that:

- The underlying geosynthetic layers are free of holes, tears, excessive wrinkles, or foreign objects.
- All work on underlying layers is complete and accepted by the CQA certifying engineer.

During placement and compaction of the drain gravel, the CQA representative will verify and document the following:

- Drain gravel material satisfies the requirements of the technical specifications as determined by the source quality control submittals.
- Drain gravel material is non-angular and free of material that could damage the underlying liner materials.
- Drain gravel material is spread during cooler portions of the day, unless otherwise approved by the CQA certifying engineer.
- Spreading and hauling equipment and operations are in compliance with material thickness and operations requirements, given in the technical specifications.
- If excessive wrinkles begin to develop in the underlying geosynthetics during gravel or sand placement or spreading, the wrinkles are worked out prior to continued placement operations.
- The drain gravel is placed in a manner that will not damage underlying geosynthetics, will minimize slippage of geosynthetic layers, and will not provide excess tensile stress on the geosynthetics, in accordance with the technical specifications.
- Close observation of the placement and compaction of drain gravel with earth moving equipment is performed.

2.4.3 Construction Quality Assurance Evaluation

No density tests will be conducted on the drain gravel. If the CQA representative suspects damage to pipes or underlying geosynthetic, the construction general contractor will be required to expose the potentially damaged materials and repair any observed damage.

2.4.4 Layer Completion Certification

The construction general contractor will be required to notify the CQA representative when an area of the LCRS or LDS drain gravel is complete, prior to constructing the overlying layer. The construction general contractor may begin placing the overlying layer when the drain gravel is accepted by the CQA certifying engineer. The CQA certifying engineer will provide a certificate of layer completion to the construction general contractor and the IDF project engineer, certifying that the area is complete.

2.5 OPERATIONS LAYER

The CQA representative will verify and document that the operations layer, including the operations layer material placed in the SLDS sump area, is constructed to the elevations, grades, and thicknesses shown in the construction drawings, with material meeting the requirements of the technical specifications as determined by the test methods and frequencies specified within this CQA Plan.

Prior to the placement of the operations layer, the CQA representative will verify and document the following:

- The underlying geosynthetic layer is free of holes, tears, excessive wrinkles, or foreign objects.
- All work on underlying layers is complete and accepted by the CQA certifying engineer.

During placement of the operations layer, the CQA representative will verify and document that:

- The soil is suitable and satisfies the requirements of the technical specifications as determined by the test methods and frequencies prescribed in Table 2-6.
- The operations soil is placed in accordance with the technical specifications and construction drawings.
- The lift thicknesses and total thickness of the operations layer agree with the requirements of the construction drawings.
- If excessive wrinkles begin to develop in the underlying geosynthetics during material placement or spreading, the wrinkles are worked out prior to continued placement operations.
- The operations layer is placed in a manner that will not damage underlying geosynthetics, will minimize slippage of geosynthetic layers, and will not provide excess tensile stress on the geosynthetics, in accordance with the technical specifications.
- Spreading and hauling equipment and operations are in compliance with material thickness and operations requirements given in the technical specifications.
- The operations layer is placed on the side slopes to the limits shown in the construction drawings.

- No operations layer material is placed or compacted during periods of unfavorable weather conditions, such as after heavy rains or snow, in accordance with requirements given in the technical specifications.

2.5.1 Conformance Evaluation

The test methods and frequencies for CQA conformance testing for the operations layer are specified in Table 2-6.

If damage to underlying geosynthetics is suspected, the CQA representative will require that the overlying operations layer material be removed to expose the geosynthetics.

The construction general contractor will be required to use all means necessary to protect all prior work, as well as all materials and completed work of other sections. In the event of damage, the construction general contractor will be required to immediately make all repairs and replacements necessary. The CQA representative will verify and document that all damages are repaired.

2.5.2 Layer Completion Certification

The construction general contractor will be required to notify the CQA representative when an area of the operations layer is complete. The CQA certifying engineer will provide a certificate of layer completion to the construction general contractor and the IDF project engineer, certifying that the area is complete.

2.6 SOIL SURVEYING

A survey will be performed by or under the direction of a professional land surveyor registered in the State of Washington. The surveyor will independently survey the elevations and grades of the soil layers including, but not limited to:

- Top of prepared subgrade
- Top of SBL
- Top of LCRS drain gravel
- Top of operations layer

Surveys will be performed on the base and side slopes of the landfill, to confirm that the grades and elevations in the field agree with those shown in the construction drawings and minimum acceptable tolerances required in the technical specifications. The results of the survey, conducted by the surveyor, will be compiled in a report signed by the surveyor and the CQA certifying engineer.

The surveyor will be required to survey each soil layer of the liner system for the IDF landfill, in accordance with the requirements of this CQA Plan. A record drawing or tabular listing of surveyed points will be submitted to the CQA certifying engineer by the surveyor before the placement of the next liner system layer. The surveys will be conducted at a 50-ft grid across the entire area of the survey. The survey will include, but not be limited to, the following features of the landfill:

- Toe of slope
- Crest of slope
- Grade breaks
- Anchor trench
- SLDS, LDS and LCRS sumps

TABLE 2-1
Minimum Frequency of Testing for CQA Evaluation of Earthfill

Test	Frequency	Standard Test Method
Material Properties		
Standard proctor or maximum index density for free-draining soil	1 per 20,000 yd^3 (minimum 1 per source or soil type)	ASTM D698 or ASTM D4253
Placement		
In-place wet unit weight	1 per 5,000 ft^2 per lift	ASTM D2922, D1556
In-place moisture content	1 per 5,000 ft^2 per lift	ASTM D3017, D2216
Standard count calibration	1 per day of fill placement	ASTM D3017/D2922
Oven moisture contents (in situ moisture content)	1 per day of fill placement	ASTM D2216

TABLE 2-2
Minimum Frequency of Testing for CQA Evaluation of Structural Fill

Test	Frequency	Standard Test Method
Material Properties		
Standard proctor or maximum index density for free-draining soil	1 per 2,000 tons (minimum 1 per source or soil type)	ASTM 698 or ASTM 4253
Placement		
In place moisture content	1 per 2,500 ft^2 per lift	ASTM D3017, D2216
In place dry unit weight	1 per 2,500 ft^2 per lift	ASTM D2922, D1556
Standard count calibration	1 per day of fill placement	ASTM D3017/D2922
Oven moisture contents (in situ moisture content)	1 per day of fill placement	ASTM D2216

TABLE 2-3
Minimum Frequency of Testing for CQA Evaluation of Prepared Subgrade

Test	Frequency	Standard Test Method
Material Properties[a]		
Standard proctor or maximum index density for free-draining soil	1 per 250,000 ft^2 (minimum 1 per source or soil type)	ASTM 698 or ASTM 4253
In Place[b]		
In-place wet unit weight	4 per acre (approx. 1 per 10,000 ft^2)	ASTM D2922, D1556
In-place moisture content	4 per acre (approx. 1 per 10,000 ft^2)	ASTM D3017, D2216
Standard count calibration	1 per day when in place tests are performed	ASTM D3017/D2922
Concrete block calibration	1 per day when in place tests are performed	ASTM D3017/D2922
Over moisture content (in situ moisture content)	1 per day when in place tests are performed	ASTM D2216

a. Prior to subgrade excavation.
b. After reaching subgrade elevation.

TABLE 2-4
Minimum Frequency of Testing for CQA Evaluation of SBL

Test	Frequency	Standard Test Method
Bentonite		
Dry fineness	1 per lot	Technical specification [a]
High swelling	1 per lot	Technical specification
Processing		
Base soil excavation	Periodic monitoring	Observation
Base soil natural moisture content	1 per working day of hauling base material or per material color/consistency change	ASTM D2216
Base soil grain size	1 per working day of hauling base material or per material color/consistency change	ASTM D422
Bentonite/Base Soil application rate	1 per working day of admix processing	Measure weight of base soil and bentonite entering pugmill during a given period of time
Maximum clod size	Periodic monitoring	Observation
Curing [c]	1 per 12 hours	Observation
Pre-Compaction		
Lift thickness [d]	1 per 2,500 ft^2 per lift	Field measurement
Percent fines	1 per 1,000 yd^3 (minimum of 1 per day of placement)	ASTM D1140
Percent gravel	1 per 1,000 yd^3 (minimum of 1 per day of placement)	ASTM D422
Atterberg limits	1 per 1,000 yd^3 (minimum of 1 per day of placement)	ASTM D4318
Placement	Periodic monitoring	Observation
Post Compaction		
Lift thickness	5 per acre per lift	Full measurement
In place moisture content	5 per acre per lift	ASTM D3017
In place dry unit weight	5 per acre per lift	ASTM D2922
Shelby tube samples (laboratory permeability)	1 per acre per lift	ASTM D1587/ ASTM D5084 [e, f]
Number of passes [g]	Observe 1 per acre per lift	Observation
Construction oversight	Periodic monitoring	Observation
Calibration and Check		
Oven moisture content (per each nuclear gauge)	1 per 10 nuclear gauge moisture contents	ASTM D2216
Standard count calibration (per each nuclear gauge)	1 per day of placement	ASTM D2922/ASTM D3017

a. The test method is described in the technical specification.
b. Not used.
c. Curing is stockpiling the SBL material for 12 hours to allow the bentonite to hydrate.
d. A loose lift thickness is such that the compacted thickness is 6 inches or less.
e. The average effective confining stress will be 5 psi.
f. Rapid turnaround tests (Method F – Constant Volume) will be used when possible.
g. A single pass is defined as forward and back.

TABLE 2-5
Maximum Allowable Percentage of Failed Tests for CQA Evaluation of SBL

Test	Maximum percentage
Percent gravel	5 percent not concentrated in one lift or one area
Clod size	10 percent not concentrated in one lift or one area
In place moisture content	3 percent not concentrated in one lift or one area, and no water content less than 2 percent or more than 3 percent of the specified value
In place dry unit weight	3 percent not concentrated in one lift or one area, and no dry unit weight less than 5 pounds per cubic foot (pcf) below the specified value
Shelby tube samples (laboratory permeability)	5 percent not concentrated in one lift or one area

TABLE 2-6
Minimum Frequency of Testing for CQA Evaluation of Operations Layer

Test	Frequency	Standard Test Method
Material Properties		
Standard proctor or maximum index density for free-draining soil	1 per 20,000 yd^3 (minimum 1 per source or soil type)	ASTM D698 or ASTM D4253
Sieve analysis	1 per 10,000 yd^3 placed (minimum 1 per source)	ASTM D422
In-Place (Outside edge of liner only)		
In-place wet unit weight	1 per 5,000 ft^2 per lift	ASTM D2922, D1556
In-place moisture content	1 per 5,000 ft^2 per lift	ASTM D3017, D2216
In-Place (SLDS sump		
In-place wet unit weight	2 per lift	ASTM D2922, D1556
In-place moisture content	2 per lift	ASTM D3017, D2216

SECTION III–GEOSYNTHETIC CLAY LINER CONSTRUCTION QUALITY ASSURANCE

3.1 GEOSYNTHETIC CLAY LINER MANUFACTURE AND DELIVERY

3.1.1 Labeling

The CQA representative will verify and document that the GCL manufacturer has labeled each roll of GCL and includes the information required by the technical specifications. The CQA representative will examine GCL rolls upon delivery and deviation from the above requirements will be reported to the CQA certifying engineer prior to installation of the GCL.

3.1.2 Transportation and Handling

The CQA representative will observe and document that the type of GCL handling equipment used by the installer minimizes damage to the material. Upon delivery at the site, the CQA representative will conduct a visual inspection of all rolls for defects and for damage. This examination will be conducted without unrolling rolls unless visible defects or damages are found. The CQA representative will indicate to the CQA certifying engineer:

- Any rolls that need to be unrolled to allow for their inspection
- Any rolls, or portions thereof, that need to be rejected and removed from the site because they have severe flaws
- Any rolls that include minor repairable flaws

3.1.3 Storage

The CQA representative will verify and document that storage of the GCL is in accordance with the technical specifications.

3.1.4 Inventory

All geosynthetic materials that arrive onsite will be inventoried. The inventory will include the specific roll numbers delivered with each shipment. The inventory will be compared to the QC testing information, supplied by the manufacturer to ensure that the material tested is the same material that was delivered to the site. Material for which QC testing data has been supplied will be sampled for conformance testing. Conformance samples may be obtained by the CQA representative at the manufacturing plant or taken upon delivery of the material to the site by a CQA representative. As shipments arrive at the site, a CQA representative will monitor the unloading operations and will inventory the material. Rolls selected for conformance testing will be set aside for sampling as soon as possible.

The CQA representative will record the following information, at a minimum, for each roll:

- **Manufacturer–**Indicate the manufacturer of the material that is being inventoried, that may not be the same as the installer
- **Date of Inventory–**Date that the material was inventoried
- **Date of Delivery–**Enter date when the truck arrived onsite, if known
- **Truck Type–**Indicate type of truck used for shipping geosynthetics (covered or uncovered flatbed, box trailer)
- **Bill of Lading Number–**If the bill-of-lading is available, indicate number and date (also attach copy to inventory form)
- **CQA Representative–**Indicate name of CQA representative performing inventory
- **Unloading Equipment–**Indicate the type and model number of the equipment unloading the geosynthetic material; also note any special attachments that are used to unload the material (stinger, straps, forks)
- **Weather Conditions–**Describe the weather conditions, including temperature, wind, cloud cover, and precipitation during unloading and conformance sampling operation
- **Material Type–**Indicate type of geosynthetic material
- **Roll Number–**Indicate each roll number that is written on the roll (The roll numbers contain a variety of information regarding the material and the manufacturing process.)
- **Lot Number**–Lot number
- **Roll (L × W)–**Indicate the roll width as written on the roll label; if two materials are bonded together (i.e., geonet/geotextile), obtain measurements for both materials
- **Area (square feet)–**Indicate the total square footage of the roll
- **Damage Remarks–**Document any visible damage to the roll; if possible, indicate if damage was present prior to unloading or if it occurred during unloading

The CQA representative will immediately notify the IDF CM if a nonconforming or conditional use tag is attached to any of the inventoried items.

Items that are restricted from further use until the inspections have been completed will be clearly delineated by the CQA representative. Accepted materials will be kept separate or clearly delineated from inventoried and approved items, to the extent possible. The CQA representative will be responsible for coordinating with the construction general contractor during material delivery, so that the material is not moved more than necessary after it is unloaded and damage due to handling is minimized.

The CQA representative will perform the inventory immediately after the material arrives on the site to avoid delaying construction. The CQA representative will be responsible for verifying that only accepted material is installed at the IDF landfill and that all inventories and inspections are documented and maintained.

3.1.5 Quality Assurance Conformance Testing

Either at the manufacturer's plant or upon delivery of the rolls of GCL, the CQA representative will ensure that samples are removed at the specified frequency and forwarded to the Geosynthetics CQA Laboratory for testing, to verify and document conformance with the technical specifications.

Conformance samples will be taken across the entire width of the roll and will not include the first 3 feet along the length of the roll. Unless otherwise specified, samples will be 1.5 feet (minimum) long by the roll width. The CQA representative will mark the machine direction on the samples with an arrow.

Unless otherwise specified, samples will be taken at a rate of one per lot or one per 50,000 square feet, whichever is greater. These samples will be tested for:

- Index Flux (ASTM D5887)
- Bentonite Mass per Unit Area (ASTM D5993)
- Bentonite Swell Index Test (ASTM D5890)

The test will be conducted in accordance with the test procedure presented in the technical specifications.

The CQA representative will examine all results from laboratory conformance testing and compare the results to the specifications presented in the technical specifications. In addition, the CQA representative will report any non-conformance to the CQA certifying engineer as soon as practical after the test results become available.

The following procedure will apply whenever a sample fails a conformance test that is conducted by the Geosynthetics CQA Laboratory:

- The construction general contractor will be required to replace the roll (or rolls) of GCL not in conformance with the specifications with a roll that meets the requirements of the technical specifications.

- The CQA representative will ensure that conformance samples are removed for testing by the Geosynthetics CQA Laboratory from the closest numerical roll on both sides of the roll from which the failing sample was obtained. These two samples must pass the above conformance tests. If either of these samples fails to meet the requirements, samples will be collected from the five numerically closest untested rolls on both sides of the failed samples and tested by the Geosynthetics CQA Laboratory. These ten samples must pass the above conformance tests. If any of these samples fail, a sample from every roll of GCL onsite and a sample from every roll that is subsequently delivered from the same manufacturer must be conformance tested by the Geosynthetics CQA Laboratory until the manufacturer has thoroughly demonstrated compliance with the above requirements to the sole satisfaction of the CQA certifying engineer. The costs of all such tests are to be borne by the construction general contractor.

- The CQA representative will document actions taken in conjunction with conformance test failures as outlined in Section 8.1.4 and report all actions to the CQA certifying officer.

3.2 GEOSYNTHETIC CLAY LINER INSTALLATION

3.2.1 Surface Preparation

For fill surfaces that will underlay a GCL layer, the CQA representative will verify and document the following:

- The surface of the fill does not contain holes, ruts, protrusions, or other surface irregularities in excess of those dimensions specified by the technical specifications.
- The surface of the fill has been compacted to form a firm, stable base.
- The surface of the fill is free of any type of deleterious material that may cause damage to GCL, including debris, organic material, frozen soil, ice, and rocks.
- The surface of the fill is free of standing water or excessive moisture.
- The construction general contractor has certified in writing that the surface on which the GCL will be installed is acceptable.

The subgrade surface will be inspected immediately prior to commencement of GCL installation. If any change in the surface requires repair work, in accordance with the technical specifications, the construction general contractor will be responsible for repairing the fill surface.

A certificate of subgrade surface acceptance will be required from the construction general contractor. The CQA representative will verify that the subgrade is accepted by the GCL installer immediately prior to commencement of GCL installation.

After the surface on which the GCL is to be installed has been accepted by the construction general contractor, it will be the CQA representative's responsibility to indicate to the CQA certifying engineer any change in the underlying layer that may, in accordance with the technical specifications, require repair work. If the CQA certifying engineer requires that repair work be done, it will be the responsibility of the construction general contractor to repair the underlying layer.

3.2.2 Anchor Trenches and Sumps

Prior to placement of geosynthetics in the anchor trenches or sumps, the CQA representative will verify and document the following:

- The sumps and anchor trenches are excavated to the grades and dimensions shown in the construction drawings. Any anomalies in the soil encountered during excavation will be brought to the attention of the IDF project engineer and removed as directed.
- The anchor trench excavation surface is prepared for installation of geosynthetics, with rounded corners, and free of loose soil or deleterious material.

After geosynthetics deployment into the anchor trench is complete, the CQA representative will verify and document that the backfill for the geosynthetic anchor trenches is placed and compacted in accordance with the technical specifications.

3.2.3 Geosynthetic Clay Liner Deployment

3.2.3.1 Field Panel Identification

A field panel is the unit area of GCL that is to be placed in the field (i.e., a field panel is a roll or a portion of roll cut in the field).

The CQA representative will track the placement location of each GCL panel by assigning an identification code (number or letter-number) or by an equivalent tracking method. The identification method will be agreed upon by the CQA certifying engineer and the construction general contractor. This field panel identification scheme will be as simple and logical as possible. (Note: manufacturing plant roll numbers are usually cumbersome and are not related to location in the field.) It will be the responsibility of the construction general contractor to ensure that each field panel placed is marked with the manufacturing plant roll number. The roll number will be marked in the center of the panel in a color to allow for easy inspection.

The CQA representative will establish a table or chart showing correspondence between manufacturing plant roll numbers and field panel identification codes. The field panel identification code will be used for all CQA records.

3.2.3.2 Field Panel Placement

Installation Schedule

The CQA representative will evaluate significant changes in the schedule, proposed by the construction general contractor, and will advise the CQA certifying engineer on the acceptability of that change. The CQA representative will verify and document that the condition of the underlying layer has not changed detrimentally during installation. Any damage to the surface of the underlying layer will be repaired by the construction general contractor in accordance with the technical specifications.

Weather Conditions

The CQA representative will verify and document that GCL is not placed during inclement weather conditions, as specified in the technical specifications. Additionally, the CQA monitor will verify and document that the existing underlying layer has not been damaged by weather conditions.

Damage

The CQA representative will visually observe each panel, after placement, for damage. The CQA representative will inform the construction general contractor which panels, or portions of panels, are rejected, repaired, or accepted. Damaged panels or portions of damaged panels that have been rejected by the CQA representative will be marked, and their removal from the work area will be documented by the CQA representative.

Seam Overlap and Bentonite Seal

The construction general contractor will observe and document that the seam overlaps and bentonite material placed between panels, if required, along the seams meets specification guidelines. The CQA representative will verify overlap width and will observe bentonite seal placement.

3.2.3.3 Field Panel Protection

The CQA representative will observe and document that the GCL is completely covered with geomembrane or protective plastic cover at the end of each workday and protected from damage and hydration due to weather. The CQA representative will verify and document that equipment does not operate directly on the GCL and that a smooth rub sheet is used to maneuver textured geomembrane over the GCL to prevent damage to the GCL.

3.2.4 Defects and Repairs

Any defects and subsequent repairs will be documented, using NCR procedures outlined in Section 8.1.4.

3.2.4.1 Identification

All seams and non-seam areas of the GCL will be inspected by the CQA representative for evidence of defects, holes, contamination of geotextiles, displaced panels, premature hydration, and any sign of contamination by foreign matter. The CQA representative will observe and document repair procedures described below.

3.2.4.2 Repair Procedures

Prior to cover material placement, damage to the GCL will be identified and repaired by the installer.

Rip and Tear Repair (Flat Surfaces)
Rips or tears may be repaired by completely exposing the affected area, removing all foreign objects or soil, and by then placing a patch cut from unused GCL over the damage (damaged material may be left in place), with a minimum overlap of 12 inches on all edges.

Accessory bentonite will be placed between the patch edges and the repaired material at a rate of a quarter pound per lineal foot of edge, spread in a continuous 6 inch fillet.

Rip and Tear Repair (Slopes)
Damaged GCL material on slopes will be repaired by the same procedures as described above, however, the overlapped edges of the patch need to be wide enough to ensure the patch will keep its position during backfill or cover operations.

Displaced Panels
Displaced panels will be adjusted to the correct position and orientation. The adjusted panel will then be inspected for any geotextile damage or bentonite loss. Damage will be repaired by the above described procedure.

Premature Hydration
If the GCL is subjected to premature hydration, the construction general contractor will notify the CQA certifying engineer for a site-specific determination as to whether the material is acceptable or if alternative measures must be taken to ensure the quality of the design dependent upon the degree of damage.

SECTION IV–GEOMEMBRANE CONSTRUCTION QUALITY ASSURANCE

4.1 GEOMEMBRANE MATERIAL

4.1.1 Labeling

The CQA representative will verify and document that the geomembrane manufacturer has labeled each roll of geomembrane and includes the information required by the technical specifications. The CQA representative will examine geomembrane rolls upon delivery and deviation from the requirements will be reported to the CQA certifying engineer, prior to installation of the geomembrane.

4.1.2 Transportation and Handling

Upon delivery at the site, the CQA representative will conduct a visual inspection of all rolls for defects and damage. This examination will be conducted without unrolling rolls unless visible defects or damage are found. The CQA representative will indicate the following to the CQA certifying engineer:

- Any rolls that need to be unrolled to allow for their inspection
- Any rolls, or portions thereof, that need to be rejected and removed from the site because they have severe flaws
- Any rolls that include minor repairable flaws

4.1.3 Storage

The CQA representative will verify and document that storage of the geomembrane is in accordance with the technical specifications.

4.1.4 Inventory

All geosynthetic materials that arrive onsite will be inventoried in accordance with the technical specifications. The inventory will include the specific roll numbers delivered with each shipment. The inventory will be compared to the QC testing information supplied by the manufacturer to ensure that the material tested is the same material that was delivered to the site. Material for which QC testing data has been supplied will be sampled for conformance testing. Conformance samples may be obtained by the CQA representative at the manufacturing plant or taken upon delivery of the material to the site by a CQA representative. As shipments arrive at the site, a CQA representative will monitor the unloading operations and will inventory the material. Rolls selected for conformance testing will be set aside for sampling as soon as possible.

The CQA representative will record the following information, at a minimum, for each roll:

- **Manufacturer–**indicate the manufacturer of the material that is being inventoried, that may not be the same as the installer
- **Date of Inventory–**Date that the material was inventoried
- **Date of Delivery–**Enter date when the truck arrived onsite, if known
- **Truck Type–**Indicate type of truck used for shipping geosynthetics (covered or uncovered flatbed, box trailer)
- **Bill-of-Lading Number–**If the bill-of-lading is available, indicate number and date (also attach copy to inventory form)
- **CQA Representative–**Indicate name of CQA representative performing inventory
- **Unloading Equipment–**Indicate the type and model number of the equipment unloading the geosynthetic material; also note any special attachments that are used to unload the material (stinger, straps, forks)
- **Weather Conditions–**Describe the weather conditions, including temperature, wind, cloud cover, and precipitation during unloading and conformance sampling operation
- **Material Type–**Indicate type of geosynthetic material (HDPE, geotextile, or geonet)
- **Roll Number–**Indicate each roll number that is indicated on the roll (The roll numbers contain a variety of information regarding the material and the manufacture process.)
- **Lot Number–**Lot number as indicated
- **Roll (L × W)–**Indicate the roll width as indicated on the roll label; if two materials are bonded together (i.e., geonet/geotextile), obtain measurements for both materials
- **Area (square feet)–**Indicate the total square footage of the roll
- **Damage Remarks–**Document any visible damage to the roll; if possible, indicate if damage was present prior to unloading or if it occurred during unloading

Items that are restricted from further use until the inspections have been completed will be clearly delineated by the CQA representative. Accepted materials will be kept separate or clearly delineated from inventoried and approved items to the extent possible. The CQA representative will be responsible for coordinating with the construction general contractor during material delivery, so that the material is not moved more than necessary after it is unloaded and damage due to handling is minimized.

The CQA representative will perform the inventory immediately after the material arrives onsite to avoid delaying construction. The CQA representative will be responsible for verifying that only accepted material is installed at the IDF landfill, and that all inventories and inspections are documented and maintained.

4.1.5 Quality Assurance Conformance Testing

Either at the manufacturer's plant or upon delivery of the rolls of geomembrane, the CQA representative will ensure that samples are removed at the specified frequency and forwarded to the Geosynthetics CQA Laboratory for testing to verify and document conformance with the technical specifications.

Conformance samples will be taken by the CQA representative across the entire width of the roll and will not include the first 3 feet. Unless otherwise specified, samples will be 3 feet (minimum) long by the roll width. The CQA representative will mark the direction of the machine used to cut the samples with an arrow.

Unless otherwise specified, samples will be taken at a rate of one per lot or one per 50,000 square feet, whichever is greater. These samples will be tested for:

- Thickness (ASTM D5199 or D5994)
- Tensile characteristics (yield strength and elongation at yield, ASTM D638)
- Asperity (GRI GM-12)
- Puncture resistance (ASTM D4833)

Test will be conducted in accordance with the test procedure presented in the technical specifications. The CQA representative will examine all results from laboratory conformance testing and will report any non-conformance after the test results become available. The following procedure will apply whenever a sample fails a conformance test that is conducted by the CQA representative:

- The construction general contractor will be required to replace the roll (or rolls) of geomembrane in non-conformance with the technical specifications with a roll that meets the technical specifications.

- The CQA certifying engineer will ensure that conformance samples are removed for testing by the Geosynthetics CQA Laboratory from the closest numerical roll on both sides of the failed roll. These two samples must pass the above conformance tests. If either of these samples fail, samples will be collected from the five numerically closest untested rolls on both sides of the failed sample and tested by the Geosynthetics CQA Laboratory. These ten samples must pass the above conformance tests. If any of these samples fail, a sample from every roll of geomembrane onsite and every roll subsequently delivered from the same manufacturer must be conformance tested by the Geosynthetics CQA Laboratory, until the manufacturer has thoroughly demonstrated compliance with the above requirements to the sole satisfaction of the CQA certifying engineer. The costs of all such tests are to be borne by the construction general contractor.

4.1.6 Manufacturing Plant Site Visit

The manufacturer shall allow the CQA certifying engineer or his designated representative to visit the manufacturing plant, if the CQA certifying engineer so chooses. If possible, the visit shall be prior to or during the manufacturing of the geomembrane rolls for the specific project. The CQA Engineer or his designated representative shall review the manufacturing process, quality control, laboratory facilities, and testing procedures as described in the technical specifications (see Section 02661).

4.2 GEOMEMBRANE INSTALLATION

4.2.1 Surface Preparation

For SBL surfaces that will underlay a geomembrane layer, the CQA representative will verify and document the following:

- The surface of the subgrade or SBL does not contain holes, depressions, or protrusions in excess of those dimensions specified by the technical specifications.
- The surface of the subgrade or SBL has been rolled with a smooth-drum roller to form a firm stable base without ridges, wheel ruts, and surface irregularities.
- The surface of the subgrade or SBL is free of any type of deleterious material that may cause damage to geomembrane.
- The construction general contractor has certified in writing that the surface on which the geomembrane will be installed is acceptable.

The subgrade and SBL surface will be inspected immediately prior to commencement of geomembrane installation. If any change in the surface requires repair work, in accordance with the technical specifications, the construction general contractor will be responsible for repairing the surface. A certificate of subgrade surface acceptance will be required from the construction general contractor. The CQA representative will verify that the subgrade is accepted by the geomembrane installer immediately prior to commencement of geomembrane installation.

After the surface on which the geomembrane is to be installed has been accepted by the construction general contractor, it will be the CQA representative's responsibility to indicate to the CQA certifying engineer any change in the underlying layer that may, in accordance with the technical specifications, require repair work. If the CQA certifying engineer requires that repair work be done, it will be the responsibility of the construction general contractor to repair the underlying layer.

4.2.2 Anchor Trenches and Sumps

Prior to placement of geosynthetics in the anchor trenches or sumps, the CQA representative will verify and document the following:

- The excavation of the sumps and anchor trenches is performed in accordance with the technical specifications. Any anomalies in the soil encountered during excavation will be brought to the attention of the IDF project engineer and removed as directed.
- The anchor trench excavation surface is prepared for installation of geosynthetics with rounded corners and is free of loose soil or deleterious material.

After geosynthetics deployment into the anchor trench is complete, the CQA representative will verify and document that the backfill for the geosynthetic anchor trenches is placed and compacted in accordance with the technical specifications and construction drawings.

4.2.3 Geomembrane Deployment

4.2.3.1 Layout Drawing

The construction general contractor will be required to produce layout drawings that show the geomembrane panel configuration, dimensions, details, and seam locations. The layout drawings must be approved by the CQA certifying engineer, prior to the installation of the geomembrane.

4.2.3.2 Field Panel Identification

A field panel is the unit area of geomembrane that is to be seamed in the field (i.e., a field panel is a roll or a portion of roll cut in the field).

The CQA representative will verify that each field panel is given an identification code (number or letter-number) consistent with the layout plan. This identification code will be agreed upon by the CQA representative and the construction general contractor. This field panel identification code will be as simple and logical as possible. (Note: manufacturing plant roll numbers are usually cumbersome and are not related to location in the field.) It will be the responsibility of the construction general contractor to ensure that each field panel placed is marked with the manufacturing plant roll number. The roll number will be marked in the center of the panel in a color to allow for easy inspection.

The CQA representative will establish a table or chart showing correspondence between manufacturing plant roll numbers and field panel identification codes. The field panel identification code will be used for all CQA records.

4.2.3.3 Field Panel Placement

Location

The CQA representative will verify and document that field panels are installed at the locations and positions indicated in the construction general contractor's layout plan, as approved or modified by the CQA certifying engineer.

Installation Schedule

The CQA representative will evaluate significant changes in the schedule, proposed by the construction general contractor, and will advise the CQA certifying engineer on the acceptability of that change. The CQA representative will verify and document that the condition of the underlying layer has not changed detrimentally during installation. Any damage to the surface of the underlying layer will be repaired by the construction general contractor in accordance with the technical specifications.

The CQA representative will record the identification code, location, and date of installation of each field panel.

Weather Conditions

The CQA representative will verify and document that geomembrane is not placed during inclement weather conditions, as specified in the technical specifications. Additionally, the CQA representative will verify and document that the underlying layer has not been damaged by weather conditions.

Damage

The CQA representatives will visually observe each panel, after placement and prior to seaming, for damage (e.g., holes, blisters, and creases). The CQA representative will inform the construction general contractor which panels, or portions of panels, need to be rejected, repaired, or accepted. Damaged panels or portions of damaged panels that have been rejected by the CQA certifying engineer will be marked, and their removal from the work area will be documented by the CQA representative, using the NCR procedures outlined in Section 8.1.4.

4.2.4 Field Seaming

4.2.4.1 Seam Layout

The CQA certifying engineer will verify and document that the seam layout shown in the panel layout drawing is consistent with the technical specifications. A seam numbering system compatible with the panel numbering system will be agreed upon by the construction general contractor and CQA certifying engineer.

4.2.4.2 Seaming Equipment and Products

Processes approved by the technical specifications for field seaming are extrusion seaming; and fusion seaming. Proposed alternate processes will be required to be documented and submitted to the CQA certifying engineer for approval. The construction general contractor will be required to use a pyrometer to ensure that accurate temperatures of the extrudate and seamer nozzle are being achieved.

The extrusion seaming apparatus will be equipped with gauges, indicating the temperatures of the extrudate and nozzle. The construction general contractor will be required to provide to the CQA certifying engineer the manufacturer's certification that the extrudate is compatible with the geomembrane material and is comprised of the same resin as the geomembrane.

The CQA representative will log ambient temperatures, seaming apparatus temperatures, and extrudate temperatures or fusion seaming apparatus speeds. Ambient temperatures will be measured to verify compliance with the technical specifications.

4.2.4.3 Seam Preparation

The CQA certifying engineer will verify and document the following:

- Prior to seaming, the seam area is clean and free of moisture, dust, dirt, debris, and foreign material.
- Preparation of seams is in accordance with the technical specifications.

4.2.4.4 Weather Conditions for Seaming

The CQA representative will verify and document that weather conditions for seaming are within the limits specified in the technical specifications.

4.2.4.5 Trial Seams

The construction general contractor will be required to make trial seams on fragment pieces of geomembrane liner to verify that seaming conditions are adequate. The construction general contractor will be required to make and test trial seams at the frequency and in accordance with the methods specified in the technical specifications.

The CQA representative will observe all trial seam procedures. The trial seam samples will be assigned a number and marked accordingly by the CQA representative, along with the date, hour, ambient temperature, number of seaming unit, name of seamer, and pass or fail description. A sample of the trial seam will be retained by the CQA team until the construction of the liner is complete and the liner has been accepted by the CQA certifying engineer.

4.2.4.6 Nondestructive Seam Continuity Testing

Except as otherwise noted in the technical specifications, the construction general contractor will nondestructively test all field seams over their full length, in accordance with the technical specifications. The purpose of nondestructive tests is to check the continuity of seams. Continuity testing will be carried out as the seaming work progresses, not at the completion of all field seaming. Nondestructive testing will not be permitted before sunrise or after sunset unless the construction general contractor demonstrates to the CQA certifying engineer that the construction general contractor has the capabilities to perform continuity testing under reduced light conditions. The CQA representative will perform the following tasks:

- Observe the continuity testing
- Record location, date, test unit number, name of tester, and outcome of all testing
- Document and inform the construction general contractor of any required repairs

The construction general contractor will be required to complete any required repairs, in accordance with the technical specifications. The CQA representative will perform the following tasks:

- Observe the repair and re-testing of the repair
- Mark on the geomembrane that the repair has been made
- Document the results

The CQA representative will verify and document the procedures specified in the technical specifications where seams cannot be nondestructively tested. The location, date of visual observation, name of tester, and outcome of the test or observation will be recorded by the CQA representative and reported to the CQA certifying engineer.

4.2.4.7 Destructive Seam Testing

Concept

Destructive seam tests will be performed at selected locations. The purpose of these tests is to evaluate seam strength and integrity. Seam strength testing will be done as the seaming work progresses, not at the completion of all field seaming.

Location and Frequency

The CQA representative will select locations where seam samples will be cut out for laboratory testing at the frequency specified in the technical specifications (see Section 02661). In general, destructive tests will be located in non-critical areas, such as seam run-out areas or near three-panel intersections or other areas that will require a patch anyway. In addition, because extrusion welding may be limited on a daily basis, extrusion destructive samples may be welded after passing a trial seam on scrap material not used for construction. However, when significant lengths (greater than 100 feet) of seams or caps are extrusion welded, a destructive test of the weld will be taken.

Control charts will be used to track the performance of each welding machine and technician to allow for biased sampling, according to performance. An upper control limit (UCL) will be established to statistically identify the sources of test failures. Machines and technicians whose failure rates exceed the UCL will then be identified and destructively tested at twice the original frequency (one per 250 feet of seam length) to better monitor their performance. Once the failure rate drops back into compliance with the UCL, the original testing frequency will be reinstated. Machines and technicians whose failure notes are below the UCL will be identified to decrease the original frequency, as approved by the CQA certifying engineer.

The UCL is established based on the failure rate for all destructive tests plus three standard deviations with a ceiling of 3.5 percent. The ceiling is the maximum failure rate determined to be acceptable, as agreed upon jointly by the construction general contractor and CQA certifying engineer. The initial UCL will be calculated once a single machine or technician fails two destructive tests and will typically be updated daily with the most recent destructive testing results. Destructive tests tracking a failed destructive will not be included in the calculation of the failure rates.

Additional destructive test locations may be required during seaming operations. The necessity for such additional sampling and testing will be determined by CQA representatives and will be implemented when there is cause to suspect the presence of excess crystallinity, contamination, offset welds, or any other reason to suspect potentially defective seams. The location selection of the additional testing will be based on the CQA representative's judgment and observation of a suspected problem.

The construction general contractor will not be informed in advance of the locations where the seam samples will be taken.

Sampling Procedure

The construction general contractor will be required to cut samples, as directed by the CQA representative as the seaming progresses, in order to have laboratory test results before the geomembrane is covered by another material. The CQA representative will perform the following tasks:

- Observe sample cutting
- Assign a number to each sample and mark it accordingly
- Record the sample number and location on the panel layout drawing
- Record the reason for taking the sample at this location (e.g., routine testing, suspicious feature of the geomembrane)

All holes in the geomembrane resulting from destructive seam sampling will be covered by the construction general contractor immediately after sampling and will be repaired in accordance with the repair procedures described in the technical specifications. The continuity of the new seams in the repaired area will be nondestructively tested, according to the technical specifications.

Size of Samples

At a given sampling location, two types of samples will be taken by the construction general contractor. First, two specimens for field testing will be taken. Each of these specimens will be 1 inch wide by 6 to 12 inches long, with the seam centered parallel to the width. The distance between these two specimens will be approximately 42 inches. If both specimens pass the field test described in the technical specifications, a sample for laboratory testing will be taken.

The sample for laboratory testing will be required to be taken between the two specimens for field testing. The destructive sample will be 12 inches wide by 42 inches long, with the seam centered lengthwise. The sample will be cut into three parts and distributed as follows:

- One portion to the construction general contractor, 12 inches long
- One portion to the IDF CM for archive storage, 12 inches long
- One portion to the CQA certifying engineer for CQA Laboratory testing, 18 inches long

Final determination of the sample sizes will be made at the preconstruction meeting.

Field Testing

The two 1-inch-wide specimens, as specified above, will be required to be tested in the field by the CQA representative by tensiometer for peel and shear and need to not fail in the seam. If any field test sample fails to pass, the procedures outlined in the technical specifications will be followed.

The CQA representative will mark all samples and portions with their number, date, and time.

Geosynthetic Construction Quality Assurance Laboratory Testing

Laboratory destructive test samples will be packaged and shipped to the Geosynthetics CQA Laboratory by the CQA representative in a manner that will not damage the test sample. The CQA representative will store the archive samples until the completion of the project.

Testing will include “Shear Strength” and “Peel Strength” (ASTM D6392) with 1-inch-wide strip, tested at 2 inches per minute. The minimum acceptable values to be obtained in these tests are those indicated in the technical specifications. At least five specimens will be tested

for each test method. Specimens will be selected alternately by test from the samples (i.e., peel, shear, peel, shear). At least four out of five of the specimens for each test must pass.

The laboratory will provide test results verbally to the CQA certifying engineer in a timely manner after they receive and test the samples. The CQA certifying engineer will review laboratory test results as soon as they become available and will inform the CQA certifying engineer of the test results.

Procedures for Destructive Test Failure

The procedures specified in the technical specifications will be required whenever a sample fails a destructive test, whether that test is conducted by the Geosynthetics CQA Laboratory or by field tensiometer. The CQA certifying engineer will verify and document that one of the options specified in the technical specifications is followed. The CQA representative will document all actions taken in conjunction with destructive test failures, including preparation of NCRs, as outlined in Section 8.1.4.

4.2.5 Defects and Repairs

4.2.5.1 Identification

All seams and non-seam areas of the geomembrane will be inspected by the CQA representative for evidence of defects, holes, blisters, undispersed raw materials, and any sign of contamination by foreign matter. Because light reflected by the geomembrane helps to detect defects, the surface of the geomembrane will be required to be clean at the time of examination. The geomembrane surface will be required to be swept or washed by the construction general contractor if the amount of dust or mud inhibits examination.

4.2.5.2 Evaluation

Each suspect location both in seam and non-seam areas will be required to be either non-destructively tested using the methods described in the technical specifications, or repaired as appropriate as determined by the CQA certifying engineer. Each location that fails the non-destructive testing will be marked by the CQA representative and will be required to be repaired by the construction general contractor. Materials will not be placed over geomembrane locations that have been repaired until the CQA representative has approved the repair.

4.2.5.3 Large Wrinkles

When seaming of the geomembrane is completed (or when seaming of a large area of the geomembrane is completed) and prior to placing overlying materials, the CQA representative will visually inspect the geomembrane for wrinkles. Based on the requirements of the technical specifications, the CQA representative will indicate to the construction general contractor which wrinkles, if any, are to be cut, overlapped, and seamed to remove the wrinkle. The seam thus produced will be tested like any other seam.

4.2.5.4 Repair Procedures

Any portion of the geomembrane exhibiting a flaw, or failing a destructive or nondestructive test, will be repaired by the construction general contractor in accordance with the applicable method specified in the technical specifications. An NCR will be

prepared to document all flaws and failed tests, as outlined in Section 8.1.4. Each repair will be located and logged by the CQA representative.

4.2.5.5 Testing of Repairs

Each repair will be non-destructively tested, using the methods described in the technical specifications as appropriate. Repairs that pass the non-destructive test will be considered adequate. Large caps may be of sufficient extent to require destructive testing, at the discretion of the CQA certifying engineer. Failed tests will require the repair to be redone and re-tested until passing test results are obtained. The CQA representative will observe the non-destructive testing of repairs and will document the date of the repair and test outcome.

4.2.6 Appurtenances

The CQA representative will verify and document the following:

- Installation of the geomembrane around, and connection of geomembrane to, appurtenances have been made according to the technical specifications or manufacturer's recommendations.
- Extreme care is taken while seaming around appurtenances, since neither non-destructive nor destructive testing may be feasible in these areas.
- The geomembrane has not been visibly damaged while being connected to appurtenances.

The CQA representative will inform the CQA certifying engineer if the above conditions are not fulfilled.

4.3 GEOMEMBRANE PANEL LAYOUT SURVEY

A survey will be performed by or under the direction of a professional land surveyor registered in the State of Washington. The surveyor will independently survey the elevations and location of each panel intersection and destructive sample. The results of the survey conducted by the surveyor will be compiled in a report signed by the surveyor and the CQA certifying engineer.

The surveyor will be required to survey each geomembrane panel intersection and destructive sample location for the IDF landfill, in accordance with the requirements of this CQA Plan. A record drawing will be submitted to the CQA certifying engineer by the surveyor. The survey will include enough information to confirm that the geomembrane layout is in accordance with the panel layout and include, but not be limited to, the following information:

- Geomembrane panel intersections
- Destructive sample location and identification
- Edge of geomembrane liner
- Panel identification numbers

Each geomembrane layer will be surveyed including, but not be limited to:

- Secondary leak detection system geomembrane
- Secondary geomembrane
- Primary geomembrane

4.4 LAYER COMPLETION CERTIFICATION

The construction general contractor will be required to notify the CQA representative when an area of geomembrane is complete, prior to constructing the overlying layer. The construction general contractor may place overlying layer after acceptance of geomembrane layer by the CQA Certifying Engineer. The CQA certifying engineer will provide a certificate of layer completion to the construction general contractor and the IDF project engineer, certifying that all CQA tests are complete and all defects have been repaired and tested.

SECTION V–GEOTEXTILE CONSTRUCTION QUALITY ASSURANCE

5.1 GEOTEXTILE MATERIAL AND INSTALLATION

5.1.1 Labeling

The CQA representative will verify and document that the geotextile manufacturer has labeled all rolls of geotextile with the information specified in the technical specifications. The CQA representative will examine rolls upon delivery, and any deviation from the requirements will be reported to the CQA certifying engineer. Geotextile rolls that are not labeled or that have illegible labels will be removed and disposed by the construction general contractor.

5.1.2 Transportation and Handling

The CQA representative will observe rolls of geotextile upon delivery at the site, and any deviation from the transportation and handling requirements specified in the technical specifications will be reported to the CQA certifying engineer. Any damaged rolls will be rejected by the CQA certifying engineer and required to be repaired or replaced by the construction general contractor.

5.1.3 Storage

The CQA representative will verify and document that storage of the geotextile is in accordance with the technical specifications.

5.1.4 Inventory

All geotextile materials that arrive onsite will be inventoried. The inventory will include the specific roll numbers delivered with each shipment. The inventory will be compared to the QC testing information, supplied by the manufacturer to ensure that the material tested is the same material that was delivered to the site. Material for which QC testing data has been supplied will be sampled for conformance testing. Conformance samples may be obtained by the CQA representative at the manufacturing plant or taken upon delivery of the material to the site by a CQA representative.

As shipments arrive at the site, a CQA representative will monitor the unloading operations and will inventory the material. Rolls selected for conformance testing will be set aside for sampling as soon as possible.

The CQA representative will record the following information, at a minimum, for each roll:

- **Manufacturer–**Indicate the manufacturer of the material that is being inventoried, that may not be the same as the installer
- **Date of Inventory–**Date that the material was inventoried
- **Date of Delivery–**Enter date when the truck arrived onsite, if known
- **Truck Type–**Indicate type of truck used for shipping geosynthetics (covered or uncovered flatbed, box trailer)
- **Bill-of-Lading Number–**If the bill-of-lading is available, indicate number and date (also attach copy to inventory form)
- **CQA Representative–**Indicate name of CQA representative performing inventory
- **Unloading Equipment–**Indicate the type and model number of the equipment unloading the geosynthetic material; also note any special attachments that are used to unload the material (stinger, straps, forks)
- **Weather Conditions–**Describe the weather conditions, including temperature, wind, cloud cover, and precipitation during unloading and conformance sampling operation
- **Material Type–**Indicate type of geosynthetic material
- **Roll Number–**Indicate each roll number that is indicated on the roll
- Lot Number–Lot number
- **Roll (L × W)–**Indicate the roll width as indicated on the roll label; if two materials are bonded together (i.e., geonet/geotextile), obtain measurements for both materials
- **Area (square feet)–**Indicate the total square footage of the roll
- **Damage Remarks–**Document any visible damage to the roll; if possible, indicate if damage was present prior to unloading or if it occurred during unloading

Items that are restricted from further use until the inspections have been completed will be clearly delineated by the CQA representative. Accepted materials will be kept separate or clearly delineated from inventoried and approved items to the extent possible. The CQA representative will coordinate with the construction general contractor during material delivery so that the material is not moved more than necessary after it is unloaded and damage due to handling is minimized.

The CQA representative will perform the inventory immediately after the material arrives onsite to avoid delaying construction. The CQA representative will be responsible for verifying that only accepted material is installed at the IDF landfill and that all inventories and inspections are documented and maintained.

5.1.5 Conformance Testing

Either at the manufacturer's factory or upon delivery of the geotextile rolls, the CQA representative will ensure that samples are removed and forwarded to the Geosynthetics CQA Laboratory for testing to verify and document conformance with the requirements of the technical specifications. Conformance samples will be taken across the entire width of the roll and will not include the first 3 feet along the edge of the roll. Unless otherwise specified, samples will be 3 feet (minimum) long by the roll width. The CQA representative will mark the machine direction on the samples with an arrow.

Samples will be taken at a rate of one per material lot or one per 50,000 square foot, whichever is greater. These samples will be tested for the following:

- Permittivity (ASTM D4491, Type 1 only)
- Grab strength (ASTM D4632)
- Tear strength (ASTM D4533)
- Puncture strength (ASTM D4833)

The CQA representative will examine all results of laboratory conformance testing and report any non-conformance to the CQA certifying engineer as soon as results become available. The following procedure will apply whenever a sample fails a conformance test that is conducted by the Geosynthetics CQA Laboratory:

- The construction general contractor will replace the roll (or rolls) of geotextile not in conformance with the specifications with a roll that meets the requirements of the technical specifications.

- The CQA representative will ensure that conformance samples are removed for testing by the Geosynthetics CQA Laboratory from the closest numerical roll on both sides of the roll from which the failing sample was obtained. These two samples must pass the above conformance tests. If either of these samples fail to meet the requirements, samples will be collected from the five numerically closest untested rolls on both sides of the failed sample and tested by the Geosynthetics CQA Laboratory. These ten samples must pass the above conformance tests. If any of these samples fail, a sample from every roll of geotextile onsite and a sample from every roll that is subsequently delivered from the same manufacturer must be conformance tested by the Geosynthetics CQA Laboratory, until the manufacturer has thoroughly demonstrated compliance with the above requirements to the sole satisfaction of the CQA certifying engineer. The cost of all such tests are to be borne by the construction general contractor.

The CQA representative will document actions taken in conjunction with conformance test failures and report all actions taken to the CQA certifying engineer. Failed tests will be documented using NCR procedures, outlined in Section 8.1.4.

5.1.6 Deployment

The construction general contractor will be required to handle all geotextile material in such a manner as to ensure that it is not damaged in any way.

It will be the CQA representative's responsibility to indicate to the CQA certifying engineer any change in the underlying layer that may, in accordance with the technical specifications, require repair work. If the CQA certifying engineer requires that repair work be done, it will be the responsibility of the construction general contractor to repair the underlying layer.

The CQA representative will verify and document compliance with the following:

- Just prior to geotextile placement, the layer that underlies the geotextile, if it is a geosynthetic, is clean and free of excessive amounts of dust, dirt, stones, rocks, or other obstructions that could potentially damage the liner system.
- In the presence of excessive wind, the geotextile is weighted with sandbags (or equivalent weight approved by the CQA representative).
- Geotextile is kept under tension to minimize the presence of wrinkles in the geotextile. If necessary, the geotextile is positioned by hand after being unrolled to minimize wrinkles.
- Geotextile is cut using a geotextile cutter approved by the geotextile manufacturer and the CQA representative. If in place, special care is taken to protect other materials (such as underlying geosynthetics) from damage that could be caused by the cutting of the geotextiles.
- The construction general contractor takes any necessary precautions to prevent damage to the underlying layers during placement of the geotextile.
- During placement of geotextile, care is taken not to entrap stones, excessive dust, or moisture that could damage the underlying layers, generate clogging of drains or filters, or hamper subsequent seaming.
- Geotextile is not left exposed for an excess of 14 days after placement, to prevent damage from exposure to ultraviolet radiation (sunlight). If the geotextile is exposed for more than 14 days, a temporary cover may be deployed for the duration of the delay or samples may be submitted to an independent testing laboratory to ensure that detrimental levels of UV degradation have not occurred. Test results shall be submitted to CQA certifying engineer for review and approval. Detrimental level of UV degradation is defined in the technical specifications (see Section 02371).

The CQA representative will document any non compliance with the above requirements and report them to the CQA certifying engineer.

5.1.7 Seams and Overlaps

The CQA representative will verify and document that all geotextile seams are oriented and overlapped, in accordance with the technical specifications. The construction general contractor will be required to pay close attention at seams to ensure that no protective soil layer material could be inadvertently placed beneath the geotextile.

5.1.8 Repair

The CQA representative will verify and document that any holes or tears in the geotextile are repaired, in accordance with the requirements of the technical specifications. The CQA representative will document any noncompliance with the above requirements and report it to the CQA certifying engineer.

SECTION VI–COMPOSITE DRAINAGE NET CONSTRUCTION QUALITY ASSURANCE

6.1 COMPOSITE DRAINAGE NET MATERIAL AND INSTALLATION

6.1.1 Labeling

The CQA representative will verify and document that the composite drainage net manufacturer has labeled all rolls of composite drainage net as specified in the technical specifications. The CQA representative will examine rolls upon delivery, and any deviation from the above requirements will be reported to the CQA certifying engineer prior to installation of the composite drainage net.

6.1.2 Transportation and Handling

The CQA representative will observe rolls of composite drainage net upon delivery at the site, and any deviation from the requirements of the technical specifications will be reported to the CQA certifying engineer. Any damaged rolls will be rejected by the CQA representative and be required to be repaired or replaced by the construction general contractor.

6.1.3 Storage

The CQA representative will verify and document that the storage of the composite drainage net is in accordance with the technical specifications.

6.1.4 Inventory

All CDN that arrive onsite will be inventoried. The inventory will record the specific roll numbers delivered with each shipment. The inventory will be compared to the QC testing information supplied by the manufacturer, to ensure that the material tested is the same material that was delivered to the site. Material for which QC testing data has been supplied will be sampled for conformance testing. Conformance samples may be obtained by the CQA representative at the manufacturing plant or taken upon delivery of the material to the site by a CQA representative.

As shipments arrive at the site, a CQA representative will monitor the unloading operations and will inventory the material. Rolls selected for conformance testing will be set aside for sampling as soon as possible.

The CQA representative will record the following information, at a minimum, for each roll:

- **Manufacturer–**Indicate the manufacturer of the material that is being inventoried, that may not be the same as the installer
- **Date of Inventory–**Date that the material was inventoried
- **Date of Delivery–**Enter date when the truck arrived onsite, if known
- **Truck Type–**Indicate type of truck used for shipping geosynthetics (covered or uncovered flatbed, box trailer)
- **Bill-of-Lading Number–**If the bill-of-lading is available, indicate number and date (also attach copy to inventory form)
- **CQA Representative–**Indicate name of CQA representative performing inventory
- **Unloading Equipment–**Indicate the type and model number of the equipment unloading the geosynthetic material; also note any special attachments that are used to unload the material (stinger, straps, forks)
- **Weather Conditions–**Describe the weather conditions, including temperature, wind, cloud cover, and precipitation during unloading and conformance sampling operation
- **Material Type–**Indicate type of geosynthetic material (high-density polyethylene, geotextile, or geonet)
- **Roll Number–**Indicate each roll number that is written on the roll
- **Lot Number–**Lot number as indicated
- **Roll (L × W)–**Indicate the roll width as indicated on the roll label; if two materials are bonded together (i.e., geonet/geotextile), obtain measurements for both materials
- **Area (square feet)–**Indicate the total square footage of the roll
- **Damage Remarks–**Document any visible damage to the roll; if possible, indicate if damage was present prior to unloading or if it occurred during unloading

Items that are restricted from further use until the inspections have been completed will be clearly delineated by the CQA representative. Accepted materials will be kept separate or clearly delineated from inventoried and approved items to the extent possible. The CQA representative will coordinate with the construction general contractor during material delivery so that the material is not moved more than necessary after it is unloaded and damage due to handling is minimized.

The CQA representative will perform the inventory immediately after the material arrives onsite to avoid delaying construction. The CQA representative will be responsible for verifying that only accepted material is installed at the IDF landfill and that all inventories and inspections are documented and maintained.

6.1.5 Conformance Testing

Either at the manufacturer's plant or upon delivery of the composite drainage net rolls, the CQA representative will ensure that samples are removed and forwarded to the Geosynthetics CQA Laboratory for testing, to verify and document conformance with the requirements of the technical specifications.

Conformance samples will be taken across the entire width of the roll and will not include the first 3 feet. Unless otherwise specified, samples will be 3 feet long (minimum) by the roll width. The CQA representative will mark the machine direction on the samples with an arrow.

Samples will be taken at a rate of one per lot or one per 50,000 square feet, except as noted otherwise below, whichever is greater. The geonets will be tested for the following:

- Polymer specific gravity (ASTM D1505)
- Thickness (ASTM D5199)
- Nominal transmissivity (ASTM D4716 – one per production lot)

The composite drainage nets will be tested for the following:

- Adhesion (GRI-GC7 or ASTM D413)
- Transmissivity (ASTM D4716 – one per production lot)

The CQA representative will examine all results from laboratory conformance testing and will report any non-conformance to the CQA certifying engineer as soon as the results become available.

The following procedure will apply whenever a sample fails a conformance test that is conducted by the Geosynthetics CQA Laboratory:

- The construction general contractor will be required to replace the roll (or rolls) of composite drainage net not in conformance with the specifications with a roll that meets the requirements of the technical specifications.

- The CQA representative will ensure that conformance samples are removed for testing by the Geosynthetics CQA Laboratory from the closest numerical roll on both sides of the failed roll. These two samples must pass the above conformance tests. If either of these samples fail, samples will be collected from the five numerically closest untested rolls on both sides of the failed sample and tested by the Geosynthetics CQA Laboratory. These ten samples must pass the above conformance tests. If any of these samples fail, a sample from every roll of composite drainage net onsite and a sample from every roll that is subsequently delivered from the same manufacturer must be conformance tested by the Geosynthetics CQA Laboratory, until the manufacturer has thoroughly demonstrated compliance with the above requirements to the sole satisfaction of the CQA certifying engineer. The cost of such tests is to be borne by the construction general contractor.

The CQA representative will document actions taken in conjunction with conformance test failures and report all actions to the CQA certifying engineer. Failed tests will be documented using NCR procedures, outlined in Section 8.1.4.

6.1.6 Deployment

The construction general contractor will be required to handle all composite drainage net in such a manner as to ensure that it is not damaged.

The construction general contractor responsible for composite drainage net installation will be required to certify in writing that the surface on which the composite drainage net will be installed is complete and acceptable. The certificate of partial completion will be given by the construction general contractor to the CQA representative, who will then verify to the CQA certifying engineer that the deployment surface is complete, prior to commencement of composite drainage net installation.

After the surface on which the composite drainage net is to be installed has been accepted by the construction general contractor, it will be the CQA representative's responsibility to indicate to the CQA certifying engineer any change in the underlying layer that may, in accordance with the technical specifications, require repair work. If the CQA certifying engineer requires that repair work be done, it will be the responsibility of the construction general contractor to repair the underlying layer.

The CQA representative will verify and document compliance with the following:

- Just prior to composite drainage net placement, the layer that will underlie the composite drainage net is clean and free of excessive amounts of dust, dirt, stones, rocks, or other obstructions that could potentially damage the underlying layers or clog the drainage system.
- In the presence of excessive wind, the composite drainage net is weighted with sandbags (or equivalent weight approved by the CQA certifying engineer).
- Composite drainage net is kept under tension to minimize the presence of wrinkles in the composite drainage net. If necessary, the composite drainage net is positioned by hand after being unrolled, to minimize wrinkles.
- Composite drainage net is cut using a composite drainage net cutter, approved by the composite drainage net manufacturer and the CQA representative. If in place, special care is taken to protect other materials from damage that could be caused by the cutting of the composite drainage net.
- The construction general contractor takes all necessary precautions to prevent damage to the underlying layers during placement of the composite drainage net.
- Composite drainage net is not welded to geomembranes.
- During placement of clean composite drainage net, care is taken not to entrap stones, excessive dust, or moisture that could damage the underlying geomembrane, generate clogging of drains or filters, or hamper subsequent seaming.
- A visual examination of the composite drainage net is carried out over the entire surface, after installation, to ensure that no potentially harmful foreign objects, such as needles, are present.

- Composite drainage net is not left exposed for an excess of 14 days after placement, to prevent damage from exposure to ultraviolet radiation (sunlight).

The CQA representative will document any noncompliance with the above requirements and report it to the CQA certifying engineer.

6.1.7 Seams and Overlaps

The components of the composite drainage net (e.g., geotextile-geonet-geotextile) are not bonded together at the ends and edges of the rolls. The CQA representative will document that the composite drainage net is overlapped and secured in accordance with the technical specifications.

6.1.8 Repair

The CQA representative will verify that any holes or tears in the composite drainage net are repaired, in accordance with the technical specifications. The CQA representative will observe any repair, document any noncompliance with the above requirements, and report the noncompliance to the CQA certifying engineer. Repair areas will be documented using NCR procedures, outlined in Section 8.1.4.

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SECTION VII–POLYETHYLENE PIPE AND FITTINGS CONSTRUCTION QUALITY ASSURANCE

7.1 PIPE AND FITTINGS

The CQA representative will monitor the placement of the LCRS, LDS and SLDS pipe, located on the IDF landfill floor and on the landfill slopes.

7.1.1 Labeling

The CQA representative will verify that the pipe is labeled with the information specified in the technical specifications. Any deviations from the labeling requirements will be reported to the CQA certifying engineer prior to pipe installation.

7.1.2 Transportation and Handling

The CQA representative will verify and document that the pipe and fittings are handled in accordance with the technical specifications. The CQA representative will visually inspect the pipe upon delivery at the site, and any deviations from the requirements of the technical specifications will be reported to the CQA certifying engineer.

7.1.3 Storage

The CQA representative will verify and document that storage of the pipe and fittings is in accordance with the technical specifications.

7.1.4 Inventory

The CQA representative will inventory the polyethylene piping and fitting, delivered to the site that will be installed at the bottom and on the slopes of the landfill. The CQA representative will perform the following tasks:

- Verify the material for conformance with the technical specifications and construction drawings
- Verify slot dimensions for conformance with the technical specifications
- Check the material for damage, mishandling, and adverse exposure

Items that are restricted from further use until the inspections have been completed will be clearly delineated by the CQA representative. Accepted materials will be kept separate from inventoried and approved items, to the extent possible. The CQA representative will be responsible for coordinating with the construction general contractor during material delivery so that the material is not moved more than necessary after it is unloaded and damage due to handling is minimized.

The CQA representative will perform the inventory immediately after the material arrives onsite to avoid delaying construction. The CQA representative will be responsible for verifying that only accepted material is installed at the IDF landfill, and that all inventories and inspections are documented and maintained.

7.1.5 Conformance Testing

No conformance testing will be conducted on the materials delivered to the site.

7.1.6 Handling and Laying

The CQA representative will verify and document that the pipe is installed at the specified locations, grades, and angles, and that placement of backfill around and over the pipe is conducted in accordance with the requirements of the technical specifications and in a manner intended to prevent damage to the pipe.

The pipe and fittings will be carefully examined before installation by the CQA representative. The CQA representative will verify and document that cracks, damage, or defects are not present in the pipe and fittings in excess of that allowed by the technical specifications.

The CQA representative will also note the condition of the interior of pipes and fittings. Foreign material will be removed from the pipe interior before it is moved into final position. No pipe will be permitted to be placed until the CQA representative has observed the condition of the pipe. The CQA representative will document any deviation from the requirements and report it to the CQA certifying engineer.

7.1.7 Joints and Connections

Lengths of pipe will be required to be assembled into suitable installation lengths by the butt-fusion process. Butt-fusion refers to the butt-joining of the pipe by softening the aligned faces of the pipe ends in a suitable apparatus and pressing them together under controlled pressure. The CQA representative will spot-monitor butt fusion welding operations to ensure that the construction general contractor follows the technical specifications for both slotted and solid pipes. The CQA representative will verify that internal weld beads have been removed from the horizontal and side slope sections of the LCRS, LDS, and SLDS riser pipes. The CQA representative will document any noncompliance with the requirements and report it to the CQA certifying engineer.

7.1.8 Surveying

A survey will be performed by or under the direction of a professional land surveyor registered in the State of Washington. The surveyor will independently survey the final elevation and alignment of the top of the pipe and fittings. Surveys will be performed on all pipe locations within the footprint of the landfill to confirm that the alignment and elevations in the field agree with those shown in the construction drawings. The results of the survey will be compiled in a report signed by the surveyor and the CQA certifying engineer.

The surveyor will be required to survey each pipe location within the IDF landfill, in accordance with the requirements of this CQA Plan. A record drawing will be submitted to

the CQA certifying engineer by the surveyor before placement of the next liner system layer. The surveys will be conducted every 50 feet along the pipe alignment and appurtenances. The survey will include enough information to confirm that the following features of the landfill piping are constructed in accordance with the construction drawings:

- Beginning and end top of pipe elevations
- Connection location
- Grade breaks
- Riser pipes
- Sump extensions

The piping that will be surveyed will include, but not be limited to, the following:

- SLDS piping
- LDS piping
- LCRS piping

The CQA certifying engineer will approve the survey results for each layer before the subsequent component of the lining system is constructed.

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SECTION VIII–CONSTRUCTION QUALITY ASSURANCE DOCUMENTATION AND CERTIFICATION

8.1 DOCUMENTATION AND CERTIFICATION

A major function of CQA is to properly and adequately document and certify the work. This section describes the minimum required documentation. The CQA certifying engineer may recommend to the IDF CM additional documentation for performing CQA tasks that are for certification. In addition, the CQA certifying engineer will prepare forms, field data sheets, sample labeling schemes, and chain-of-custody procedures and submit them to the IDF CM and IDF PM for approval, prior to construction.

8.1.1 Daily Reports

Daily reports will be completed by the CQA representatives when they are onsite. All CQA personnel will be assigned field books by the CQA certifying engineer that will be labeled with a unique number. The CQA representatives, including the CQA certifying engineer, will record all field observations and the results of field tests in their assigned field book. When not in use, all field books will be left in the field records file. After each book is filled (or at the end of the project), the field book will be returned to the CQA certifying engineer and routed to the project files.

Each page of the field book will be numbered, dated, and initialed by CQA personnel. At the start of a new work shift, CQA personnel will list the following information at the top of the page:

- Job name
- Job number
- Date
- Name
- Weather conditions
- Page number (if pages are not pre-numbered)

The remaining individual entries will be prefaced by an indication of the time at which they occurred. If the results of test data are being recorded on separate sheets, it will be noted in the field book. Entries in the field book will include, but not be limited to, the following information:

- Reports on any meetings held and their results
- Equipment and personnel being used in each location, including construction general contractors

- Descriptions of areas being observed and documented
- Descriptions of materials delivered to the site, including any quality verification (vendor certification) documentation
- Descriptions of materials incorporated into construction
- Calibrations, or recalibrations, of test equipment, including actions taken as a result of recalibration
- Decisions made regarding use of material and/or corrective actions to be taken in instances of substandard quality
- Unique identifying sheet numbers of inspection data sheets and/or problem reporting and corrective measures reports used to substantiate the decisions described in the preceding item

At the end of each day, the field CQA monitor will summarize the day's activities on a daily field monitoring report form. The field report will include a brief summary of the day's activities and highlight any unresolved issues that must be addressed by the CQA certifying engineer or by CQA representatives the following day.

The daily field monitoring report will be filled out in triplicate. The CQA monitor will attach three copies of the field book notes for that day. The three copies will be distributed as follows:

- Original will be filed in field office
- One copy will be transmitted to the CQA certifying engineer
- One copy will be transmitted to the IDF CM

The CQA certifying engineer will review and initial each summary field report before distributing to the project quality records and the IDF CM.

8.1.2 Inspection Data Sheets

All observed field and laboratory test data will be recorded on an inspection data sheet. At a minimum, each inspection data sheet will include the following information:

- Unique identifying sheet number for cross-referencing and document control
- Description of the inspection activity
- If appropriate, location of inspection activity or location from which the sample was obtained
- Type of inspection activity and/or procedure used (reference to standard method when appropriate)
- Any recorded observation or test data, with all necessary calculations
- Results of the inspection activity and comparison with specification requirements
- Identification of any personnel involved in the inspection activity

- Signature of the individual(s) performing the CQA representative activity and concurrence by the CQA certifying engineer
- Identification of deficiencies and any required reinspections

Forms used for the data sheets will be prepared and submitted to the IDF CM and IDF PM in accordance with this section. The data sheets will include, but are not limited to, the forms listed below:

- Sample log
- Compaction test result log
- Soil test result summary form
- Equipment calibration log

8.1.3 Record Drawing Maintenance

The construction general contractor will maintain a complete set of construction drawings labeled "Red-Line" as-built drawings. At the completion of the project, the as-built drawings pertaining to the work certified under this CQA Plan will be produced in electronic format and submitted to the CQA certifying engineer. The CQA certifying engineer will review the completed set of as-built drawings and certify the drawing set as the record drawings for the IDF.

8.1.4 Non-Conformance Reporting

Deficiencies/defects identified by in-process testing may be reworked in accordance with the technical specifications or CQA Plan to correct the deficiency without initiating the NCR process (i.e., failed compaction test or failed geomembrane destructive test), and in-process tests will be tracked by the CQA representative until it is corrected. A non-conformance is considered to be a deficiency in characteristics, documentation, or procedures that renders the quality of an item or activity unacceptable or indeterminate. All deficiencies, defects, damage, or test failures that are not corrected by in-process rework will be considered a non-conformance and will be documented on a Non-Conformance Report (NCR) form. The non-conformance will be referred to the IDF CM, for disposition and initiation of corrective action processes.

All NCR situations will be brought to the attention of the IDF CM for concurrence, prior to initiating the NCR. Upon issuance of the non-conformance report, the IDF CM will notify the IDF design engineer, IDF quality engineer, and IDF PM that the report has issued. Other individuals, as directed by the IDF PM, will participate in NCR disposition, resolution, and corrective action processes as needed. All documentation relating to NCR situations will be retained in the project quality records.

8.1.5 Resolution of Contract Document Questions and Clarifications

Request for Information (RFI) forms will be provided to the CQA certifying engineer for the purpose of submitting written requests to the IDF CM, for assistance in understanding the design intent of the contract documents. The CM will determine whether the IDF design engineer's technical support staff will address the RFI.

RFIs initiated by the construction general contractor will be addressed by the IDF project engineer and CM, not by the CQA certifying engineer, and are not in the scope of the CQA Plan.

Any RFIs that result in contract document changes will be incorporated by the IDF CM and PM, following the procedures outlined in Section 8.1.6.

8.1.6 Construction Change Order and Contract Document Changes

Requests for changes to the technical specifications or construction drawings will be referred to the IDF CM and initiated as a change order. All change orders and resulting design changes will be approved by the appropriate project team member prior to implementation, as outlined in procedure HNF-IP-0842, Volume 4., Section 4.29 (Engineering Document Change Control Requirements). Requests for modifications to the CQA Plan will also be made by completing a change order to the IDF CM and procurement agent, with copies to the IDF quality engineer and IDF project engineer.

If, during the course of construction, questions arise regarding interpretation of the plans and/or specifications, the IDF CM will be contacted by the CQA certifying engineer. Any clarification of the construction drawings will be documented by a change order, if necessary, or by telephone conversation records or meeting minutes, and routed to the IDF design engineer, IDF CM, and IDF PM. The change order will also be routed to the project files.

8.1.7 Progress Reports

The CQA certifying engineer will prepare a summary progress report each week, or at time intervals established at the pre-construction meeting. At a minimum, this report will include the following information:

- A unique identifying sheet number for cross-referencing and document control
- The date, project name, location, and other information
- A summary of work activities accomplished during the progress reporting period
- Identification of areas or items inspected and/or tested during the reporting period that are addressed by the report
- A summary of the quality characteristics being evaluated, with appropriate cross-references to technical specifications and/or construction drawings
- References to the technical specifications or construction drawings defining the acceptance criteria for each inspected characteristic
- A summary of inspection and test results, failures, and re-tests
- A summary of construction situations, deficiencies, and/or defects occurring during the progress reporting period
- A summary of other problem resolutions and dispositions
- The signature of the CQA certifying engineer

The progress report will be submitted to the IDF PM no more than two days after the last reporting day in the progress report. Copies will also be submitted to the IDF PM, IDF quality engineer, and construction general contractor.

8.1.8 Final Documentation and Certification

All daily inspection summary reports, inspection sheets, problem identification and corrective measures reports, acceptance reports, change orders, NCRs, photographic records, progress reports, construction drawings, construction drawing revisions, and other pertinent documentation will be retained as permanent project quality records. At the completion of the project, a final CQA report that incorporates all such information, along with as-built drawings, will be prepared by the CQA certifying engineer and submitted to the IDF PM. A final CQA report and certification letter will be completed at the end of the construction that will fulfill the CQA certification requirements specified in WAC 173-303-335(4).

The CQA certifying engineer will coordinate the completion of the as-built record drawings that will be generated by a land surveyor licensed in the State of Washington. The as-built records will include scale drawings depicting depths, plan dimensions, elevations, fill thicknesses, and geosynthetic panel layouts. The report will include documentation of each construction component monitored by CQA personnel and will be signed, stamped, and certified by the CQA certifying engineer.

8.1.9 Storage of Records

During the construction of the IDF, the CQA certifying engineer will be responsible for all CQA documents. This includes the CQA certifying engineer's copy of the design criteria, plans, procedures, and specifications; the CQA Plan; and the originals of all the data sheets and reports. The field records will be kept in lockable, metal cabinets or on metal shelving within a facility, protected by a fire alarm and/or a communication system that provides fire department response and/or fire suppression systems; or, in an Underwriters Laboratory-listed, one-hour fire-rated cabinet. At the completion of the project, all completed documents will be routed to the project quality records.

8.1.10 Storage of Archive Construction Material Samples

The CQA certifying engineer will be responsible for storing construction material samples collected during the duration of the project.

The CQA certifying engineer will coordinate with the IDF PM and IDF CM on which samples will be archived at the completion of the project. All samples will be kept in small containers (i.e., 5-gallon plastic buckets). Each container will be labeled with the following information:

- Project name
- Date
- Sample I.D.
- Material type
- Point of contact

Control and protection of samples will be accomplished through the use of an index listing of samples. This index will identify each sample gathered and include the same information required for the sample containers. It will also identify where the sample is stored and person responsible for the sample storage, thus providing a documented record of each sample and methodology for verifying that all samples are available in storage and that no samples have been misplaced.

All samples will be stored neatly in a cool, dry location, approved by the CQA certifying engineer. The CQA certifying engineer will coordinate with the IDF PM and IDF CM to determine which sample will be archived at the project completion.

SECTION IX–REFERENCES

40 CFR 264.19. *Code of Federal Regulations,* Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, Section 19, "Construction Quality Assurance Program." Office of the Federal Register. July 9, 1999.

ASTM. *1997 Annual Book of ASTM Standards,* Volume 4.08: Soil and Rock (I). American Society for Testing and Materials, Philadelphia, Pennsylvania. 1997.

CH2M HILL. *Specifications for the Integrated Disposal Facility (IDF) 80% Phase I Critical Systems Design.* EDT 634144, Rev. 0. Prepared for CH2M HILL Hanford Group. April 2003.

Geosynthetic Research Institute (GRI). "Standard Test Method for Asperity Measurement of Textured Geomembranes Using a Depth Gage," Test Method GM12. Philadelphia, Pennsylvania. 2000.

U.S. Department of Energy. "Radioactive Waste Management," DOE O 435.1. August 28, 2001.

U.S. Environmental Protection Agency, Office of Research and Development. *Technical Guidance Document: Quality Assurance and Quality Control for Waste Containment Facilities*, EPA/600/R-93-182. Cincinnati, Ohio. 1993.

Washington Administrative Code (WAC) 173-303-335.

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		Sched.		Compliance Responsibility						
Spec Number	**Specification Title**	**A**	**B**	**CQA Certification**	**Oversight Compliance**	**General Construction Contractor CQC Compliance**	**Other CQC Inspections (FHEU, FHWU, NEC or others)**	**Verification Point Type**	**Reference Standard or Spec Section**	**Comments**
DIVISION 2 – SITE CONSTR										
2200	*Site Preparation*	X	X							
	Observation Only	X	X	---	X	---	---	W	N/A	verify compliance with plans and specs
2315	*Fill and Backfill*		X							
	Import Materials Gradation Tests (Source Quality Control)		X	---	V	X	---	W	ASTM D422	per 2315 one per 2000 tons imported material (structural fill, drain gravel, CSBC)
	In-Place Density Tests		X	X	---	S	---	W	see 2315	
	- Earthfill		X	X	---	S	---	W	See CQA Plan Table 2.1	one per 5,000 sf per lift
	- Structural Fill		X	X	---	S	---	W	See CQA Plan Table 2.2	one per 2,500 sf per lift
	- Subgrade Preparation		X	X	---	S	---	W	See CQA Plan Table 2.3	4 per acre (one per 10,000 sf); see spec 02319 for reqts
	- Operations Layer (outside edge of liner)		X	X	---	S	---	W	See CQA Plan Table 2.7	one per 5,000 sf per lift
	- Operations Layer Material (SLDS)		X	X	---	S	---	W	See CQA Plan Table 2.7	two per lift
	- Stockpile (upper 2 feet)		X	---	V	X	---	W	see 2315	one per 10,000 sf per lift
	Operations Layer Gradation Tests		X	X	---	S	---	W	ASTM D422	per 2315
2316	*Excavation*	X	X							
	Observation Only	X	X	---	X	---	---	W	N/A	verify compliance with plans and specs
	Survey Control to avoid unauthorized excav	X	X	---	W	X	---	W	N/A	verify compliance with plans and specs
2317	*Borrow Area Excavation*		X							
	Observation Only		X	X	---	S	---	W	N/A	verify compliance with plans and specs; base soil tests are specified in 02666
2319	*Subgrade Preparation*	X	X							
	In-place Density Tests	X	X	X[1]	---	X[1]	---	H	2315	See spec section 2315 for requirements: Sched A for utility vault for pad-mount transformer
	Visual verification	X	X	X	---	S	---	W	2319	verify compliance with plans and specs
2320	*Trench Backfill*	*X*	*X*							
	Import Materials Gradation Tests (Source Quality Control)	X	X	---	V	X	---	W	ASTM D422	per 2315 for source quality control
	In-place Density -- Backfill above Pipe Zone	X	X	---	V	X	---	W	see 2320	one per 500 lf pipe
2371	*Geotextiles*		*X*							
	Verify Material Roll Certifications		*X*	X	W	---	---	R	2371	MQC certs submitted to IDF CM; CQA verifies shipped material complies
	Conformance Testing		*X*	X	---	S	---	R		verify compliance with plans and specs
	--- grab strength		*X*	X	---	S	---	R	ASTM D4632	one per lot or one per 50,000 sf
	--- tear strength		*X*	X	---	S	---	R	ASTM D4533	one per lot or one per 50,000 sf
	--- puncture strength		*X*	X	---	S	---	R	ASTM D4833	one per lot or one per 50,000 sf
	--- permittivity		*X*	X	---	S	---	R	ASTM D4491	one per lot or one per 50,000 sf --- Type 1 only)
	Visual inspection		*X*	X	---	S	---	H	2371	verify compliance with plans and specs
2373	*Composite Drainage Net*		*X*							
	Verify Material Roll Certifications		*X*	X	W	---	---	R	2373	MQC certs submitted to IDF CM; CQA verifies shipped material complies
	Conformance Testing - geonet		*X*	X	---	S	---	R		verify compliance with plans and specs
	--- specific gravity		*X*	X	---	S	---	R	ASTM D1505	one per lot or one per 50,000 sf
	--- thickness		*X*	X	---	S	---	R	ASTM D5199	one per lot or one per 50,000 sf
	--- transmissivity		*X*	X	---	S	---	R	ASTM D4716	one per production lot
	Conformance Testing - geocomposite		*X*	X	---	S	---	R		
	--- adhesion		*X*	X	---	S	---	R	ASTM D413/GRI-GC7	one per lot or one per 50,000 sf
	--- nominal transmissivity		*X*	X	---	S	---	R	ASTM D4716	one per production lot
	Visual inspection		*X*	X	---	S	---	H	2373	verify compliance with plans and specs

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Spec Number	Specification Title	Sched. A	Sched. B	Compliance Responsibility: CQA Certification	Compliance Responsibility: Oversight Compliance	Compliance Responsibility: General Construction Contractor CQC Compliance	Compliance Responsibility: Other CQC Inspections (FHEU, FHWU, NEC or others)	Verification Point Type	Reference Standard or Spec Section	Comments
2500	*Raw Water Conveyance Piping - General*	X	X							
	Pressure Leakage Testing			---	W	X	W[2]	H		
	--- Raw Water DI and PVC	X	X	---	W	X		H	---	see 2502 & 2509 for requirements; DI is Sched. A; PVC is Sched. A except all 1" solvent weld for yard hydrants & some 4" solvent weld for fill station/pug mill service is Sched. B
	--- Raw Water Carbon Steel Pipe	X		---	W	X	W[2]	H	see 2500	shop test; in-service field test with fittings and valves upstream of 12" GV
	--- Raw Water GSP and Malleable Iron		X	---	W	X	W[2]	H	see 2500	
2502	*Raw Water Ductile Iron Pipe and Fittings*	X								
	Cleaning	X		---	W	X	---	W	see 2502	Min velocity req'd = 2.5 fps
	Hydrostatic Leak Test	X		---	W	X	W[2]	H	see 2502	
2509	*Raw Water PVC Pressure Pipe and Fittings*	X	X							All Sched. A except 1" solvent weld PVC to Yard Hydrants (YH) is Sched B
	Cleaning	X	X	---	W	X	---	W	see 2509	Min velocity req'd = 2.5 fps
	Hydrostatic Leak Test	X	X	---	W	X	W[2]	H	see 2509	
2631	*Catch Basins*		X							
	Observation Only		X	---	X	---	---	W	N/A	verify compliance with plans and specs
2632	*Stormwater Piping*		X							
	Observation Only		X	---	X	---	---	W	N/A	verify compliance with plans and specs; incl. cleaning/flushing
2661	*High Density Polyethylene Geomembranes*		X							
	Verify Material Roll Certifications (MQC)		X	X	W	---	---	R	see 2661	MQC certs submitted to IDF CM; CQA verifies shipped material complies
	Manufacturer Plant Site Visit		X	X	W	---	---	W		
	Conformance Testing		X	X	---	S	---	R		verify compliance with plans and specs
	---thickness		X	X	---	S	---	R	ASTM D5994	one per lot or one per 50,000 sf
	--- tensile properties at yield		X	X	---	S	---	R	ASTM D638	one per lot or one per 50,000 sf
	--- asperity		X	X	---	S	---	R	GRI GM-12	one per lot or one per 50,000 sf
	--- puncture resistance		X	X	---	S	---	R	ASTM D4833	one per lot or one per 50,000 sf
	Seam Testing		X							
	--- Trial Seams		X	W	---	X	---	W	ASTM 6392	per CQA Plan (RPP-18490, Attach 1 and 2); verify compliance with plans and specs
	--- Nondestructive seam testing		X	W	---	X	---	W	ASTM 6392	per CQA Plan (RPP-18490, Attach 1 and 2); verify compliance with plans and specs
	--- Destructive seam - field testing		X	X	---	S	---	H	ASTM 6392	per CQA Plan (RPP-18490, Attach 1 and 2); verify compliance with plans and specs
	--- Destructive seam - CQA Lab testing		X	X	---	S	---	H	ASTM 6392	per CQA Plan (RPP-18490, Attach 1 and 2); verify compliance with plans and specs
	Visual inspection		X	X	---	S	---	H	see 2661	per CQA Plan (RPP-18490, Attach 1 and 2); verify compliance with plans and specs

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Spec Number	Specification Title	Sched. A	Sched. B	Compliance Responsibility: CQA Certification	Compliance Responsibility: Oversight Compliance	Compliance Responsibility: General Construction Contractor CQC Compliance	Compliance Responsibility: Other CQC Inspections (FHEU, FHWU, NEC or others)	Verification Point Type	Reference Standard or Spec Section	Comments
2666	*Admix Liner*		X							
	Horizontal Test Pad -Cell 1 only		X	X	W	S	---	H	2666	see CQA Plan (RPP-18490, Attach 1, Table 2.4) for min test frequency for material property and placement testing
	Sideslope Test Pad - Cell 1 only		X	X	W	S	---	H	2666	see CQA Plan (RPP-18490, Attach 1, Table 2.4) for min test frequency for material property and placement testing
	Production Placement Testing		X	X	W	S	---	H	2666	see CQA Plan (RPP-18490, Attach 1, Table 2.5 (Cell 1) and Attach 2, Table 2.4 (Cell 2)) for min test frequency for material property, processing and placement testing
2667	*Geosynthetic Clay Liner*		X							
	Verify Material Roll Certifications		X	X	W	---	---	R	2667	MQC certs submitted to IDF CM; CQA verifies shipped material complies
	Conformance Testing		X	X	---	---	---	R		verify compliance with plans and specs
	--- GCL Index Flux		X	X	---	---	---	R	ASTM D5887	one per lot or one per 50,000 sf
	--- Bentonite Mass per unit area		X	X	---	---	---	R	ASTM D5993	one per lot or one per 50,000 sf
	--- Swell Index		X	X	---	---	---	R	ASTM D5890	one per lot or one per 50,000 sf
	Visual inspection		X	X	---	S	---	H	2667	verify compliance with plans and specs
2920	*Reclamation and Revegetation*									
	Observation Only	X	X	---	X	S	---	W	N/A	verify compliance with plans and specs
DIVISION 3 – CONCRETE										
3301	*Reinforced Concrete*									All Sched B except thrust blocks, pole embedment and conduit duct encasement
	Pre-Concrete Placement Inspections			---	W	X	---	W		
	--- Pour Slips	X	X	---	W	X	---	W	see 3301	form provided by IDF CM; see submittals
	Concrete Placement and Finish Inspections			---	W	X	---	W	N/A	
	--- Batch (Trip) Tickets	X	X	---	W	X	---	R	N/A	see submittals; verify compliance with plans and specs
	--- Concrete Finish		X	---	W	X	---	W	N/A	
	Construction Contractor Supplied Testing	X	X	---	W	X	---	W	see 3301	independent test lab required to control/monitor concrete work as specified
	Concrete Field Strength Testing	X	X	---	W	X	---	W	see 3301	testing by independent lab
DIVISION 5 – METALS										
5500	*Metal Fabrications and Castings*		X							All Sched B except for some steel pipe for bollards installed during sched A, (no inspections required)
	Source Quality Control -- Fabrication Welds		X	---	W	X	---	R	AWS D1.1 of D1.6	
	Visual Inspect on concrete drill anchor		X	---	W	X	---	W	see 5500	verify compliance for anchor size, embedment, edge length and spacing
DIVISION 7 – THERMAL AND MOISTURE PROTECTION										
7210	*Building Insulation*		X							
	Observation Only		X	---	X	S	---	W	N/A	verify compliance with plans and specs

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Spec Number	Specification Title	Sched. A	Sched. B	Compliance Responsibility: CQA Certification	Compliance Responsibility: Oversight Compliance	Compliance Responsibility: General Construction Contractor CQC Compliance	Compliance Responsibility: Other CQC Inspections (FHEU, FHWU, NEC or others)	Verification Point Type	Reference Standard or Spec Section	Comments
DIVISION 9 – FINISHES										
9900	*Paint Coating Systems*	X	X							All Sched B except for steel pipe for bollards
	Visual Inspection	X	X	---	X	S	---	W	see 9900	verify compliance with plans and specs --surface prep and application
	Thickness Testing	X	X	---	W	X	---	W	see 9900	verify compliance with plans and specs
	Adhesion Testing	X	X	---	W	X	---	W	ASTM D4541	steel substrate only
	Concrete Sump Water Tightness		X	---	W	X	---	W	see CAT	Coating of truck loading slabs, building slabs,and the surfaces of associated sumps. CAT procedure prepared for watertightness of sumps in crest pad building, leachate transfer building and at truck loading slab. Note: test/inspection requirement in specification added by addendum.
DIVISION 11 – EQUIPMENT										
11305	*Combined and Building Sump Pump*		X							
	Functional Test		X	---	W	X	---	H	see CQC 11305/CAT	verify compliance with plans and specs; CAT procedure prepared for functional tests of crest pad bldg sump pumps and combined sump pumps.
11306	*Leachate Pumps*		X							
	Source Quality Control		X					R		
	--- Factory Performance Testing/Reporting		X	---	W	X	---	R	see 11306	compliance with section 11306
	Functional Testing		X	---	W	X	---	H	see 11306/CAT	per 11306 -- simulated conditions in temp tank at bottom of landfill; CAT procedures prepared for functional tests of LCRS and LDS pumps.
	--- Verify Riser Pipe Transition		X	---	W	X	---	H	see 11306	function test not part of CAT; verify for LCRS, LDS and SLDS pipes with pump/level transducer insertion
	--- Pump Insertion/Extraction into Crest Pad Building		X	---	W	X	---	H	see 11306/CAT	part of function test; specs require testing while pipes are exposed in sump -- GC needs to sequence work to perform in LDS prior to install of overlying liner system; CAT procedure prepared for pump insertion tests for LCRS and LDS pumps, and LCRS transducer.
11312	*Horizontal End Suction Centrifugal Pumps*		X							
	Source Quality Control		X				---	R		
	--- Factory Performance Testing/Reporting		X	---	W	X	---	R	see 11312	compliance with section 11312
	Functional Testing		X	---	W	X	---	H	see 11312/CAT	test requirements specified in 11312; CAT procedures prepared for functional tests of horizontal end suction centrifugal pumps
	Manufacturer's Services		X	---	W	X	---	W	see 11312	Complete Manuf. Certificate of Install during Function Test
DIVISION 13 – SPECIAL CONSTRUCTION										
13122	*Metal Building Systems*		X							
	High Strength Bolted Connections		X	---	W	X	---	W	AISC	Construction contractor shall provide special inspections per CQC section in 13122
	Shop (off-site) Welding		X	---	W	X	---	W	AWS D1.1	Provided CWI for inspect and test per AWS D1.1, Section 6 for off-site welds

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		Sched.		Compliance Responsibility						
Spec Number	**Specification Title**	**A**	**B**	**CQA Certification**	**Oversight Compliance**	**General Construction Contractor CQC Compliance**	**Other CQC Inspections (FHEU, FHWU, NEC or others)**	**Verification Point Type**	**Reference Standard or Spec Section**	**Comments**
	Field Welding		X	---	---	---	---	W	N/A	No field weld permitted per 13122
13205	*Lined Bolt Steel Liquid Storage Tanks*		X							
	Leachate Compatibility Testing		X	---	X[3]	---	---	H	EPA 9090/ASTM D5322	Design Engineer will conduct tank liner leachate compatibility testing. GC submits liner samples
	Tank System Installation Inspection		X	---	W	X	---	H	see 13205	Construction Contractor shall provide full-time Installation Inspector
	Tank Liner Inspection		X	---	W	X	---	H	see 13205	per CQC section in 13205
	--- Visual Inspection		X	---	W	X	---	H	see 13205	per CQC section in 13205
	--- Air Jet Inspection		X	---	W	X	---	H	see 13205	per CQC section in 13205
	--- Electronic Leak Location Survey		X	---	W	X	---	H	see 13205	per CQC section in 13205 perform on primary and secondary tank liner prior to floating cover installation
	Floating Cover Drainage Test		X	---	W	X	---	H	see 13205	per CQC section in 13205
	Tank Tightness Testing		X	---	W	X	---	H	see 13205/CAT	per CQC section in 13205; CAT procedure prepared for hydrostatic leak test, including water level fluctuation, for the leachate storage tank. Tank mfr must complete specified electronic leak location survey.
13401	*Process I&C*		X							
	Source Quality Control		X					R		
	--- Factory Demonstration Testing (FDT)		X	---	W	X	---	R	see 13401	at PICS factory; demonstrate proper function for each control loop as shown on P&IDs
	Onsite Testing		X	---	W	X	---	H		Onsite testing performed on electrical components in advance of facility-wide CAT
	--- Operational Readiness Testing (ORT)		X	---	W	X	---	H	see 13401	Prior to startup inspect to ensure PICS is ready for operation per CQC section in 13401; Completion of the Operational Readiness Test on the PICS is a prerequisite for all of the CAT procedures.
	--- Performance Acceptance Tests (PAT)		X	---	W	X	---	H	see 13401	After startup and facility is operating per CQC section in 13401
DIVISION 15 - MECHANICAL										
15021	*HDPE Pipe*		X							
	Verify Manuf. Certifications (In-cell)		X	X	W	---	---	R	see 15021	MQC certs submitted to IDF CM; CQA verifies shipped material complies
	Verify Manuf. Certifications (Out of Cell)		X	---	X	---	---	R	see 15021	MQC certs submitted to IDF CM; out of cell not in CQA scope
	Visual Examination (In-Cell)		X	X	---	S	---	H	see 15021	per CQA Plan (RPP-18490, Attach 1 and 2); verify compliance with plans and specs
	Visual Examination (Out of Cell)		X	---	X	S	---	W	see 15021	verify conformance to plans and specs
	Pipe Leakage Testing (non-slotted)		X	---	W	X	---	H	see 15021	compliance with section 15992 & 15060 (Piping Schedule)
15022	*HDPE Manholes*		X							
	Leakage Testing		X	---	W	X	---	H	see 15022	per CQC section in 15022
15060	*Piping – General*		X							
	Leakage Testing		X	---	W	X	---	H	see 15992	compliance with section 15992 & 15060 (Piping Schedule) for leachate piping
15100	*Valves, Operators and Filters*	X	X							All Raw Water is Sched A except for V931 for Yard Hydrant is Sched B

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Spec Number	Specification Title	Sched. A	Sched. B	Compliance Responsibility: CQA Certification	Compliance Responsibility: Oversight Compliance	Compliance Responsibility: General Construction Contractor CQC Compliance	Compliance Responsibility: Other CQC Inspections (FHEU, FHWU, NEC or others)	Verification Point Type	Reference Standard or Spec Section	Comments
	Operational Testing	X	X	---	W	X	---	W	N/A	Open/close under operating pressures; may be performed with pipe leakage testing specified in Section 15992 and 15060
15140	*Piping Support Systems*		X							
	Observation Only		X	---	X	S	---	W	15140	verify compliance with plans and specs
15500	*HVAC Systems*		X							
	Observation Only		X	---	X	S	---	W	15500	verify compliance with plans and specs; Assure all portions of HVAC system are functional and thermostat settings are as specified.
15992	*Piping Leakage Testing*		X							refer to 15060 pipe schedule for test type and test pressures; applies to leachate piping only; Leak testing of leachate handling system pipe is a prerequisite to all CAT procedures.
	Hydrostatic Testing		X	---	W	X	---	H	see 15992	test procedures defined in section 15992 and approved testing plan
	Pneumatic Testing		X	---	W	X	---	H	see 15992	test procedures defined in section 15992 and approved testing plan
DIVISION 16 – ELECTRICAL										
16005	*Electrical*	*X*	*X*							
	Circuit Balance		X	---	W	X[4]	V[5]	W	see 16005	See Specification 16005 for Execution and Testing
	Voltage Testing		X	---	W	X[4]	V[5]	W	see 16005	See Specification 16005 for Execution and Testing
	Equipment Line Current		X	---	W	X[4]	V[5]	W	see 16005	See Specification 16005 for Execution and Testing
	Low Voltage Cable Inspection (600 Volts Max)		X	---	W	X[4]	V[5]	W	see 16080	
	High Voltage Cable Inspection (above 600 volts)	X		---	W	---	X[6]	W	see 16080	FHEU to test conductors/cables above 600 volts; GC to coordinate with IDF CM
	Electrical Tests for Conductors							W		
	--- 600 volts and below		X	---	W	X[4]	V[5]	W	see 16080	
	--- above 600 volts	X		---	W	---	X[6]	W	see 16080	FHEU to test conductors/cables above 600 volts; GC to coordinate with IDF CM
	Ground Electrode Test	X	X	---	W	X[4]	V[5]	W	see 16005	See Specification 16005 for Execution and Testing: Sched A = grounding system for pad mount transformer
16055	*Pipe Heat Tracing*		*X*							

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		Sched.		Compliance Responsibility						
Spec Number	**Specification Title**	**A**	**B**	**CQA Certification**	**Oversight Compliance**	**General Construction Contractor CQC Compliance**	**Other CQC Inspections (FHEU, FHWU, NEC or others)**	**Verification Point Type**	**Reference Standard or Spec Section**	**Comments**
	Insulation Resistance		X	---	W	X[4]	V[5]	W	see 16080	
16080	*Electrical Testing*	*X*	*X*							
	General	X	X							Onsite Testing performed on each major electrical system in advance of facility -wide CAT; Construction GC Contractor to provide NICET/NETA certified inspector. CHG will provide NEC inspector. GC to coordinate NEC and FHEU inspections with IDF CM. Completion of the electrical testing as specified in 16080 is a prerequisite to all CAT procedures.
	Pad-Mounted Transformer Testing/Inspections	X		---	W	---	X[6]	W	see 16080/16270	FHEU to pad mount transformers; GC to coordinate with IDF CM
	Conductors/Cables above 600 V	X		---	W	---	X[6]	W	see 16080/16312	FHEU to test conductors/cables above 600 volts; GC to coordinate with IDF CM
	General Electrical Testing and Inspections		X	---	W	X[4]	V[5]	W	NETA ATS	See Specification 16080 for Execution and Testing
	Dry Type Transformers		X							
	Visual and mechanical inspection		X	---	W	X[4]	V[5]	R	NETA ATS	See Specification 16080 for Execution and Testing
	Insulation resistance tests		X	---	W	X[4]	V[5]	W	NETA ATS	See Specification 16080 for Execution and Testing
	Tests and adjustments for fans, controls, and alarms		X	---	W	X[4]	V[5]	W	NETA ATS	See Specification 16080 for Execution and Testing
	Low Voltage Cables (600 V maximum)		X							
	Visual and mechanical inspection		X	---	W	X[4]	V[5]	R	NETA ATS	See Specification 16080 for Execution and Testing
	Insulation resistance tests		X	---	W	X[4]	V[5]	W	NETA ATS	See Specification 16080 for Execution and Testing
	Safety Switches		X							
	Visual and mechanical inspection		X	---	W	X[4]	V[5]	R	NETA ATS	See Specification 16080 for Execution and Testing
	Insulation resistance tests		X	---	W	X[4]	V[5]	W	NETA ATS	See Specification 16080 for Execution and Testing
	Contact resistance tests		X	---	W	X[4]	V[5]	W	NETA ATS	See Specification 16080 for Execution and Testing
	Molded and Insulated Case Circuit Breakers		X							
	Visual and mechanical inspection		X	---	W	X[4]	V[5]	R	NETA ATS	See Specification 16080 for Execution and Testing
	Insulation resistance tests		X	---	W	X[4]	V[5]	W	NETA ATS	See Specification 16080 for Execution and Testing
	Contact Resistance Tests		X	---	W	X[4]	V[5]	W	NETA ATS	See Specification 16080 for Execution and Testing
	Current Injection Test		X	---	W	X[4]	V[5]	W	NEMA AB	See Specification 16080 for Execution and Testing
	Instrument Transformers		X							
	Visual and mechanical inspection		X	---	W	X[4]	V[5]	R	NETA ATS	See Specification 16080 for Execution and Testing
	Current Transformer Tests		X	---	W	X[4]	V[5]	W	NETA ATS	See Specification 16080 for Execution and Testing
	Potential Transformer Tests		X	---	W	X[4]	V[5]	W	NETA ATS	See Specification 16080 for Execution and Testing
	Utility Metering		X	---	W	---	X[6]	W	NETA ATS	FHEU to test utility meter; GC to coordinate with IDF CM
	Grounding Systems	X	X							Sched A = grounding system for pad mount transformer
	Visual and mechanical inspection	X	X	---	W	X[4]	V[5]	R	IEEE 81	See Specification 16080 for Execution and Testing
	Fall-Of-Potential Test	X	X	---	W	X[4]	V[5]	W	IEEE 81	See Specification 16080 for Execution and Testing
	Two-Point Direct Method Test	X	X	---	W	X[4]	V[5]	W	IEEE 81	See Specification 16080 for Execution and Testing
	AC Induction Motors		X							Inspection and Testing limited to motors 1/3 hp and larger

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Spec Number	Specification Title	Sched. A	Sched. B	Compliance Responsibility: CQA Certification	Compliance Responsibility: Oversight Compliance	Compliance Responsibility: General Construction Contractor CQC Compliance	Compliance Responsibility: Other CQC Inspections (FHEU, FHWU, NEC or others)	Verification Point Type	Reference Standard or Spec Section	Comments
	Visual and mechanical inspection		X	---	W	X[4]	V[5]	R	NETA ATS	See Specification 16080 for Execution and Testing
	Insulation resistance tests		X	---	W	X[4]	V[5]	W	NETA ATS	See Specification 16080 for Execution and Testing
	Low Voltage Motor Control		X							
	Visual and Mechanical Inspection		X	---	W	X[4]	V[5]	R	NETA ATS	See Specification 16080 for Execution and Testing
	Insulation Resistance Test		X	---	W	X[4]	V[5]	W	NETA ATS	See Specification 16080 for Execution and Testing
	Overpotential Test		X	---	W	X[4]	V[5]	W	NETA ATS	See Specification 16080 for Execution and Testing
	Current Injection Through Overload at 300%		X	---	W	X[4]	V[5]	W	NETA ATS	See Specification 16080 for Execution and Testing
	Control Wiring Tests		X	---	W	X[4]	V[5]	W	NETA ATS	See Specification 16080 for Execution and Testing
	Low Voltage Surge Arrestors		X							
	Visual and Mechanical Inspection		X	---	W	X[4]	V[5]	R	NETA ATS	See Specification 16080 for Execution and Testing
	Varistor Type Arrestors		X	---	W	X[4]	V[5]	W	ANSI C62.33	See Specification 16080 for Execution and Testing
16270	*Oil-Filled Pad Mounted Transformers*	*X*								
	Source Quality Control (Factory Tests)	*X*		---	W	X	V[6]	R	see 16270	
	--- Design Test and Assemble	*X*		---	W	X	V[6]	R	ANSI C57.12	see 16270 for detailed ANSI reference standard
	--- Production Tests	*X*		---	W	X	V[6]	R	ANSI C57.12	see 16270 for detailed ANSI reference standard
	--- Dielectric Test	*X*		---	W	X	V[6]	R	ANSI C57.12	see 16270 for detailed ANSI reference standard
	Field Testing (CQC)	*X*		---	W	---	X[6]	W	see 16080	FHEU to test; GC to coordinate with IDF CM
16312	*Overhead Electrical Distribution*	*X*								
	Wood Crossarm Inspection	X		---	W	X	V[6]	W	see 16312	Construction Contractor to furnish inspection report for compliance
	Acceptance Checks and Tests	X								
	--- 15 kV cables and transformers	X		---	W	---	X[6]	W	see 16312	FHEU to test 15 KV cables and transformers; GC to coordinate with IDF CM
	--- Ground Resistance Test	X		---	W	X[4]	V[6]	W	see 16312	
16440	*Low Voltage Motor Control*		*X*							
			X	---	W	X[4]	V[5]	W	see 16080	Test and Inspections for Low Voltage Motor Control in 16080

Responsibility Legend
- X - Primary responsibility for performing testing and/or inspection
- S - Supplemental testing may (optional) be performed by construction contractor for construction QC purposes
- V - When testing is performed by construction contractor, inspection coordinator, or other inspections will review results to verify compliance
- --- - No responsibility for testing associated with this component of the work
- W - Witness Performance of Activity

Abbreviations:
- CATs = Construction Acceptance Tests
- FHEU = Fluor Hanford Electrical Utility
- FHWU = Fluor Hanford Water Utility

Verification Point Type Legend
- H - Hold
- W - Witness
- R - Receiving Inspection

Notes:

1 - Subgrade prep in-place density is responsibility of CQA engineer per 02319 and CQA plan. Small amount of subgrade prep testing needed in Sched A for utility vault not intended to be done by CQA engineer. Make construction contractor responsibility.
2- Fluor Hanford option to witness pressure leak test on raw water piping.
3 - Design engineer for TFC will perform tank liner compatibility testing on samples submitted by construction contractor.
4 - Construction General Contractor to provide services of testing firm for electrical equipment ,installations and systems.
5 - TFC to provide services of NEC inspector.
6 - The IDF inspection coordinator to coordinate FHEU required inspections and testing.

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Spec Number	Specification Title	Spec Lead for Coordination	Sched A	Sched B	TFC Approval Required (AR)	TFC Approval Not Required - Information/Record (IR)	TFC Approval Not Required - Vendor Information (VI)	Reference Standard or Spec Section	Submittal Schedule	Comments
DIVISION 2 – SITE CONSTR										
2200	*Site Preparation*	*Reimbold*	X	X						
	Site Preparation Plan		X	X	X			N/A	NTP -	
	Dust Control Plan		X	X	X			N/A	NTP -	
2315	*Fill and Backfill*	*Reimbold*								
	Import Material Gradation Test Results		X	X	X			ASTM D422	NTP +	
	Stockpile Plan			X	X			N/A	NTP +	
	Qualifications - Independent Testing Laboratory					X			NTP +	
	Qualifications - Construction QC Personnel					X			NTP +	
2316	*Excavation*	*Reimbold*								
	Excavation Support and Safety Design		X	X		X		29 CFR 1926 (Sub P)	NTP+	If applicable to work; custom shoring by Licensed PE (WA)
2317	*Borrow Area Excavation*	*Reimbold*		X						
	Borrow Area Development Plan			X	X			2317	NTP +	prior to borrow area excavation
2319	*Subgrade Preparation*	*Reimbold*	X	X						
	None Required								N/A	
2320	*Trench Backfill*	*Reimbold*	X	X						
	Import Material Gradation Test Results		X	X	X			ASTM D422	NTP +	If applicable to work
	Locator Ribbon Product Data		X	X			X	N/A	NTP +	Compliance with section 2320
2371	*Geotextiles*	*Reimbold*		X						
	Manuf. Descriptive Data, spec sheets			X	X			N/A	NTP +	compliance with section 2371
	Manuf. QC test data			X	X				NTP +	Test frequency at standard rate in MQC Plan
	Manuf. Written Certification			X	X				NTP +	compliance with section 2371
2373	*Composite Drainage Net*	*Reimbold*								
	Manuf. Descriptive Data, spec sheets			X	X			N/A	NTP +	compliance with section 2373
	Manuf. QC test data			X	X				NTP +	Test frequency at standard rate in MQC Plan
	Manuf. Written Certification			X	X				NTP +	compliance with section 2373
	Interface Shear Strength Test Data			X	X			ASTM D5321	NTP +	For CDN/textured HDPE geomembrane and CDN/Ops Layer; Allow 20 working says for design engineer review
	Installation Plan			X	X			N/A	NTP +	Includes Construction Contractor QA program for CDN
2500	*Raw Water Conveyance Piping - General*		X	X						DI pipe is all Sched A.; PVC is all Sched A except all 1" solvent weld for yard hydrants & some 4" solvent weld for fill station/pug mill service is Sched. B
	Detailed Pipe Fabrication Drawings		X		X				NTP +	Steel Pipe Only (Sched A)
	Pipe Pressure Class Documentation		X	X	X				NTP +	
	Pressure Leakage Test Results		X	X		X			NTP +	
	NFPA 24 Chap. 9 -- Materials and Test Certifications		X	X		X			NTP +	
2502	*Raw Water Ductile Iron Pipe and Fittings*		X		X					DI pipe is all Sched A
	Flushing Procedure		X		X			see 2502	NTP +	
	Field Hydrostatic Test Plan		X		X			see 2502	NTP +	
	Certifications of Calibration		X		X				NTP +	
	As-Built Survey		X		X				CC	Certified by WA licensed land surveyor
	Shop Drawings		X		X				NTP +	
	Hydrostatic Test Documentation Form and Results		X			X		see 2502	NTP +	

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2509	*Raw Water PVC Pressure Pipe and Fittings*		X	X						All sched A except for 1" solvent weld for yard hydrants & some 4" solvent weld for fill station/pug mill service is Sched. B
	Flushing Procedure		X	X	X			see 2509	NTP +	
	Qualifications - Solvent Welders		X	X	X				NTP +	
	Hydrostatic Testing Plan		X	X	X			see 2509	NTP +	
	Certifications of Calibration		X	X	X				NTP +	
	As-Built Survey		X	X	X				CC	Certified by WA licensed land surveyor
	Shop Drawings		X	X	X				NTP +	
	Hydrostatic Test Documentation Form and Results		X	X		X		see 2509	NTP +	
2631	*Catch Basins*	*Reimbold*		X						
	None Required			X					N/A	
2632	*Stormwater Piping*	*Reimbold*		X						
	Catalog/Manuf. Data Sheets			X		X		AASHTO M294	NTP +	
2661	*High Density Polyethylene Geomembranes*	*Reimbold*								
	Manuf. Descriptive Data, spec sheets			X	X			N/A	NTP +	compliance with section 2661
	Manuf. QC test data			X	X			2661	NTP +	see article MQC - Polyethylene Geomembranes
	Manuf. QC Certification			X	X				NTP +	see article MQC - Polyethylene Geomembranes
	Interface Shear Strength Test Data			X	X			ASTM D5321	NTP +	For textured HDPE geomembrane and CDN, GCL and admix; Allow 20 working days for design engineer review
	Installation Plan			X	X			see 02661	NTP +	
	Geomembrane Installer's Organization and Personnel Qualifications			X	X			N/A	Bid	see personnel/organization requirements in 02661, p.9
	Geomembrane Installer's Certificate of Subgrade Acceptability			X	X			2661	NTP +	see supplement 3 for form
	Calibration Certification -- CQC test equipment			X	X			N/A	NTP +	
	Test Results from CQC testing			X		X		2661	NTP +	
2666	*Admix Liner*	*Reimbold*		X	X					
	Admix Preparation Plan			X	X			2666	NTP +	Submit prior to test pad construction. Spec needs clarification to be consistent.
	Admix Liner Placement Plan			X	X			2666	NTP +	Submit prior to test pad construction. Spec needs clarification to be consistent.
	Bentonite - QC data			X	X			2666	NTP +	Compliance with section 2666; req'd each railcar or every truckload
	Bentonite - QC certificates			X	X			2666	NTP +	Compliance with section 2666
	Equipment Calibration Certificates			X	X			N/A	NTP +	
2667	*Geosynthetic Clay Liner*	*Reimbold*								
	Manuf. Descriptive Data, spec sheets			X	X			N/A	NTP +	compliance with section 2667
	Manuf. QC test data			X	X			2667	NTP +	see Part 2 -- Products
	Manuf. QC Certification			X	X			2667	NTP +	
2920	*Reclamation and Revegetation*		X	X						
	Erosion Control Matting - Manuf. Technical data		X	X	X			N/A	NTP +	
	Wood Fiber Mulch - Manuf. Written Certification		X	X	X			ASTM D586	NTP +	
	Tackifier and Mulch - product data sheets		X	X		X		N/A	NTP +	
	Installation Warranty		X	X		X		N/A	CC	
	Seed Certification		X	X		X		N/A	NTP +	Seed certification provided by recognized seed testing latoratory upon IDF CM request (optional).

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DIVISION 3 – CONCRETE										
3301	*Reinforced Concrete*	*Goto*	X	X						All Sched B except for thrust blocks for RW pipe; Bollard/pole embedment; conduit duct
	Shop Drawings		X	X	X			03301	NTP +	see 03301 for detailed submittals - incl. Concrete mix design
	Concrete Testing Laboratory - Qualifications		X	X		X			NTP +	
	Curing Compound - Manuf. Instructions			X		X			NTP +	
	Batch Plant Certification		X	X		X			NTP +	
	Concrete Transport Trucks - Certification		X	X		X			NTP +	
	Trip (Batch) Tickets		X	X		X			NTP +	batch ticket copy for each concrete load
	Concrete Repair Epoxy - qualifications from manuf.			X		X			NTP +	
	Pour Slips		X	X		X			NTP +	
	CQC Testing -- Results		X	X		X			CC	
DIVISION 5 – METALS										
5500	*Metal Fabrications and Castings*	*Goto*	X	X	X					All Sched B - except for some steel pipe for bollards
	Shop Drawings			X	X			05500	NTP +	see 05500 for detailed submittals - incl. Concrete mix design
	Source Quality Control			X	X				NTP +	
	Samples - abrasive stair nosing			X	X			AWS D1.1/D1.6	NTP +	
	Concrete Drilled Anchors			X		X			NTP +	
	Product Description			X		X			NTP +	
	ICBO Evaluation Report			X		X			CC	
	Adhesive Anchor Installer Certification			X		X			NTP +	
	Welding			X		X			NTP +	
	WPS/WPQs			X		X		AWS D1.1	NTP +	
	CWI Credentials/Reports			X		X			NTP +	
	U-Channel Concrete Inserts			X		X			NTP +	
	Product Description			X		X			NTP +	
	Allowable Loads			X		X			NTP +	
	Ladders - Cert of Load and Fatigue Tests			X		X			NTP +	
	CQC Inspections Documentation			X		X			CC	
DIVISION 7 – THERMAL AND MOISTURE PROTECTION										
7210	*Building Insulation*	*Goto*		*X*						
	Material Product Data			X	X				NTP +	compliance with section 07210
DIVISION 9 – FINISHES										
9900	*Paint Coating Systems*	*Goto*	*X*	*X*						All Sched B - except for steel pipe for bollards
	List of Materials		X	X	X			09900	NTP +	
	Installer's Certificate (Decontaminable Only)			X	X				NTP +	For Alternative Certification see specs
	Cleaning and Disposal Plan			X	X				NTP +	
DIVISION 11 – EQUIPMENT										
11305	*Combined and Building Sump Pump*	*Thomas*		*X*						Provide for each pump specified in section 11305 pump data sheets
	Product catalog data - each equipment assembly			X	X			11305	NTP +	
	Performance Data Curves			X	X				NTP +	
	Power and Control Wiring Diagrams			X	X				NTP +	
	Complete Motor Nameplate Data			X	X				NTP +	
	Functional Testing Plan			X	X				NTP +	
	CQC Test Results			X		X			CC	
	Manuf. Installation Instructions and O&M data			X			X		NTP +	
	Spare Parts List (5 years)			X			X		NTP +	
	Factory Finish			X			X		NTP +	

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Spec Number	Specification Title	Spec Lead for Coordination	Sched A	Sched B	TFC Approval Required (AR)	TFC Approval Not Required - Information/Record (IR)	TFC Approval Not Required - Vendor Information (VI)	Reference Standard or Spec Section	Submittal Schedule	Comments
11306	*Leachate Pumps*	*Thomas*								Provide for each pump specified in section 11306 pump data sheets
	Product catalog data - each equipment assembly			X	X			11306	NTP +	
	Performance Data Curves			X	X				NTP +	
	Functional Testing Plan			X	X				NTP +	
	Detailed Mech/Elec Shop Drawings			X	X				NTP +	
	Pump Removal System product data			X	X				NTP +	
	Power and Control Wiring Diagrams			X	X				NTP +	
	Complete Motor Nameplate Data			X	X				NTP +	
	Source Quality Control (Factory Tests) Results			X	X				NTP +	
	Manuf. Certification of factory testing			X		X		NIST	NTP +	
	Special Shipping, Handling and storage instructions			X		X			NTP +	
	Manuf. Certificate of Proper Installation			X		X			CC	
	CQC Test Results			X		X			CC	
	Manuf. Installation Instructions and O&M data			X			X		NTP +	
	Spare Parts List (1 year)			X			X		NTP +	
	Special Tools List			X			X		NTP +	
11312	*Horizontal End Suction Centrifugal Pumps*	*Thomas*								
	Product catalog data - each equipment assembly			X	X			11312	NTP +	
	Performance Data Curves			X	X				NTP +	
	Functional Testing Plan			X	X				NTP +	
	Detailed Mech/Elec Shop Drawings			X	X				NTP +	
	Power and Control Wiring Diagrams			X	X				NTP +	
	Complete Motor Nameplate Data			X	X				NTP +	
	Source Quality Control (Factory Tests) Results			X	X				NTP +	
	Special Shipping, Handling and storage instructions			X		X			NTP +	
	Manuf. Certificate of Proper Installation			X		X			CC	
	CQC Test Results			X		X			CC	
	Manuf. Installation Instructions and O&M data			X			X		NTP +	
	Spare Parts List (1 year)			X			X		NTP +	
	Special Tools List			X			X		NTP +	
	Factory Finish System			X			X		NTP +	
DIVISION 13 – SPECIAL CONSTRUCTION				*X*						
13122	*Metal Building Systems*	*Goto*		X	X					
	Shop Drawings			X	X			13122	NTP +	
	Manuf. Standard Details and Structural Calcs			X	X				NTP +	
	Manuf. Literature and Tech Data			X	X				NTP +	
	Painting System			X	X				NTP +	
	Drawings and Calcs			X	X				NTP +	PE stamp required
	Samples - color select			X	X				NTP +	
	CQC Inspections Documentation			X	X				CC	
	Statement of Quals			X		X			NTP +	see spec for SOQ requirements
	Manuf. Instructions			X			X		NTP +	
	Manuf. MBMA membership certificate			X			X		NTP +	
	Manuf. Certificate of Proper Installation			X			X		NTP +	
	O&M Manual			X			X		NTP +	
	Warranties			X		X		N/A	CC	see warranty reqt's in section 13122

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13205	*Lined Bolt Steel Liquid Storage Tanks*	*Goto*		*X*				13205		
	Statement of Quals			X	X				NTP +	see spec for SOQ requirements
	Tank Liners and Floating Cover			X	X				NTP +	
	Material Samples			X	X				NTP + (see note)	Within 15 days NTP for Leachate Comp.Testing by Engineer
	Manuf. Data			X	X				NTP +	
	Installation Plan			X	X				NTP +	
	Tank and Equipment Drawings			X	X				NTP +	
	Factory Fabrication Inspection Data (Source Quality Control			X	X				NTP +	
	Calculations			X	X				NTP +	
	Design Assessment Report			X	X				NTP +	
	Installation Instructions			X			X		NTP +	
	O&M Manual			X			X		NTP +	
	CQC Inspections Documentation			X		X			CC	
	Installation Inspection Report			X		X			CC	see spec for report requirements by Installation Inspector
13401	*Process I&C*	*Fox*						13401		
	Shop Drawings			X	X				NTP +	
	Bill of materials			X	X				NTP +	
	complete catalog cuts			X	X				NTP +	
	component data sheets			X	X				NTP +	
	panel construction drawings			X	X				NTP +	
	panel control and wiring diagrams			X	X				NTP +	
	loop diagrams			X	X				NTP +	
	interconnecting wiring diagrams			X	X				NTP +	
	application software documentation			X	X				NTP +	
	Factory Demonstration Test (FDT) documentation			X	X				NTP +	
	Installation details			X	X				NTP +	FDT for control panels
	Spare tools, equipment list			X	X				NTP +	
	Tank Farm (operating) Contractor training plan			X		X			NTP +	
	CQC test data			X		X			CC	
	O & M Manual			X		X			NTP +	
	FDT, ORT and PAT submittals			X		X			NTP +	FDT = factory demonstration test; ORT = operational readiness test; PAT = performance acceptance test; Prelim and Final test procedures and documentation
	Application software documentation and design workshops			X		X			NTP +	see spec 13401 for detailed requirements
DIVISION 15 - MECHANICAL										
15021	*HDPE Pipe*			*X*				15021		
	Manuf. Material Certifications and Test Data	*Thomas*		X	X				NTP +	compliance with section 15021
	Catalog and Manuf. Data sheets -- HDPE pipe			X		X			NTP +	
	Fusion equipment descriptive literature			X	X				NTP +	Note: 15021 submittals listed as Approval Not Required (IR) - spec correction needed
	--- technician certifications			X	X				NTP +	Note: 15021 submittals listed as Approval Not Required (IR) - spec correction needed
	Catalog and Manuf. Data sheets -- Electrofusion couplers, mech cutters			X		X			NTP +	
	Leakage Testing			X		X			CC	per 15992
15022	*HDPE Manholes*			*X*				15022		
	Product Data Sheets	*Thomas*		X	X				NTP +	compliance with section 15022
	Calculations for design criteria			X	X				NTP +	
	Manhole Leakage Testing Results			X		X			CC	

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Spec Number	Specification Title	Spec Lead for Coordination	Sched A	Sched B	TFC Approval Required (AR)	TFC Approval Not Required - Information/Record (IR)	TFC Approval Not Required - Vendor Information (VI)	Reference Standard or Spec Section	Submittal Schedule	Comments
15060	*Piping – General*	*Thomas*		*X*				15060		Leachate piping only
	Product data sheets			X	X				NTP +	compliance with section 15021 and 15060
	Laboratory test equipment -- certified calibrations			X	X				NTP +	
	Qualifications - solvent welders			X	X				NTP +	
	Manuf. Certification of Compliance			X		X			NTP +	
	Leakage Testing			X		X			CC	per 15992
15100	*Valves and Operators*	*Thomas*	*X*	*X*				15100		Raw water valves is all Sched A except V931 for Yard Hydrant which is Sched B; All other valves are Sched. B
	Product Data Sheets		X	X	X				NTP +	compliance with section 15100
	Manuf. Certification of Compliance for Butterfly Valves		X		X				NTP +	
	CQC Test Documentation		X	X		X			CC	
15140	*Piping Support Systems*	*Thomas*		*X*						
	Shop Drawings			X	X			15140	NTP +	see spec 15140 for detailed requirements
15500	*HVAC Systems*	*Thomas/Yury*							NTP +	
	Shop Drawings			X	X			15550	NTP +	sse spec 15550 for detailed requirements
	Recommended Procedures for handling and protection			X	X				NTP +	
	Factory Testing - Manuf. Certification			X	X				NTP +	compliance with section 15550
	Certified Test Reports - energy efficient motors			X	X			NEMA MG 1-12.53.a/IEEE 112	NTP +	only for motors specified energy efficient
	Struct, Mech and Elec. Modifications required for equipment			X	X				NTP +	
	Spare Parts List			X		X			NTP +	
	Manufacturer's warranty			X		X			CC	
15992	*Piping Leakage Testing*	*Thomas/BT*		*X*				15992		test procedures defined; 15992 is for leachate piping only (Sched B)
	Testing Plan			X	X				NTP +	Include test dates, type and isolation methods
	Testing Equipment Calibration Certs			X	X				NTP +	
	Certified Test Reports			X		X			CC	
ON 16 – ELECTRICAL										
16005	*Electrical*	*Fox*	*X*	*X*					NTP +	
	Product Data			X	X			16005	NTP +	see Product Data article in 16005 for detailed list
	Factory Test Reports			X	X				NTP +	
	Field (CQC) Test Reports		X	X		X			CC	
	AHJ - signed permits		X	X		X			CC	
	O&M Data			X		X			NTP +	
16055	*Pipe Heat Tracing*	*Fox*		*X*				16055		
	Manuf. Descriptive Literature			X	X				NTP +	
	Plastic Pipe Installations -- Output adjustment factors			X	X				NTP +	
	Pipe Heat Loss Calcs			X	X				NTP +	
	Field (CQC) Test Reports			X		X			CC	
16080	*Electrical Testing*	*Fox*	*X*	*X*				16080		
	Testing Firm Qualifications		X	X	X				NTP +	
	Inspection Test Schedule		X	X		X			NTP +	30 days prior to inspections/tests
	Test Reference List		X	X		X			NTP +	30 days prior to inspections/tests
	Sample Inspection Form(s)		X	X		X			NTP +	30 days prior to inspections/tests
	Sample Device Test Form		X	X		X			NTP +	30 days prior to inspections/tests
	Sample System Test Form		X	X		X			NTP +	30 days prior to inspections/tests
	Test and Inspections Reports		X	X		X			NTP +	30 days after inspections/tests completion
	O&M Data		X	X		X			CC	

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Spec Number	Specification Title	Spec Lead for Coordination	Sched A	Sched B	TFC Approval Required (AR)	TFC Approval Not Required - Information/Record (IR)	TFC Approval Not Required - Vendor Information (VI)	Reference Standard or Spec Section	Submittal Schedule	Comments
16270	*Oil-Filled Pad Mounted Transformers*	*Fox*								
	Product Data		X		X			16270	NTP +	see Product Data article in 16270 for detailed list
	Factory Test Reports		X		X				NTP +	
	O&M Data		X			X			CC	
	MSDS for Envirotemp FR3 fluid		X			X			NTP +	
	Field (CQC) Test Reports		X			X			CC	
16312	*Overhead Electrical Distribution*	*Fox*								
	Product Data		X		X			16312	NTP +	see Product Data article in 16312 for detailed list
	Test Reports		X			X			NTP +	
	Acceptance Checks and Tests		X			X			NTP +	
	Ground Resistance Tests		X			X			NTP +	
	Certificates -- Wood Poles and Crossarms		X			X			NTP +	
16440	*Low Voltage Motor Control*	*Fox*		*X*						
	Product Data			X	X			16440	NTP +	see Product Data article in 16440 for detailed list
	Control Diagrams			X	X				NTP +	
	One-Line Diagrams			X	X				NTP +	
	Schematic Diagrams			X	X				NTP +	
	Outline Diagrams			X	X				NTP +	
	Manuf. Installation Instructions			X		X			NTP +	
	O&M Data			X		X			NTP +	
	Field (CQC) Test Reports			X		X			CC	

Submittal Schedule Legend
With Proposal Submittal = Bid
Post Award Prior to Notice-To-Proceed (NTP) = NTP -
Post NTP = NTP +
Prior to Contract Closeout = CC

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Component Construction Acceptance Test Procedures

Introduction

Construction Acceptance Testing (CAT) of components of the Integrated Disposal Facility (IDF) will be performed after completion of construction and following completion of the operational readiness test (ORT) of the Process Instrumentation and Control System (PICS) and the electrical testing. The PICS and electrical tests are detailed in the IDF technical specifications (RPP-18489), and their completion will be verified as part of the IDF Construction Inspection Plan (CIP, RPP-18490). In addition, the CIP will confirm the completion of all hydrostatic leakage testing of piping prior to the start of CAT procedures.

The IDF is comprised of two landfill cells, each with their own leachate handling and leak detection system facilities. The eleven component CAT procedures for IDF are focused on functional requirements identified with the IDF technical specifications for these leachate handling facilities. These functional tests are part of the construction quality control requirements for construction of the IDF.

The eleven component CAT procedures included in Attachment 5 are listed on Table 1 and comprise the component CAT procedures for IDF Cell 1 facilities. A duplicate set of procedures for Cell 2 facilities is under development and will be issued as part of future revisions to the CIP. It should be anticipated that a comparable level of effort will be needed to complete the CAT procedures for Cell 1 and Cell 2.

The component CAT procedures state the purpose, precautions and limitations, prerequisites, instructions, acceptance criteria, and records. Prior to the initiation of any operational testing, the following conditions will be satisfied:

- The PICS operational readiness testing will be completed as specified.
- All electrical testing described in the CIP will be completed.
- Hydrostatic testing of all leachate piping will be completed.
- Calibration for all test meters used to read/test values for confirmation of performance will be documented.
- An inspection or walk-down will be completed to ensure the components being tested, and those required for support, are complete and ready to safely perform the test. This walkdown will include verification that all valves (as described in the CAT procedure) are in the appropriate position to support the testing.

The construction general contractor will provide the necessary labor, equipment, and materials to successfully complete each component CAT. Each CAT procedure will be

witnessed at a minimum by two people in addition to those actually completing the test. These witnesses will represent the construction general contractor and the compliance oversight engineer. When a test is successfully completed in accordance with the procedures, the witnesses will sign the completed test form, indicating their acceptance.

During all activities associated with component CAT, safety will be managed in accordance with the requirements of Section 1110 in the Statement of Work.

Purpose

Table 1 presents the component name, equipment number, summary of the test planned, and the order in which the CAT procedures will be preformed. The table also provides the specification section related to the component being tested.

As a separate task, system construction acceptance tests will be completed. These tests will proceed after the component CAT procedures have been successfully completed.

Precautions and Limitations

Specific precautions and limitations associated with each CAT procedure have been included in the procedural instructions. The following general precautions and limitations have been developed for testing of any pumps:

- Confirm proper positioning of all associated valves before starting pump.
- Do not operate pump without sufficient water supply; running pump dry can damage the equipment.
- Do not operate pump in dead-head condition for extended period; pump motor can overheat without sufficient cooling water circulation.
- Use caution when venting air from piping; contents may be under pressure; air must be evacuated from high points in all piping for maximum performance.

Prerequisites

Prerequisites for testing each component are included in the detailed instructions (Exhibit 1). The recommended sequence shown in Table 1 is based on the anticipated availability of equipment for testing and equipment necessary to support subsequent tests.

All mechanical and electrical components will be labeled prior to testing. Temporary labels can be utilized for components as long as an inspection of the labeling has been completed and determined accurate prior to testing.

Test procedures will be discussed at the daily planning meeting with the construction and or operations staff. The schedule and planned testing activities will be provided to the appropriate safety personnel for their input.

Instructions

Specific instructions for each test in Table 1 are presented in Exhibit 1. Space is provided on the test form adjacent to each step where those witnessing the test will initial to indicate that the instruction step was completed satisfactorily.

Acceptable Results

Each step will be completed in the order presented in the Component CAT procedure. An acceptable result for each step will be the successful completion of that step following the procedure described. When a procedure step cannot be successfully completed or its requirements satisfied, the CAT activities will stop until that step can be completed. If a modification to the procedure is necessary, the proposed procedure modification must be reviewed and approved by the IDF compliance oversight engineer's representative, in conjunction with the IDF design engineer.

Records

The detailed CAT procedures in Exhibit 1 will be used to document the testing completed tests. When a test is successfully completed, the procedure form will be signed by the witnesses and the original of the form will be provided to the IDF compliance oversight engineer.

Definitions

A complete set of abbreviations for the IDF detailed design can be found on drawing H-2-830825, sheet 1 of 5.

Process Instrumentation and Control Diagrams

For reference, the process instrumentation and control diagrams (P&ID) for IDF Cells 1 and 2 are included as Exhibit 2. The P&IDs are useful in understanding the planned tests and valve positions.

Tables and Exhibits

- Table 1: IDF Component CAT Procedures and Related CIP Testing
  (Only Cell 1 procedures are shown. An identical set of CAT procedures will be completed for testing of the Cell 2 facilities. Final CAT procedures will include tests for both cells.)
- Exhibit 1: Test Instructions
- Exhibit 2: Process Instrumentation and Control Diagrams for Cell 1

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TABLE 1
Integrated Disposal Facility: Component CAT Procedures and Related Construction Inspection Plan Testing Cell 1 Equipment
RPP-18490, Rev. 0, Attachment 5, IDF Detailed Design Construction Inspection Plan

Specification Section	Equipment Name	Equipment No.	Item to be tested	Summary of Planned Tests	CAT Number	Order of Completion
Prerequisites to all CAT Procedures (see note 1)						
Division 2 - Site Construction						
02500, 02502 and 02509	Raw Water Conveyance Piping	None	Raw water (RW) pipe	Confirm all RW pipe has successfully passed pressure tests. No additional testing required during the CATs.		See Note 1
Division 13 - Process Instrumentation and Control Systems						
13401	Process Instrumentation and Control Systems (PICS)	NA	PICS ORT	Confirm that the Operational Readiness Test (ORT) has been completed as specified and the PICS is ready to support the component CAT procedures. ORT is a complete check of the PICS system prior to CAT initiation. ORT checked PICS for proper installation, calibration, and adjustment on a loop-by-loop and PICS component-by-component basis.		See Note 1
Division 15 - Mechanical						
15992	Pipe Leak Testing	NA	Leachate pipe	Confirm that Pressure Leakage Testing was successfully completed as specified for all leachate handling and containment piping.		See Note 1
Division 16 - Electrical						
16080	Electrical Testing	NA	Electrical system	All electrical system work has been completed as described in specification section 16080 Electrical Testing.		See Note 1
Component Construction Acceptance Test (CAT) Procedures (see note 2)						
Division 9 - Finishes						
09900	Paint Coating Systems	None	Concrete sumps and inner sump of Combined Sump for water tightness	Test water tightness of concrete sumps associated with truck loading slab, leachate transfer building and crest pad building. Also tests the tightness of the HDPE inner sump of the Combined Sump.	CAT-Conc Sumps-A	11
Division 11 - Equipment						
11305-01	Crest Pad Building Sump Pump	219A-LH-P-205	Pumping function	Field test to verify pumps flow and head capacity. Test results including voltage and amp draw readings will be compared against factory test data for the pump. Coordinate testing with Combined Sump Pump and Leachate Storage Tank.	CAT-PC-205-A	12
11305-02	Combined Sump Pump	219A-LH-P-207	Pumping function	Field test to verify pumps flow and head capacity and other factory test results.	CAT-PC-207-A	1
11306-01	Leachate Low Flow Pump	219A-LH-P-202	Pumping function	Field test to verify pumps flow and head capacity in simulated service conditions using temporary tanks and discharge hoses. Test results including amp draw readings will be compared against factory test data for the pump.	CAT-PC-202&203-A	4a
11306-01	Leachate Low Flow Pump	219A-LH-P-202	Pump insertion/extraction	Complete insertion and extraction of Low Flow LCRS Leachate Pump in carrier pipe 12"-LHCP-026-HDPE	CAT-PI-202-A	7
11306-02	Leachate High Flow Pump	219A-LH-P-203	Pumping function	CAT completed with testing of Leachate Low Flow Pump	CAT-PC-202&203-A	4b

TABLE 1
Integrated Disposal Facility: Component CAT Procedures and Related Construction Inspection Plan Testing Cell 1 Equipment
RPP-18490, Rev. 0, Attachment 5, IDF Detailed Design Construction Inspection Plan

Specification Section	Equipment Name	Equipment No.	Item to be tested	Summary of Planned Tests	CAT Number	Order of Completion
11306-02	Leachate High Flow Pump	219A-LH-P-203	Pump insertion/extraction	Complete insertion and extraction of High Flow LCRS Leachate Pump in carrier pipe 18"-LHCP-025-HDPE	CAT-PI-203-A	8
11306-03	Leachate Leak Detection Pump	219A-LH-P-204	Pumping function	Similar to CAT for Leachate Low Flow Pump	CAT-PC-204-A	5
11306-03	Leachate Leak Detection Pump	219A-LH-P-204	Pump insertion/extraction	Complete insertion and extraction of the LDS Leachate Pump in carrier pipe 12"-LHCP-027-HDPE	CAT-PI-204-A	9
11312	Leachate Transfer Pump	219A1-LH-P-302	Pumping function	Field test to verify pumps flow and head capacity and other factory test results.	CAT-PC-302-A	2
Division 13 - Process Instrumentation and Control Systems						
13205	Lined Bolted Steel Liquid Storage Tanks	219A201-LH-TK-300	Leachate Storage Tank	Includes 30-day long tank tightness test as specified. Tightness test is preceded by a leak location survey by the tank manufacturer.	CAT-TT-300-A	3
13401	Process Instrumentation and Control Systems	219A-LH-LT-101	Level Transducer insertion/extraction	Complete insertion and extraction of LCRS Sump Level Transducer. Transducer in carrier pipe 3"-LHCP-048-HDPE	CAT-TI-101-A	10

Notes:
1. Testing on these items will be completed as part of the CIP prior starting any of the component CATS.
2. Tests shown are for equipment associated with IDF Cell #1. The same CAT procedures are required for the Cell #2 equipment.

Exhibit 1
Test Instructions

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CH2M HILL **CONSTRUCTION ACCEPTANCE TEST SHEET**

Test No. CAT-Conc Sumps-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Tightness Test of Concrete Sumps **IDF Cell No. 1**	Completed By

Test Purpose

This test will determine the tightness of concrete sumps at the Truck Loading Station and in the Crest Pad and Leachate Transfer Buildings.

Equipment Identification and Notes

1. Note that for the remainder of this Construction Acceptance Test procedure, an asterisk "*" will be used in place of the prefix 219A-LH for most instruments, valves, process piping, and equipment. As an example, *-P-205 will be used in place of 219A-LH-P-205.
2. The Crest Pad Building (CPB) sump pump is automatically controlled by the PLC that is located within panel CP-001 in the CPB.
3. Equipment/instrumentation associated with the CPB sump pump testing includes:
   a. Sump Pump *-P-205.
   b. Control Panel *-CP-001.
   c. Motor Control Center (MCC) *-MCC-001.

Additional Definitions and Abbreviations

1. Leachate Transfer Building (LTB)
2. Truck Loading Station (TLS).

Precautions and Limitations	
1. Prior to testing, prevent operation of the Crest Pad Building sump pump and leachate transfer pump associated with Cell No. 1; *-P-205 and 219A1-LH-P-302, respectively.	
2. Be advised that precipitation during the test may make determination of water levels in the sump inaccurate.	
Prerequisites	
1. Review test procedures in Pre-Job Briefing on day of test.	
2. Confirm the following procedures and tests are complete: Leakage testing of leachate piping.	
3. Tightness testing of the concrete sumps shall procedure only after the coating system has been applied to the surface of the sumps and is complete and cured as per manufacturer's recommendations	
4. Piping and valves associated with this test must be labeled or tagged.	
5. Construction General Contractor (CGC) staff will conduct the CAT. The test will be witnessed by representatives of the CGC and the Construction Manager.	
6. Confirm that the raw water yard hydrants at the Crest Pad Building and the Truck Loading Station are functional.	
7. Equipment required: a. CPB Sump level indicator b. Hose to fill sumps with raw water from yard hydrants. c. Pipe plugs suitable for use in 2" and 4" diameter HDPE drain pipes	
8. Select pump control hand switch *-HS-205 to OFF position. Pump control hand switch is located on the front of *-MCC-001.	
9. Select pump control hand switch *-HS-207 to OFF position. It is located on the front of *-MCC-001.	
10. Open Cell No. 1 pump disconnect 219A1-LH-SW-302, located inside LTB	
11. Close valve 219A1-LH-V-037	
12. Close valve 219A1-LH-V-036	
13. Close valve *-V-024	
14. Close valve 219A1-LH-V-031	

Test No. CAT-Conc Sumps-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Tightness Test of Concrete Sumps **IDF Cell No. 1**	Completed By
15. Relevant documents: P&IDs (H-2-830854 sheets 1 & 2) Electrical wiring and connection diagrams for control panel *-CP-001.	
Instructions – Tightness Test for Truck Loading Station Sumps	
1. Remove the two solid, gasketed manhole lids that cover each Truck Loading Station (TLS) sump to allow access.	
2. Install plug in the outlet pipe of the east TLS sump.	
3. Using a yard hydrant and hose, add raw water to the sumps until the water level reaches a point approximately 6 inches below the bottom of the manhole lid's frame.	
4. After allowing the water to stand in the sump for approximately 2 hours, measure the distance from the manhole frame to the water surface. Use care in measuring to the water surface. Distance measured = _____inches; Date and Time Test Started:_____	
5. Place the solid manhole lids back in place to cover the catch basins.	
6. Cover the manhole lids with plywood or another material to shade the lid.	
7. Approximately 24 hours after starting the test, carefully remove the manhole lids.	
8. Using the same location and method as used at the start of the test, measure the distance to the water surface. Distance measured = _____inches; Date and Time Test Ended:_____	
9. Tightness test passes if the water level over the 24 hr period changes by less than 1/4".	
10. Using a portable sump pump, remove water from the sumps so the pipe plug can be removed.	
11. Reinstall the manhole lids.	
Instructions – Tightness Test for Leachate Transfer Building Sump	
1. Remove the grating covering the sump and install a plug into the sump outlet pipe.	
2. Using a yard hydrant and hose, add raw water to the sump until the water level is within 2 inches of the bottom of the grating support angle.	
3. Measure the distance from the grating angle to the water surface. Use care in measuring to the water surface. Distance measured = _____inches; Date and Time Test Started:_____	
4. Reinstall the grating over the sump.	
5. Cover with plastic sheeting to limit evaporation loss.	
6. Approximately 24 hours after starting the test, remove the grating. Using the same location and method as was used at the start of the test, measure the distance to the water surface. Distance measured = _____inches; Date and Time Test Ended:_____	
7. Tightness test passes if the water level over the 24 hr period changes by less than 1/4".	
8. Remove the plug from the sump drain pipe.	
9. Reinstall the grating.	
Instructions – Tightness Test for Crest Pad Building Sump	
1. Loosen the union on the pump's discharge to allow air to bleed out as the sump is filled.	
2. Using a yard hydrant and hose, add raw water to the sump until the water level is within 2 inches of the bottom of the grating angle support.	

Test No. CAT-Conc Sumps-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Tightness Test of Concrete Sumps **IDF Cell No. 1**	Completed By
3. Remove the grating and measure the distance from the grating angle to the water surface. Use care when measuring to the water surface. Replace grating after measurement and cover with plastic sheeting to minimize evaporation loss. Distance measured = _____inches; Date and Time Test Started:_____	
4. Replace grating after measurement and cover with plastic sheeting to minimize evaporation loss.	
5. Approximately 24 hours after starting the test, measure the water level using the same location and method as before. Distance measured = _____inches; Date and Time Test Ended:_____	
6. Tightness test passes if the water level over the 24 hr period changes by less than 1/4”.	
7. Retighten the union on the discharge of pump *P-205.	
8. Reinstall grating over the sump.	
9. Use a portable sump pump to remove water from the sump.	
Instructions – Tightness Test for Inner Sump of Combined Sump	
1. Visually inspect the exterior of the floor to wall joint of the inner sump to see that it is dry.	
2. Using a yard hydrant and hose, carefully add raw water to the inner sump (where pump 219A1-LH-P-207 is located) until the water level is within 2 inches of the top edge of the sump wall which has an elevation of 720.0).	
3. Repeat the first step of this test to assure that the joint is dry after filling the sump.	
4. Approximately 24 hours after starting the test, visually inspect the exterior of the floor to wall joint for water. If no water is present, the leakage test passes. If water is present, the sump will require repair and retesting.	

Construction Acceptance Test	By (Print Name & Sign)	Date
Performed:		
Witnessed:		
Insp. Coord. Rep.:		

Exceptions/Discrepancies

CH2M HILL **COMPONENT CONSTRUCTION ACCEPTANCE TEST**

Test No. CAT-PC-205-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of Crest Pad Building Sump Pump: 219A-LH-P-205 **IDF Cell No. 1**	Completed By

Test Purpose

This test will confirm the pump capacity of 219A-LH-P-205 which is specified by IDF Technical Specifications (RPP-18489) Section 11305-2.

Equipment Identification and Notes

1. Note that for the remainder of this Construction Acceptance Test procedure, an asterisk "*" will be used in place of the prefix 219A-LH for most instruments, valves, process piping, and equipment. As an example, *-P-205 will be used in place of 219A-LH-P-205.
2. The crest pad building (CPB) sump pump is automatically controlled by the PLC that is located within panel CP-001 in the CPB.
3. Equipment/instrumentation associated with the CPB sump pump testing includes:
   a. Sump Pump *-P-205.
   b. Control Panel *-CP-001.
   c. Motor Control Center (MCC) *-MCC-001.
   d. LDS Flowmeter *-FIT-204 and pressure gage *-PI-204.

Additional Definitions and Abbreviations

1. Leak Detection System (LDS).
2. Leachate Transfer Building (LTB).
3. Leachate Collection and Recovery System (LCRS).
4. Raw Water (RW).

Precautions and Limitations

1. Precautions shall be taken during testing so that water level does not drop to within 4 inches above the sump pump intake (to prevent pump from running dry).	
2. If leaking is observed at CPB, LTB or combined sump during testing, shut down test and repair leak.	
3. Since the CPB floor sump does not have a flowmeter on its discharge piping, the discharge piping will temporarily be routed through the LDS flowmeter and pressure gage for testing purposes only.	

Prerequisites

1. Review test procedures in Pre-Job Briefing on day of test.	
2. Confirm the following procedure is complete: PICS testing.	
3. Confirm the following procedure is complete: Leachate pipe hydrostatic leak testing.	
4. Confirm the following procedure is complete: CAT-TT-300-A (leachate storage tank leak testing).	
5. Confirm the following procedure is complete: CAT-PC-202&203-A (LCRS pump testing).	
6. Confirm the following procedure is complete: CAT-PC-204-A (LDS pump testing).	
7. Confirm the following procedure is complete: CAT-PC-302-A (leachate transfer pump testing).	
8. Piping and valves associated with this test procedure must be labeled or tagged.	
9. Construction General Contractor (CGC) staff will conduct the CAT. The test will be witnessed by representatives of the CGC and the Construction Manager.	
10. Equipment required: a. CPB Sump level indicator b. Flexible hoses/equipment as necessary to maintain water level in sump during testing. c. Volt/current meter for measuring volts and amps within *-MCC-01: Meter type_____ ID No. _____ Calibration Expiration Date:_____	

Test No. CAT-PC-205-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of Crest Pad Building Sump Pump: 219A-LH-P-205 **IDF Cell No. 1**	Completed By
Initial circuit breaker and valve alignments shall be as follows (for water recycle back to CPB sump):	
11. Turn *-HS-202 OFF in *-MCC-001 for Pump *-P-202	
12. Turn *-HS-203 OFF in *-MCC-001 for Pump *-P-203.	
13. Turn *-HS-204 OFF in *-MCC-001 for Pump *-P-204.	
14. Turn *-HS-205 OFF in *-MCC-001 for Pump *-P-205.	
15. Turn 219A1-LH-HS-207 OFF in *-MCC-001 for Pump 219A1-LH-P-207.	
16. Turn 219A1-LH-HS-302 OFF in 219A1-LH-LCP-005 for Pump 219A1-LH-P-302.	
17. Open Cell No. 1 pump disconnect *-SW-202 located in the CPB.	
18. Open Cell No. 1 pump disconnect *-SW-203 located in the CPB.	
19. Open Cell No. 1 pump disconnect *-SW-204 located in the CPB.	
20. Open Cell No. 1 pump disconnect 219A1-LH-SW-302, located inside the LTB.	
21. Open valve *-V-013.	
22. Open valve *-V-014.	
23. Open valve *-V-015.	
24. Open valve *-V-017.	
25. Open valve *-V-019.	
26. Open valve *-V-021.	
27. Place valve *-V-047 in the filter position.	
28. Close valve *-V-024	
29. Close valve *-V-042	
30. Close valve *-V-018	
31. Close valve *-V-020	
32. Close valve *-V-011	
33. Close valve *-V-005	
34. Close valve *-V-048	
35. Close valve *-V-049	
36. Close valve *-V-050	
37. Close valve *-V-051	
38. *-MCC-001 shall be energized.	
39. Relevant documents: P&IDs (H-2-830854 sheets 1 & 2) Electrical wiring and connection diagrams for control panel *-CP-001. Pump manufacturer's information and O&M Manual. System/Pump curve data Pump Motor Nameplate data.	
40. Verify RW system will be operational for duration of testing.	
Instructions	
1. Temporarily disconnect union located immediately after *-P-205 pump discharge.	
2. Tie-in to union with temporary fittings and flexible hose as necessary to connect pump discharge to LDS pipe quick connect located on the south wall of the CPB, just upstream of *-FIT-204.	
3. Temporarily install one end of a flex hose on the re-circulation line quick connect located on the south wall of the CPB.	
4. Insert the other end of the flex hose into the floor sump.	
5. Secure the hose end in place.	
6. Fill floor sump with raw water, maintaining water level to a depth at least 4 inches above the pump intake during testing.	
**-P-205 Baseline Performance Testing for System/Pump Curve Data Collection*	
7. Operate *-P-205 by selecting hand switch *-HS-205 at *-MCC-001 to the manual (local) position.	

Test No. CAT-PC-205-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of Crest Pad Building Sump Pump: 219A-LH-P-205 **IDF Cell No. 1**	Completed By
8. Using the data sheet at the end of this procedure (and after readings stabilize) with V-019 fully open: record discharge pressure at *-PI-204 and flow rate at *-FIT-204.	
9. With V-019 fully open: when pump performance stabilizes (consistent flow and pressure), record currents and voltages for all three phases of pump power at disconnect *-SW-205 using the data sheet at the end of this procedure. a. Current readings for each phase shall agree with motor nameplate data (to be identified during testing). b. Current readings for each phase shall be within 10% of average ((I(p)/Average (Ia, Ib, Ic))-1) *100%. c. Voltage readings between phases shall be within 2% of average ((V(p-p)/Average(Vab, Vbc, Vca))-1)*100%.	
10. Using the data sheet at the end of this procedure (and after readings stabilize) with V-019 ½ closed: record discharge pressure at *-PI-204 and flow rate at *-FIT-204.	
11. Using the data sheet at the end of this procedure (and after readings stabilize) with V-019 ¼ closed: record discharge pressure at *-PI-204 and flow rate at *-FIT-204.	
12. Using the data sheet at the end of this procedure (and after readings stabilize) with V-019 fully closed (minimize fully closed position to one minute): record discharge pressure at *-PI-204 and flow rate at *-FIT-204.	
13. Throttle *-V-019 as necessary to produce 8 gpm,	
14. Record pressure at *-PI-204 _____psig and difference in height between *-PI-204 and *-PI-205 _____ ft.	
15. Select hand switch *-HS-205 at *-MCC-001 for *-P-205 to the OFF position and verify no discharge.	
**-P-205 – Baseline performance for pumping to Leachate Storage Tank.*	
16. Remove temporary piping/fittings.	
17. Connect discharge piping in original design configuration.	
18. Close *-V-017.	
19. Close *-V-019.	
20. Open *-V-024.	
21. Open *-V-042.	
22. Open *-V-048.	
23. Close 219A1-LH-V-025.	
24. Open 219A1-LH-V-026.	
25. Select hand switch *-HS-205 at *-MCC-001 for *-P-205 to the manual (local) position and verify discharge at the leachate storage tank.	
26. Verification pump produces 8 gpm in design configuration: Verify pressure at *-PI-205 is equal to or less than the following: Previously recorded *-PI-204 pressure taken during pump throttling at 8 gpm + (height difference/2.31). _____YES _____NO Record *-PI-205 pressure. *-PI-205 _____ psig	
27. Select hand switch *-HS-205 at *-MCC-001 for *-P-205 to the OFF position and verify no discharge at the leachate storage tank.	

Test No. CAT-PC-205-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of Crest Pad Building Sump Pump: 219A-LH-P-205 **IDF Cell No. 1**	Completed By

Valve Position	***-FIT-204 Flow rate (gpm)**	***-PI-204 Pressure (psig)**	**N/A**	**N/A**	**N/A**
Full Open (See Step 8)			-	-	-
½ Closed (See Step 10)			-	-	-
¼ Closed (See Step 11)			-	-	-
Fully Closed (See Step 12)			-	-	-

*Volt and Amp Readings for Pump *-P-205*

Parameter	**Power Supply Phase A *-MCC-001***	**Power Supply Phase B *-MCC-001***	**Power Supply Phase C *-MCC-001***	**Average of Phase A, B and C**	**Each Phase within 2% of Average (Y/N)**
Volts (See Step 9)					
	Power Supply Phase A *-MCC-001*	**Power Supply Phase B *-MCC-001***	**Power Supply Phase C *-MCC-001***	**Average of Phase A, B and C**	**Each Phase within 10% of Average (Y/N)**
Amps (See Step 9)					

Construction Acceptance Test	By (Print Name & Sign)	Date
Performed:		
Witnessed:		
Insp. Coord. Rep.:		

Exceptions/Discrepancies

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CH2M HILL **COMPONENT CONSTRUCTION ACCEPTANCE TEST**

Test No. CAT-PC-207-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of Combined Sump Pump: 219A-LH-P-207 **IDF Cell No. 1**	Completed By

Test Purpose

This test will confirm the pump capacity of 219A-LH-P-207 which is specified by IDF Technical Specifications (RPP-18489) Section 11305-1.

Equipment Identification and Notes

1. Note that for the remainder of this Construction Acceptance Test procedure, an asterisk "*" will be used in place of the prefix 219A-LH for most instruments, valves, process piping, and equipment. As an example, *-P-207 will be used in place of 219A-LH-P-207.
2. The combined sump pump in the combined sump is automatically controlled by the PLC in the crest pad building (CPB).
3. Equipment/instrumentation associated with the leachate transfer pump testing includes:
   a. Combined Sump Pump *-P-207.
   b. Motor Control Center (MCC) *-MCC-001.
   c. Stop watch or timer.

Additional Definitions and Abbreviations

1. Crest Pad Building (CPB).

Precautions and Limitations	
1. Precautions shall be taken during testing so that water level does not drop below the pump intake located in the pump chamber of the combined sump (to prevent pump from running dry).	
2. If leaking is observed at combined sump during testing, shut down test and repair leak.	
Prerequisites	
1. Review test procedures in Pre-Job Briefing on day of test.	
2. Confirm the following procedure is complete: PICS testing.	
3. Confirm the following procedure is complete: hydrostatic leak testing.	
4. Piping and valves associated with this test procedure must be labeled or tagged.	
5. Construction General Contractor (CGC) staff will conduct the CAT. The test will be witnessed by representatives of the CGC and the Construction Manager.	
6. Equipment required: a. Volt/current meter for measuring volts and amps within respective 480-volt disconnects: Meter type_____ ID No. _____ Calibration Expiration Date:_____	
7. Turn *-HS-202 OFF in *-MCC-001 for Pump *-P-202	
8. Turn *-HS-203 OFF in *-MCC-001 for Pump *-P-203.	
9. Turn *-HS-204 OFF in *-MCC-001 for Pump *-P-204.	
10. Turn *-HS-205 OFF in *-MCC-001 for Pump *-P-205.	
11. Turn 219A1-LH-HS-207 OFF in *-MCC-001 for Pump 219A1-LH-P-207.	
12. Turn 219A1-LH-HS-302 OFF in 219A1-LH-LCP-005 for Pump 219A1-LH-P-302.	
13. Open Cell No. 1 pump disconnect *-SW-202 located in the CPB.	
14. Open Cell No. 1 pump disconnect *-SW-203 located in the CPB.	
15. Open Cell No. 1 pump disconnect *-SW-204 located in the CPB.	
16. Open Cell No. 1 pump disconnect 219A1-LH-SW-302, located inside the LTB.	
17. Open valve 219A1-LH-V-031.	
18. *-MCC-001shall be energized.	

Test No. CAT-PC-207-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of Combined Sump Pump: 219A-LH-P-207 **IDF Cell No. 1**	Completed By
19. Relevant documents: P&IDs (H-2-830854 sheets 1 & 2) Electrical wiring and connection diagrams for control panel *-MCC-001. Pump manufacturer's information and O&M Manual. System/Pump curve data Pump Motor Nameplate data.	
20. Verify RW system will be operational for duration of testing.	
Instructions	
**-P-207 Baseline Performance Testing for System/Pump Curve Data Collection*	
1. With combined sump pump off, fill the pump chamber with raw water.	
2. Select Cell No. 1 Combined Sump Pump's pump control hand switch, *-HS-207, to AUTO position. This pump control hand switch is located on the front of *-MCC-001 in the CPB.	
3. While pump is operating, record currents and voltages for all three phases of pump power at disconnect *-MCC-001 using the data sheet at the end of this procedure. Add RW to the pump chamber as necessary to keep the pump continually operating until all readings are recorded. a. Current readings for each phase shall be equal to or less than motor nameplate data (to be identified during testing). b. Current readings for each phase shall be within 10% of average ((I(p)/Average (Ia, Ib, Ic))-1) *100%. c. Voltage readings between phases shall be within 2% of average ((V(p-p)/Average(Vab, Vbc, Vca))-1)*100%.	
4. Select hand switch *-HS-207 at *-MCC-001 for *-P-207 to the OFF position.	
5. Determine the inner cross-sectional area of the combined sump pump chamber and record in table at end of this procedure.	
Test #1	
6. With combined sump pump off, add raw water to one inch below the invert of pipe 219A1-4"-LT-041-HDPE within the pump chamber.	
7. Select Cell No. 1 Combined Sump Pump's pump control hand switch, *-HS-207, to manual position. This pump control hand switch is located on the front of *-MCC-001 in the CPB.	
8. Simultaneously begin timing pumping event.	
9. Allow pump to remove measurable amount of water but do not run pump dry.	
10. Simultaneously select Cell No. 1 Combined Sump Pump's pump control hand switch, *-HS-207, to OFF position and stop timing pumping event, record time in table at end of this procedure.	
11. Measure and record water depth in table at end of this procedure.	
12. Calculate and record the pumping rate in table at end of this procedure using the following equation: (Pump chamber inner area; ft^2)(Pumped water depth; ft)(7.48 gal/ft^3) / (Pumping Time; min) = (Pumping Rate; gpm)	
Test #2	
13. With combined sump pump off, add raw water to one inch below the invert of pipe 219A1-4"-LT-041-HDPE within the pump chamber.	
14. Select Cell No. 1 Combined Sump Pump's pump control hand switch, *-HS-207, to manual position. This pump control hand switch is located on the front of *-MCC-001 in the CPB.	
15. Simultaneously begin timing pumping event.	
16. Allow pump to remove measurable amount of water but do not run pump dry.	
17. Simultaneously select Cell No. 1 Combined Sump Pump's pump control hand switch, *-HS-207, to OFF position and stop timing pumping event, record time in table at end of this procedure.	

Test No. CAT-PC-207-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of Combined Sump Pump: 219A-LH-P-207 **IDF Cell No. 1**	Completed By
18. Measure and record water depth in table at end of this procedure.	
19. Calculate and record the pumping rate in table at end of this procedure using the following equation: (Pump chamber inner area; ft^2)(Pumped water depth; ft)(7.48 gal/ft^3) / (Pumping Time; min) = (Pumping Rate; gpm)	
Test #3	
20. With combined sump pump off, add raw water to one inch below the invert of pipe 219A1-4”-LT-041-HDPE within the pump chamber.	
21. Select Cell No. 1 Combined Sump Pump’s pump control hand switch, *-HS-207, to manual position. This pump control hand switch is located on the front of *-MCC-001 in the CPB.	
22. Simultaneously begin timing pumping event.	
23. Allow pump to remove measurable amount of water but do not run pump dry.	
24. Simultaneously select Cell No. 1 Combined Sump Pump’s pump control hand switch, *-HS-207, to OFF position and stop timing pumping event, record time in table at end of this procedure.	
25. Measure and record water depth in table at end of this procedure.	
26. Calculate and record the pumping rate in table at end of this procedure using the following equation: (Pump chamber inner area; ft^2)(Pumped water depth; ft)(7.48 gal/ft^3) / (Pumping Time; min) = (Pumping Rate; gpm)	
Test #4	
27. With combined sump pump off, add raw water to one inch below the invert of pipe 219A1-4”-LT-041-HDPE within the pump chamber.	
28. Select Cell No. 1 Combined Sump Pump’s pump control hand switch, *-HS-207, to manual position. This pump control hand switch is located on the front of *-MCC-001 in the CPB.	
29. Simultaneously begin timing pumping event.	
30. Allow pump to remove measurable amount of water but do not run pump dry.	
31. Simultaneously select Cell No. 1 Combined Sump Pump’s pump control hand switch, *-HS-207, to OFF position and stop timing pumping event, record time in table at end of this procedure.	
32. Measure and record water depth in table at end of this procedure.	
33. Calculate and record the pumping rate in table at end of this procedure using the following equation: (Pump chamber inner area; ft^2)(Pumped water depth; ft)(7.48 gal/ft^3) / (Pumping Time; min) = (Pumping Rate; gpm)	
Test #5	
34. With combined sump pump off, add raw water to one inch below the invert of pipe 219A1-4”-LT-041-HDPE within the pump chamber.	
35. Select Cell No. 1 Combined Sump Pump’s pump control hand switch, *-HS-207, to manual position. This pump control hand switch is located on the front of *-MCC-001 in the CPB.	
36. Simultaneously begin timing pumping event.	
37. Allow pump to remove measurable amount of water but do not run pump dry.	
38. Simultaneously select Cell No. 1 Combined Sump Pump’s pump control hand switch, *-HS-207, to OFF position and stop timing pumping event, record time in table at end of this procedure.	
39. Measure and record water depth in table at end of this procedure.	
40. Calculate and record the pumping rate in table at end of this procedure using the following equation: (Pump chamber inner area; ft^2)(Pumped water depth; ft)(7.48 gal/ft^3) / (Pumping Time; min) = (Pumping Rate; gpm)	
41. Average the calculated flowrate developed during tests 1 through 5: _____gpm	

Test No. CAT-PC-207-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of Combined Sump Pump: 219A-LH-P-207 **IDF Cell No. 1**	Completed By
42. Verify pump produces minimum average of 250 gpm (+25 gpm / -15 gpm tolerance): _____YES _____NO	

Test Number	**Inner Area of Pump Chamber (ft^2) (See Step 5)**	**Water Depth at Start (ft)**	**Water Depth at Finish (ft) (See Steps 11, 18, 25, 32, 39)**	**Pumping Time (min) (See Steps 10, 17, 24, 31, 38)**	**Pumping Rate (gpm) (See Steps 12, 19, 26, 33, 40)**
1		0			
2		0			
3		0			
4		0			
5		0			

*Volt and Amp Readings for Pump *-P-207*

Parameter	**Power Supply Phase A *-MCC-001***	**Power Supply Phase B *-MCC-001***	**Power Supply Phase C *-MCC-001***	**Average of Phase A, B and C**	**Each Phase within 2% of Average (Y/N)**
Volts (See Step XXX)					
	Power Supply Phase A *-MCC-001*	**Power Supply Phase B *-MCC-001***	**Power Supply Phase C *-MCC-001***	**Average of Phase A, B and C**	**Each Phase within 10% of Average (Y/N)**
Amps (See Step XXX)					

Construction Acceptance Test	By (Print Name & Sign)	Date
Performed:		
Witnessed:		
Insp. Coord. Rep.:		

Exceptions/Discrepancies

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CH2M HILL **COMPONENT CONSTRUCTION ACCEPTANCE TEST**

Test No. CAT-PC-202 & 203-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of LCRS Pumps: 219A-LH-P-202 **219A-LH-P-203** **IDF Cell No. 1**	Completed By

Test Purpose

This test will confirm the capacities of leachate pumps 219A-LH-P-202 and 203 which are specified by IDF Technical Specifications (RPP-18489) Section 11306-01 and 11306-02.

Equipment Identification and Notes

1. Note that for the remainder of this Construction Acceptance Test procedure, an asterisk "*" will be used in place of the prefix 219A-LH for most instruments, valves, process piping, and equipment. As an example, *-P-203 will be used in place of 219A-LH-P-203.
2. Leachate Collection Recovery System (LCRS) is automatically controlled by the PLC that is located within panel CP-001 in the crest pad building (CPB).
3. Equipment/instrumentation associated with the LCRS testing includes:
   a. Low Flow Pump *-P-202 and associated flowmeter *-FIT-202.
   b. High Flow Pump *-P-203 and associated flowmeter *-FIT-203.
   c. Control Panel *-CP-001.
   d. Motor Control Center (MCC) *-MCC-001.
   e. Truck Loading Flowmeter *-FIT-302.

Additional Definitions and Abbreviations

1. Leak Detection System (LDS).
2. Leachate Transfer Building (LTB).
3. Raw Water (RW).

Precautions and Limitations

1. Precautions shall be taken during testing (as described below) to maintain target water level to simulate worst case pumping situation and to prevent pump from running dry.	
2. If leaking is observed at CPB, LTB, side slope piping, or combined sump during testing, shut down test and repair leak.	
3. Pump discharge piping up side slope shall be in final configuration using pipe disconnects in the pipe string.	
4. Verify flexible hose from LDS manifold in CPB is not connected to LDS pump discharge pipe (1-1/2"-LH-015-HDPE) or riser pipe (12"-LHCP-027-HDPE). This step is to ensure that a leaking check valve does not allow water to backflow into the LDS sump.	

Prerequisites

1. Review test procedures in Pre-Job Briefing on day of test.	
2. Confirm the following procedure is complete: PICS testing.	
3. Confirm the following procedure is complete: Leachate pipe hydrostatic leak testing.	
4. Confirm the following procedure is complete: CAT-TT-300-A (leachate storage tank leak testing).	
5. Confirm the following procedure is complete: CAT-PC-302-A (leachate transfer pump testing).	
6. Piping and valves associated with this test procedure must be labeled or tagged.	
7. Construction General Contractor (CGC) staff will conduct the CAT. The test will be witnessed by representatives of the CGC and the Construction Manager.	

Test No. CAT-PC-202 & 203-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of LCRS Pumps: 219A-LH-P-202 219A-LH-P-203 IDF Cell No. 1	Completed By
8. Equipment required: a. Equipment as necessary to maintain water level in tank and collect water at truck loading station during testing. b. Tank(s) sized as required to maintain minimum water level above pump. Size will vary depending on method used for maintaining water level in tank (recycling water is recommended). c. Volt/current meter for measuring volts and amps within respective 480-volt disconnects: Meter type_____ ID No. _____ Calibration Expiration Date:_____ d. Temporary flexible hoses and piping/fittings located immediately after pump discharge and where side slope riser piping transitions to the piping manifold in the CPB shall be minimum 4-inch diameter to minimize friction losses during pump test. e. A temporary pressure gage with petcock for stabilizing pressure gage dial indication shall be provided immediately after pump. Gage shall have minimum 1-psi increments.	
Initial circuit breaker and valve alignments shall be as follows (for discharge at truck loading station):	
9. Turn *-HS-202 OFF in *-MCC-001 for Pump *-P-202	
10. Turn *-HS-203 OFF in *-MCC-001 for Pump *-P-203.	
11. Turn *-HS-204 OFF in *-MCC-001 for Pump *-P-204.	
12. Turn *-HS-205 OFF in *-MCC-001 for Pump *-P-205.	
13. Turn 219A1-LH-HS-207 OFF in *-MCC-001 for Pump 219A1-LH-P-207.	
14. Turn 219A1-LH-HS-302 OFF in 219A1-LH-LCP-005 for Pump 219A1-LH-P-302.	
15. Open Cell No. 1 pump disconnect *-SW-202 located in the CPB.	
16. Open Cell No. 1 pump disconnect *-SW-203 located in the CPB.	
17. Open Cell No. 1 pump disconnect *-SW-204 located in the CPB.	
18. Open Cell No. 1 pump disconnect 219A1-LH-SW-302, located inside the LTB.	
19. Open valve *-V-001.	
20. Open valve *-V-002.	
21. Open valve *-V-003.	
22. Open valve *-V-005.	
23. Open valve *-V-007.	
24. Open valve *-V-008.	
25. Open valve *-V-009.	
26. Open valve *-V-011.	
27. Open valve *-V-021.	
28. Place valve *-V-047 in the filter position.	
29. Open valve *-V-048.	
30. Open valve 219A1-LH -V-025.	
31. Open valve 219A1-LH-V-037.	
32. Close *-V-006	
33. Close *-V-012	
34. Close *-V-017	
35. Close *-V-018	
36. Close *-V-019	
37. Close *-V-024	
38. Close *-V-049	
39. Close *-V-050	

Test No. CAT-PC-202 & 203-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of LCRS Pumps: 219A-LH-P-202 219A-LH-P-203 IDF Cell No. 1	Completed By
40. Close *-V-051	
41. Close 219A1-LH-V-026	
42. Close 219A1-LH-V-029	
43. Close 219A1-LH-V-041	
44. Close 219A1-LH-V-036	
45. *-MCC-001 shall be energized.	
46. Relevant documents: P&IDs (H-2-830854 sheets 1 & 2) Electrical wiring and connection diagrams for control panel *-CP-001. Pump manufacturer's information and O&M Manual. System/Pump curve data Pump Motor Nameplate data. Electrical test results from EPG manufacturer's tests.	
47. Verify RW system will be operational for duration of testing.	
Instructions	
**-P-202 & *-P-203 – Baseline performance for pumping to Truck Loading Station.*	
1. Place tank on the operations layer of Cell No. 1 on its north/south centerline and adjacent to the north toe of slope.	
2. Connect *-P-202 to temporary piping/flexible hose that includes a calibrated (see below if applicable) or new pressure gage. Temporary pressure gage type_____ ID No. _____ Calibration Expiration Date:_____	
3. Connect temporary piping/flex hose to 1-1/2"-LH-009-HDPE discharge pipe which is temporarily routed above ground up the side slope to the CPB.	
4. Connect *-P-203 to temporary piping/flexible hose that includes a calibrated (see below if applicable) or new pressure gage. Temporary pressure gage type_____ ID No. _____ Calibration Expiration Date:_____	
5. Connect *-P-203 to temporary flexible hose which is connected to *-3"-LH-001-HDPE discharge pipe routed up the side slope to the CPB adjacent to 1-1/2"-LH-009-HDPE.	
6. Place LCRS high flow pump into bottom of tank.	
7. Place LCRS low flow pump into bottom of tank.	
8. Connect temporary flexible hose from side slope discharge pipe to associated 1-1/2" leachate piping manifold quick connect inside the CPB.	
9. Connect temporary flexible hose from side slope discharge pipe to associated 3" leachate piping manifold quick connect inside the CPB.	
10. Perform this step for LCRS high flow pump: Begin filling tank with water until water level is 1 inch above the top pump rollers. Mark this water level inside the tank with tape or permanent marker. Add another mark inside the tank two inches above previous mark. The lower mark is the minimum and target water level to be maintained during the pumping test except during initial pipe filling and pump stabilization. Once pump has stabilized, adjust water level such that it doesn't exceed the second mark.	

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Operational Test of LCRS Pumps: 219A-LH-P-202 219A-LH-P-203 IDF Cell No. 1	Completed By
11. Perform this step for LCRS low flow pump: Begin filling tank with water until water level is 1 inch above the top pump rollers. Mark this water level inside the tank with tape or permanent marker. Add another mark inside the tank two inches above previous mark. The lower mark is the minimum and target water level to be maintained during the pumping test except during initial pipe filling and pump stabilization. Once pump has stabilized, adjust water level such that it doesn't exceed the second mark.	
12. Close power disconnect *-SW-203 for LCRS high flow pump.	
13. Close power disconnect *-SW-202 for LCRS low flow pump.	
14. Select hand switch *-HS-202 at *-MCC-001 for *-P-202 to the manual (local) position, maintaining target water level discussed previously.	
15. While pump *-P-202 is operating, slowly open sample valve *-V-012, observe flow, and then close sample valve.	
16. Observe and record below the flow rates for *-FIT-202 and 219A1-LH-FIT-302 and pressure indication at *-PI-202 and temporary pressure gage. *-FIT-202 _____ gpm 219A1-LH-FIT-302 _____ gpm *-PI-202 _____ psig Temporary gage _____ psig & height above pump centerline _____ ft	
17. Throttle valve *-V-011 until temporary pressure gage increases 4 psig (this simulates actual installation head conditions). Observe and record below the flow rates for *-FIT-202, *-PI-202 and temporary pressure gage. *-FIT-202 _____ gpm *-PI-202 _____ psig Temporary gage _____ psig	
18. Verify pump produces minimum 13 gpm (+15 gpm / - 3 gpm tolerance): _____YES _____NO	
19. Leave valve *-V-011 in throttled position.	
20. Select hand switch *-HS-202 at *-MCC-001 for *-P-202 to the OFF position.	
21. Verify no discharge at the truck loading station.	
22. Select hand switch *-HS-203 at *-MCC-001 for *-P-203 to the manual (local) position, maintain target water level discussed previously.	
23. While pump *-P-203 is operating, slowly open sample valve *-V-006, observe flow, and then close sample valve.	
24. Observe and record below the flow rates for *-FIT-203 and 219A1-LH-FIT-302 and pressure indication at *-PI-203 and temporary pressure gage. *-FIT-203 _____ gpm 219A1-LH-FIT-302 _____ gpm *-PI-203 _____ psig Temporary gage _____ psig & height above pump centerline _____ ft	

Test No. CAT-PC-202 & 203-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of LCRS Pumps: 219A-LH-P-202 219A-LH-P-203 IDF Cell No. 1	Completed By
25. Throttle valve *-V-005 until temporary pressure gage increases 4 psig (this simulates actual installation head conditions). Observe and record below the flow rates for *-FIT-203, *-PI-203 and temporary pressure gage. *-FIT-203 _____ gpm *-PI-203 _____ psig Temporary gage _____ psig	
26. Verify pump produces 155 gpm (+30 gpm / -15 gpm tolerance): _____YES _____NO	
27. Leave valve *-V-005 in throttled position.	
28. Select hand switch *-HS-203 at *-MCC-001 for *-P-203 to the OFF position.	
29. Verify no discharge at the truck loading station.	
**-P-202 & *-P-203 – Baseline performance for pumping to Leachate Storage Tank.*	
30. Close valve 219A1-LH-V-025.	
31. Open valve 219A1-LH-V-026.	
32. Select hand switch *-HS-202 at *-MCC-001 for *-P-202 to the manual (local) position, maintain target water level discussed previously.	
33. Observe and record below the flow rate for *-FIT-202 and pressure indication at *-PI-202 and temporary pressure gage. *-FIT-202 _____ gpm *-PI-202 _____ psig Temporary gage _____ psig	
34. Verify pump produces minimum 13 gpm (+15 gpm / - 3 gpm tolerance): _____YES _____NO	
35. Open valve *-V-011.	
36. Select hand switch *-HS-202 at *-MCC-001 for *-P-202 to the OFF position.	
37. Verify no discharge at the leachate storage tank.	
38. Select hand switch *-HS-203 at *-MCC-001 for *-P-203 to the manual (local) position, maintain target water level discussed previously.	
39. Observe and record below the flow rate for *-FIT-203 and pressure indication at *-PI-203 and temporary pressure gage. *-FIT-203 _____ gpm *-PI-203 _____ psig Temporary gage _____ psig	
40. Verify pump produces minimum 155 gpm (+30 gpm / -15 gpm tolerance): _____YES _____NO	
41. Open valve *-V-005.	
42. Select hand switch *-HS-203 at *-MCC-001 for *-P-203 to the OFF position.	
43. Verify no discharge at the leachate storage tank.	
Configure valves for pump discharge at truck loading station.	
44. Close valve 219A1-LH-V-026.	
45. Open 219A1-LH-V-025.	

Test No. CAT-PC-202 & 203-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of LCRS Pumps: 219A-LH-P-202 219A-LH-P-203 IDF Cell No. 1	Completed By
**-P-202 Baseline Performance Testing for System/Pump Curve Data Collection*	
46. Operate *-P-202 by selecting hand switch *-HS-202 at *-MCC-001 to the manual (local) position, maintain target water level discussed previously.	
47. Using the data sheet at the end of this procedure (and after readings stabilize) with V-011 fully open: record discharge pressure at *-PI-202, temporary pressure gage, and flow rate at *-FIT-202.	
48. With V-011 fully open: when pump performance stabilizes (consistent flow and pressure), record currents and voltages for all three phases of pump power at disconnect *-SW-202 using the data sheet at the end of this procedure. a. Current readings for each phase shall agree with motor nameplate data (to be identified during testing). b. Current readings for each phase shall be within 10% of average ((I(p)/Average (Ia, Ib, Ic))-1) *100%. c. Voltage readings between phases shall be within 2% of average ((V(p-p)/Average(Vab, Vbc, Vca))-1)*100%.	
49. Using the data sheet at the end of this procedure (and after readings stabilize) with V-011 ½ closed: record discharge pressure at *-PI-202, temporary pressure gage, and flow rate at *-FIT-202.	
50. Using the data sheet at the end of this procedure (and after readings stabilize) with V-011 ¼ closed: record discharge pressure at *-PI-202, temporary pressure gage, and flow rate at *-FIT-202.	
51. Using the data sheet at the end of this procedure (and after readings stabilize) with V-011 fully closed (minimize fully closed position to one minute): record discharge pressure at *-PI-202, temporary pressure gage, and flow rate at *-FIT-202.	
*During the performance test, test check valve *-CV-004 as follows (remaining check valves tested during *-P-203 operation):*	
52. Verify *-V-005 is open.	
53. Open *-V-006 for a minimum of 10 minutes.	
54. Verify water does not flow out of the *-V-006 sample port.	
55. Close *-V-005.	
56. Close *-V-006.	
57. Select hand switch *-HS-202 at *-MCC-001 for *-P-202 to the OFF position.	
58. Verify no discharge.	
**-P-203 Baseline Performance Testing for System/Pump Curve Data Collection*	
59. Operate *-P-203 by selecting hand switch *-HS-203 at *-MCC-001 to the manual (local) position, maintain target water level discussed previously.	
60. Using the data sheet at the end of this procedure (and after readings stabilize) with V-005 fully open: record discharge pressure at *-PI-203, temporary pressure gage, and flow rate at *-FIT-203.	
61. With V-005 fully open: when pump performance stabilizes (consistent flow and pressure), record currents and voltages for all three phases of pump power at disconnect *-SW-203 using the data sheet at the end of this procedure. a. Current readings for each phase shall agree with motor nameplate data (to be identified during testing). b. Current readings for each phase shall be within 10% of average ((I(p)/Average (Ia, Ib, Ic))-1) *100%. c. Voltage readings between phases shall be within 2% of average ((V(p-p)/Average(Vab, Vbc, Vca))-1)*100%.	

Test No. CAT-PC-202 & 203-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of LCRS Pumps: 219A-LH-P-202 219A-LH-P-203 IDF Cell No. 1	Completed By
62. Using the data sheet at the end of this procedure (and after readings stabilize) with V-005 ½ closed: record discharge pressure at *-PI-203, temporary pressure gage, and flow rate at *-FIT-203.	
63. Using the data sheet at the end of this procedure (and after readings stabilize) with V-005 ¼ closed: record discharge pressure at *-PI-203, temporary pressure gage, and flow rate at *-FIT-203.	
64. Using the data sheet at the end of this procedure (and after readings stabilize) with V-005 fully closed (minimize fully closed position to one minute): record discharge pressure at *-PI-203, temporary pressure gage, and flow rate at *-FIT-203.	
*During the performance test, test check valves *-CV-010, *-CV-016, *-CV-023, and 219A1-LH-CV-028 as follows:*	
65. For *-CV-010, verify *-V-011 is open.	
66. Open *-V-012 for a minimum of 10 minutes.	
67. Verify water does not flow out of the *-V-012 sample port.	
68. Close *-V-011.	
69. Close *-V-012	
70. For *-CV-016, open *-V-017.	
71. Open *-V-018 for a minimum of 10 minutes.	
72. Verify water does not flow out of the *-V-018 sample port.	
73. Close *-V-017.	
74. Close *-V-018.	
75. For *-CV-023, open *-V-024 for a minimum of 10 minutes.	
76. Verify water does not flow out of *-P-205 into the CPB floor sump.	
77. Close *-V-024.	
78. For 219A1-LH-CV-028, remove plug from volute of 219A1-LH-P-302.	
79. Open 219A1-LH-V-029 for a minimum of 10 minutes.	
80. Verify water does not flow out of 219A1-LH-P-302 port.	
81. Close 219A1-LH-V-029.	
82. Re-install plug in *-P-302 volute.	
83. Select hand switch *-HS-203 at *-MCC-001 for *-P-203 to the OFF position.	
84. Verify no discharge.	

Valve Position	***-P-202 Temporary Pressure Gage (psig)**	***-FIT-202 Flow rate (gpm)**	***-PI-202 Pressure (psig)**	***-P-202 Temporary Pressure Gage (psig)**	***-FIT-203 Flow rate (gpm)**	***-PI-203 Pressure (psig)**
Full Open (see Steps 47 & 60)						
½ Closed (see Steps 49 & 62)						
¼ Closed (see Steps 50 & 63)						
Fully Closed (see Steps 51 & 64)						

Test No. CAT-PC-202 & 203-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of LCRS Pumps: 219A-LH-P-202 **219A-LH-P-203** **IDF Cell No. 1**	Completed By

*Volt and Amp Readings for Pump *-P-202, *-P-203*

Parameter	**Power Supply Phase A *-SW-202**	**Power Supply Phase B *-SW-202**	**Power Supply Phase C *-SW-202**	**Average of Phase A, B and C**	**Each Phase within 2% of Average (Y/N)**
Volts (See step 48)					
	Power Supply Phase A *-SW-202	**Power Supply Phase B *-SW-202**	**Power Supply Phase C *-SW-202**	**Average of Phase A, B and C**	**Each Phase within 10% of Average (Y/N)**
Amps (See step 48)					
	Power Supply Phase A *-SW-203	**Power Supply Phase B *-SW-203**	**Power Supply Phase C *-SW-203**	**Average of Phase A, B and C**	**Each Phase within 2% of Average (Y/N)**
Volts (See step 61)					
	Power Supply Phase A *-SW-203	**Power Supply Phase B *-SW-203**	**Power Supply Phase C *-SW-203**	**Average of Phase A, B and C**	**Each Phase within 10% of Average (Y/N)**
Amps (See step 61)					

Construction Acceptance Test	By (Print Name & Sign)	Date
Performed:		
Witnessed:		
Insp. Coord. Rep.:		

Exceptions/Discrepancies

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CH2M HILL **CONSTRUCTION ACCEPTANCE TEST**

Test No. CAT-PI-202-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Pump Insertion/Extraction Test of LCRS Pump 219A-LH-P-202. **IDF Cell No. 1**	Completed By
Test Purpose	
This test will confirm that the LCRS pump 219A-LH-P-202 can be inserted into place and then extracted from the LCRS sump via riser pipe 12”-LHCP-026.	
Equipment Identification and Notes	
1. Leachate Collection Recovery System (LCRS) is automatically controlled by the programmable logic controller located in Control Panel 219A-LH-CP-001 on the east wall of the Crest Pad Building 219A. Electric power for the pump comes from motor control center 219A-LH-MCC-001 also located in Bldg 219A. 2. Note that for the remainder of this Construction Acceptance Test procedure, an asterisk “*” will be used in place of the prefix 219A-LH for instruments, valves, process piping, and equipment. As an example, *-P-203 will be used in place of 219A-LH-P-203.	
Precautions and Limitations	
1. Interior bead at joints of HDPE riser pipe was removed during installation 2. To complete the pump insertion test, the length of discharge pipe needed to position the pump in the LCRS sump as shown on Dwg H-2-830849 Detail 1 must be known. This length shall be determined during the construction of the LCRS sump as specified in Section 11306. This measurement must occur during the construction of the LCRS sump and installation of the LCRS pump riser pipe when there is access to the perforated section of the riser pipe located in the sump. 3. When installing the pump into the riser pipe, do not secure the lifting cable to the discharge pipe.	
Prerequisites	
1. Review test procedures in Pre-Job Briefing on day of test.	
2. Piping and valves associated with this test must be labeled or tagged.	
3. Construction General Contractor (CGC) staff will conduct the CAT. The test will be witnessed by representatives of the CGC and the Construction Manager.	
4. Inspect pump and appurtenances (e.g. discharge piping, winch, hose reels) for damage or defects prior to installation.	
5. Review manufacturer’s instruction manuals associated with the pump, pipe quick connects, and winch. In the event of conflicts between manufacturer’s recommendations and this CAT procedure, discuss issues and resolve with Construction Manager’s representative.	
6. Equipment required: Manual pump removal winch as specified Plastic wire zip ties. Ties shall be nylon with stainless steel lock tab and with a minimum 50 lb. tensile strength. Hose reel as specified Anti-seize compound for stainless steel fasteners used Cotton rags Thermometers for ambient air and pipe temperature.	
7. Select pump control hand switch *-HS-202 to the OFF position. Pump control hand switch is located on the front of *-MCC-001	
8. Select pump control hand switch *-HS-203 to the OFF position.	
9. Select pump control hand switch *-HS-204 to the OFF position.	
10. Close valve *-V-007.	
11. Close valve *-V-019.	
12. Relevant documents: Pump manufacturer’s information and O&M Manual. P&ID H-2-830854 Sheet 1 Electrical wiring and connection diagrams for control panel *-CP-001.	

Test No. CAT-PI-202-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Pump Insertion/Extraction Test of LCRS Pump 219A-LH-P-202. **IDF Cell No. 1**	Completed By
Instructions	
PUMP 219A-LH-P-202 INSERTION	
1. Remove HDPE blind flange which covers the flanged end of riser pipe 12”-LHCP-026-HDPE located on the south wall of Crest Pad Building (CPB) 219A. The HDPE flange is intended to prevent foreign objects from accidentally entering the riser pipe when the pump is not installed.	
2. Secure the winch support post to the floor at its location on the centerline of the riser pipe for *-P-202.	
3. Secure the pump removal winch (with pre-wound cable) to the winch support.	
4. Secure the power conductors reel (with conductors pre-wound on reel) to the floor.	
5. Place discharge pipe sections to be added in a convenient position within the CPB.	
6. Place pump on floor of CPB 219A with its winch cable attached.	
7. Connect first section of 1-1/2” diameter discharge pipe (1-1/2”-LH-009-HDPE) to the pump.	
8. Connect electrical conductor plugs to the pump using dielectric compound and sealant as recommended by the manufacturer.	
9. Secure power conductors to discharge pipe with plastic tie wraps (3 ties per pipe section). Do not tie the lifting cable to the discharge pipe.	
10. Trim tie wrap ends after securing conductors to the pipe.	
11. Familiarize yourself with the operation of the winch.	
12. Test the automatic free-wheel lock mechanism	
13. Engage the mechanism before placing the pump and assembly into the pipe.	
14. Carefully disengage the winch free-wheel lock while always keeping one hand on the winch hand crank. Should always be ready to engage the lock mechanism in case the winch begins to free wheel. One person should be in control of the winch whenever pump is being inserted and should not leave the winch without a deliberate and systematic procedure for totally locking out the winch drum whenever the winch cable is under tension.	
15. While slowly feeding out cable from the winch and maintaining tension on the cable, place pump into the riser pipe and lower the pump until the pump housing wheels are inside the riser pipe.	
16. Confirm that the pump wheels are free to move and that the pump lifting cable is clear of the wheels.	
17. Wipe down the discharge pipe section exterior with a cotton cloth to remove debris.	
18. Using the winch to feed out cable, lower the pump and first discharge pipe section into the riser pipe.	
19. Confirm the winch is at the proper elevation to allow the cable to enter the riser pipe parallel to the pump’s discharge pipe without rubbing/damaging the riser pipe flange. If necessary, remove the pump and adjust the winch elevation as necessary before lowering the pump.	
20. As the upper end of discharge pipe approaches riser pipe flange, stop and connect next discharge pipe section.	
21. Close cam arms of the pipe coupling and use zip ties to secure the coupling arms to pipe assembly.	
22. Trim the ends of the zip ties while confirming that the zip ties will not unduly interfere with the lowering of the pipe junction down the riser pipe.	
23. Wipe off debris from the added section of discharge pipe and the conductor cables.	
24. Use zip ties (3 per pipe section) to secure the conductors to the discharge pipe.	
25. As the pump and discharge pipe assembly are lowered into the riser pipe, assure that the weight of the assembly is carried by the lifting cable and that there is no pump or pipe load on the conductors as they feed out from the hose reel.	
26. Hold the conductors up as the pump and discharge pipe assembly are fed down the riser pipe to prevent the conductors from wearing against the edge of the pipe opening.	

Test No. CAT-PI-202-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Pump Insertion/Extraction Test of LCRS Pump 219A-LH-P-202. **IDF Cell No. 1**	Completed By
27. One person should feed and guide the pipe, conductor, and cable assembly into the riser pipe entrance while the other person slowly operates the winch. As the pump/discharge pipe assembly is lowered, assist conductors in unreeling from hose reel.	
28. Keep track of the cumulative length of discharge pipe installed.	
29. Continue adding discharge pipe sections while feeding out the conductors from the hose reel as described for the first pipe section in Steps 20 through 28, until the pump reaches the position in the LCRS sump as shown on Drawing H-2-830849 Detail 1. This position is confirmed by installing the length of discharge pipe as discussed in Prerequisite #2 of this CAT procedure.	
30. As the end of the last section of discharge pipe approaches the riser pipe, position the blind flange with conductors and lifting cable routed through slot in blind flange.	
31. Bolt flange in place. Use anti-seize compound on stainless steel fasteners.	
32. Install the NPT by quick connect elbow on the discharge pipe.	
33. Record the total length of pipe connected to the pump for future reference. Discharge pipe length installed = _____ft.	
34. Unreel the remaining lifting cable and disconnect the cable's swage ball end connector from the winch drum.	
35. Coil up excess lifting cable and secure to the wall anchor attachment.	
36. At disconnect switch (*-SW-202), open the switch to the de-energized position.	
37. Attach conductors to terminals in the disconnect switch (*-SW-202), re-establishing their original positions (conductors to each side of the terminals are marked) for proper pump rotation.	
38. Connect discharge pipe fitting to flexible discharge hose mounted along wall using quick-connect coupling.	
PUMP 219A-LH-P-202 EXTRACTION	
1. If the pump extraction test does not follow the insertion test as part of one testing effort, confirm that the prerequisites on page 1 of this component CAT procedure are met before continuing with the pump extraction test.	
2. Disconnect flexible hose that connects discharge pipe fitting to wall-mounted leachate piping.	
3. If not already in place, mount the winch support post to the floor on the centerline of the riser pipe for *-P-202.	
4. At disconnect switch (*-SW-202), open the switch to the de-energized position.	
5. Confirm that conductors on each side of the terminals are marked.	
6. Disconnect conductors from terminals in the disconnect switch (*-SW-202).	
7. Secure the pump removal winch to the winch support.	
8. Mount the cable reel in the appropriate location.	
9. Familiarize yourself with the operation of the winch.	
10. Test the automatic free-wheel lock mechanism	
11. Engage the free-wheel mechanism.	
12. Connect lift cable end to winch	
13. Should always be ready to engage the lock mechanism in case the winch begins to free wheel. One person should be in control of the winch as the pump is being extracted and should never leave the winch without a deliberate and systematic procedure for totally locking out the winch drum whenever the winch cable is under tension.	
14. With the winch, wind the cable onto the winch until the cable between the riser pipe and cable reel is taunt.	
15. Remove the blind flange from the riser pipe.	
16. Using the winch, raise the pump and discharge pipe assembly until the first entire pipe section is exposed.	
17. Remove plastic tie wraps and reel up power conductors as discharge pipe is being raised.	
18. Do not allow any tie wraps or other materials to fall down the riser pipe during the removal procedure.	
19. Remove first pipe section, wiping the discharge pipe and conductors with a cotton cloth.	

Test No. CAT-PI-202-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Pump Insertion/Extraction Test of LCRS Pump 219A-LH-P-202. **IDF Cell No. 1**	Completed By
20. Use cable reel to wind up conductors as the discharge pipe sections are removed.	
21. Continue removing discharge pipe sections as described in steps 16 through 20.	
22. For the last discharge pipe section, carefully remove it and the attached leachate pump.	
23. Disconnect winch cable from pump and reel up on winch drum.	
24. Store removed pipe sections on the floor of the CPB near the west wall. Secure the removed pipe sections together in a bundle with a rope.	
25. Reinstall the blind flange cover on the riser pipe.	

Construction Acceptance Test	By (Print Name & Sign)	Date
Performed:		
Witnessed:		
Insp. Coord. Rep.:		

Exceptions/Discrepancies

CH2M HILL **CONSTRUCTION ACCEPTANCE TEST**

Test No. CAT-PI-203-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Pump Insertion/Extraction Test of LCRS Pump 219A-LH-P-203. **IDF Cell No. 1**	Completed By
Test Purpose	
This test will confirm that the LCRS pump 219A-LH-P-203 can be inserted into place and then extracted from the LCRS sump via riser pipe 18”-LHCP-025.	
Equipment Identification and Notes	
1. Leachate Collection Recovery System (LCRS) is automatically controlled by the programmable logic controller located in Control Panel 219A-LH-CP-001 on the east wall of the Crest Pad Building 219A. Electric power for the pump comes from motor control center 219A-LH-MCC-001 also located in Bldg 219A. 2. Note that for the remainder of this Construction Acceptance Test procedure, an asterisk “*” will be used in place of the prefix 219A-LH for all instruments, valves, process piping, and equipment. As an example, *-P-203 will be used in place of 219A-LH-P-203.	
Precautions and Limitations	
1. Interior bead at joints of HDPE riser pipe was removed during installation 2. To complete the pump insertion test, the length of discharge pipe needed to position the pump in the LCRS sump as shown on Dwg H-2-830849 Detail 1 must be known. This length shall be determined during the construction of the LCRS sump as specified in Section 11306. This measurement must occur during the construction of the LCRS sump and installation of the LCRS pump riser pipe when there is access to the perforated section of the riser pipe located in the sump. 3. When installing the pump into the riser pipe, do not secure the lifting cable to the discharge pipe.	
Prerequisites	
1. Review test procedures in Pre-Job Briefing on day of test.	
2. Piping and valves associated with this test must be labeled or tagged.	
3. Construction General Contractor (CGC) staff will conduct the CAT. The test will be witnessed by representatives of the CGC and the Construction Manager.	
4. Inspect pump and appurtenances (e.g. discharge piping, winch, hose reels) for damage or defects prior to installation.	
5. Review manufacturer’s instruction manuals associated with the pump, pipe quick connects, and winch. In the event of conflicts between manufacturer’s recommendations and this CAT procedure, discuss issues and resolve with Construction Manager’s representative.	
6. Equipment required: Manual pump removal winch as specified Plastic wire zip ties. Ties shall be nylon with stainless steel lock tab and with a minimum 50 lb. tensile strength. Hose reel as specified Anti-seize compound for stainless steel fasteners used Cotton rags Thermometers for ambient air and pipe temperature.	
7. Select pump control hand switch *-HS-202 to the OFF position. Pump control hand switch is located on the front of *-MCC-001	
8. Select pump control hand switch *-HS-203 to the OFF position.	
9. Select pump control hand switch *-HS-204 to the OFF position.	
10. Close valve *-V-001.	
11. Close valve *-V-019.	
12. Relevant documents: Pump manufacturer’s information and O&M Manual. P&ID H-2-830854 Sheet 1 Electrical wiring and connection diagrams for control panel *-CP-001.	

Test No. CAT-PI-203-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Pump Insertion/Extraction Test of LCRS Pump 219A-LH-P-203. **IDF Cell No. 1**	Completed By
Instructions	
PUMP 219A-LH-P-203 INSERTION	
1. Remove HDPE blind flange which covers the flanged end of riser pipe 18”-LHCP-025-HDPE located on the south wall of Crest Pad Building (CPB) 219A. The HDPE flange is intended to prevent foreign objects from accidentally entering the riser pipe when the pump is not installed.	
2. Secure the winch support post to the floor at its location on the centerline of the riser pipe for *-P-203.	
3. Secure the pump removal winch (with pre-wound cable) to the winch support.	
4. Secure the power conductors reel (with conductors pre-wound on reel) to the floor.	
5. Place discharge pipe sections to be added in a convenient position within the CPB.	
6. Place pump on floor of CPB 219A with its winch cable attached.	
7. Connect first section of 3” diameter discharge pipe (3”-LH-001-HDPE) to the pump.	
8. Connect electrical conductor plugs to the pump using dielectric compound and sealant as recommended by the manufacturer.	
9. Secure power conductors to discharge pipe with plastic tie wraps (3 ties per pipe section). Do not tie the lifting cable to the discharge pipe.	
10. Trim tie wrap ends after securing conductors to the pipe.	
11. Familiarize yourself with the operation of the winch.	
12. Test the automatic free-wheel lock mechanism	
13. Engage the mechanism before placing the pump and assembly into the pipe.	
14. Carefully disengage the winch free-wheel lock while always keeping one hand on the winch hand crank. Should always be ready to engage the lock mechanism in case the winch begins to free wheel. One person should be in control of the winch whenever pump is being inserted and should not leave the winch without a deliberate and systematic procedure for totally locking out the winch drum whenever the winch cable is under tension.	
15. While slowly feeding out cable from the winch and maintaining tension on the cable, place pump into the riser pipe and lower the pump until the pump housing wheels are inside the riser pipe.	
16. Confirm that the pump wheels are free to move and that the pump lifting cable is clear of the wheels.	
17. Wipe down the discharge pipe section exterior with a cotton cloth to remove debris.	
18. Using the winch to feed out cable, lower the pump and first discharge pipe section into the riser pipe.	
19. Confirm the winch is at the proper elevation to allow the cable to enter the riser pipe parallel to the pump’s discharge pipe without rubbing/damaging the riser pipe flange. If necessary, remove the pump and adjust the winch elevation as necessary before lowering the pump.	
20. As the upper end of discharge pipe approaches riser pipe flange, stop and connect next discharge pipe section.	
21. Close cam arms of the pipe coupling and use zip ties to secure the coupling arms to pipe assembly.	
22. Trim the ends of the zip ties while confirming that the zip ties will not unduly interfere with the lowering of the pipe junction down the riser pipe.	
23. Wipe off debris from the added section of discharge pipe and the conductor cables.	
24. Use zip ties (3 per pipe section) to secure the conductors to the discharge pipe.	
25. As the pump and discharge pipe assembly are lowered into the riser pipe, assure that the weight of the assembly is carried by the lifting cable and that there is no pump or pipe load on the conductors as they feed out from the hose reel.	
26. Hold the conductors up as the pump and discharge pipe assembly are fed down the riser pipe to prevent the conductors from wearing against the edge of the pipe opening.	
27. One person should feed and guide the pipe, conductor, and cable assembly into the riser pipe entrance while the other person slowly operates the winch. As the pump/discharge pipe assembly is lowered, assist conductors in unreeling from hose reel.	

Test No. CAT-PI-203-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Pump Insertion/Extraction Test of LCRS Pump 219A-LH-P-203. **IDF Cell No. 1**	Completed By
28. Keep track of the cumulative length of discharge pipe installed.	
29. Continue adding discharge pipe sections while feeding out the conductors from the hose reel as described for the first pipe section in Steps 20 through 28, until the pump reaches the position in the LCRS sump as shown on Drawing H-2-830849 Detail 1. This position is confirmed by installing the length of discharge pipe as discussed in Prerequisite #2 of this CAT procedure.	
30. As the end of the last section of discharge pipe approaches the riser pipe, position the blind flange with conductors and lifting cable routed through slot in blind flange.	
31. Bolt flange in place. Use anti-seize compound on stainless steel fasteners.	
32. Install the NPT by quick connect elbow on the discharge pipe.	
33. Record the total length of pipe connected to the pump for future reference. Discharge pipe length installed = _____ft.	
34. Unreel the remaining lifting cable and disconnect the cable's swage ball end connector from the winch drum.	
35. Coil up excess lifting cable and secure to the wall anchor attachment.	
36. At disconnect switch (*-SW-203), open the switch to the de-energized position.	
37. Attach conductors to terminals in the disconnect switch (*-SW-203), re-establishing their original positions (conductors to each side of the terminals are marked) for proper pump rotation.	
38. Connect discharge pipe fitting to flexible discharge hose mounted along wall using quick-connect coupling.	
PUMP 219A-LH-P-203 EXTRACTION	
1. If the pump extraction test does not follow the insertion test as part of one testing effort, confirm that the prerequisites on page 1 of this component CAT procedure are met before continuing with the pump extraction test.	
2. Disconnect flexible hose that connects discharge pipe fitting to wall-mounted leachate piping.	
3. If not already in place, mount the winch support post to the floor on the centerline of the riser pipe for *-P-203.	
4. At disconnect switch (*-SW-203), open the switch to the de-energized position.	
5. Confirm that conductors on each side of the terminals are marked.	
6. Disconnect conductors from terminals in the disconnect switch (*-SW-203).	
7. Secure the pump removal winch to the winch support.	
8. Mount the cable reel in the appropriate location.	
9. Familiarize yourself with the operation of the winch.	
10. Test the automatic free-wheel lock mechanism	
11. Engage the free-wheel mechanism.	
12. Connect lift cable end to winch	
13. Should always be ready to engage the lock mechanism in case the winch begins to free wheel. One person should be in control of the winch as the pump is being extracted and should never leave the winch without a deliberate and systematic procedure for totally locking out the winch drum whenever the winch cable is under tension.	
14. With the winch, wind the cable onto the winch until the cable between the riser pipe and cable reel is taunt.	
15. Remove the blind flange from the riser pipe.	
16. Using the winch, raise the pump and discharge pipe assembly until the first entire pipe section is exposed.	
17. Remove plastic tie wraps and reel up power conductors as discharge pipe is being raised.	
18. Do not allow any tie wraps or other materials to fall down the riser pipe during the removal procedure.	
19. Remove first pipe section, wiping the discharge pipe and conductors with a cotton cloth.	
20. Use cable reel to wind up conductors as the discharge pipe sections are removed.	
21. Continue removing discharge pipe sections as described in steps 16 through 20.	

Test No. CAT-PI-203-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Pump Insertion/Extraction Test of LCRS Pump 219A-LH-P-203. **IDF Cell No. 1**	Completed By
22. For the last discharge pipe section, carefully remove it and the attached leachate pump.	
23. Disconnect winch cable from pump and reel up on winch drum.	
24. Store removed pipe sections on the floor of the CPB near the west wall. Secure the removed pipe sections together in a bundle with a rope.	
25. Reinstall the blind flange cover on the riser pipe.	

Construction Acceptance Test	By (Print Name & Sign)	Date
Performed:		
Witnessed:		
Insp. Coord. Rep.:		

Exceptions/Discrepancies

Test No. CAT-PC-204-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of LDS Pump: 219A-LH-P-204 **IDF Cell No. 1**	Completed By

Test Purpose

This test will confirm the capacity of leachate pump 219A-LH-P-204 which is specified by IDF Technical Specifications (RPP-18489) Section 11306-03.

Equipment Identification and Notes

1. Note that for the remainder of this Construction Acceptance Test procedure, an asterisk "*" will be used in place of the prefix 219A-LH for most instruments, valves, process piping, and equipment. As an example, *-P-204 will be used in place of 219A-LH-P-204.
2. Leachate Collection Recovery System (LCRS) is automatically controlled by the PLC that is located within panel CP-001 in the crest pad building (CPB).
3. Equipment/instrumentation associated with the LCRS testing includes:
   a. Low Flow Pump *-P-204 and associated flowmeter *-FIT-204.
   b. Control Panel *-CP-001.
   c. Motor Control Center (MCC) *-MCC-001.
   d. Truck Loading Flowmeter *-FIT-302.

Additional Definitions and Abbreviations

1. Leak Detection System (LDS).
2. Leachate Transfer Building (LTB).
3. Raw Water (RW).

Precautions and Limitations

1. Precautions shall be taken during testing (as described below) to maintain target water level to simulate worst case pumping situation and to prevent pump from running dry.	
2. If leaking is observed at CPB, LTB, side slope piping, or combined sump during testing, shut down test and repair leak.	
3. Pump discharge piping up side slope shall be in final configuration using pipe disconnects in the pipe string.	
4. Verify flexible hoses from LCRS low and high flow manifolds in CPB are not connected to LCRS pump discharge or riser pipes. This step is to ensure that a leaking check valve does not allow water to backflow into the LCRS sump undetected.	

Prerequisites

1. Review test procedures in Pre-Job Briefing on day of test.	
2. Confirm the following procedure is complete: PICS testing.	
3. Confirm the following procedure is complete: Leachate pipe hydrostatic leak testing.	
4. Confirm the following procedure is complete: CAT-TT-300-A (leachate storage tank leak testing).	
5. Confirm the following procedure is complete: CAT-PC-202&203-A (LCRS pump testing).	
6. Confirm the following procedure is complete: CAT-PC-302-A (leachate transfer pump testing).	
7. Piping and valves associated with this test procedure must be labeled or tagged.	
8. Construction General Contractor (CGC) staff will conduct the CAT. The test will be witnessed by representatives of the CGC and the Construction Manager.	

Test No. CAT-PC-204-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of LDS Pump: 219A-LH-P-204 **IDF Cell No. 1**	Completed By
9. Equipment required: a. Equipment as necessary to maintain water level in tank and collect water at truck loading station during testing. b. Tank(s) sized as required to maintain minimum water level above pump. Size will vary depending on method used for maintaining water level in tank (recycling water is recommended). c. Volt/current meter for measuring volts and amps within respective 480-volt disconnects: Meter type_____ ID No. _____ Calibration Expiration Date:_____ d. Temporary flexible hoses and piping/fittings located immediately after pump discharge and where side slope riser piping transitions to the piping manifold in the CPB shall be minimum 4-inch diameter to minimize friction losses during pump test. e. A temporary pressure gage with petcock for stabilizing pressure gage dial indication shall be provided immediately after pump. Gage shall have minimum 1-psi increments.	

Initial circuit breaker and valve alignments shall be as follows (for discharge at truck loading station):

10. Turn *-HS-202 OFF in *-MCC-001 for Pump *-P-202.	
11. Turn *-HS-203 OFF in *-MCC-001 for Pump *-P-203.	
12. Turn *-HS-204 OFF in *-MCC-001 for Pump *-P-204.	
13. Turn *-HS-205 OFF in *-MCC-001 for Pump *-P-205.	
14. Turn 219A1-LH-HS-207 OFF in *-MCC-001 for Pump 219A1-LH-P-207.	
15. Turn 219A1-LH-HS-302 OFF in 219A1-LH-LCP-005 for Pump 219A1-LH-P-302.	
16. Open Cell No. 1 pump disconnect *-SW-202 located in the CPB.	
17. Open Cell No. 1 pump disconnect *-SW-203 located in the CPB.	
18. Open Cell No. 1 pump disconnect *-SW-204 located in the CPB.	
19. Open Cell No. 1 pump disconnect 219A1-LH-SW-302, located inside the LTB.	
20. Open valve *-V-013.	
21. Open valve *-V-014.	
22. Open valve *-V-015.	
23. Open valve *-V-017.	
24. Open valve *-V-021.	
25. Place valve *-V-047 in the filter position.	
26. Open valve *-V-048.	
27. Open valve 219A1-LH -V-025.	
28. Open valve 219A1-LH-V-037.	
29. Close valve *-V-018	
30. Close valve *-V-019	
31. Close valve *-V-011	
32. Close valve *-V-005	
33. Close valve *-V-024	
34. Close valve *-V-049	
35. Close valve *-V-050	
36. Close valve *-V-051	
37. Close valve 219A1-LH-V-026	
38. Close valve 219A1-LH-V-029	
39. Close valve 219A1-LH-V-041	

Test No. CAT-PC-204-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of LDS Pump: 219A-LH-P-204 **IDF Cell No. 1**	Completed By
40. Close valve 219A1-LH-V-036	
41. *-MCC-001shall be energized.	
42. Relevant documents: P&IDs (H-2-830854 sheets 1 & 2) Electrical wiring and connection diagrams for control panel *-CP-001. Pump manufacturer's information and O&M Manual. System/Pump curve data Pump Motor Nameplate data. Electrical test results from EPG manufacturer's tests.	
43. Verify RW system will be operational for duration of testing.	
Instructions	
**-P-204 – Baseline performance for pumping to Truck Loading Station.*	
1. Place tank on the operations layer of Cell No. 1 on its north/south centerline and adjacent to the north toe of slope.	
2. Connect *-P-204 to temporary piping/flexible hose that includes a calibrated (see below if applicable) or new pressure gage. Temporary pressure gage type_____ ID No. _____ Calibration Expiration Date:_____	
3. Connect temporary piping/flex hose to 1-1/2"-LH-015-HDPE discharge pipe which is temporarily routed above ground up the side slope to the CPB.	
4. Place LDS pump into bottom of tank.	
5. Connect temporary flexible hose from side slope discharge pipe to associated 1-1/2" leachate piping manifold quick connect inside the CPB.	
6. Begin filling tank with water until water level is 1 inch above the top pump rollers.	
7. Mark this water level inside the tank with tape or permanent marker.	
8. Add another mark inside the tank two inches above previous mark.	
9. The lower mark is the minimum and target water level to be maintained during the pumping test except during initial pipe filling and pump stabilization. Once pump has stabilized, adjust water level such that it doesn't exceed the second mark.	
10. Close power disconnect *-SW-204 for LDS pump.	
11. Select hand switch *-HS-204 at *-MCC-001 for *-P-204 to the manual (local) position, and maintain target water level discussed previously.	
12. While pump *-P-204 is operating, slowly open sample valve *-V-018, observe flow, and then close sample valve.	
13. Observe and record below the flow rates for *-FIT-204 and 219A1-LH-FIT-302 and pressure indication at *-PI-204 and temporary pressure gage. *-FIT-204 _____ gpm 219A1-LH-FIT-302 _____ gpm *-PI-204 _____ psig Temporary gage _____ psig & height above pump centerline _____ ft	

Test No. CAT-PC-204-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of LDS Pump: 219A-LH-P-204 **IDF Cell No. 1**	Completed By
14. Throttle valve *-V-017 until temporary pressure gage increases 4 psig (this simulates actual installation head conditions). Observe and record below the flow rates for *-FIT-204, *-PI-204 and temporary pressure gage. *-FIT-204 _____ gpm *-PI-204 _____ psig Temporary gage _____ psig	
15. Verify pump produces minimum 4 gpm (+10 gpm / -2 gpm tolerance): _____YES _____NO	
16. Leave valve *-V-017 in throttled position.	
17. Select hand switch *-HS-204 at *-MCC-001 for *-P-204 to the OFF position.	
18. Verify no discharge at the truck loading station.	
**-P-204 – Baseline performance for pumping to Leachate Storage Tank.*	
19. Close valve 219A1-LH-V-025.	
20. Open valve 219A1-LH-V-026.	
21. Select hand switch *-HS-204 at *-MCC-001 for *-P-204 to the manual (local) position, maintain target water level discussed previously.	
22. Observe and record below the flow rate for *-FIT-204 and pressure indication at *-PI-204 and temporary pressure gage. *-FIT-204 _____ gpm *-PI-204 _____ psig Temporary gage _____ psig	
23. Verify pump produces minimum 4 gpm (+10 gpm / -2 gpm tolerance): _____YES _____NO	
24. Open valve *-V-017.	
25. Select hand switch *-HS-204 at *-MCC-001 for *-P-204 to the OFF position.	
26. Verify no discharge at the leachate storage tank.	
Configure valves for pump discharge at truck loading station.	
27. Close valve 219A1-LH-V-026.	
28. Open valve 219A1-LH-V-025.	
**-P-204 Baseline Performance Testing for System/Pump Curve Data Collection*	
29. Operate *-P-204 by selecting hand switch *-HS-204 at *-MCC-001 to the manual (local) position, maintain target water level discussed previously.	
30. Using the data sheet at the end of this procedure (and after readings stabilize) with V-017 fully open: record discharge pressure at *-PI-204, temporary pressure gage, and flow rate at *-FIT-204.	

Test No. CAT-PC-204-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of LDS Pump: 219A-LH-P-204 **IDF Cell No. 1**	Completed By
31. With V-017 fully open: when pump performance stabilizes (consistent flow and pressure), record currents and voltages for all three phases of pump power at disconnect *-SW-204 using the data sheet at the end of this procedure. a. Current readings for each phase shall agree with motor nameplate data (to be identified during testing). b. Current readings for each phase shall be within 10% of average ((I(p)/Average (Ia, Ib, Ic))-1) *100%. c. Voltage readings between phases shall be within 2% of average ((V(p-p)/Average(Vab, Vbc, Vca))-1)*100%.	
32. Using the data sheet at the end of this procedure (and after readings stabilize) with V-017 ½ closed: record discharge pressure at *-PI-204, temporary pressure gage, and flow rate at *-FIT-204.	
33. Using the data sheet at the end of this procedure (and after readings stabilize) with V-017 ¼ closed: record discharge pressure at *-PI-204, temporary pressure gage, and flow rate at *-FIT-204.	
34. Using the data sheet at the end of this procedure (and after readings stabilize) with V-017 fully closed (minimize fully closed position to one minute): record discharge pressure at *-PI-204, temporary pressure gage, and flow rate at *-FIT-204.	
35. Select hand switch *-HS-204 at *-MCC-001 for *-P-204 to the OFF position.	
36. Verify no discharge.	

Valve Position	**Temporary Pressure Gage (psig)**	***-FIT-204 Flow rate (gpm)**	***-PI-204 Pressure (psig)**	**N/A**	**N/A**
Full Open (see Step 30)				-	-
½ Closed (see Step 32)				-	-
¼ Closed (see Step 33)				-	-
Fully Closed (see Step 34)				-	-

*Volt and Amp Readings for Pump *-P-204*

Parameter	**Power Supply Phase A *-SW-204***	**Power Supply Phase B *-SW-204***	**Power Supply Phase C *-SW-204***	**Average of Phase A, B and C**	**Each Phase within 2% of Average (Y/N)**
Volts (see Step 31)					
	Power Supply Phase A *-SW-204*	**Power Supply Phase B *-SW-204***	**Power Supply Phase C *-SW-204***	**Average of Phase A, B and C**	**Each Phase within 10% of Average (Y/N)**
Amps (see Step 31)					

Construction Acceptance Test	By (Print Name & Sign)	Date
Performed:		
Witnessed:		
Insp. Coord. Rep.:		

Exceptions/Discrepancies

CH2M HILL **CONSTRUCTION ACCEPTANCE TEST**

Test No. CAT-PI-204-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Pump Insertion/Extraction Test of LDS Pump 219A-LH-P-204. **IDF Cell No. 1**	Completed By
Test Purpose	
This test will confirm that the LDS pump 219A-LH-P-204 can be inserted into place and then extracted from the LDS sump via riser pipe 12”-LHCP-027.	
Equipment Identification and Notes	
1. Leachate Collection Recovery System (LCRS) is automatically controlled by the programmable logic controller located in Control Panel 219A-LH-CP-001 on the east wall of the Crest Pad Building 219A. Electric power for the pump comes from motor control center 219A-LH-MCC-001 also located in Bldg 219A. 2. Note that for the remainder of this Construction Acceptance Test procedure, an asterisk “*” will be used in place of the prefix 219A-LH for instruments, valves, process piping, and equipment. As an example, *-P-204 will be used in place of 219A-LH-P-204.	
Precautions and Limitations	
1. Interior bead at joints of HDPE riser pipe was removed during installation 2. To complete the pump insertion test, the length of discharge pipe needed to position the pump in the LDS sump as shown on Dwg H-2-830849 Detail 1 must be known. This length shall be determined during the construction of the LDS sump as specified in Section 11306. This measurement must occur during the construction of the LDS sump and installation of the LDS pump riser pipe when there is access to the perforated section of the riser pipe located in the sump. 3. When installing the pump into the riser pipe, do not secure the lifting cable to the discharge pipe.	
Prerequisites	
1. Review test procedures in Pre-Job Briefing on day of test.	
2. Piping and valves associated with this test must be labeled or tagged.	
3. Construction General Contractor (CGC) staff will conduct the CAT. The test will be witnessed by representatives of the CGC and the Construction Manager.	
4. Inspect pump and appurtenances (e.g. discharge piping, winch, hose reels) for damage or defects prior to installation.	
5. Review manufacturer’s instruction manuals associated with the pump, pipe quick connects, and winch. In the event of conflicts between manufacturer’s recommendations and this CAT procedure, discuss issues and resolve with Construction Manager’s representative.	
6. Equipment required: Manual pump removal winch as specified Plastic wire zip ties. Ties shall be nylon with stainless steel lock tab and with a minimum 50 lb. tensile strength. Hose reel as specified Anti-seize compound for stainless steel fasteners used Cotton rags Thermometers for ambient air and pipe temperature.	
7. Select pump control hand switch *-HS-202 to the OFF position. Pump control hand switch is located on the front of *-MCC-001	
8. Select pump control hand switch *-HS-203 to the OFF position.	
9. Select pump control hand switch *-HS-204 to the OFF position.	
10. Close valve *-V-013.	
11. Close valve *-V-019.	
12. Relevant documents: Pump manufacturer’s information and O&M Manual. P&ID H-2-830854 Sheet 1 Electrical wiring and connection diagrams for control panel *-CP-001.	

Test No. CAT-PI-204-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Pump Insertion/Extraction Test of LDS Pump 219A-LH-P-204. **IDF Cell No. 1**	Completed By
Instructions	
PUMP 219A-LH-P-204 INSERTION	
1. Remove HDPE blind flange which covers the flanged end of riser pipe 12”-LHCP-027-HDPE located on the south wall of Crest Pad Building (CPB) 219A. The HDPE flange is intended to prevent foreign objects from accidentally entering the riser pipe when the pump is not installed.	
2. Secure the winch support post to the floor at its location on the centerline of the riser pipe for *-P-204.	
3. Secure the pump removal winch (with pre-wound cable) to the winch support.	
4. Secure the power conductors reel (with conductors pre-wound on reel) to the floor.	
5. Place discharge pipe sections to be added in a convenient position within the CPB.	
6. Place pump on floor of CPB 219A with its winch cable attached.	
7. Connect first section of 1-1/2” diameter discharge pipe (1-1/2”-LH-015-HDPE) to the pump.	
8. Connect electrical conductor plugs to the pump using dielectric compound and sealant as recommended by the manufacturer.	
9. Secure power conductors to discharge pipe with plastic tie wraps (3 ties per pipe section). Do not tie the lifting cable to the discharge pipe.	
10. Trim tie wrap ends after securing conductors to the pipe.	
11. Familiarize yourself with the operation of the winch.	
12. Test the automatic free-wheel lock mechanism	
13. Engage the mechanism before placing the pump and assembly into the pipe.	
14. Carefully disengage the winch free-wheel lock while always keeping one hand on the winch hand crank. Should always be ready to engage the lock mechanism in case the winch begins to free wheel. One person should be in control of the winch whenever pump is being inserted and should not leave the winch without a deliberate and systematic procedure for totally locking out the winch drum whenever the winch cable is under tension.	
15. While slowly feeding out cable from the winch and maintaining tension on the cable, place pump into the riser pipe and lower the pump until the pump housing wheels are inside the riser pipe.	
16. Confirm that the pump wheels are free to move and that the pump lifting cable is clear of the wheels.	
17. Wipe down the discharge pipe section exterior with a cotton cloth to remove debris.	
18. Using the winch to feed out cable, lower the pump and first discharge pipe section into the riser pipe.	
19. Confirm the winch is at the proper elevation to allow the cable to enter the riser pipe parallel to the pump’s discharge pipe without rubbing/damaging the riser pipe flange. If necessary, remove the pump and adjust the winch elevation as necessary before lowering the pump.	
20. As the upper end of discharge pipe approaches riser pipe flange, stop and connect next discharge pipe section.	
21. Close cam arms of the pipe coupling and use zip ties to secure the coupling arms to pipe assembly.	
22. Trim the ends of the zip ties while confirming that the zip ties will not unduly interfere with the lowering of the pipe junction down the riser pipe.	
23. Wipe off debris from the added section of discharge pipe and the conductor cables.	
24. Use zip ties (3 per pipe section) to secure the conductors to the discharge pipe.	
25. As the pump and discharge pipe assembly are lowered into the riser pipe, assure that the weight of the assembly is carried by the lifting cable and that there is no pump or pipe load on the conductors as they feed out from the hose reel.	
26. Hold the conductors up as the pump and discharge pipe assembly are fed down the riser pipe to prevent the conductors from wearing against the edge of the pipe opening.	

Test No. CAT-PI-204-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Pump Insertion/Extraction Test of LDS Pump 219A-LH-P-204. **IDF Cell No. 1**	Completed By
27. One person should feed and guide the pipe, conductor, and cable assembly into the riser pipe entrance while the other person slowly operates the winch. As the pump/discharge pipe assembly is lowered, assist conductors in unreeling from hose reel.	
28. Keep track of the cumulative length of discharge pipe installed.	
29. Continue adding discharge pipe sections while feeding out the conductors from the hose reel as described for the first pipe section in Steps 20 through 28, until the pump reaches the position in the LDS sump as shown on Drawing H-2-830849 Detail 1. This position is confirmed by installing the length of discharge pipe as discussed in Prerequisite #2 of this CAT procedure.	
30. As the end of the last section of discharge pipe approaches the riser pipe, position the blind flange with conductors and lifting cable routed through slot in blind flange.	
31. Bolt flange in place. Use anti-seize compound on stainless steel fasteners.	
32. Install the NPT by quick connect elbow on the discharge pipe.	
33. Record the total length of pipe connected to the pump for future reference. Discharge pipe length installed = _____ft.	
34. Unreel the remaining lifting cable and disconnect the cable's swage ball end connector from the winch drum.	
35. Coil up excess lifting cable and secure to the wall anchor attachment.	
36. At disconnect switch (*-SW-204), open the switch to the de-energized position.	
37. Attach conductors to terminals in the disconnect switch (*-SW-204), re-establishing their original positions (conductors to each side of the terminals are marked) for proper pump rotation.	
38. Connect discharge pipe fitting to flexible discharge hose mounted along wall using quick-connect coupling.	
PUMP 219A-LH-P-204 EXTRACTION	
1. If the pump extraction test does not follow the insertion test as part of one testing effort, confirm that the prerequisites on page 1 of this component CAT procedure are met before continuing with the pump extraction test.	
2. Disconnect flexible hose that connects discharge pipe fitting to wall-mounted leachate piping.	
3. If not already in place, mount the winch support post to the floor on the centerline of the riser pipe for *-P-204.	
4. At disconnect switch (*-SW-204), open the switch to the de-energized position.	
5. Confirm that conductors on each side of the terminals are marked.	
6. Disconnect conductors from terminals in the disconnect switch (*-SW-204).	
7. Secure the pump removal winch to the winch support.	
8. Mount the cable reel in the appropriate location.	
9. Familiarize yourself with the operation of the winch.	
10. Test the automatic free-wheel lock mechanism	
11. Engage the free-wheel mechanism.	
12. Connect lift cable end to winch	
13. Should always be ready to engage the lock mechanism in case the winch begins to free wheel. One person should be in control of the winch as the pump is being extracted and should never leave the winch without a deliberate and systematic procedure for totally locking out the winch drum whenever the winch cable is under tension.	
14. With the winch, wind the cable onto the winch until the cable between the riser pipe and cable reel is taunt.	
15. Remove the blind flange from the riser pipe.	
16. Using the winch, raise the pump and discharge pipe assembly until the first entire pipe section is exposed.	
17. Remove plastic tie wraps and reel up power conductors as discharge pipe is being raised.	
18. Do not allow any tie wraps or other materials to fall down the riser pipe during the removal procedure.	
19. Remove first pipe section, wiping the discharge pipe and conductors with a cotton cloth.	

Test No. CAT-PI-204-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Pump Insertion/Extraction Test of LDS Pump 219A-LH-P-204. **IDF Cell No. 1**	Completed By
20. Use cable reel to wind up conductors as the discharge pipe sections are removed.	
21. Continue removing discharge pipe sections as described in steps 16 through 20.	
22. For the last discharge pipe section, carefully remove it and the attached leachate pump.	
23. Disconnect winch cable from pump and reel up on winch drum.	
24. Store removed pipe sections on the floor of the CPB near the west wall. Secure the removed pipe sections together in a bundle with a rope.	
25. Reinstall the blind flange cover on the riser pipe.	

Construction Acceptance Test	By (Print Name & Sign)	Date
Performed:		
Witnessed:		
Insp. Coord. Rep.:		

Exceptions/Discrepancies

CH2M HILL **COMPONENT CONSTRUCTION ACCEPTANCE TEST**

Test No. CAT-PC-302-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of Leachate Transfer Pump: 219A1-LH-P-302 **IDF Cell No. 1**	Completed By
Test Purpose	
This test will confirm the capacity of the leachate transfer pump 219A1-LH-P-302 which is specified by IDF Technical Specifications (RPP-18489) Section 11312.	
Equipment Identification and Notes	
1. Note that for the remainder of this Construction Acceptance Test procedure, an asterisk "*" will be used in place of the prefix 219A1-LH for most instruments, valves, process piping, and equipment. As an example, *-P-302 will be used in place of 219A1-LH-P-302. 2. The leachate transfer pump in the leachate transfer building (LTB) is manually controlled by panel *-LCP-005 located in the LTB. 3. Equipment/instrumentation associated with the leachate transfer pump testing includes: a. Leachate Transfer Pump *-P-302 and associated flowmeter *-FIT-302. b. Control Panel *-LCP-005. c. Motor Control Center (MCC) *-MCC-001. d. Combined Sump Pump *-P-207 e. Leachate Storage Tank 219A201-LH-TK-300 Additional Definitions and Abbreviations 1. Crest Pad Building (CPB). 2. Water Column (WC).	
Precautions and Limitations	
1. Precautions shall be taken during testing so that water level does not drop below the pump intake located in the leachate tank (to prevent pump from running dry).	
2. If leaking is observed at LTB or combined sump during testing, shut down test and repair leak.	
Prerequisites	
1. Review test procedures in Pre-Job Briefing on day of test.	
2. Confirm the following procedure is complete: PICS testing.	
3. Confirm the following procedure is complete: leachate pipe hydrostatic leak testing	
4. Confirm the following procedure is complete: CAT-PC-207-A (combined sump pump testing).	
5. Verify leachate tank available for testing.	
6. Piping and valves associated with this test procedure must be labeled or tagged.	
7. Construction General Contractor (CGC) staff will conduct the CAT. The test will be witnessed by representatives of the CGC and the Construction Manager.	
8. Equipment required: a. Volt/current meter for measuring volts and amps within respective 480-volt disconnects: Meter type_____ ID No. _____ Calibration Expiration Date:_____ b. Flexible hose	
9. Turn 219A-LH-HS-202 OFF in 219A-LH-MCC-001 for Pump 219A-LH-P-202	
10. Turn 219A-LH-HS-203 OFF in 219A-LH-MCC-001 for Pump 219A-LH-P-203.	
11. Turn 219A-LH-HS-204 OFF in 219A-LH-MCC-001 for Pump 219A-LH-P-204.	
12. Turn 219A-LH-HS-205 OFF in 219A-LH-MCC-001 for Pump 219A-LH-P-205.	
13. Turn *-HS-207 OFF in 219A-LH-MCC-001 for Pump *-P-207.	
14. Turn *-HS-302 OFF in *-LCP-005 for Pump *-P-302.	
15. Open Cell No. 1 pump disconnect 219A-LH-SW-202 located in the CPB.	

Test No. CAT-PC-302-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of Leachate Transfer Pump: 219A1-LH-P-302 **IDF Cell No. 1**	Completed By
16. Open Cell No. 1 pump disconnect 219A-LH-SW-203 located in the CPB.	
17. Open Cell No. 1 pump disconnect 219A-LH-SW-204 located in the CPB.	
18. Open Cell No. 1 pump disconnect *-SW-302, located inside the LTB.	
19. Open valve *-V-027.	
20. Open valve *-V-043.	
21. Open valve *-V-029.	
22. Open valve *-V-040.	
23. Open valve *-V-037.	
24. Open valve *-V-031.	
25. Close valve *-V-025.	
26. Close valve *-V-041.	
27. Close valve *-V-036.	
28. 219A-LH-MCC-001 shall be energized.	
29. Relevant documents: P&IDs (H-2-830854 sheets 1 & 2) Electrical wiring and connection diagrams for control panel *-LCP-005. Pump manufacturer's information and O&M Manual. System/Pump curve data Pump Motor Nameplate data.	
30. Verify RW system will be operational for duration of testing.	
31. Verify minimum 24" of raw water in leachate tank.	
Instructions	
**-P-302 Baseline Performance Testing for System/Pump Curve Data Collection*	
1. Install the necessary fittings and minimum 6 inch diameter flex hose as necessary to connect to the overhead discharge quick connect at the truck loading station.	
2. Install the other end of the minimum 6 inch diameter flex hose within the west sump of the truck loading pad.	
3. Secure in place.	
4. Record *-PI-303 before pumping begins: *-PI-303 _____ inches WC	
5. Select Cell No. 1 Combined Sump Pump's pump control hand switch, *-HS-207, to AUTO position. This pump control hand switch is located on the front of 219A-LH-MCC-001 in the CPB.	
6. Close leachate transfer pump disconnect switch *-SW-302.	
7. Operate *-P-302 by selecting hand switch *-HS-302 located on *-LCP-005 to the manual (local) position.	
8. Verify water flowing from truck loading pad sumps to the combined sump pump chamber is being pumped to the leachate storage tank by the combined sump pump *-P-207.	
9. Using the data sheet at the end of this procedure (and after readings stabilize) with V-037 fully open: record discharge pressure at *-PI-302, *-PI-303, and flow rate at *-FIT-302. Continue pumping for minimum 30 minutes.	
10. With V-037 fully open: when pump performance stabilizes (consistent flow and pressure), record currents and voltages for all three phases of pump power at disconnect *-SW-302 using the data sheet at the end of this procedure. a. Current readings for each phase shall agree with motor nameplate data (to be identified during testing). b. Current readings for each phase shall be within 10% of average ((I(p)/Average (Ia, Ib, Ic))-1) *100%. c. Voltage readings between phases shall be within 2% of average ((V(p-p)/Average(Vab, Vbc, Vca))-1)*100%.	
11. Using the data sheet at the end of this procedure (and after readings stabilize) with V-037 ½ closed: record discharge pressure at *-PI-302, *-PI-303, and flow rate at *-FIT-302.	

Test No. CAT-PC-302-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Operational Test of Leachate Transfer Pump: 219A1-LH-P-302 **IDF Cell No. 1**	Completed By
12. Using the data sheet at the end of this procedure (and after readings stabilize) with V-037 ¼ closed: record discharge pressure at *-PI-302, *-PI-303, and flow rate at *-FIT-302.	
13. Using the data sheet at the end of this procedure (and after readings stabilize) with V-037 fully closed (minimize fully closed position to one minute): record discharge pressure at *-PI-302, *-PI-303, and flow rate at *-FIT-302.	
14. Verify pump produces minimum 250 gpm (+25 gpm / -15 gpm tolerance): _____YES _____NO	
15. Select hand switch *-HS-302 at *-LCP-005 for *-P-302 to the OFF position and verify no discharge at truck loading station.	
16. Allow combined sump pump *-P-207 to drain pump chamber and automatically turn off.	
17. Select combined sump pump control hand switch, *-HS-207 to OFF position.	

Valve Position	***-FIT-302 Flow rate (gpm)**	***-PI-302 Pressure (psig)**	***-PI-303 Pressure (inches WC)**	**N/A**	**N/A**
Full Open (See Step 9)				-	-
½ Closed (See Step 11)				-	-
¼ Closed (See Step 12)				-	-
Fully Closed (See Step 13)				-	-

*Volt and Amp Readings for Pump *-P-302*

Parameter	**Power Supply Phase A *-SW-302***	**Power Supply Phase B *-SW-302***	**Power Supply Phase C *-SW-302***	**Average of Phase A, B and C**	**Each Phase within 2% of Average (Y/N)**
Volts (See Step 10)					
	Power Supply Phase A *-SW-302*	**Power Supply Phase B *-SW-302***	**Power Supply Phase C *-SW-302***	**Average of Phase A, B and C**	**Each Phase within 10% of Average (Y/N)**
Amps (See Step 10)					

Construction Acceptance Test	By (Print Name & Sign)	Date
Performed:		
Witnessed:		
Insp. Coord. Rep.:		

Exceptions/Discrepancies

CH2M HILL **CONSTRUCTION ACCEPTANCE TEST**

Test No. CAT-TT-300-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Tank Tightness Test of Leachate Tank 219A201-LH-TK-300. **IDF Cell No. 1**	Completed By
Test Purpose	
This test will determine if the Leachate Storage Tank 219A201-LH-TK-300 can pass the 30 day long tightness test as specified in Section 13205 of the IDF Technical Specifications (RPP-18489).	
Equipment Identification and Notes	
1. Tank 219A201-LH-TK-300 is a storage tank for leachate from IDF Cell No. 1 and is part of the Leachate Collection Recovery System (LCRS). 2. The specified tank tightness test for the Leachate Storage Tanks requires the water level in the tank initially be held for 2 days at 7.2 feet then the tank level is to be cycled between approximately 0.5 to 7 feet for 4 cycles during a period of 28 days. It will required over 400,000 gallons of water to fill the tank for each cycle. Rather than refilling the tank each cycle with water from the raw water pipeline hydrant, the construction acceptance test process described in CAT-TT-300 assumes that the water can be recycled by using leachate transfer pumps, combined sumps and combined sump pumps to transfer the water between the two leachate storage tanks. 3. Unless noted otherwise, for the remainder of this Construction Acceptance Test procedure, an asterisk "*" will be used in place of the prefix 219A-LH for most instruments, valves, process piping, and equipment. As an example, *-P-302 will be used in place of 219A-LH-P-302.	
Precautions and Limitations	
1. During the tightness test for this tank, the tank shall be isolated by closing the valves on leachate handling pipelines connected to the tank except as described in the directions for this construction acceptance test.	
2. Upon completion of the tank tightness testing, dispose of test water as directed by the Construction Manager.	
Prerequisites	
1. Review test procedures in Pre-Job Briefing on day of test.	
2. Piping and valves associated with this test must be labeled or tagged.	
3. Construction General Contractor (CGC) staff will conduct the CAT. The test will be witnessed by representatives of the CGC and the Construction Manager.	
4. Tank manufacturer shall complete an electronic leak location survey of the tank's primary and secondary liners prior to the start of the tank tightness test.	
5. Complete the pressure testing of leachate handling piping and containment piping which is needed to support the leachate tank tightness test. Pressure testing is specified in IDF specifications 15060 and 15992.	
6. Successful completion of 8-hr leak test of Combined Sump inner and outer manhole sections (see specification 15022).	
7. Successful completion of CAT-PC-302-A (Cell No. 1 Leachate Transfer Pump) and CAT-PC-302-E (Cell No. 2 Leachate Transfer Pump).	
8. Leachate Storage Tank 219E201-LH-TK-300 (Cell No. 2 Tank) is ready for tank tightness testing and is available for use.	
9. Equipment required: Temporary piping, hoses and couplings to support pumping water from the Cell No. 1 Leachate Storage Tank using Leachate Transfer Pump 219A1-LH-P-302 and discharging directly into the Cell No. 2 Leachate Storage Tank (219E201-LH-TK-300). Provide necessary fittings to discharge beneath the tank's floating cover without damaging the cover or liner. Equipment to measure tank depth to the nearest 0.1 feet if the tank level transmitter (219A201-LH-LT-301) is not available at control panel *-CP-001 in the Crest Pad Building (CPB).	
10. Place valve 219A-LH-V-047 in the filter position.	
11. Close valve 219A-LH-V-048.	
12. Close valve 219A-LH-V-049.	
13. Open valve 219A1-LH-V-039 which is located in the leak detection chamber of the Combined Sump.	

Test No. CAT-TT-300-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Tank Tightness Test of Leachate Tank 219A201-LH-TK-300. **IDF Cell No. 1**	Completed By
14. Close valve 219A1-LH-V-025.	
15. Close valve 219A1-LH-V-026.	
16. Close valve 219A1-LH-V-027.	
17. Close valve 219A1-LH-V-029.	
18. Close valve 219A1-LH-V-031.	
19. Close valve 219A1-LH-V-041.	
20. Turn off the circuit breaker in *-MCC-001 for Pump *-P-202.	
21. Turn off the circuit breaker in *-MCC-001 for Pump *-P-203.	
22. Turn off the circuit breaker in *-MCC-001 for Pump *-P-204.	
23. Turn off the circuit breaker in *-MCC-001 for Pump *-P-205.	
24. Turn off the circuit breaker in *-MCC-001 for Pump *-P-207.	
25. Relevant documents: Leachate Transfer Pump mfr's information and O&M Manual. P&ID H-2-830854 Sheets 1 & 2 Electrical wiring and connection diagrams for control panel *-CP-001 and local control panel 219A1-LH-LCP-005	
26. Provide tank initial filling plan to Construction Manager for review and approval.	
Instructions	
INITIAL FILLING & START OF TIGHTNESS TEST OF TANK 219A201-LH-TK-300	
1. Provide a container inside the secondary containment portion of the Combined Sump *-M-207 to receive and contain discharge from Pipe 219A201-2"-LTCP-036-HDPE. This pipe is the containment pipe that monitors for leaks in the primary liner of 219A-LH-TK-300.	
2. Fill the leachate storage tank with raw water from the IDF raw water system. Where fire hydrants are used for this step, their use shall be coordinated with Fluor Hanford Water Utilities (FHWU) staff. Tank filling will take several days as the flow rate from the hydrant will be limited by FHWU.	
3. Monitor the secondary containment pipe 219A201-2"-LTCP-036-HDPE for discharge to the Combined Sump *-M-207 during the tank filling process. If discharge from this pipe is identified, discontinue the tank filling process and determine the source of the water and repair leaks before restarting the tank tightness test.	
4. Discontinue filling the tank when the water depth reaches 7.2 feet .	
5. With the tank level at 7.2 feet, the tightness test can be started. Document that there is no discharge from Pipe 219A201-2"-LTCP-036-HDPE. Document the time and date of the start of the tightness test. Date and time: _____	
6. Install temporary piping and hoses (minimum size: 4" diameter) to carry water from the Cell No. 1 Truck Loading Station to the Cell No. 2 Leachate Storage Tank. Piping will extend from the quick disconnect fitting downstream of valve 219A1-LH-V-036 located at the Cell No. 1 Tank Loading Station to Cell No. 2 Leachate Storage Tank.	
7. Route pipe/hoses aboveground. Install fittings and pipe to discharge beneath the tank's floating cover without damaging the cover or liner.	
8. Secure the pipe discharge to the tank wall.	
9. After a minimum of 48 hours with the tank water level at 7.2 feet, check the combined sump (219A-LH-M-207) for water collected in the container. If no water is found, proceed with the water level cycling portion of the test. If leakage is found, discontinue the test and identify/repair leaks in the primary liner before restarting the entire tightness test CAT. Document the time and date of the 48 hour inspection:_____	
10. If no water is found, proceed with the water level cycling portion of the test.	
CYCLING WATER LEVEL IN TANK 219A201-LH-TK-300	
1. Turn off the circuit breaker in *-MCC-001 for Pump 219A1-LH-P-302.	
2. Close valve 219A1-LH-V-036	
3. Close valve 219A1-LH-V-037	
4. Open valve 219A1-LH-V-027	

Test No. CAT-TT-300-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Tank Tightness Test of Leachate Tank 219A201-LH-TK-300. **IDF Cell No. 1**	Completed By
5. Close valve 219A1-LH-V-041	
6. Open valve 219A1-LH-V-029	
7. Open valve 219A1-LH-V-043	
8. Open valve 219A1-LH-V-040	
9. Confirm that the water level in the Cell No. 2 Leachate Storage Tank is less than 0.5 ft depth. If the level is above 0.5 ft, it must be lowered prior to beginning water transfer from Cell No. 1 Leachate Storage Tank.	
10. Open valve 219A1-LH-V-036. This setup prepares a route that allows water from the Cell No. 1 Leachate Storage Tank to be pumped to the Cell No. 2 Leachate Storage Tank by the Cell No. 1 Leachate Transfer Pump.	
11. Select Cell No. 1 pump control hand switch 219A1-LH-HS-302 to OFF position. This pump control hand switch is located on the front of 219A1-LH-LCP-005 of the Cell No. 1 LTB (Bldg 219A1).	
12. Turn on the circuit breaker in *-MCC-001 for Pump 219A1-LH-P-302.	
13. Place the Cell No. 1 Leachate Transfer Pump disconnect switch 219A1-LH-SW-302 in the closed (energized) position.	
14. Throttle valve 219A1-LH-V-036 to the half open position.	
15. To begin pumping, select Cell No. 1 pump control hand switch 219A1-LH-HS-302 to the ON position.	
16. Adjust the position of valve 219A1-LH-V-036 until a constant flow rate of between 100 and 150 gpm is established and registered by 219A1-LH-FIT-302.	
17. Confirm that water is being delivered to Cell No. 2 Leachate Storage Tank.	
18. Continue pumping until the water level in Cell No. 1 Leachate Storage Tank is lowered to the level of the suction pipe connection to the tank (approximately 0.5 feet). This water transfer process will take between 2 and 3 days, depending on the pumping rate, to lower the tank level to 0.5 feet.	
19. When the water level in Cell No. 1 Leachate Storage Tank is near 0.5 feet, pump suction will be lost. At this point, set Cell No. 1 pump control hand switch 219A1-LH-HS-302 to OFF position.	
20. Close valve 219A1-LH-V-036.	
21. Document the time and date that pumping is stopped. _____	
22. Drain and reroute the temporary pipe between the two Leachate Handling facilities so that the Cell No. 2 Truck Loading Station is now connected by pipe to a discharge into Cell No. 1 Leachate Storage Tank.	
23. After five days have elapsed since the start of the tank tightness test, use the temporary pipe to connect from the Cell No. 2 Truck Loading Station valve 219E1-LH-V-036 to a discharge point into Cell No. 1 Leachate Storage Tank.	
24. Route pipe/hoses aboveground. Install fittings and pipe to discharge beneath the tank's floating cover without damaging the cover or liner.	
25. Secure the pipe discharge to the tank wall.	
26. The following prepares valve positions to pump water from Cell No. 2 Leachate Storage Tank back to the Cell No. 1 Leachate Storage Tank via the Cell No. 2 Leachate Transfer Pump.	
27. Turn off the circuit breaker in 219E-LH-MCC-001 for Pump 219E1-LH-P-302.	
28. Close valve 219E1-LH-V-036	
29. Close valve 219E1-LH-V-037	
30. Close valve 219E1-LH-V-025.	
31. Close valve 219E1-LH-V-026.	
32. Open valve 219E1-LH-V-043	
33. Open valve 219E1-LH-V-040	
34. Open valve 219E1-LH-V-027.	
35. Close valve 219E1-LH-V-041.	
36. Open valve 219E1-LH-V-029.	
37. Close valve 219E1-LH-V-031.	

Test No. CAT-TT-300-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Tank Tightness Test of Leachate Tank 219A201-LH-TK-300. **IDF Cell No. 1**	Completed By
38. Open valve 219E1-LH-V-036. This setup prepares a route that allows water from the Cell No. 2 Leachate Storage Tank to be pumped to the Cell No. 1 Leachate Storage Tank by the Cell No. 2 Leachate Transfer Pump.	
39. Proceeding with preparation for pumping from Cell No. 2 Leachate Storage Tank, select Cell No. 2 pump control hand switch 219E1-LH-HS-302 to OFF position. This pump control hand switch is located on the front of 219E1-LH-LCP-005 of the Cell No. 2 LTB (Bldg 219E1).	
40. Turn on the circuit breaker in 219E-LH-MCC-001 for Pump 219E1-LH-P-302.	
41. Place the Cell No. 2 Leachate Transfer Pump disconnect switch 219E1-LH-SW-302 in the closed (energized) position.	
42. Throttle valve 219E1-LH-V-036 to the half open position.	
43. To begin pumping, select Cell No. 2 pump control hand switch 219E1-LH-HS-302 to the ON position to start the Cell No. 2 leachate transfer pump.	
44. Adjust the position of valve 219E1-LH-V-036 until a constant flow rate of between 100 and 150 gpm is established and registered by 219E1-LH-FIT-302.	
45. Confirm that water is being delivered to Cell No. 1 Leachate Storage Tank.	
46. Continue pumping until the water level in Cell No. 2 Leachate Storage Tank is lowered to 0.5 feet. This water transfer process will take between 2 and 3 days, depending on the pumping rate, to lower the tank level to near 0.5 feet.	
47. At this point, the water level in Cell No. 1 Leachate Storage Tank has been raised to between 6.7 and 7.2 ft.	
48. Discontinue pumping by setting Cell No. 2 pump control hand switch 219E1-LH-HS-302 to OFF position.	
49. Close valve 219E1-LH-V-036.	
50. Document the time and date that pumping is discontinued to Cell No. 1 Leachate Storage Tank.: _____	
51. This completes first cycle of water level adjustment in the Cell No. 1 Leachate Storage Tank.	
52. Check for water in the leak container in the Cell No. 1 Combined Sump. If no leakage is found, continue the tightness test into the second week. This activity will repeat the lowering the water level to 0.5 ft then followed by raising the water level back to between 6.7 and 7.2 feet. This second cycle should take approximately one week to complete.	
53. Drain and reroute the temporary pipe between the two Leachate Handling facilities so that the Cell No. 1 Truck Loading Station is connected by pipe to a discharge into Cell No. 2 Leachate Storage Tank.	
54. Route pipe/hoses aboveground. Install fittings and pipe to discharge beneath the tank's floating cover without damaging the cover or liner.	
55. Secure the pipe discharge to the tank wall.	
Begin 2nd week of fluctuating water level in Cell No. 1 Leachate Storage Tank	
56. Turn off the circuit breaker in *-MCC-001 for Pump 219A1-LH-P-302.	
57. Close valve 219A1-LH-V-025	
58. Close valve 219A1-LH-V-026	
59. Close valve 219A1-LH-V-036	
60. Close valve 219A1-LH-V-037	
61. Open valve 219A1-LH-V-027	
62. Close valve 219A1-LH-V-041	
63. Open valve 219A1-LH-V-029	
64. Open valve 219A1-LH-V-043	
65. Open valve 219A1-LH-V-040	
66. Open valve 219A1-LH-V-036. This setup will water to be pumped from the Cell No. 1 Leachate Storage Tank to the Cell No. 2 Leachate Storage Tank by the Cell No. 1 Leachate Transfer Pump.	
67. Select Cell No. 1 pump control hand switch 219A1-LH-HS-302 to OFF position.	
68. Turn on the circuit breaker in *-MCC-001 for Pump 219A1-LH-P-302.	

Test No. CAT-TT-300-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Tank Tightness Test of Leachate Tank 219A201-LH-TK-300. **IDF Cell No. 1**	Completed By
69. Place the Cell No. 1 Leachate Transfer Pump disconnect switch 219A1-LH-SW-302 in the closed (energized) position.	
70. Throttle valve 219A1-LH-V-036 to the half open position.	
71. To begin pumping, select Cell No. 1 pump control hand switch 219A1-LH-HS-302 to the ON position to start the Cell No. 1 leachate transfer pump.	
72. Adjust the position of valve 219A1-LH-V-036 until a constant flow rate of between 100 and 150 gpm is established and registered by 219A1-LH-FIT-302.	
73. Confirm that water is being delivered to Cell No. 2 Leachate Storage Tank.	
74. Continue pumping until the water level in Cell No. 1 Leachate Storage Tank is lowered to the level of the suction pipe connection to the tank (approximately 0.5 feet). This water transfer process will take between 2 and 3 days, depending on the pumping rate, to lower the tank level to 0.5 feet.	
75. When the water level in Cell No. 1 Leachate Storage Tank is near 0.5 feet, pump suction will be lost. At this point, set Cell No. 1 pump control hand switch 219A1-LH-HS-302 to OFF position.	
76. Close valve 219A1-LH-V-036.	
77. Document the time and date that pumping is stopped _____	
78. Drain and reroute the temporary pipe between the two Leachate Handling facilities so that the Cell No. 2 Truck Loading Station is now connected by pipe to a discharge into Cell No. 1 Leachate Storage Tank.	
79. After three to four days have elapsed since the start of the second week of the tank tightness test, use the temporary pipe to connect from the Cell No. 2 Truck Loading Station valve 219E1-LH-V-036 to a discharge point into Cell No. 1 Leachate Storage Tank.	
80. Route pipe/hoses aboveground. Install fittings and pipe to discharge beneath the tank's floating cover without damaging the cover or liner.	
81. Secure the pipe discharge to the tank wall.	
82. The following prepares valve positions to pump water from Cell No. 2 Leachate Storage Tank back to the Cell No. 1 Leachate Storage Tank via the Cell No. 2 Leachate Transfer Pump.	
83. Turn off the circuit breaker in 219E-LH-MCC-001 for Pump 219E1-LH-P-302.	
84. Close valve 219E1-LH-V-036	
85. Close valve 219E1-LH-V-037	
86. Close valve 219E1-LH-V-025.	
87. Close valve 219E1-LH-V-026.	
88. Open valve 219E1-LH-V-043	
89. Open valve 219E1-LH-V-040	
90. Open valve 219E1-LH-V-027.	
91. Close valve 219E1-LH-V-041.	
92. Open valve 219E1-LH-V-029.	
93. Close valve 219E1-LH-V-031.	
94. Open valve 219E1-LH-V-036. This setup allows water from the Cell No. 2 Leachate Storage Tank to be pumped to the Cell No. 1 Leachate Storage Tank by the Cell No. 2 Leachate Transfer Pump.	
95. Proceeding with preparation for pumping from Cell No. 2 Leachate Storage Tank, select Cell No. 2 pump control hand switch 219E1-LH-HS-302 to OFF position.	
96. Turn on the circuit breaker in 219E-LH-MCC-001 for Pump 219E1-LH-P-302.	
97. Place the Cell No. 2 Leachate Transfer Pump disconnect switch 219E1-LH-SW-302 in the closed (energized) position.	
98. Throttle valve 219E1-LH-V-036 to the half open position.	
99. To begin pumping, select Cell No. 2 pump control hand switch 219E1-LH-HS-302 to the ON position.	
100. Adjust the position of valve 219E1-LH-V-036 until a constant flow rate of between 100 and 150 gpm is established and registered by 219E1-LH-FIT-302.	
101. Confirm that water is being delivered to Cell No. 1 Leachate Storage Tank.	

Test No. CAT-TT-300-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Tank Tightness Test of Leachate Tank 219A201-LH-TK-300. **IDF Cell No. 1**	Completed By
102. Continue pumping until the water level in Cell No. 2 Leachate Storage Tank is lowered to 0.5 feet. This water transfer process will take between 2 and 3 days, depending on the pumping rate, to lower the tank level to near 0.5 feet.	
103. At this point, the water level in Cell No. 1 Leachate Storage Tank has been raised to between 6.7 and 7.2 ft.	
104. Set Cell No. 2 pump control hand switch 219E1-LH-HS-302 to OFF position to discontinue pumping.	
105. Close valve 219E1-LH-V-036.	
106. Document the time and date that pumping is discontinued to Cell No. 1 Leachate Storage Tank.: _____	
107. This completes the second cycle of water level adjustment in the Cell No. 1 Leachate Storage Tank.	
108. Check for water in the leak container in the Cell No. 1 Combined Sump. If no leakage is found, continue the tightness test into the third week. This activity will repeat the lowering the water level to 0.5 ft then followed by raising the water level back to between 6.7 and 7.2 feet. This third cycle should take approximately one week to complete.	
109. Drain and reroute the temporary pipe between the two Leachate Handling facilities so that the Cell No. 1 Truck Loading Station is connected by pipe to a discharge into Cell No. 2 Leachate Storage Tank.	
110. Route pipe/hoses aboveground. Install fittings and pipe to discharge beneath the tank's floating cover without damaging the cover or liner.	
111. Secure the pipe discharge to the tank wall.	
Begin 3rd week of fluctuating water level in Cell No. 1 Leachate Storage Tank	
112. Turn off the circuit breaker in *-MCC-001 for Pump 219A1-LH-P-302.	
113. Close valve 219A1-LH-V-025	
114. Close valve 219A1-LH-V-026	
115. Close valve 219A1-LH-V-036	
116. Close valve 219A1-LH-V-037	
117. Open valve 219A1-LH-V-027	
118. Close valve 219A1-LH-V-041	
119. Open valve 219A1-LH-V-029	
120. Open valve 219A1-LH-V-043	
121. Open valve 219A1-LH-V-040	
122. Open valve 219A1-LH-V-036. This setup allows water from the Cell No. 1 Leachate Storage Tank to be pumped to the Cell No. 2 Leachate Storage Tank by the Cell No. 1 Leachate Transfer Pump.	
123. Select Cell No. 1 pump control hand switch 219A1-LH-HS-302 to OFF position.	
124. Turn on the circuit breaker in *-MCC-001 for Pump 219A1-LH-P-302.	
125. Place the Cell No. 1 Leachate Transfer Pump disconnect switch 219A1-LH-SW-302 in the closed (energized) position.	
126. Throttle valve 219A1-LH-V-036 to the half open position.	
127. To begin pumping, Select Cell No. 1 pump control hand switch 219A1-LH-HS-302 to the ON position.	
128. Adjust the position of valve 219A1-LH-V-036 until a constant flow rate of between 100 and 150 gpm is established and registered by 219A1-LH-FIT-302.	
129. Confirm that water is being delivered to Cell No. 2 Leachate Storage Tank.	
130. Continue pumping until the water level in Cell No. 1 Leachate Storage Tank is lowered to the level of the suction pipe connection to the tank (approximately 0.5 feet). This water transfer process will take between 2 and 3 days, depending on the pumping rate, to lower the tank level to 0.5 feet.	
131. When the water level in Cell No. 1 Leachate Storage Tank is near 0.5 feet, pump suction will be lost. At this point, set Cell No. 1 pump control hand switch 219A1-LH-HS-302 to OFF position.	

Test No. CAT-TT-300-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Tank Tightness Test of Leachate Tank 219A201-LH-TK-300. **IDF Cell No. 1**	Completed By
132. Close valve 219A1-LH-V-036.	
133. Document the time and date that pumping is stopped _____	
134. Drain and reroute the temporary pipe between the two Leachate Handling facilities so that the Cell No. 2 Truck Loading Station is now connected by pipe to a discharge into Cell No. 1 Leachate Storage Tank.	
135. After three to four days have elapsed since the start of the third week of the tank tightness test, use the temporary pipe to connect from the Cell No. 2 Truck Loading Station valve 219E1-LH-V-036 to a discharge point into Cell No. 1 Leachate Storage Tank.	
136. Route pipe/hoses aboveground. Install fittings and pipe to discharge beneath the tank's floating cover without damaging the cover or liner.	
137. Secure the pipe discharge to the tank wall.	
138. The following prepares valve positions to pump water from Cell No. 2 Leachate Storage Tank back to the Cell No. 1 Leachate Storage Tank via the Cell No. 2 Leachate Transfer Pump.	
139. Turn off the circuit breaker in 219E-LH-MCC-001 for Pump 219E1-LH-P-302.	
140. Close valve 219E1-LH-V-036	
141. Close valve 219E1-LH-V-037	
142. Close valve 219E1-LH-V-025.	
143. Close valve 219E1-LH-V-026.	
144. Open valve 219E1-LH-V-043	
145. Open valve 219E1-LH-V-040	
146. Open valve 219E1-LH-V-027.	
147. Close valve 219E1-LH-V-041.	
148. Open valve 219E1-LH-V-029.	
149. Close valve 219E1-LH-V-031.	
150. Open valve 219E1-LH-V-036. This setup allows water to be pumped from the Cell No. 2 Leachate Storage Tank to the Cell No. 1 Leachate Storage Tank by the Cell No. 2 Leachate Transfer Pump.	
151. Proceeding with preparation for pumping from Cell No. 2 Leachate Storage Tank, select Cell No. 2 pump control hand switch 219E1-LH-HS-302 to OFF position.	
152. Turn on the circuit breaker in 219E-LH-MCC-001 for Pump 219E1-LH-P-302.	
153. Place the Cell No. 2 Leachate Transfer Pump disconnect switch 219E1-LH-SW-302 in the closed (energized) position.	
154. Throttle valve 219E1-LH-V-036 to the half open position.	
155. To begin pumping, select Cell No. 2 pump control hand switch 219E1-LH-HS-302 to the ON position.	
156. Adjust the position of valve 219E1-LH-V-036 until a constant flow rate of between 100 and 150 gpm is established and registered by 219E1-LH-FIT-302.	
157. Confirm that water is being delivered to Cell No. 1 Leachate Storage Tank.	
158. Continue pumping until the water level in Cell No. 2 Leachate Storage Tank is lowered to 0.5 feet. This water transfer process will take between 2 and 3 days, depending on the pumping rate, to lower the tank level to near 0.5 feet.	
159. At this point, the water level in Cell No. 1 Leachate Storage Tank has been raised to between 6.7 and 7.2 ft.	
160. Discontinue pumping by setting Cell No. 2 pump control hand switch 219E1-LH-HS-302 to OFF position.	
161. Close valve 219E1-LH-V-036.	
162. Document the time and date that pumping is discontinued to Cell No. 1 Leachate Storage Tank.: _____	
163. This completes the third cycle of water level adjustment in the Cell No. 1 Leachate Storage Tank.	

Test No. CAT-TT-300-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Tank Tightness Test of Leachate Tank 219A201-LH-TK-300. **IDF Cell No. 1**	Completed By
164. Check for water in the leak container in the Cell No. 1 Combined Sump. If no leakage is found, continue the tightness test into the fourth week. This activity will repeat the lowering the water level to 0.5 ft then followed by raising the water level back to between 6.7 and 7.2 feet. This fourth cycle should take approximately one week to complete.	
165. Drain and reroute the temporary pipe between the two Leachate Handling facilities so that the Cell No. 1 Truck Loading Station is connected by pipe to a discharge into Cell No. 2 Leachate Storage Tank.	
166. Route pipe/hoses aboveground. Install fittings and pipe to discharge beneath the tank's floating cover without damaging the cover or liner.	
167. Secure the pipe discharge to the tank wall.	
Begin 4th week of fluctuating water level in Cell No. 1 Leachate Storage Tank	
168. Turn off the circuit breaker in *-MCC-001 for Pump 219A1-LH-P-302.	
169. Close valve 219A1-LH-V-025	
170. Close valve 219A1-LH-V-026	
171. Close valve 219A1-LH-V-036	
172. Close valve 219A1-LH-V-037	
173. Open valve 219A1-LH-V-027	
174. Close valve 219A1-LH-V-041	
175. Open valve 219A1-LH-V-029	
176. Open valve 219A1-LH-V-043	
177. Open valve 219A1-LH-V-040	
178. Open valve 219A1-LH-V-036. This setup allows water from the Cell No. 1 Leachate Storage Tank to be pumped to the Cell No. 2 Leachate Storage Tank by the Cell No. 1 Leachate Transfer Pump.	
179. Select Cell No. 1 pump control hand switch 219A1-LH-HS-302 to OFF position	
180. Turn on the circuit breaker in *-MCC-001 for Pump 219A1-LH-P-302.	
181. Place the Cell No. 1 Leachate Transfer Pump disconnect switch 219A1-LH-SW-302 in the closed (energized) position.	
182. Throttle valve 219A1-LH-V-036 to the half open position.	
183. To begin pumping, select Cell No. 1 pump control hand switch 219A1-LH-HS-302 to the ON position.	
184. Adjust the position of valve 219A1-LH-V-036 until a constant flow rate of between 100 and 150 gpm is established and registered by 219A1-LH-FIT-302.	
185. Confirm that water is being delivered to Cell No. 2 Leachate Storage Tank.	
186. Continue pumping until the water level in Cell No. 1 Leachate Storage Tank is lowered to the level of the suction pipe connection to the tank (approximately 0.5 feet). This water transfer process will take between 2 and 3 days, depending on the pumping rate, to lower the tank level to 0.5 feet.	
187. When the water level in Cell No. 1 Leachate Storage Tank is near 0.5 feet, pump suction will be lost. At this point, set Cell No. 1 pump control hand switch 219A1-LH-HS-302 to OFF position.	
188. Close valve 219A1-LH-V-036.	
189. Document the time and date that pumping is stopped. _____	
190. Drain and reroute the temporary pipe between the two Leachate Handling facilities so that the Cell No. 2 Truck Loading Station is now connected by pipe to a discharge into Cell No. 1 Leachate Storage Tank.	
191. After three to four days have elapsed since the start the fourth week of the tank tightness test, use the temporary pipe to connect from the Cell No. 2 Truck Loading Station valve 219E1-LH-V-036 to a discharge point into Cell No. 1 Leachate Storage Tank.	
192. Route pipe/hoses aboveground. Install fittings and pipe to discharge beneath the tank's floating cover without damaging the cover or liner.	
193. Secure the pipe discharge to the tank wall.	

Test No. CAT-TT-300-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Tank Tightness Test of Leachate Tank 219A201-LH-TK-300. **IDF Cell No. 1**	Completed By
194. The following prepares valve positions to pump water from Cell No. 2 Leachate Storage Tank back to the Cell No. 1 Leachate Storage Tank via the Cell No. 2 Leachate Transfer Pump.	
195. Turn off the circuit breaker in 219E-LH-MCC-001 for Pump 219E1-LH-P-302.	
196. Close valve 219E1-LH-V-036	
197. Close valve 219E1-LH-V-037	
198. Close valve 219E1-LH-V-025.	
199. Close valve 219E1-LH-V-026.	
200. Open valve 219E1-LH-V-043	
201. Open valve 219E1-LH-V-040	
202. Open valve 219E1-LH-V-027.	
203. Close valve 219E1-LH-V-041.	
204. Open valve 219E1-LH-V-029.	
205. Close valve 219E1-LH-V-031.	
206. Open valve 219E1-LH-V-036. This setup allows water from the Cell No. 2 Leachate Storage Tank to be pumped to the Cell No. 1 Leachate Storage Tank by the Cell No. 2 Leachate Transfer Pump.	
207. Proceeding with preparation for pumping from Cell No. 2 Leachate Storage Tank, select Cell No. 2 pump control hand switch 219E1-LH-HS-302 to OFF position.	
208. Turn on the circuit breaker in 219E-LH-MCC-001 for Pump 219E1-LH-P-302.	
209. Place the Cell No. 2 Leachate Transfer Pump disconnect switch 219E1-LH-SW-302 in the closed (energized) position.	
210. Throttle valve 219E1-LH-V-036 to the half open position.	
211. To begin pumping, select Cell No. 2 pump control hand switch 219E1-LH-HS-302 to the ON position.	
212. Adjust the position of valve 219E1-LH-V-036 until a constant flow rate of between 100 and 150 gpm is established and registered by 219E1-LH-FIT-302.	
213. Confirm that water is being delivered to Cell No. 1 Leachate Storage Tank.	
214. Continue pumping until the water level in Cell No. 2 Leachate Storage Tank is lowered to 0.5 feet. This water transfer process will take between 2 and 3 days, depending on the pumping rate, to lower the tank level to near 0.5 feet.	
215. At this point, the water level in Cell No. 1 Leachate Storage Tank has been raised to between 6.7 and 7.2 ft.	
216. Discontinue pumping by setting the Cell No. 2 pump control hand switch 219E1-LH-HS-302 to OFF position.	
217. Close valve 219E1-LH-V-036.	
218. Document the time and date that pumping is discontinued to Cell No. 1 Leachate Storage Tank.: _____	
219. This completes fourth cycle of water level adjustment in the Cell No. 1 Leachate Storage Tank.	
220. Check for water in the leak container in the Cell No. 1 Combined Sump. If no water is found, the tank tightness test has been successfully completed. If water is observed that indicates a leak in the primary liner of the tank. The leak location will need to be identified, repaired and the tank tightness test repeated. Document the time and date of completion of this step. _____	
221. Dispose of the water used for the tightness test as directed by the Construction Manager.	
222. The results of this test will be provided to the Construction Manager.	

Construction Acceptance Test	By (Print Name & Sign)	Date
Performed		
Witnessed:		
Insp. Coord. Rep.:		

Exceptions/Discrepancies

CH2M HILL **CONSTRUCTION ACCEPTANCE TEST**

Test No. CAT-TI-101-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Insertion/Extraction Test of Level Transducer 219A-LH-LT-101. **IDF Cell No. 1**	Completed By
Test Purpose	
This test will confirm that Level Transducer 219A-LH-LT-101 can be inserted into place in the LCRS sump via riser pipe 3”-LH-048 and that the level transducer can be extracted.	
Equipment Identification and Notes	
1. Leachate Collection Recovery System (LCRS) is automatically controlled by the programmable logic controller located in Control Panel 219A-LH-CP-001 on the east wall of the Crest Pad Building 219A. Control of the LCRS pumps relies on the input from level transducer 219A-LH-LT-101. 2. Note that for the remainder of this Construction Acceptance Test procedure, an asterisk “*” will be used in place of the prefix 219A-LH for instruments, valves, process piping, and equipment. As an example, *-P-203 will be used in place of 219A-LH-P-203.	
Precautions and Limitations	
1. Interior bead at joints of HDPE riser pipe was removed during installation	
2. To complete the level transducer insertion test, the length of pipe needed to position the transducer in the LCRS sump must be known. The transducer must be in approximately the same position as the LCRS pumps as shown on Dwg H-2-830849 Detail 1. Pipe length shall be determined during the construction of the LCRS sump as specified in Section 11306. This measurement must occur during the construction of the LDS sump and installation of the LCRS pump riser pipe when there is access to the perforated section of the riser pipe located in the sump.	
Prerequisites	
1. Review test procedures in Pre-Job Briefing on day of test.	
2. Piping and valves associated with this test must be labeled or tagged.	
3. Construction General Contractor (CGC) staff will conduct the CAT. The test will be witnessed by representatives of the CGC and the Construction Manager.	
4. Review manufacturer’s instruction manuals associated with the level transducer. In the event of conflicts between manufacturer’s recommendations and this CAT procedure, discuss issues and resolve with Construction Manager’s representative.	
5. Equipment required: Plastic wire zip ties. Ties shall be nylon with stainless steel lock tab and with a minimum 50 lb. tensile strength. Hose reels as specified Anti-seize compound for stainless steel fasteners used Cotton rags	
6. Select pump control hand switch *-HS-202 to the OFF position. Pump control hand switch is located on the front of *-MCC-001	
7. Select pump control hand switch *-HS-203 to the OFF position.	
8. Select pump control hand switch *-HS-204 to the OFF position.	
9. Relevant documents: Pump manufacturer’s information and O&M Manual. P&ID H-2-830854 Sheet 1 Electrical wiring and connection diagrams for control panel *-CP-001.	
Instructions	
LEVEL TRANSDUCER 219A-LH-LT-101 INSERTION	
1. Remove HDPE blind flange which covers the flanged end of riser pipe 3”-LH-048-HDPE located on the south wall of Crest Pad Building (CPB) 219A (the HDPE flange is intended to prevent foreign objects from accidentally entering the riser pipe when the level transducer is not installed).	
2. Position the conductors reel (with conductors for the level transducer pre-wound on reel) and secure the reel to the floor.	
3. Position the leash cable reel (with cable pre-wound on reel) and secure the reel to the floor.	

Test No. CAT-TI-101-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Insertion/Extraction Test of Level Transducer 219A-LH-LT-101. **IDF Cell No. 1**	Completed By
4. Place 1” diameter PVC threaded pipe sections to be added in a convenient position within the CPB.	
5. Provide necessary coupling to connect the level transducer to the first section of PVC pipe.	
6. Connect first section of 1” diameter transducer carrier pipe to the transducer.	
7. Terminate the conductors to the transducer as recommended by the transducer manufacturer.	
8. Use plastic tie wraps (3 ties per pipe section) to attach conductors to transducer carrier pipe. Do not attach the leash cable to the carrier pipe.	
9. Trim tie wrap ends after securing conductors to the pipe.	
10. While slowly feeding out the conductors from the reel, place transducer and first section of carrier pipe into the HDPE riser pipe. One person should be feeding out the conductors as the transducer pipe is inserted.	
11. Wipe down the transducer pipe section exterior with a cotton cloth to remove debris.	
12. By hand, lower the transducer and first pipe section into the riser pipe. hose reel.	
13. As the upper end of carrier pipe approaches riser pipe flange, stop and connect next carrier pipe section.	
14. Wipe off debris from the added section of pipe and conductors and use zip ties to secure the conductors to the PVC carrier pipe.	
15. When lowering the transducer and pipe sections, do not use the conductors to control the insertion (or described later, the extraction).	
16. Hold the conductors up as the assembly is fed down the riser pipe to prevent the conductors from wearing against the edge of the pipe opening. One person should feed and guide the pipe and conductor into the riser pipe entrance while the other person slowly operates the cable reel. As the transducer/pipe assembly is lowered, assist conductors and leash cable in unreeling from hose reels.	
17. Continue adding of carrier pipe sections while keeping track of the total pipe length inserted, until the transducer reaches the position in the LCRS sump as shown on Drawing H-2-830849 Detail 1. This position is confirmed by installing the length of PVC pipe as discussed in Prerequisite #2 of this CAT procedure.	
18. Record the total length of pipe connected to the transducer for future reference. Total length of carrier pipe installed = _____ ft.	
19. Insert the last section of transducer pipe through the blind flange. As the end of the last section of transducer pipe approaches the riser pipe, position the blind flange with conductors routed through slot in blind flange.	
20. Bolt flange in place and secure the end of the PVC pipe. Use anti-seize compound on stainless steel fasteners.	
21. Unreel the remaining conductors and cable.	
22. Open (de-energize) fuse on *LT-101 loop power in *-CP-001	
23. Terminate conductor wires in appropriate termination box (*-TBX-101).	
24. Coil the remaining leash cable, secure with ties and store it adjacent to the transducer carrier pipe.	
LEVEL TRANSDUCER 219A-LH-LT-101 EXTRACTION	
1. Remove the blind flange from the riser pipe 3”-LH-048.	
2. Temporarily secure the PVC transducer carrier pipe.	
3. Mount the hose reels in the appropriate location if not already in place.	
4. Open (de-energize) fuse on *LT-101 loop power in *-CP-001	
5. Disconnect conductors from the termination box (*-TBX-101)	
6. By hand pull up the PVC pipe sections until the first pipe section is entirely exposed.	
7. Remove plastic tie wraps and reel up conductors and leash cable as carrier pipe is being raised. Do not allow any tie wraps or other materials to fall down the riser pipe during the removal procedure.	

Test No. CAT-TI-101-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

Insertion/Extraction Test of Level Transducer 219A-LH-LT-101. **IDF Cell No. 1**	Completed By
8. Remove first pipe section with blind flange and place on floor (set aside blind flange for re-installation on riser pipe after pump removal). As they are removed, wipe the pipe, conductors and cable exterior surfaces with a cotton cloth.	
9. Continue removing the remaining pipe sections until transducer approaches riser pipe opening.	
10. Carefully remove the transducer from the last PVC pipe section; placing it in a secure location.	
11. Store removed pipe sections on the floor of the CPB near the west wall.	
12. Secure the removed pipe sections together in a bundle with a rope.	
13. Store the transducer with the removed conductors and leash cable from the hose reels.	
14. Reinstall the blind flange cover on the riser pipe.	

Construction Acceptance Test	By (Print Name & Sign)	Date
Performed:		
Witnessed:		
Insp. Coord. Rep.:		

Exceptions/Discrepancies

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Exhibit 2
Process Instrumentation and Control Diagrams for Cell 1

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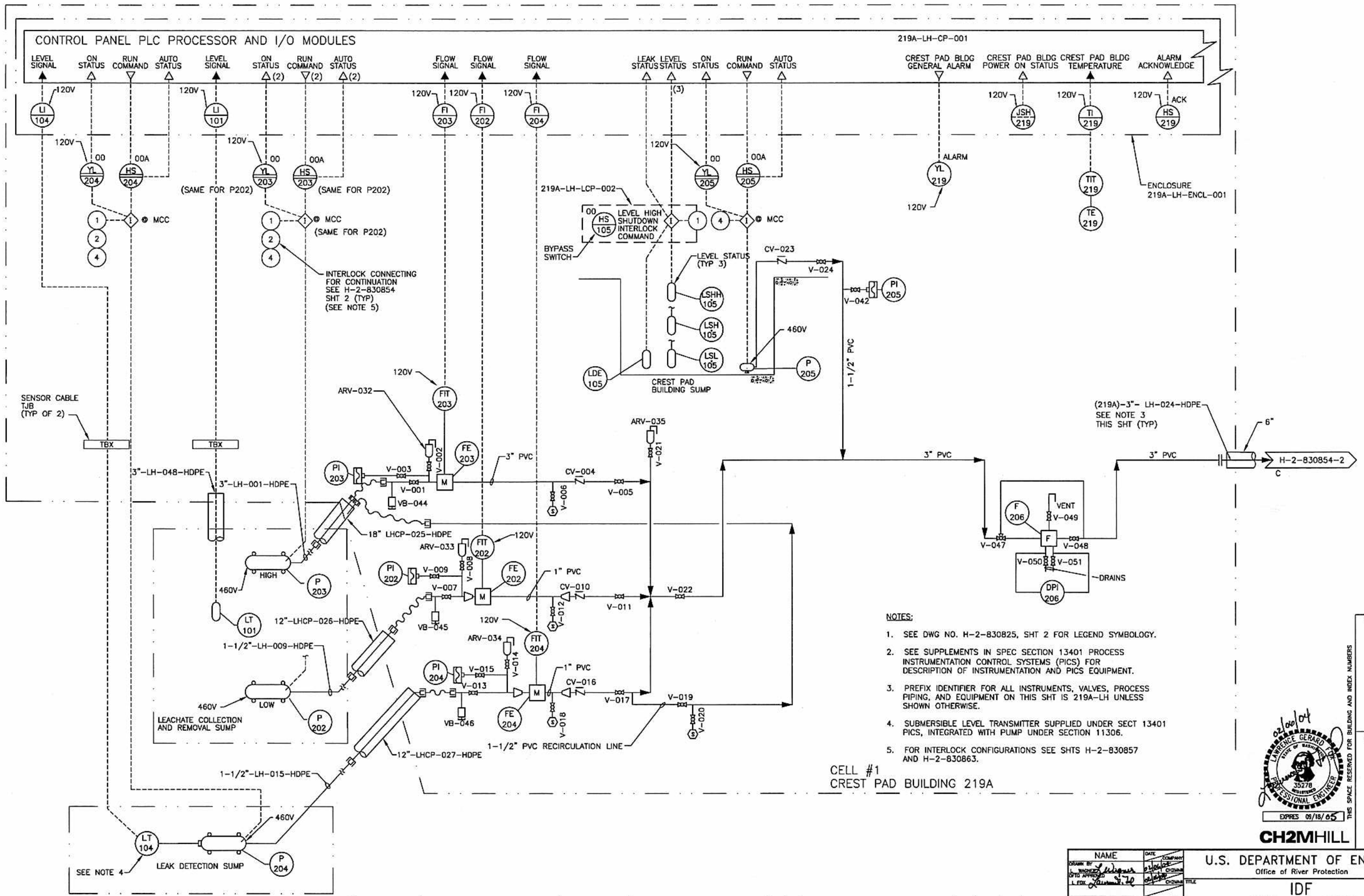
DWG NO H-2-830854 SH 1 OF 4 REV A



NOTES:

1. SEE DWG NO. H-2-830825, SHT 2 FOR LEGEND SYMBOLOGY.
2. SEE SUPPLEMENTS IN SPEC SECTION 13401 PROCESS INSTRUMENTATION CONTROL SYSTEMS (PICS) FOR DESCRIPTION OF INSTRUMENTATION AND PICS EQUIPMENT.
3. PREFIX IDENTIFIER FOR ALL INSTRUMENTS, VALVES, PROCESS PIPING, AND EQUIPMENT ON THIS SHT IS 219A-LH UNLESS SHOWN OTHERWISE.
4. SUBMERSIBLE LEVEL TRANSMITTER SUPPLIED UNDER SECT 13401 PICS, INTEGRATED WITH PUMP UNDER SECTION 11306.
5. FOR INTERLOCK CONFIGURATIONS SEE SHTS H-2-830857 AND H-2-830863.

BLDG. NO. 219A 219A1 219A201 219E 219E1 219E201

INDEX NO.

THIS SPACE RESERVED FOR BUILDING AND INDEX NUMBERS

02/06/04 LAWRENCE GERARD FOX STATE OF WASHINGTON 35278 REGISTERED PROFESSIONAL ENGINEER EXPIRES 09/18/05

CH2MHILL

U.S. DEPARTMENT OF ENERGY
Office of River Protection

IDF
CELL #1 P&ID

NAME	DATE	COMPANY
DRAWN BY L. WAGNER	02/06/04	CH2MHILL
DFTG APPROVED L. FOX	02/06/04	CH2MHILL
DESIGN AUTHORITY E. GIRGIS	2/9/04	CH2MHILL

SIZE	BLDG NO	INDEX NO	DWG NO	REV
D	219A	7004	H-2-830854	A

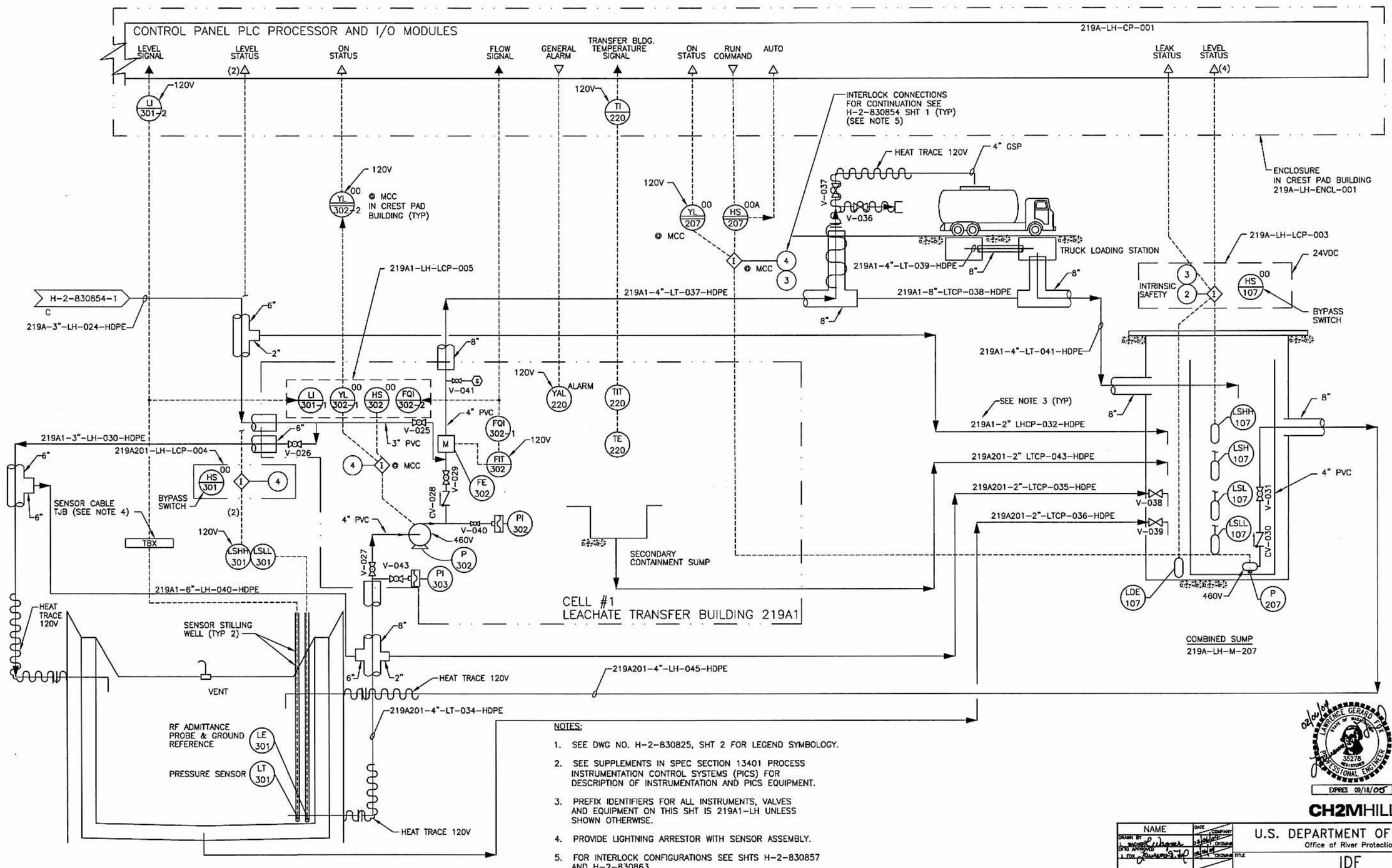
SCALE NONE EDT 634144 SHEET 1 OF 4

XXXX PLOTID XXXX

DWG NO	TITLE	REF NUMBER	TITLE
DRAWING TRACEABILITY LIST		REFERENCES	
		NEXT USED ON	

REVISIONS: MFD | REV NO | DESCRIPTION | REV BY DATE | ENGR | COMPANY

DWG NO H-2-830854 SH 2 OF REV A



NOTES:

1. SEE DWG NO. H-2-830825, SHT 2 FOR LEGEND SYMBOLOGY.
2. SEE SUPPLEMENTS IN SPEC SECTION 13401 PROCESS INSTRUMENTATION CONTROL SYSTEMS (PICS) FOR DESCRIPTION OF INSTRUMENTATION AND PICS EQUIPMENT.
3. PREFIX IDENTIFIERS FOR ALL INSTRUMENTS, VALVES AND EQUIPMENT ON THIS SHT IS 219A1-LH UNLESS SHOWN OTHERWISE.
4. PROVIDE LIGHTNING ARRESTOR WITH SENSOR ASSEMBLY.
5. FOR INTERLOCK CONFIGURATIONS SEE SHTS H-2-830857 AND H-2-830863.

BLDG. NO. 219A 219A1 219A201 219E 219E1 219E201

INDEX NO.

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LAWRENCE GERARD FOX, STATE OF WASHINGTON, 35278, REGISTERED PROFESSIONAL ENGINEER, EXPIRES 09/18/05

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D	219A1 219A201	7004	H-2-830854	A

SCALE NONE EDT 634144 SHEET 2 OF

DWG NO	TITLE	REF NUMBER	TITLE
DRAWING TRACEABILITY LIST		REFERENCES	
		NEXT USED ON	

REVISIONS

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System Construction Acceptance Test Procedures

Introduction

System Construction Acceptance Testing procedures (system CATs) have been prepared for the six pumping systems associated with the leachate handling facilities of an integrated disposal facility (IDF) cell. These system CATs will be performed following completion of the component CATs. As was described in Attachment 5, the readiness test (RT) of the Process Instrumentation and Control System (PICS) and the electrical testing per the Construction Inspection Plan (CIP) will precede the component CATs (refer to Attachment 5 and the IDF technical specifications, RPP-18489 for the requirements of these tests).

The IDF is comprised of two landfill cells, each with its own leachate handling and leak detection system facilities. The six system CAT procedures provide for "wet" testing of each of the pumping systems using raw water available at the IDF site. These system CATs are part of the construction quality control requirements for construction of the IDF.

The six system CAT procedures for IDF Cell 1 included in Attachment 6 are listed on Table 1. A duplicate set of procedures for Cell 2 facilities is under development and will be issued as part of future revisions to the CIP. It should be anticipated that a comparable level of effort will be needed to complete the CAT procedures for Cell 1 and Cell 2.

The system CAT procedures state the purpose, precautions and limitations, prerequisites, instructions, acceptance criteria, and records. Prior to the initiation of any operational testing, the following conditions will be satisfied:

- Completion of the component CAT procedures for the pump to be used in the system CAT procedures
- An inspection or walk-down will be completed to ensure the components being tested, and those required for support, are complete and ready to safely perform the test. This walkdown will include verification that all valves (as described in the CAT procedure) are in the appropriate position to support the testing.

The construction general contractor will provide the necessary labor, equipment, and materials to successfully complete each system CAT. Each system CAT procedure will be witnessed at a minimum by two people in addition to those actually conducting the test. These witnesses will represent the construction general contractor and the compliance oversight engineer. When a test is successfully completed in accordance with the procedures, the witnesses will sign the completed test form, indicating their acceptance.

During all activities associated with system CAT procedures, safety will be managed in accordance with the requirements of Section 1110 in the Statement of Work.

Purpose

The purpose of these procedures is to test as a system the IDF components that have been tested earlier as individual components. For example, the pumping capacity of the low flow leachate pump was tested in its component CAT and will now be tested for operation in manual and automatic modes using the control logic in the programmable logic controller with input from the associated level transmitter and flow meters. As part of the system CAT, hardwire interlocks and alarms associated with each pump will be tested.

Table 1 presents the system CAT name, equipment number, and the functions to be tested during the procedure.

Precautions and Limitations

Specific precautions and limitations associated with each CAT procedure have been included in the procedural instructions. The following general precautions and limitations have been developed for testing of any pumps:

- Confirm proper positioning of all associated valves before starting pump.
- Do not operate pump without sufficient water supply; running pump dry can damage the equipment.
- Do not operate pump in shutoff head condition for more than one minute.
- Use caution when venting air from piping; contents may be under pressure; air must be evacuated from high points in all piping for maximum performance.

Prerequisites

Prerequisites for testing each component are included in the detailed instructions (Exhibit 1). The system CATs may be completed in any order. For the most part, the order will be controlled by availability of equipment for testing and completion of the prerequisite component CATs.

All mechanical and electrical components will be labeled prior to testing. Temporary labels can be utilized for components as long as an inspection of the labeling has been completed and determined accurate prior to testing.

Test procedures will be discussed at the daily planning meeting with the construction and or operations staff. The schedule and planned testing activities will be provided to the appropriate safety personnel for their input.

Instructions

Specific instructions for each test in Table 1 are presented in Exhibit 1. Space is provided on the test form adjacent to each step where those witnessing the test will initial to indicate that the instruction step was completed satisfactorily.

Acceptable Results

Each step will be completed in the order presented in the System CAT procedure. An acceptable result for each step will be the successful completion of that step following the procedure described. When a procedure step cannot be successfully completed or its requirements satisfied, the CAT activities will stop until that step can be completed. If a modification to the procedure is necessary, the proposed procedure modification must be reviewed and approved by the IDF compliance oversight engineer's representative, in conjunction with the IDF design engineer.

Records

The detailed CAT procedures in Exhibit 1 will be used to document the completed tests. When a test is successfully completed, the procedure form will be signed by the witnesses and the original of the form will be provided to the IDF compliance oversight engineer.

Definitions

A complete set of abbreviations for the IDF detailed design can be found on drawing H-2-830825, sheet 1 of 5, RPP 18489.

Process Instrumentation and Control Diagrams

For reference, the process instrumentation and control diagrams (P&IDs) for IDF Cells 1 is included as Exhibit 2 of Attachment 5. The P&IDs are useful in understanding the planned tests and valve positions.

Tables and Exhibits

- Table 1: IDF System CAT Procedures with Summary of Function Tests
  (Only Cell 1 procedures are shown. An identical set of CAT procedures will be completed for testing of the Cell 2 facilities. Final CAT procedures will include tests for both cells.)
- Exhibit 1: Test Instructions

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TABLE 1

Integrated Disposal Facility: System CAT Procedures with Summary of Function Tests
RPP-18490, Rev. 0, Attachment 6, IDF Detailed Design Construction Inspection Plan

			Operation control/status				PLC Interlocks							PLC Functions.				
System Construction Acceptance Test Procedures	**Eqmt No.**	**System CAT No.**	**Eqmt Start Stop Control - Auto On/Off**	**Eqmt Start Stop Control - Manual On/Off**	**Flow rate indication**	**Level Indication**	**Prevent operation of pump if High-High Leachate Storage Tank level**	**Prevent operation of pump if Low-Low level in Leachate Storage Tank**	**Prevent operation of pump if leak detected in Crest Pad Bldg sump or in the Combined Sump**	**Prevent operation of eqmt if power to Control Panel is lost.**	**1. Equipment Run Timers (ck hr accumulation)**	**2A. Equipment Failure Detection (ck On status interlock)**	**2B. Equipment Flow Failure Detection (ck flow failure interlock)**	**4. Analog Alarms**	**5. Discrete Alarms**	**7. Process Flow Totalizer**	**8. Pump Restart Time Delay**	**9. Power Failure Condition**
LCRS Low Flow Pump	219A-LH-P-202	SystemCAT-P-202-A	X	X	X	X	X		X	X	X	X	X	X		X	X	X
(see Dwgs. H-830854, sheets 1&2)																		
LCRS High Flow Pump	219A-LH-P-203	SystemCAT-P-203-A	X	X	X	X	X		X	X	X	X	X	X		X	X	X
(see Dwgs. H-830854, sheets 1&2)																		
LDS Pump	219A-LH-P-204	SystemCAT-P-204-A	X	X	X	X			X	X	X	X	X	X		X	X	X
(see Dwgs. H-830854, sheets 1&2)																		
Sump Pump - Crest Pad Bldg	219A-LH-P-205	SystemCAT-P-205-A	X	X		X	X		X	X	X	X			X		X	X
(see Dwgs. H-2-830847, sh 1 and H-830854, sheets 1&2)																		
Combined Sump Pump	219A-LH-P-207	SystemCAT-P-207-A	X	X		X	X			X	X	X			X		X	X
(see Dwgs. H-2-830850, sh 1 and H-830854, sheets 1&2)																		
Leachate Transfer Pump	219A1-LH-P-302	SystemCAT-P-302-A		X	X	X		X		X	X	X	X	X		X		X
(see Dwgs. H-2-830851, sh 1 and H-830854, sheets 1&2)																		

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Exhibit 1
Test Instructions

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Test No. SystemCAT-P-202-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LCRS Pump: 219A-LH-P-202 **IDF Cell No. 1**	Completed By

Test Purpose

This test will check the manual and automatic operation of the low flow pump, 219A-LH-P-202, of the leachate collection and recovery system (LCRS). The test will also check for proper operation of the hardwire interlocks and the applicable programmable logic controller (PLC) functions associated with the pump.

Equipment Identification and Notes

1. Note that for the remainder of this system Construction Acceptance Test (CAT) procedure, an asterisk "*" will be used in place of the prefix 219A-LH for most instruments, valves, process piping, and equipment. As an example, *-P-202 will be used in place of 219A-LH-P-202.
2. Leachate Collection Recovery System (LCRS) is automatically controlled by the PLC that is located within panel *-CP-001 in the Crest Pad Building (CPB).
3. Equipment/instrumentation associated with the LCRS testing includes:
   a. Low Flow LCRS Pump *-P-202 and associated flowmeter *-FIT-202.
   b. Level Transmitter *-LT-101
   c. Leak Detection Element *-LDE-105
   d. Leak Detection Element *-LDE-107
   e. Level Element 219A201-LH-LE-301
   f. Motor Control Center (MCC) *-MCC-001
   g. Control Panel *-CP-001.
   h. Local Panel *-LP-001
   i. Local Control Panel *-LCP-002
   j. Leachate Storage Tank 219A201-LH-TK-300

Additional Definitions and Abbreviations

1. Leachate Transfer Building (LTB)
2. Raw Water (RW).

Document Pump Tested

1. Manufacturer Name: _____
2. Model No. :_____
3. Serial No.:_____

Precautions and Limitations

1. If leaking is observed at CPB, LTB, side slope piping, or combined sump during testing, shut down test and repair leak.	
2. For this test, Pump *-P-202 and level transmitter (*-LT-101) will be installed in a temporary tank located inside Cell No. 1.	
3. Cell No. 1 Leachate Storage Tank will be used in this test for receiving flow from Pump *-P-202. Confirm that there is adequate volume in the tank for the planned tests.	
4. IDF project safety program shall be followed during this test procedure. For termination of conductors, follow the IDF project's lock out/tag out procedure.	

Prerequisites

1. Review test procedures in Pre-Job Briefing on day of test.	
2. Confirm the component construction acceptance test (CAT-PC-202-A) for Pump *-P-202 has been successfully completed.	
3. Confirm that Cell No. 1 Leachate Storage Tank is available for use as part of this system CAT procedure.	
4. Confirm that piping, valves and electrical equipment associated with this test procedure is labeled or tagged.	

Test No. SystemCAT-P-202-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LCRS Pump: 219A-LH-P-202 **IDF Cell No. 1**	Completed By
5. Confirm that Construction General Contractor (CGC) staff will conduct the CAT. Confirm the test will be witnessed by representatives of the CGC and the Construction Manager.	
6. Verify RW is available from the fire hydrants on the IDF site.	
7. Confirm that the following relevant documents are available during this testing: P&IDs (H-2-830854 sheets 1 & 2) Electrical wiring and connection diagrams for control panel *-CP-001. Pump manufacturer's information and O&M Manual. IDF Master Equipment List	
8. Assure that the following equipment is staged and ready to support this testing procedure: a. Equipment as necessary to transport and deliver water to a temporary pump tank located at the north end of the operations layer of Cell No. 1. Will need to maintain water level in the temporary pump tank during the pump test. b. Tank(s) size as required to maintain minimum water level above pump. Size will depend on method selected for maintaining water level in tank (recycling water via a temporary pipeline or hauling water by tanker truck.). Tank shall be at least 30 inches deep. c. Temporary flexible hoses and piping/fittings located immediately after pump discharge and where side slope riser piping transitions to the piping manifold in the CPB shall be minimum 2-inch diameter to minimize friction losses during pump test. The hoses, pipes and fittings shall have a pressure rating equal to or greater than the permanent piping to which it is connected. d. A solid wall section of Schedule 40 or 80 PVC pipe of the same diameter and length as the stilling well used in the Cell No. 1 Leachate Storage Tank for installation of Level Element 219A201-LH-LE-301. One end of the pipe will have a ball valve (designated as Temp Valve 1). The other end of the pipe shall have a tee mounted with its run in line with the pipe centerline. The pipe section will be used for testing one of the pump interlocks.	
The following steps set initial valve and circuit breaker positions for the testing with discharge to the Cell No. 1 Leachate Storage Tank.	
9. Turn off the circuit breaker in *-MCC-001 for Pump *-P-202	
10. Turn off the circuit breaker in *-MCC-001 for Pump *-P-203.	
11. Turn off the circuit breaker in *-MCC-001 for Pump *-P-204.	
12. Turn off the circuit breaker in *-MCC-001 for Pump *-P-205.	
13. Open and tag disconnect switch *-SW-202 in open, de-energized position.	
14. Close valve 219A1-LH-V-025	
15. Close valve 219A1-LH-V-027	
16. Open valve 219A1-LH -V-026	
17. Open valve 219A201-LH-V-038	
18. Close valve *-V-005	
19. Open valve *-V-011	
20. Open valve *-V-007	
21. Open valve *-V-008	
22. Open valve *-V-009	
23. Close valve *-V-017	
24. Close valve *-V-012	
25. Close valve *-V-019	
26. Open valve *-V-021	
27. Place valve *-V-047 in the filter position.	
28. Open valve *-V-048	
29. Close valve *-V-024	
30. Close valve *-V-042	
31. Close valve *-V-049	
32. Close valve *-V-050	

Test No. SystemCAT-P-202-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LCRS Pump: 219A-LH-P-202 **IDF Cell No. 1**	Completed By
33. Close valve *-V-051	
34. Confirm *-MCC-001 is energized.	
35. Confirm Control Panel *-CP-001 is energized.	
36. Confirm Local Control Panel *-LCP-002 is energized.	
Instructions	
**-P-202 – Manual ON/OFF Operation with Discharge to Cell No. 1 Leachate Storage Tank.*	
1. Place temporary pump tank(s) on the operations layer of Cell No. 1 near its north/south centerline and adjacent to the north toe of slope.	
2. Secure the PVC section pipe with valve and tee attached (see Equipment Required) in a vertical position (with valve on lower end of the pipe) next to the installation of 219A201-LH-LE-301 at the Leachate Storage Tank.	
3. Close valve (Temp Valve 1) on the temporary pipe.	
4. Install 219A201-LH-LE-301 in the temporary pipe.	
5. Through the branch of the tee on the temporary pipe, slowly add water into the temporary pipe until the water depth in the pipe is approximately 5 feet.	
6. Press the reset button on Control Panel *-CP-001, and see that the low–low level alarm clears from 219A201-LH-LE-301.	
7. Connect temporary piping/flex hose between Pump *-P-202 and 1-1/2”-LH-009-HDPE discharge pipe which is temporarily routed above ground up the Cell No. 1 side slope to the CPB.	
8. Place Pump *-P-202 on the bottom of the temporary pump tank.	
9. Place level transmitter *-LT-101 on the bottom of the temporary pump tank.	
10. Connect temporary flexible hoses from side slope discharge pipe to associated 1-1/2” leachate piping manifold quick connect inside the CPB.	
11. Add raw water to temporary pump tank until the water level is 1 inch above the top pump rollers.	
12. Mark this water level inside the tank with tape or permanent marker.	
13. Add another mark inside the tank two inches above the first mark. This second mark is the minimum water level. Water level in the tank during the test should be maintained above this minimum level except during initial pipe filling and pump stabilization.	
14. Place hand switch *-HS-202 at *-MCC-001 in the OFF position.	
15. Confirm that disconnect switch *-SW-202 is tagged out in the open, de-energized position.	
16. Confirm that the conductors for Pump *-P-202 and inside *-SW-202 were marked during construction for proper pump rotation.	
17. Terminate conductors for Pump *-P-202 in *-SW-202 matching the conductor markings for each phase for proper pump rotation.	
18. Open (de-energize) fuse on *-LT-101 loop power in *-CP-001 and tag *-CP-001.	
19. Terminate the conductors for Level Transmitter *-LT-101 in *-TBX-101.	
20. Remove tag from *-CP-001 and close (energize) the fuse on *-LT-101 loop power in *-CP-001.	
21. Remove tag and close disconnect switch *-SW-202 placing it in a closed, energized position.	
22. Close the circuit breaker in *-MCC-001 for Pump *-P-202.	
23. Confirm that Control Panel *-CP-001 is receiving a level signal from *-LT-101.	
24. Record the water depth in the temporary pump tank. Depth = _____ ft	
25. Record run time hour reading for *-P-202. Hour meter reading =_____	
26. Using raw water source, either hose or truck, add water to the temporary pump tank and begin raising the water level.	
27. Turn on Pump *-P-202 by selecting the ON position for hand switch *-HS-202.	
28. Adjust raw water addition to the temporary tank to maintain level above the minimum water level marked on the tank.	

Test No. SystemCAT-P-202-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LCRS Pump: 219A-LH-P-202 **IDF Cell No. 1**	Completed By
29. Note that it will take several minutes to fill the pipelines between the pump and the leachate tank.	
30. Record the flow rate reading from *-FIT-202 on *-CP-001. Flow rate reading : _____ gpm	
31. Record the flow total reading from *-CP-001 for Pump *-P-202. Flow totalizer reading = _____ gallons at _____(insert time of day)	
32. Record the pump hour meter reading from *-CP-001 for Pump *-P-202. Hour meter reading = _____ hrs at _____(insert time of day)	
33. After a minimum of 10 minutes more of pump operation, record the flow totalizer and hour meter readings. Flow totalizer reading = _____ gallons at _____(insert time of day) Hour meter reading = _____ hrs at _____(insert time of day)	
34. Verify that the flow totalizer and hour readings have increased properly.	
35. Record the reading of level in the temporary tank, that is displayed at Control Panel *-CP-001, to confirm that *-LT-101 is indicating properly. *-LT-101 water depth reading at control panel = _____ft	
36. While noting the level reading on the control panel in the previous step, measure the distance from the centerline of *-LT-101 to water surface in the temporary tank. Record that distance: Distance measured from *-LT-101 to water surface = _____ft	
37. At Control Panel *-CP-001, confirm that the ON status for Pump *-P-202 is being displayed.	
*Test of interlocks while operating Pump *-P-202 in manual mode – Pump Shut Off Interlocks* *(note that the interlock numbers are from the IDF Process and Instrumentation Drawings and may not be sequential)*	
⇒ <u>Interlock 1 Test</u> (Dwg H-2-830854 Sht 1).	
38. Position bypass hand switch *-HS-105 to the ON (CLOSED) position.	
39. While Pump *-P-202 is operating, lift by hand for several seconds the float of Leak Detection Element *-LDE-105 in the Crest Pad Building.	
40. Confirm that the pump has stopped operation by watching the flow rate reading on *-FIT-202 drop to approximately 0 gpm.	
41. So as not to overflow the temporary pump tank as water drains back down the side slope pipe, the float of *-LDE-105 should be lowered as soon as possible after confirming that the pump has stopped.	
42. Confirm that Pump *-P-202 restarts once the float of *-LDE-105 is lowered.	
⇒ <u>Interlock 2 (Dwg H-2-830854 Sheets 1 and 2).</u>	
43. Position bypass hand switch *-HS-107 to the ON (CLOSED) position.	
44. While Pump *-P-202 is operating, lift by hand for several seconds the float of Leak Detection Element *-LDE-107 in the Combined Sump.	
45. Confirm that the pump has stopped operation by watching the flow rate reading on *-FIT-202 drop to approximately 0 gpm.	
46. So as not to overflow the temporary tank as water drains back down the side slope pipe, the float of *-LDE-107 should be lower as soon as possible after confirming that the pump has stopped.	
47. Confirm that Pump *-P-202 restarts once the float of *-LDE-107 is lowered.	
⇒ <u>Interlock 4 (Dwg H-2-830854 Sheets 1 and 2).</u>	
48. Position bypass hand switch 219A201-LH-HS-301 to the ON (CLOSED) position.	
49. While Pump *-P-202 is operating, add water to the temporary vertical pipe (with Level Element 219A201-LH-LE-301 mounted inside) at the Leachate Storage Tank until the water level is high enough to cause 219A201-LH-LSHH-301 to shut off Pump *-P-202.	

Test No. SystemCAT-P-202-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LCRS Pump: 219A-LH-P-202 **IDF Cell No. 1**	Completed By
50. Confirm that the pump has stopped operation by watching the flow rate reading on *-FIT-202 drop to approximately 0 gpm.	
51. Slowly open the valve at the bottom of the temporary vertical pipe. Drain water from the pipe until the water level in the pipe is below 6 feet in depth.	
52. Confirm that the Pump *-P-202 restarts.	
53. Press the reset button on Control Panel *-CP-001, and see that the high-high level alarm clears from 219A201-LH-LE-301.	
54. Turn the hand switch *-HS-202 to the OFF position.	
55. Discontinue filling the temporary storage tank.	
⇒ *Check Alarms Associated with Level Element in Leak Detection Sump*	
56. Use raw water source and fill the temporary tank slowly while *-P-202 is not running.	
57. On *-CP-001, note when the high level and high-high level alarms actuate.	
58. Record the water depth above Pump *-P-202 centerline at which the alarms actuated. Leak Detection Sump High Level Alarm = _____ft Leak Detection Sump High-High Level Alarm = _____ft	
59. Turn off the raw water supply to the temporary tank.	
60. Select the ON position at *-HS-202 and pump the level in the temporary tank down to the minimum water level marked on the side of the tank.	
61. Select the OFF position at *-HS-202.	
62. At Control Panel *-CP-001, use the reset button and confirm that the alarms for the high and high-high levels clear.	
**-P-202 – Automatic Operation with Discharge to Cell No. 1 Leachate Storage Tank.*	
63. Select the AUTO position at *-HS-202.	
64. At Control Panel *-CP-001, verify that there is indication of Pump *-P-202 set in AUTO status.	
65. Turn on the raw water supply to slowly increase the water level in the temporary pump tank.	
66. Monitor the level in the temporary pump tank marking the water level when Pump *-P-202 energizes. Distance above the centerline of the pump at which pump turns on =_____ft	
67. Once the pump has started, turn off the raw water supply to the temporary pump tank.	
68. Monitor the level in the temporary pump tank marking the water level when the pump stops. Distance above the centerline of the pump at which pump turns off =_____ft	
⇒ *Check Pump and Flow Failure Alarms*	
69. Select the AUTO position at *-HS-202.	
70. Turn off the circuit breaker in *-MCC-001 for Pump *-P-202.	
71. Turn on the raw water supply to slowly increase the water level in the temporary pump tank to approximately 1.5 ft above the top of the pump.	
72. Turn off the raw water supply.	
73. Monitor Control Panel *-CP-001 for verification of a pump fail alarm.	
74. Turn *-HS-202 to the OFF position (reset required after pump fail condition)	
75. Close the circuit breaker in *-MCC-001 for Pump *-P-202.	
76. Turn *-HS-202 to the AUTO position	
77. Verify that there is an approximate 10-second delay before the pump restarts.	
78. Verify that the pump has restarted.	
79. Close valve *-V-011 in the CPB to simulate a no flow condition.	
80. Monitor Control Panel *-CP-001 to see that a flow failure alarm occurs.	
81. Confirm that as a result of the flow failure alarm, *-P-202 is automatically shut off.	
82. Turn *-HS-202 to the OFF position (reset required after flow fail condition)	

Test No. SystemCAT-P-202-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LCRS Pump: 219A-LH-P-202 **IDF Cell No. 1**	Completed By
83. Open valve *-V-011.	
84. Turn *-HS-202 to the AUTO position	
85. Verify that there is an approximate 10-second delay before the pump restarts.	
86. Monitor that *-P-202 draws down the level in the temporary pump tank and stops operation automatically.	
⇒ *Check Flow Signal and Level Signal Failures*	
87. Open (de-energize) the fuse at *-CP-001 for the loop power to *-FIT-202 .	
88. Monitor Control Panel *-CP-001 to see that a flow signal failure alarm occurs.	
89. Close (energize) the fuse at *-CP-001 for the loop power to *-FIT-202.	
90. Push the reset button on *-CP-001 to clear the flow signal failure alarm.	
91. Open (de-energize) the fuse at *-CP-001 for the loop power to *-LT-101.	
92. Monitor Control Panel *-CP-001 to see that a level signal failure alarm occurs.	
93. Close (energize) the fuse at *-CP-001 for the loop power to *-LT-101.	
94. Push the reset button on *-CP-001 to clear the level signal failure alarm.	
⇒ *Check PLC Power Failure Mode*	
95. Verify that the uninterruptable power supply in Control Panel *-CP-001 is on.	
96. At Local Panel *-LP-001, turn off the breaker for Control Panel *-CP-001.	
97. Place *-HS-202 in the AUTO position	
98. Using the raw water supply, fill the temporary water tank to 1.5 feet above the top of Pump *-P-202.	
99. Confirm with power off to the PLC, that Pump *-P-202 is not actuated to run.	
100. Place *-HS-202 in the OFF position	
101. At Local Panel *-LP-001, turn on the breaker for Control Panel *-CP-001.	
Remove Temporary Equipment	
102. Turn off the circuit breaker in *-MCC-001 for Pump *-P-202	
103. Open and tag disconnect switch *-SW-202 in open, de-energized position.	
104. Disconnect conductors for Pump *-P-202 in *-SW-202.	
105. Using a cable reel, wind up the conductors for Pump *-P-202 on the reel for storage with *-P-202.	
106. Disconnect temporary piping/flex hose between Pump *-P-202 and 1-1/2”-LH-009-HDPE discharge pipe which is temporarily routed above ground up the Cell No. 1 side slope to the CPB.	
107. Disconnect temporary flexible hoses from side slope discharge pipe to associated 1-1/2” leachate piping manifold quick connect inside the CPB.	
108. Close valve *-V-007	
109. Disconnect the sections of pipe 1-1/2”-LH-009-HDPE and store them safely to be used for final installation of *-P-202.	
110. Leave Level Transmitter *-LT-101 in the temporary tank for testing of other leachate system pumps	
111. Pump *-P-202 has been stored and is ready for final installation by the Construction General Contractor.	

Construction Acceptance Test	By (Print Name & Sign)	Date
Performed:		
Witnessed:		
Insp. Coord. Rep.:		

Exceptions/Discrepancies

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Test No. SystemCAT-P-203-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LCRS Pump: 219A-LH-P-203 **IDF Cell No. 1**	Completed By

Test Purpose

This test will check the manual and automatic operation of the high flow pump, 219A-LH-P-203, of the leachate collection and recovery system (LCRS). The test will also check for proper operation of the hardwire interlocks and the applicable programmable logic controller (PLC) functions associated with the pump.

Equipment Identification and Notes

1. Note that for the remainder of this system Construction Acceptance Test (CAT) procedure, an asterisk "*" will be used in place of the prefix 219A-LH for most instruments, valves, process piping, and equipment. As an example, *-P-203 will be used in place of 219A-LH-P-203.
2. Leachate Collection Recovery System (LCRS) is automatically controlled by the PLC that is located within panel *-CP-001 in the Crest Pad Building (CPB).
3. Equipment/instrumentation associated with the LCRS testing includes:
   a. High Flow LCRS Pump *-P-203 and associated flowmeter *-FIT-203.
   b. Level Transmitter *-LT-101
   c. Leak Detection Element *-LDE-105
   d. Leak Detection Element *-LDE-107
   e. Level Element 219A201-LH-LE-301
   f. Motor Control Center (MCC) *-MCC-001
   g. Control Panel *-CP-001.
   h. Local Panel *-LP-001
   i. Local Control Panel *-LCP-002
   j. Leachate Storage Tank 219A201-LH-TK-300
   k. Differential Pressure Indicator *-DPI-206

Additional Definitions and Abbreviations

1. Leachate Transfer Building (LTB)
2. Raw Water (RW).

Document Pump Tested

1. Manufacturer Name: _____
2. Model No. :_____
3. Serial No.:_____

Precautions and Limitations

1. If leaking is observed at CPB, LTB, side slope piping, or combined sump during testing, shut down test and repair leak.	
2. For this test, Pump *-P-203 and level transmitter (*-LT-101) will be installed in a temporary tank located inside Cell No. 1.	
3. Cell No. 1 Leachate Storage Tank will be used in this test for receiving flow from Pump *-P-203. Confirm that there is adequate volume in the tank for the planned tests.	
4. IDF project safety program shall be followed during this test procedure. For termination of conductors, follow the IDF project's lock out/tag out procedure.	

Prerequisites

1. Review test procedures in Pre-Job Briefing on day of test.	
2. Confirm the component construction acceptance test (CAT-PC-203-A) for Pump *-P-203 has been successfully completed.	
3. Confirm that Cell No. 1 Leachate Storage Tank is available for use as part of this system CAT procedure.	
4. Confirm that piping, valves and electrical equipment associated with this test procedure is labeled or tagged.	

Test No. SystemCAT-P-203-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LCRS Pump: 219A-LH-P-203 **IDF Cell No. 1**	Completed By
5. Confirm that Construction General Contractor (CGC) staff will conduct the CAT. Confirm the test will be witnessed by representatives of the CGC and the Construction Manager.	
6. Verify RW is available from the fire hydrants on the IDF site.	
7. Confirm that the following relevant documents are available during this testing: P&IDs (H-2-830854 sheets 1 & 2) Electrical wiring and connection diagrams for control panel *-CP-001. Pump manufacturer's information and O&M Manual. IDF Master Equipment List	
8. Assure that the following equipment is staged and ready to support this testing procedure: a. Equipment as necessary to transport and deliver water to a temporary pump tank located at the north end of the operations layer of Cell No. 1. Will need to maintain water level in the temporary pump tank during the pump test. b. Tank(s) size as required to maintain minimum water level above pump. Size will depend on method selected for maintaining water level in tank (recycling water via a temporary pipeline or hauling water by tanker truck). Tank shall be at least 30 inches deep. c. Temporary flexible hoses and piping/fittings located immediately after pump discharge and where side slope riser piping transitions to the piping manifold in the CPB shall be minimum 3-inch diameter to minimize friction losses during pump test. The hoses, pipes and fittings shall have a pressure rating equal to or greater than the permanent piping to which it is connected. d. A solid wall section of Schedule 40 or 80 PVC pipe of the same diameter and length as the stilling well used in the Cell No. 1 Leachate Storage Tank for installation of Level Element 219A201-LH-LE-301. One end of the pipe will have a ball valve (designated as Temp Valve 1). The other end of the pipe shall have a tee mounted with its run in line with the pipe centerline. The pipe section will be used for testing one of the pump interlocks.	
The following steps set initial valve and circuit breaker positions for the testing with discharge to the Cell No. 1 Leachate Storage Tank.	
9. Turn off the circuit breaker in *-MCC-001 for Pump *-P-202	
10. Turn off the circuit breaker in *-MCC-001 for Pump *-P-203.	
11. Turn off the circuit breaker in *-MCC-001 for Pump *-P-204.	
12. Turn off the circuit breaker in *-MCC-001 for Pump *-P-205.	
13. Open and tag disconnect switch *-SW-203 in open, de-energized position	
14. Close valve 219A1-LH-V-025	
15. Close valve 219A1-LH-V-027	
16. Open valve *-V-005	
17. Close valve *-V-011	
18. Open valve *-V-001	
19. Open valve *-V-002	
20. Open valve *-V-003	
21. Close valve *-V-017	
22. Close valve *-V-006	
23. Close valve *-V-019	
24. Open valve *-V-021	
25. Place valve *-V-047 in the filter position.	
26. Open valve *-V-048	
27. Open valve 219A1-LH -V-026	
28. Close valve *-V-024	
29. Close valve *-V-042	
30. Close valve *-V-049	
31. Open valve *-V-050	
32. Open valve *-V-051	
33. Open valve 219A201-LH-V-038	

Test No. SystemCAT-P-203-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LCRS Pump: 219A-LH-P-203 **IDF Cell No. 1**	Completed By
34. Confirm *-MCC-001 is energized.	
35. Confirm Control Panel *-CP-001 is energized.	
36. Confirm Local Control Panel *-LCP-002 is energized.	
Instructions	
**-P-203 – Manual ON/OFF Operation with Discharge to Cell No. 1 Leachate Storage Tank.*	
1. Place temporary pump tank(s) on the operations layer of Cell No. 1 near its north/south centerline and adjacent to the north toe of slope.	
2. Secure the PVC section pipe with valve and tee attached (see Equipment Required) in a vertical position (with valve on lower end of the pipe) next to the installation of 219A201-LH-LE-301 at the Leachate Storage Tank.	
3. Close valve (Temp Valve 1) on the temporary pipe.	
4. Install 219A201-LH-LE-301 in the temporary pipe.	
5. Through the branch of the tee on the temporary pipe, slowly add water into the temporary pipe until the water depth in the pipe is approximately 5 feet.	
6. Press the reset button on Control Panel *-CP-001, and see that the low–low level alarm clears from 219A201-LH-LE-301.	
7. Connect temporary piping/flex hose between Pump *-P-203 and 3”-LH-001-HDPE discharge pipe which is temporarily routed above ground up the Cell No. 1 side slope to the CPB.	
8. Place Pump *-P-203 on the bottom of the temporary pump tank.	
9. Place level transmitter *-LT-101 on the bottom of the temporary pump tank.	
10. Connect temporary flexible hoses from side slope discharge pipe to associated 3” leachate piping manifold quick connect inside the CPB.	
11. Add raw water to temporary pump tank until the water level is 1 inch above the top pump rollers.	
12. Mark this water level inside the tank with tape or permanent marker.	
13. Add another mark inside the tank two inches above the first mark. This second mark is the minimum water level. Water level in the tank during the test should be maintained above this minimum level except during initial pipe filling and pump stabilization.	
14. Place hand switch *-HS-203 at *-MCC-001 in the OFF position.	
15. Confirm that disconnect switch *-SW-203 is tagged out in the open, de-energized position.	
16. Confirm that the conductors for Pump *-P-203 and inside *-SW-203 were marked during construction for proper pump rotation.	
17. Terminate the conductors for Pump *-P-203 in *-SW-203 matching correct position of each phase for proper pump rotation.	
18. Open (de-energize) fuse on *-LT-101 loop power in *-CP-001 and tag *-CP-001 .	
19. Terminate the conductors for Level Transmitter *-LT-101 in *-TBX-101.	
20. Remove tag from *-CP-001 and close (energize) fuse on *-LT-101 loop power in *-CP-001.	
21. Remove tag and close disconnect switch *-SW-203 in closed, energized position.	
22. Close the circuit breaker in *-MCC-001 for Pump *-P-203.	
23. Confirm that Control Panel *-CP-001 is receiving a level signal from *-LT-101.	
24. Record the water depth in the temporary pump tank. Depth = _____ ft	
25. Record run time hour reading for *-P-203. Hour meter reading =_____	
26. Using raw water source, either hose or truck, add water to the temporary pump tank and begin raising the water level.	
27. Turn on Pump *-P-203 by selecting the ON position for hand switch *-HS-203.	
28. Adjust raw water addition to the temporary tank to maintain level above the minimum water level marked on the tank.	
29. Note that it will take several minutes to fill the pipelines between the pump and the leachate tank.	

Test No. SystemCAT-P-203-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LCRS Pump: 219A-LH-P-203 **IDF Cell No. 1**	Completed By
30. Record the flow rate reading from *-FIT-203 on *-CP-001. Flow rate reading : _____ gpm	
31. Record the differential pressure reading on *-DPI-206 : _____ psi (See previous step for associated flow rate). Represents differential pressure with the high flow pump on and a clean filter.	
32. Record the flow total reading from *-CP-001 for Pump *-P-203. Flow totalizer reading = _____ gallons at _____(insert time of day)	
33. Record the pump hour meter reading from *-CP-001 for Pump *-P-203. Hour meter reading = _____ hrs at _____(insert time of day)	
34. After a minimum of 10 minutes more of pump operation, record the flow totalizer and hour meter readings. Flow totalizer reading = _____ gallons at _____(insert time of day) Hour meter reading = _____ hrs at _____(insert time of day)	
35. Verify that the flow totalizer and hour readings have increased properly.	
36. Record the reading of level in the temporary tank, that is displayed at Control Panel *-CP-001, to confirm that *-LT-101 is indicating properly. *-LT-101 water depth reading = _____ft	
37. While noting the level reading on the control panel in the previous step, measure the distance from the centerline of *-LT-101 to water surface in the temporary tank. Record that distance: Distance measured from *-LT-101 to water surface = _____ft	
38. At Control Panel *-CP-001, confirm that the ON status for Pump *-P-203 is being displayed.	
*Test of interlocks while operating Pump *-P-203 in manual mode – Pump Shut Off Interlocks (note that the interlock numbers are from the IDF Process and Instrumentation Drawings and may not be sequential)*	
⇒ <u>Interlock 1 Test</u> (Dwg H-2-830854 Sht 1).	
39. Position bypass hand switch *-HS-105 to the ON (CLOSED) position.	
40. While Pump *-P-203 is operating, lift by hand for several seconds the float of Leak Detection Element *-LDE-105 in the Crest Pad Building.	
41. Confirm that the pump has stopped operation by watching the flow rate reading on *-FIT-203 drop to approximately 0 gpm.	
42. So as not to overflow the temporary pump tank as water drains back down the side slope pipe, the float of *-LDE-105 should be lowered as soon as possible after confirming that the pump has stopped.	
43. Confirm that Pump *-P-203 restarts once the float of *-LDE-105 is lowered.	
⇒ <u>Interlock 2 (Dwg H-2-830854 Sheets 1 and 2).</u>	
44. Position bypass hand switch *-HS-107 to the ON (CLOSED) position.	
45. While Pump *-P-203 is operating, lift by hand for several seconds the float of Leak Detection Element *-LDE-107 in the Combined Sump.	
46. Confirm that the pump has stopped operation by watching the flow rate reading on *-FIT-203 drop to approximately 0 gpm.	
47. So as not to overflow the temporary tank as water drains back down the side slope pipe, the float of *-LDE-107 should be lower as soon as possible after confirming that the pump has stopped.	
48. Confirm that Pump *-P-203 restarts once the float of *-LDE-107 is lowered.	
⇒ <u>Interlock 4 (Dwg H-2-830854 Sheets 1 and 2).</u>	
49. Position bypass hand switch 219A201-LH-HS-301 to the ON (CLOSED) position.	
50. While Pump *-P-203 is operating, add water to the temporary vertical pipe (with Level Element 219A201-LH-LE-301 mounted inside) at the Leachate Storage Tank until the water level is high enough to cause 219A201-LH-LSHH-301 to shut off Pump *-P-203.	

Test No. SystemCAT-P-203-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LCRS Pump: 219A-LH-P-203 **IDF Cell No. 1**	Completed By
51. Confirm that the pump has stopped operation by watching the flow rate reading on *-FIT-203 drop to approximately 0 gpm.	
52. Slowly open the valve at the bottom of the temporary vertical pipe. Drain water from the pipe until the water level in the pipe is below 6 feet in depth.	
53. Confirm that the Pump *-P-203 restarts.	
54. Press the reset button on Control Panel *-CP-001, and see that the high-high level alarm clears from 219A201-LH-LE-301.	
55. Turn the hand switch *-HS-203 to the OFF position.	
56. Discontinue filling the temporary storage tank.	
⇒ *Check Alarms Associated with Level Element in Leak Detection Sump*	
57. Use raw water source and fill the temporary tank slowly while *-P-203 is not running.	
58. On *-CP-001, note when the high level and high-high level alarms actuate.	
59. Record the water depth above Pump *-P-203 centerline at which the alarms actuated. Leak Detection Sump High Level Alarm = _____ft Leak Detection Sump High-High Level Alarm = _____ft	
60. Turn off the raw water supply to the temporary tank.	
61. Select the ON position at *-HS-203 and pump the level in the temporary tank down to the minimum water level marked on the side of the tank.	
62. Select the OFF position at *-HS-203.	
63. At Control Panel *-CP-001, use the reset button and confirm that the alarms for the high and high-high levels clear.	
**-P-203 – Automatic Operation with Discharge to Cell No. 1 Leachate Storage Tank.*	
64. Select the AUTO position at *-HS-203.	
65. At Control Panel *-CP-001, verify that there is indication of Pump *-P-203 set in AUTO status.	
66. Turn on the raw water supply to slowly increase the water level in the temporary pump tank.	
67. Monitor the level in the temporary pump tank marking the water level when Pump *-P-203 energizes. Distance above the centerline of the pump at which pump turns on =_____ft	
68. Once the pump has started, turn off the raw water supply to the temporary pump tank.	
69. Monitor the level in the temporary pump tank marking the water level when the pump stops. Distance above the centerline of the pump at which pump turns off =_____ft	
⇒ *Check Pump and Flow Failure Alarms*	
70. Select the AUTO position at *-HS-203.	
71. Turn off the circuit breaker in *-MCC-001 for Pump *-P-203.	
72. Turn on the raw water supply to slowly increase the water level in the temporary pump tank to approximately 1.5 ft above the top of the pump.	
73. Turn off the raw water supply.	
74. Monitor Control Panel *-CP-001 for verification of a pump fail alarm.	
75. Turn *-HS-203 to the OFF position (reset required after pump fail condition)	
76. Close the circuit breaker in *-MCC-001 for Pump *-P-203.	
77. Turn *-HS-203 to the AUTO position	
78. Verify that there is an approximate 10-second delay before the pump restarts.	
79. Verify that the pump has restarted.	
80. Close valve *-V-005 in the CPB to simulate a no flow condition.	
81. Monitor Control Panel *-CP-001 to see that a flow failure alarm occurs.	
82. Confirm that as a result of the flow failure alarm, *-P-203 is automatically shut off.	
83. Turn *-HS-203 to the OFF position (reset required after flow fail condition)	

Test No. SystemCAT-P-203-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LCRS Pump: 219A-LH-P-203 **IDF Cell No. 1**	Completed By
84. Open valve *-V-005.	
85. Turn *-HS-203 to the AUTO position	
86. Verify that there is an approximate 10-second delay before the pump restarts.	
87. Monitor that *-P-203 draws down the level in the temporary pump tank and stops operation automatically.	
⇒ *Check Flow Signal and Level Signal Failures*	
88. Open (de-energize) the fuse at *-CP-001 for the loop power to *-FIT-203.	
89. Monitor Control Panel *-CP-001 to see that a flow signal failure alarm occurs.	
90. Close (energize) the fuse at *-CP-001 for the loop power to *-FIT-203.	
91. Push the reset button on *-CP-001 to clear the flow signal failure alarm.	
92. Open (de-energize) the fuse at *-CP-001 for the loop power to *-LT-101.	
93. Monitor Control Panel *-CP-001 to see that a level signal failure alarm occurs.	
94. Close (energize) the fuse at *-CP-001 for the loop power to *-LT-101.	
95. Push the reset button on *-CP-001 to clear the level signal failure alarm.	
⇒ *Check PLC Power Failure Mode*	
96. Verify that the uninterruptable power supply in Control Panel *-CP-001 is on.	
97. At Local Panel *-LP-001, turn off the breaker for Control Panel *-CP-001.	
98. Place *-HS-203 in the AUTO position	
99. Using the raw water supply, fill the temporary water tank to 1.5 feet above the top of Pump *-P-203.	
100. Confirm with power off to the PLC, that Pump *-P-203 is not actuated to run.	
101. Place *-HS-203 in the OFF position	
102. At Local Panel *-LP-001, turn on the breaker for Control Panel *-CP-001.	
Remove Temporary and Other Equipment	
103. Turn off the circuit breaker in *-MCC-001 for Pump *-P-203	
104. Open and tag disconnect switch *-SW-203 in open, de-energized position.	
105. Disconnect conductors for Pump *-P-203 in *-SW-203.	
106. Using a cable reel, wind up the conductors for Pump *-P-203 on the reel for storage with *-P-203.	
107. Disconnect temporary piping/flex hose between Pump *-P-203 and 3”-LH-001-HDPE discharge pipe which is temporarily routed above ground up the Cell No. 1 side slope to the CPB.	
108. Disconnect temporary flexible hoses from side slope discharge pipe to associated 3” leachate piping manifold quick connect inside the CPB.	
109. Close valve *-V-001	
110. Disconnect the sections of pipe 3”-LH-001-HDPE and store them safely to be used for final installation of *-P-203.	
111. Open (de-energize) fuse on *-LT-101 loop power in *-CP-001 and tag *-CP-001.	
112. Disconnect the conductors for Level Transmitter *-LT-101 in *-TBX-101.	
113. Close *-TBX-101	
114. Using a cable reel, wind the conductors up for Level Transmitter *-LT-101 on the reel for storage with *-LT-101.	
115. Pump *-P-203 and *-LT-101 have been stored and are ready for final installation by the General Construction Contractor.	

Construction Acceptance Test	By (Print Name & Sign)	Date
Performed:		
Witnessed:		
Insp. Coord. Rep.:		

Exceptions/Discrepancies

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Test No. SystemCAT-P-204-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LDS Pump: 219A-LH-P-204 **IDF Cell No. 1**	Completed By

Test Purpose

This test will check the manual and automatic operation of the leak detection system (LDS) pump 219A-LH-P-204. The test will also check for proper operation of the hardwire interlocks and the applicable programmable logic controller (PLC) functions associated with the pump.

Equipment Identification and Notes

1. Note that for the remainder of this system Construction Acceptance Test (CAT) procedure, an asterisk "*" will be used in place of the prefix 219A-LH for most instruments, valves, process piping, and equipment. As an example, *-P-204 will be used in place of 219A-LH-P-204.
2. Leak Detection System is automatically controlled by the PLC that is located within panel *-CP-001 in the Crest Pad Building (CPB).
3. Equipment/instrumentation associated with the LDS pump testing includes:
   a. Leak Detection Pump *-P-204 and associated flowmeter *-FIT-204.
   b. Level Transmitter *-LT-104
   c. Leak Detection Element *-LDE-105
   d. Leak Detection Element *-LDE-107
   e. Level Element 219A201-LH-LE-301
   f. Motor Control Center (MCC) *-MCC-001
   g. Control Panel *-CP-001.
   h. Local Panel *-LP-001
   i. Local Control Panel *-LCP-002
   j. Leachate Storage Tank 219A201-LH-TK-300

Additional Definitions and Abbreviations

1. Leak Detection System (LDS)
2. Leachate Transfer Building (LTB)
3. Raw Water (RW).

Document Pump Tested

1. Manufacturer Name: _____
2. Model No. :_____
3. Serial No.:_____

Precautions and Limitations

1. If leaking is observed at CPB, LTB, side slope piping, or combined sump during testing, shut down test and repair leak.	
2. For this test, Pump *-P-204 and with its level transmitter (*-LT-104) will be installed in a temporary tank located inside Cell No. 1..	
3. Cell No. 1 Leachate Storage Tank will be used in this test for receiving flow from Pump *-P-204. Confirm that there is adequate volume in the tank for the planned tests.	
4. IDF project safety program shall be followed during this test procedure. For termination of conductors, follow the IDF project's lock out/tag out procedure.	

Prerequisites

1. Review test procedures in Pre-Job Briefing on day of test.	
2. Confirm the component construction acceptance test (CAT-PC-204-A) for Pump *-P-204 has been successfully completed.	
3. Confirm that Cell No. 1 Leachate Storage Tank is available for use as part of this system CAT procedure.	
4. Confirm that piping, valves and electrical equipment associated with this test procedure is labeled or tagged.	

Test No. SystemCAT-P-204-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LDS Pump: 219A-LH-P-204 **IDF Cell No. 1**	Completed By
5. Confirm that Construction General Contractor (CGC) staff will conduct the CAT. Confirm the test will be witnessed by representatives of the CGC and the Construction Manager.	
6. Verify RW is available from the fire hydrants on the IDF site.	
7. Confirm that the following relevant documents are available during this testing: P&IDs (H-2-830854 sheets 1 & 2) Electrical wiring and connection diagrams for control panel *-CP-001. Pump manufacturer's information and O&M Manual. IDF Master Equipment List	
8. Assure that the following equipment is staged and ready to support this testing procedure: a. Equipment as necessary to transport and deliver water to a temporary pump tank located at the north end of the operations layer of Cell No. 1. Will need to maintain water level in the temporary pump tank during the pump test. b. Tank(s) size as required to maintain minimum water level above pump. Size will depend on method selected for maintaining water level in tank (recycling water via a temporary pipeline or hauling water by tanker truck). Tank shall be at least 30 inches deep. c. Temporary flexible hoses and piping/fittings located immediately after pump discharge and where side slope riser piping transitions to the piping manifold in the CPB shall be minimum 2-inch diameter to minimize friction losses during pump test. The hoses, pipes and fittings shall have a pressure rating equal to or greater than the permanent piping to which it is connected. d. A solid wall section of Schedule 40 or 80 PVC pipe of the same diameter and length as the stilling well used in the Cell No. 1 Leachate Storage Tank for installation of Level Element 219A201-LH-LE-301. One end of the pipe will have a ball valve (designated as Temp Valve 1). The other end of the pipe shall have a tee mounted with its run in line with the pipe centerline. The pipe section will be used for testing one of the pump interlocks.	
The following steps set initial valve and circuit breaker positions for the testing with discharge to the Cell No. 1 Leachate Storage Tank.	
9. Turn off the circuit breaker in *-MCC-001 for Pump *-P-202	
10. Turn off the circuit breaker in *-MCC-001 for Pump *-P-203.	
11. Turn off the circuit breaker in *-MCC-001 for Pump *-P-204.	
12. Turn off the circuit breaker in *-MCC-001 for Pump *-P-205.	
13. Open and tag disconnect switch *-SW-204 in open, de-energized position.	
14. Open valve 219A1-LH -V-026	
15. Close valve 219A1-LH-V-025	
16. Close valve 219A1-LH-V-027	
17. Close valve *-V-005	
18. Close valve *-V-011	
19. Open valve *-V-013	
20. Open valve *-V-014	
21. Open valve *-V-015	
22. Open valve *-V-017	
23. Close valve *-V-018	
24. Close valve *-V-019	
25. Open valve *-V-021	
26. Place valve *-V-047 in the filter position.	
27. Open valve *-V-048	
28. Close valve *-V-049	
29. Close valve *-V-050	
30. Close valve *-V-051	
31. Close valve *-V-024	
32. Close valve *-V-042	

Test No. SystemCAT-P-204-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LDS Pump: 219A-LH-P-204 **IDF Cell No. 1**	Completed By
33. Open valve 219A201-LH-V-038	
34. Confirm *-MCC-001 is energized.	
35. Confirm Control Panel *-CP-001 is energized.	
36. Confirm Local Control Panel *-LCP-002 is energized.	
Instructions	
**-P-204 – Manual ON/OFF Operation with Discharge to Cell No. 1 Leachate Storage Tank.*	
1. Place temporary pump tank(s) on the operations layer of Cell No. 1 near its north/south centerline and adjacent to the north toe of slope.	
2. Secure the PVC section pipe with valve and tee attached (see Equipment Required) in a vertical position (with valve on lower end of the pipe) next to the installation of 219A201-LH-LE-301 at the Leachate Storage Tank.	
3. Close valve (Temp Valve 1) on the temporary pipe.	
4. Install 219A201-LH-LE-301 in the temporary pipe.	
5. Through the branch of the tee on the temporary pipe, slowly add water into the temporary pipe until the water depth in the pipe is approximately 5 feet.	
6. Press the reset button on Control Panel *-CP-001, and see that the low–low level alarm clears from 219A201-LH-LE-301.	
7. Connect temporary piping/flex hose between Pump *-P-204 and 1-1/2”-LH-015-HDPE discharge pipe which is temporarily routed above ground up the Cell No. 1 side slope to the CPB.	
8. Place Pump *-P-204 on the bottom of the temporary pump tank.	
9. Connect temporary flexible hoses from side slope discharge pipe to associated 1-1/2” leachate piping manifold quick connect inside the CPB.	
10. Add raw water to temporary pump tank until the water level is 1 inch above the top pump rollers.	
11. Mark this water level inside the tank with tape or permanent marker.	
12. Add another mark inside the tank two inches above the first mark. This second mark is the minimum water level. Water level in the tank during the test should be maintained above this minimum level except during initial pipe filling and pump stabilization.	
13. Place hand switch *-HS-204 at *-MCC-001 in the OFF position.	
14. Confirm that disconnect switch *-SW-204 is tagged out in the open, de-energized position.	
15. Confirm that the conductors for Pump *-P-204 and inside *-SW-204 were marked during construction for proper pump rotation.	
16. Terminate conductors for Pump *-P-204 in *-SW-204 matching the conductor markings for each phase for proper pump rotation.	
17. Open (de-energize) fuse on *-LT-104 loop power in *-CP-001 and tag *-CP-001.	
18. Terminate the conductors for Level Transmitter *-LT-104 in *-TBX-104.	
19. Remove tag from *-CP-001 and close (energize) fuse on *-LT-104 loop power in *-CP-001.	
20. Remove and close disconnect switch *-SW-204 in closed, energized position.	
21. Close the circuit breaker in *-MCC-001 for Pump *-P-204.	
22. Confirm that Control Panel *-CP-001 is receiving a level signal from *-LT-104.	
23. Record the water depth in the temporary pump tank. Depth = _____ ft	
24. Record run time hour reading for *-P-204. Hour meter reading =_____	
25. Using raw water source, either hose or truck, add water to the temporary pump tank and begin raising the water level.	
26. Turn on Pump *-P-204 by selecting the ON position for hand switch *-HS-204.	
27. Adjust raw water addition to the temporary tank to maintain level above the minimum water level marked on the tank.	
28. Note it will take several minutes to fill the pipelines between the pump and the leachate tank.	

Test No. SystemCAT-P-204-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LDS Pump: 219A-LH-P-204 **IDF Cell No. 1**	Completed By
29. Record the flow rate reading from *-FIT-204 on *-CP-001. Flow rate reading : _____ gpm	
30. Record the flow total reading from *-CP-001 for Pump *-P-204. Flow totalizer reading = _____ gallons at _____(insert time of day)	
31. Record the pump hour meter reading from *-CP-001 for Pump *-P-204. Hour meter reading = _____ hrs at _____(insert time of day)	
32. After a minimum of 10 minutes more of pump operation, record the flow totalizer and hour meter readings. Flow totalizer reading = _____ gallons at _____(insert time of day) Hour meter reading = _____ hrs at _____(insert time of day)	
33. Verify that the flow totalizer and hour readings have increased properly.	
34. Record the reading of level in the temporary tank, that is displayed at Control Panel *-CP-001, to confirm that *-LT-104 is indicating properly. *-LT-104 water depth reading = _____ft	
35. While noting the level on the control panel in the previous step, measure the distance from the centerline of *-LT-104 to water surface in the temporary tank. Record that distance: Distance measured from *-LT-104 to water surface = _____ft	
36. At Control Panel *-CP-001, confirm that the ON status for Pump *-P-204 is being displayed.	
*Test of interlocks while operating Pump *-P-204 in manual mode – Pump Shut Off Interlocks (note that the interlock numbers are from the IDF Process and Instrumentation Drawings and may not be sequential)*	
⇒ <u>Interlock 1 Test</u> (Dwg H-2-830854 Sht 1).	
37. Position bypass hand switch *-HS-105 to the ON (CLOSED) position.	
38. While Pump *-P-204 is operating, lift by hand for several seconds the float of Leak Detection Element *-LDE-105 in the Crest Pad Building.	
39. Confirm that the pump has stopped operation by watching the flow rate reading on *-FIT-204 drop to approximately 0 gpm.	
40. So as not to overflow the temporary pump tank as water drains back down the side slope pipe, the float of *-LDE-105 should be lowered as soon as possible after confirming that the pump has stopped.	
41. Confirm that Pump *-P-204 restarts once the float of *-LDE-105 is lowered.	
⇒ <u>Interlock 2 (Dwg H-2-830854 Sheets 1 and 2).</u>	
42. Position bypass hand switch *-HS-107 to the ON (CLOSED) position.	
43. While Pump *-P-204 is operating, lift by hand for several seconds the float of Leak Detection Element *-LDE-107 in the Combined Sump.	
44. Confirm that the pump has stopped operation by watching the flow rate reading on *-FIT-204 drop to approximately 0 gpm.	
45. So as not to overflow the temporary tank as water drains back down the side slope pipe, the float of *-LDE-107 should be lower as soon as possible after confirming that the pump has stopped.	
46. Confirm that Pump *-P-204 restarts once the float of *-LDE-107 is lowered.	
⇒ <u>Interlock 4 (Dwg H-2-830854 Sheets 1 and 2).</u>	
47. Position bypass hand switch 219A201-LH-HS-301 to the ON (CLOSED) position.	
48. While Pump *-P-204 is operating, add water to the temporary vertical pipe (with Level Element 219A201-LH-LE-301 mounted inside) at the Leachate Storage Tank until the water level is high enough to cause 219A201-LH-LSHH-301 to shut off Pump *-P-204.	
49. Confirm that the pump has stopped operation by watching the flow rate reading on *-FIT-204 drop to approximately 0 gpm.	
50. Slowly open the valve at the bottom of the temporary vertical pipe. Drain water from the pipe until the water level in the pipe is below 6 feet in depth.	

Test No. SystemCAT-P-204-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LDS Pump: 219A-LH-P-204 **IDF Cell No. 1**	Completed By
51. Confirm that the Pump *-P-204 restarts.	
52. Press the reset button on Control Panel *-CP-001, and see that the high-high level alarm clears from 219A201-LH-LE-301.	
53. Turn the hand switch *-HS-204 to the OFF position.	
54. Discontinue filling the temporary storage tank.	
⇒ *Check Alarms Associated with Level Element in Leak Detection Sump*	
55. Use raw water source and fill the temporary tank slowly while *-P-204 is not running.	
56. On *-CP-001, note when the high level and high-high level alarms actuate.	
57. Record the water depth above Pump *-P-204 centerline at which the alarms actuated. Leak Detection Sump High Level Alarm = _____ft Leak Detection Sump High-High Level Alarm = _____ft	
58. Turn off the raw water supply to the temporary tank.	
59. Select the ON position at *-HS-204 and pump the level in the temporary tank down to the minimum water level marked on the side of the tank.	
60. Select the OFF position at *-HS-204.	
61. At Control Panel *-CP-001, use the reset button and confirm that the alarms for the high and high-high levels in the LDS sump clear.	
**-P-204 – Automatic Operation with Discharge to Cell No. 1 Leachate Storage Tank.*	
62. Select the AUTO position at *-HS-204.	
63. At Control Panel *-CP-001, verify that there is indication of Pump *-P-204 set in AUTO status.	
64. Turn on the raw water supply to slowly increase the water level in the temporary pump tank.	
65. Monitor the level in the temporary pump tank marking the water level when Pump *-P-204 energizes. Distance above the centerline of the pump at which pump turns on =_____ft	
66. Once the pump has started, turn off the raw water supply to the temporary pump tank.	
67. Monitor the level in the temporary pump tank marking the water level when the pump stops. Distance above the centerline of the pump at which pump turns off =_____ft	
⇒ *Check Pump and Flow Failure Alarms*	
68. Select the AUTO position at *-HS-204.	
69. Turn off the circuit breaker in *-MCC-001 for Pump *-P-204.	
70. Turn on the raw water supply to slowly increase the water level in the temporary pump tank to approximately 1.5 ft above the top of the pump.	
71. Turn off the raw water supply.	
72. Monitor Control Panel *-CP-001 for verification of a pump fail alarm.	
73. Turn *-HS-204 to the OFF position (reset required after pump fail condition)	
74. Close the circuit breaker in *-MCC-001 for Pump *-P-204.	
75. Turn *-HS-204 to the AUTO position	
76. Verify that there is an approximate 10-second delay before the pump restarts.	
77. Verify that the pump has restarted.	
78. Close valve *-V-017 in the CPB to simulate a no flow condition.	
79. Monitor Control Panel *-CP-001 to see that a flow failure alarm occurs.	
80. Confirm that as a result of the flow failure alarm, *-P-204 is automatically shut off.	
81. Turn *-HS-204 to the OFF position (reset required after flow fail condition)	
82. Open valve *-V-017.	
83. Turn *-HS-204 to the AUTO position	
84. Verify that there is an approximate 10-second delay before the pump restarts.	
85. Monitor that *-P-204 draws down the level in the temporary pump tank and stops operation automatically.	

Test No. SystemCAT-P-204-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of LDS Pump: 219A-LH-P-204 **IDF Cell No. 1**	Completed By
⇒ *Check Flow Signal and Level Signal Failures*	
86. Open (de-energize) the fuse at *-CP-001 for the loop power to *-FIT-204.	
87. Monitor Control Panel *-CP-001 to see that a flow signal failure alarm occurs.	
88. Close (energize) the fuse at *-CP-001 for the loop power to *-FIT-204.	
89. Push the reset button on *-CP-001 to clear the flow signal failure alarm.	
90. Open (de-energize) the fuse at *-CP-001 for the loop power to *-LT-104.	
91. Monitor Control Panel *-CP-001 to see that a level signal failure alarm occurs.	
92. Close (energize) the fuse at *-CP-001 for the loop power to *-LT-104.	
93. Push the reset button on *-CP-001 to clear the level signal failure alarm.	
⇒ *Check PLC Power Failure Mode*	
94. Verify that the uninterruptable power supply in Control Panel *-CP-001 is on.	
95. At Local Panel *-LP-001, turn off the breaker for Control Panel *-CP-001.	
96. Place *-HS-204 in the AUTO position	
97. Using the raw water supply, fill the temporary water tank to 1.5 feet above the top of Pump *-P-204.	
98. Confirm with power off to the PLC, that Pump *-P-204 is not actuated to run.	
99. Place *-HS-204 in the OFF position	
100. At Local Panel *-LP-001, turn on the breaker for Control Panel *-CP-001.	
Remove Temporary and Other Equipment Change to TBX 104	
101. Turn off the circuit breaker in *-MCC-001 for Pump *-P-204	
102. Open and tag disconnect switch *-SW-204 in open, de-energized position.	
103. Disconnect conductors for Pump *-P-204 in *-SW-204.	
104. Using a cable reel, wind up the conductors for Pump *-P-204 on the reel for storage with *-P-204.	
105. Disconnect temporary piping/flex hose between Pump *-P-204 and 1-1/2”-LH-015-HDPE discharge pipe which is temporarily routed above ground up the Cell No. 1 side slope to the CPB.	
106. Disconnect temporary flexible hoses from side slope discharge pipe to associated 1-1/2” leachate piping manifold quick connect inside the CPB.	
107. Close valve *-V-013	
108. Disconnect the sections of pipe 1-1/2”-LH-015-HDPE and store them safely to be used for final installation of *-P-204.	
109. Open (de-energize) fuse on *-LT-104 loop power in *-CP-001 and tag *-CP-001.	
110. Disconnect the conductors for Level Transmitter *-LT-104 in *-TBX-104.	
111. Close *-TBX-104	
112. Using a cable reel, wind the conductors up for Level Transmitter *-LT-104 on the reel for storage with *-LT-104.	
113. Pump *-P-204 and *-LT-104 have been stored and are ready for final installation by the General Construction Contractor.	
114. Remove the temporary tank and associated test equipment from the landfill cell.	

Construction Acceptance Test	By (Print Name & Sign)	Date
Performed:		
Witnessed:		
Insp. Coord. Rep.:		

Exceptions/Discrepancies

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Test No. SystemCAT-P-205-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of Crest Pad Bldg Sump Pump: 219A-LH-P-205 IDF Cell No. 1	Completed By

Test Purpose

This test will check the manual and automatic operation of the sump pump 219A-LH-P-205 in the Crest Pad Building. The test will also check for proper operation of the hardwire interlocks and the applicable programmable logic controller (PLC) functions associated with the pump.

Equipment Identification and Notes

1. Note that for the remainder of this system Construction Acceptance Test (CAT) procedure, an asterisk "*" will be used in place of the prefix 219A-LH for most instruments, valves, process piping, and equipment. As an example, *-P-205 will be used in place of 219A-LH-P-205.
2. The sump pump is automatically controlled by the PLC that is located within panel *-CP-001 in the Crest Pad Building (CPB).
3. Equipment/instrumentation associated with the sump pump testing includes:
   a. CPB Sump Pump *-P-205
   b. Float switches *-LSL-105, *-LSH-105, and *-LSHH-105.
   c. Leak Detection Element *-LDE-107
   d. Level Element 219A201-LH-LE-301
   e. Motor Control Center (MCC) *-MCC-001
   f. Control Panel *-CP-001.
   g. Local Panel *-LP-001
   h. Local Control Panel *-LCP-002
   i. Local Control Panel *-LCP-003
   j. Level Element 219A201-LH-LE-301

Additional Definitions and Abbreviations

1. Leachate Transfer Building (LTB)
2. Raw Water (RW).

Document Pump Tested

1. Manufacturer Name: _____
2. Model No. :_____
3. Serial No.:_____

Precautions and Limitations

1. If leaking is observed at CPB, LTB or combined sump during testing, shut down test and repair leak.	
2. Cell No. 1 Leachate Storage Tank will be used in this test for receiving flow from Pump *-P-205. Confirm that there is adequate volume in the tank for the planned tests.	
3. IDF project safety program shall be followed during this test procedure.	

Prerequisites

1. Review test procedures in Pre-Job Briefing on day of test.	
2. Confirm the component construction acceptance test (CAT-PC-205-A) for Pump *-P-205 has been successfully completed.	
3. Confirm that Cell No. 1 Leachate Storage Tank is available for use as part of this system CAT procedure.	
4. Confirm that piping, valves and electrical equipment associated with this test procedure is labeled or tagged.	
5. Confirm that Construction General Contractor (CGC) staff will conduct the CAT. Confirm the test will be witnessed by representatives of the CGC and the Construction Manager.	
6. Verify RW is available from the yard hydrant immediately outside the Cell No. 1 CPB.	

Test No. SystemCAT-P-205-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of Crest Pad Bldg Sump Pump: 219A-LH-P-205 IDF Cell No. 1	Completed By
7. Confirm that the following relevant documents are available during this testing: P&IDs (H-2-830854 sheets 1 & 2) Electrical wiring and connection diagrams for control panel *-CP-001. Pump manufacturer's information and O&M Manual. IDF Master Equipment List	
8. Assure that the following equipment is staged and ready to support this testing procedure: a. Temporary flexible hoses or pipe/fittings to deliver water from the yard hydrant to the Combined Sump. Hoses, pipe and fittings used shall be suitable for 120 psi operating pressure minimum. Will use water from the hydrant to actuate the pump's level switches. b. A solid wall section of Schedule 40 or 80 PVC pipe of the same diameter and length as the stilling well used in the Cell No. 1 Leachate Storage Tank for installation of Level Element 219A201-LH-LE-301. One end of the pipe will have a ball valve (designated as Temp Valve 1). The other end of the pipe shall have a tee mounted with its run in line with the pipe centerline. The pipe section will be used for testing one of the pump interlocks.	
The following steps set initial valve and circuit breaker positions for the testing with discharge to the Cell No. 1 Leachate Storage Tank.	
9. Turn off the circuit breaker in *-MCC-001 for Pump *-P-202	
10. Turn off the circuit breaker in *-MCC-001 for Pump *-P-203.	
11. Turn off the circuit breaker in *-MCC-001 for Pump *-P-204.	
12. Turn off the circuit breaker in *-MCC-001 for Pump *-P-205.	
13. Close valve 219A1-LH-V-025	
14. Close valve 219A1-LH-V-027	
15. Open valve 219A1-LH -V-026	
16. Open valve 219A201-LH-V-038	
17. Close valve *-V-005	
18. Close valve *-V-011	
19. Close valve *-V-017	
20. Close valve *-V-019	
21. Open valve *-V-021	
22. Open valve *-V-024	
23. Open valve *-V-042	
24. Place valve *-V-047 in the filter position.	
25. Open valve *-V-048	
26. Close valve *-V-049	
27. Close valve *-V-050	
28. Close valve *-V-051	
29. Confirm *-MCC-001 is energized.	
30. Confirm Control Panel *-CP-001 is energized.	
31. Confirm Local Control Panel *-LCP-002 is energized	
32. Confirm Local Control Panel *-LCP-003 is energized	
Instructions	
**-P-205 – Manual ON/OFF Operation with Discharge to Cell No. 1 Leachate Storage Tank.*	
1. Connect a hose to yard hydrant and secure its discharge inside the CPB sump.	
2. Secure the PVC section pipe with valve and tee attached (see Equipment Required) in a vertical position (with valve on lower end of the pipe) next to the installation of 219A201-LH-LE-301 at the Leachate Storage Tank.	
3. Close valve (Temp Valve 1) on the temporary pipe	
4. Install 219A201-LH-LE-301 in the temporary pipe.	

Test No. SystemCAT-P-205-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of Crest Pad Bldg Sump Pump: 219A-LH-P-205 IDF Cell No. 1	Completed By
5. Through the branch of the tee on the temporary pipe, slowly add water into the temporary pipe until the water depth in the pipe is approximately 5 feet.	
6. Press the reset button on Control Panel *-CP-001, and see that the low–low level alarm clears from 219A201-LH-LE-301.	
7. Visually note that the three level switch floats in the sump are mounted so that when water fills the sump, the floats can move upward without interfering with each other.	
8. Place bypass hand switch *-HS-105 to the OFF (OPEN) position.	
9. Place hand switch *-HS-205 at *-MCC-001 in the OFF position.	
10. Close the circuit breaker in *-MCC-001 for Pump *-P-205.	
11. Using the yard hydrant source, add water to the CPB sump until the water depth is a minimum of 2 feet.	
12. Turn on Pump *-P-205 by selecting the ON position for hand switch *-HS-205.	
13. Using the yard hydrant valve and valve *-V-024 on the sump pump's discharge, balance the raw water addition and the pump discharge rates. The intent of this step is to have the sump pump operate during the manual mode test without running the pump dry or overflowing the sump. It may be necessary to adjust the hydrant and/or valve openings during the test to accomplish this goal.	
14. Record the pump hour meter reading from *-CP-001 for Pump *-P-205. Hour meter reading = _____ hrs at _____(insert time of day)	
15. After a minimum of 10 minutes more of pump operation, record the hour meter reading. Hour meter reading = _____ hrs at _____(insert time of day)	
16. Verify that the hour readings have increased properly.	
17. At Control Panel *-CP-001, confirm that the ON status for Pump *-P-205 is being displayed.	
*Test of interlocks while operating Pump *-P-205 in manual mode – Pump Shut Off Interlocks (note that the interlock numbers are from the IDF Process and Instrumentation Drawings and may not be sequential)*	
⇒ <u>Interlock 2 (Dwg H-2-830854 Sheets 1 and 2).</u>	
18. Position bypass hand switch *-HS-107 to the ON (CLOSED) position.	
19. While Pump *-P-205 is operating, lift by hand for several seconds the float of Leak Detection Element *-LDE-107 in the Combined Sump.	
20. Confirm that the pump has stopped operation.	
21. Lower the float of *-LDE-107 after confirming that the pump has stopped from the previous step.	
22. Confirm that Pump *-P-205 restarts once the *-LDE-107 float is lowered.	
⇒ <u>Interlock 4 (Dwg H-2-830854 Sheets 1 and 2).</u>	
23. Position bypass hand switch 219A201-LH-HS-301 to the ON (CLOSED) position.	
24. While Pump *-P-205 is operating, add water to the temporary vertical pipe (with Level Element 219A201-LH-LE-301 mounted inside) at the Leachate Storage Tank until the water level is high enough to cause 219A201-LH-LSHH-301 to shut off Pump *-P-205.	
25. Confirm that the pump has stopped operation.	
26. Using Temp Valve 1 at the bottom of the temporary vertical pipe, drain water from the pipe until the water level in the pipe is less than 6 feet.	
27. Confirm that the Pump *-P-205 restarts.	
28. Press the reset button on Control Panel *-CP-001, and see that the high-high level alarm clears from 219A201-LH-LE-301.	
29. Turn the hand switch *-HS-205 to the OFF position.	
30. Turn off the yard hydrant used to fill the CPB sump.	
⇒ *Check Alarms Associated with the CPB Sump*	
31. Use the yard hydrant, fill the sump slowly while the hand switch for *-P-205 is still in the OFF position.	

Test No. SystemCAT-P-205-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of Crest Pad Bldg Sump Pump: 219A-LH-P-205 IDF Cell No. 1	Completed By
32. On *-CP-001, note when the high-high level alarm actuates.	
33. Record the water depth above the bottom of the sump at which the alarm actuated. CPB Sump High-High Level Alarm = _____ft	
34. Turn off the raw water supply to the CPB sump after the High-High Level Alarm is actuated.	
35. Record the water depth in the sump at which the High-High Level Alarm occurred. Water depth in sump at *-LSHH-105 = _____ feet.	
36. Confirm on Control Panel *-CP-001 that it is showing a Leak Alarm for the CPB sump.	
37. Select the ON position at *-HS-205 and pump the water level in the sump down to a depth of less than 6 inches.	
38. Select the OFF position at *-HS-205.	
39. At Control Panel *-CP-001, use the reset button and confirm that the alarm for the high-high level in the CPB sump clears. There will still be a leak detection alarm shown for the CPB sump.	
**-P-205 – Automatic Operation with Discharge to Cell No. 1 Leachate Storage Tank.*	
40. Select the AUTO position at *-HS-205.	
41. At Control Panel *-CP-001, verify that there is indication of Pump *-P-205 set in AUTO status.	
42. Turn on the yard hydrant to slowly increase the water level in the CPB sump.	
43. Record the water depth above the bottom of the sump at which Pump *-P-205 energizes. Distance above the bottom of the sump at which pump turns on =_____ft	
44. Once the pump has started, turn off the raw water supply to the sump.	
45. Confirm that the high level alarm is actuated when the Pump *-P-205 was energized.	
46. Record the water depth above the bottom of the sump at which the pump stops. Distance above the bottom of the sump at which pump turns off =_____ft	
⇒ *Check Pump Failure Alarm*	
47. Select the AUTO position at *-HS-205.	
48. Turn off the circuit breaker in *-MCC-001 for Pump *-P-205.	
49. Turn on the yard hydrant to slowly increase the water level in the sump to a minimum of 2 ft (or as required to actuate *-LSH-105) above the bottom of the sump.	
50. Turn off the yard hydrant.	
51. Monitor Control Panel *-CP-001 for verification of a pump fail alarm.	
52. Turn *-HS-205 to the OFF position (reset required after pump fail condition)	
53. Close the circuit breaker in *-MCC-001 for Pump *-P-205.	
54. Turn *-HS-205 to the AUTO position	
55. Verify that there is a time delay of approximately 10 seconds before the pump restarts.	
56. Verify that the pump has restarted.	
57. Monitor that *-P-205 draws down the level in the sump and stops operation automatically.	
58. Measure water depth (_____ ft) when pump stops and compare to that measured in earlier System CAT step.	
⇒ *Check PLC Power Failure Mode*	
59. Verify that the uninterruptable power supply in Control Panel *-CP-001 is on.	
60. At Local Panel *-LP-001, turn off the breaker for Control Panel *-CP-001.	
61. Place *-HS-205 in the AUTO position	
62. Using the yard hydrant, fill the sump to a minimum of 2 feet above the bottom of the sump.	
63. Confirm with power off to the PLC, that Pump *-P-205 is not actuated to run.	
64. Place *-HS-205 in the OFF position	
65. At Local Panel *-LP-001, turn on the breaker for Control Panel *-CP-001.	
66. Place *-HS-205 in the AUTO position to pump out the majority of water in the sump.	

Test No. SystemCAT-P-205-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of Crest Pad Bldg Sump Pump: 219A-LH-P-205 IDF Cell No. 1	Completed By
67. Use a wet/dry vacuum to remove the water from the CPB sump that is actuating *-LDE-105.	
68. At Control Panel *-CP-001, use the reset button and confirm that the alarms for the high level, high-high level and leak detection in the CPB sump clear.	
Remove Temporary Equipment	
69. Remove the temporary hose and fitting used to deliver water to the Crest Pad Building sump.	
70. If removed, re-install the grating over the CPB sump.	

Construction Acceptance Test	By (Print Name & Sign)	Date
Performed:		
Witnessed:		
Insp. Coord. Rep.:		

Exceptions/Discrepancies

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Test No. SystemCAT-P-207-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of Combined Sump Pump: 219A-LH-P-207 **IDF Cell No. 1**	Completed By

Test Purpose

This test will check the manual and automatic operation of the sump pump 219A-LH-P-207 which is located in the Cell No. 1 Leachate Handling Facilities Combined Sump. The test will also check for proper operation of the hardwire interlocks and the applicable programmable logic controller (PLC) functions associated with the pump.

Equipment Identification and Notes

1. Note that for the remainder of this system Construction Acceptance Test (CAT) procedure, an asterisk "*" will be used in place of the prefix 219A-LH for most instruments, valves, process piping, and equipment. As an example, *-P-207 will be used in place of 219A-LH-P-207.
2. The sump pump is automatically controlled by the PLC that is located within panel *-CP-001 in the Crest Pad Building (CPB).
3. Equipment/instrumentation associated with the sump pump testing includes:
   a. Combined Sump Pump *-P-207
   b. Float switches *-LSLL-107, *-LSL-107, *-LSH-107, and *-LSHH-107.
   c. Leak Detection Element *-LDE-107
   d. Level Element 219A201-LH-LE-301
   e. Motor Control Center (MCC) *-MCC-001
   f. Control Panel *-CP-001.
   g. Local Panel *-LP-001
   h. Local Control Panel *-LCP-003
   i. Level Element 219A201-LH-LE-301

Additional Definitions and Abbreviations

1. Leachate Transfer Building (LTB)
2. Raw Water (RW).

Document Pump Tested

1. Manufacturer Name: _____
2. Model No. :_____
3. Serial No.:_____

Precautions and Limitations

1. If leaking is observed at CPB, LTB or combined sump during testing, shut down test and repair leak.	
2. Cell No. 1 Leachate Storage Tank will be used in this test for receiving flow from Pump *-P-207. Confirm that there is adequate volume in the tank for the planned tests.	
3. IDF project safety program shall be followed during this test procedure.	

Prerequisites

1. Review test procedures in Pre-Job Briefing on day of test.	
2. Confirm the component construction acceptance test (CAT-PC-207-A) for Pump *-P-207 has been successfully completed.	
3. Confirm that Cell No. 1 Leachate Storage Tank is available for use as part of this system CAT procedure.	
4. Confirm that piping, valves and electrical equipment associated with this test procedure is labeled or tagged.	
5. Confirm that Construction General Contractor (CGC) staff will conduct the CAT. Confirm the test will be witnessed by representatives of the CGC and the Construction Manager.	
6. Verify RW is available from the yard hydrant adjacent to the Cell No. 1 Truck Loading Station.	

Test No. SystemCAT-P-207-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of Combined Sump Pump: 219A-LH-P-207 **IDF Cell No. 1**	Completed By
7. Confirm that the following relevant documents are available during this testing: P&IDs (H-2-830854 sheets 1 & 2) Electrical wiring and connection diagrams for control panel *-CP-001. Pump manufacturer's information and O&M Manual. IDF Master Equipment List	
8. Assure that the following equipment is staged and ready to support this testing procedure: a. Temporary flexible hoses or pipe/fittings to deliver water from the yard hydrant to the Combined Sump. Hoses, pipe and fittings used shall be suitable for 120 psi operating pressure minimum. Will use water from the hydrant to actuate the pump's level (float) switches. b. A solid wall section of Schedule 40 or 80 PVC pipe of the same diameter and length as the stilling well used in the Cell No. 1 Leachate Storage Tank for installation of Level Element 219A201-LH-LE-301. One end of the pipe will have a ball valve (designated as Temp Valve 1). The other end of the pipe shall have a tee mounted with its run in line with the pipe centerline. The pipe section will be used for testing one of the pump interlocks.	
The following steps set initial valve and circuit breaker positions for the testing with discharge to the Cell No. 1 Leachate Storage Tank.	
9. Turn off the circuit breaker in *-MCC-001 for Pump *-P-202	
10. Turn off the circuit breaker in *-MCC-001 for Pump *-P-203.	
11. Turn off the circuit breaker in *-MCC-001 for Pump *-P-204.	
12. Turn off the circuit breaker in *-MCC-001 for Pump *-P-205.	
13. Turn off the circuit breaker in *-MCC-001 for Pump *-P-207.	
14. Open valve *-V-031	
15. Close valve 219A1-LH-V-027	
16. Close valve 219A201-LH-V-038	
17. Close valve 219A201-LH-V-039	
18. Confirm *-MCC-001 is energized.	
19. Confirm Control Panel *-CP-001 is energized.	
20. Confirm Local Control Panel *-LCP-003 is energized	
Instructions	
**-P-207 – Manual ON/OFF Operation with Discharge to Cell No. 1 Leachate Storage Tank.*	
1. Connect a hose to yard hydrant and secure its discharge into the Combined Sump's pump chamber.	
2. Secure the PVC pipe section with valve and tee attached (see Equipment Required) in a vertical position (with valve on lower end of the pipe) next to the installation of 219A201-LH-LE-301 at the Leachate Storage Tank.	
3. Close valve (Temp Valve 1) on the temporary pipe	
4. Install 219A201-LH-LE-301 in the temporary pipe.	
5. Through the branch of the tee on the temporary pipe, slowly add water into the temporary pipe until the water depth in the pipe is approximately 5 feet.	
6. Press the reset button on Control Panel *-CP-001, and see that the low–low level alarm clears from 219A201-LH-LE-301.	
7. Visually note that the four level switch floats in the Combined Sump's pump chamber are mounted so that when water fills the sump, the floats can move upward without interfering with each other.	
8. Place hand switch *-HS-207 at *-MCC-001 in the OFF position.	
9. Close the circuit breaker in *-MCC-001 for Pump *-P-207.	
10. Using the yard hydrant source, add water to the pump chamber until the water depth is a minimum of 4 feet.	
11. Partially close valve *-V-031 so that it is between one-quarter and half open position.	
12. Turn on Pump *-P-207 by selecting the ON position for hand switch *-HS-207.	

Test No. SystemCAT-P-207-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of Combined Sump Pump: 219A-LH-P-207 **IDF Cell No. 1**	Completed By
13. Using the yard hydrant valve and valve *-V-031 on the sump pump's discharge, balance the raw water addition and the pump discharge rates (see note below).	
Note: The goal is to allow the pump to run as long as possible without shutting off during the manual operations test. If the water level reaches the low-low level during the manual mode test, the pump will shut off and the pump chamber will need to be refilled before continuing the test. The pumping rate should always be equal to or higher than the fill rate so as not to overflow the pump chamber. It may be necessary to adjust the valve opening during the test to accomplish this goal. Even with adjustment, it may not be possible to match the pumping and filling rates but at least the continuous pump run time will be extended as much as possible during the manual test.	
14. Record the pump hour meter reading from *-CP-001 for Pump *-P-207. Hour meter reading = _____ hrs at _____(insert time of day)	
15. After a minimum of 6 minutes of pump operation, record the hour meter reading. Hour meter reading = _____ hrs at _____(insert time of day)	
16. Verify that the hour readings have increased properly.	
17. At Control Panel *-CP-001, confirm that the ON status for Pump *-P-207 is being displayed.	
*Test of interlocks while operating Pump *-P-207 in manual mode – Pump Shut Off Interlocks* *(note that the interlock numbers are from the IDF Process and Instrumentation Drawings and may not be sequential)*	
⇒ Interlock 3 (Dwg H-2-830854 Sheets 1 and 2).	
18. While Pump *-P-207 is operating, turn off the raw water source to the sump.	
19. Confirm that when the water level in the sump reaches *-LSLL-107, the low-low level alarm is actuated and *-P-207 turns off.	
20. Record the water depth above the bottom of the sump at which the low-low alarm was actuated. Combined Sump Pump Chamber Low-Low Level Alarm = _____ft	
21. Confirm that the pump has stopped operation.	
22. Position hand switch *-HS-207 to the OFF position.	
23. Press the reset button on Control Panel *-CP-001, and see that the low-low level alarm clears from *-LSLL-107 (add water as necessary to the sump to clear the low-low alarm).	
⇒ Interlock 4 (Dwg H-2-830854 Sheets 1 and 2).	
24. Position bypass hand switch 219A201-LH-HS-301 to the ON (CLOSED) position.	
25. Add water to the pump chamber of the Combined Sump until the water level is approximately 4 feet.	
26. Turn off the yard hydrant used to deliver water to the pump chamber.	
27. Place hand switch *-HS-207 to the ON position.	
28. Using the raw water source, add water to the temporary vertical pipe (with Level Element 219A201-LH-LE-301 is mounted inside) at the Leachate Storage Tank until the water level is high enough to cause 219A201-LH-LSHH-301 to close to shut off Pump *-P-207.	
29. Using the valve (Temp Valve 1) at the bottom of the temporary vertical pipe drain water from the pipe until the water level in the pipe is less than 6 feet.	
30. Confirm that the Pump *-P-207 restarts.	
31. Press the reset button on Control Panel *-CP-001, and see that the high-high level alarm clears from 219A201-LH-LE-301.	
32. Turn the hand switch *-HS-207 to the OFF position.	
⇒ *Check Alarms Associated with the Combined Sump*	
33. Use the yard hydrant, fill the pump chamber slowly while the hand switch for *-P-207 is still in the OFF position.	
34. On *-CP-001, note when the high-high level alarm actuates.	
35. Record the water depth above the bottom of the sump at which the alarm actuated. Combined Sump Pump Chamber High-High Level Alarm = _____ft	

Test No. SystemCAT-P-207-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of Combined Sump Pump: 219A-LH-P-207 IDF Cell No. 1	Completed By
36. Turn off the raw water supply to the pump chamber after the High-High Level Alarm is actuated.	
37. Select the ON position at *-HS-207 and pump the water level in the sump down until the Low-Low Level Alarm actuates and shuts off the pump.	
38. Select the OFF position at *-HS-207.	
39. At Control Panel *-CP-001, use the reset button and confirm that the alarms for the high-high level and the low-low level in the Combined Sump clear. Water addition may be required to clear the low-low level alarm.	
**-P-207 – Automatic Operation with Discharge to Cell No. 1 Leachate Storage Tank.*	
40. Select the AUTO position at *-HS-207.	
41. At Control Panel *-CP-001, verify that there is indication of Pump *-P-207 set in AUTO status.	
42. Turn on the yard hydrant to slowly increase the water level in the pump chamber.	
43. Record the water depth above the bottom of the sump at which Pump *-P-207 energizes. Distance above the bottom of the sump at which pump turns on =_____ft	
44. Once the pump has started, turn off the raw water supply to the sump.	
45. Record the water depth above the bottom of the sump at which the pump stops. Distance above the bottom of the sump at which pump turns off =_____ft	
⇒ *Check Pump Failure Alarm*	
46. Select the AUTO position at *-HS-207.	
47. Turn off the circuit breaker in *-MCC-001 for Pump *-P-207.	
48. Turn on the yard hydrant to slowly increase the water level in the sump as required to actuate *-LSH-107 which calls the pump to turn on.	
49. Turn off the yard hydrant.	
50. Monitor Control Panel *-CP-001 for verification that a pump fail alarm occurs.	
51. Turn *-HS-207 to the OFF position (reset required after pump fail condition)	
52. Close the circuit breaker in *-MCC-001for Pump *-P-207.	
53. Turn *-HS-207 to the AUTO position	
54. Verify that there is a time delay of approximately 10 seconds before the pump restarts.	
55. Verify that the pump has restarted.	
56. Monitor that *-P-207 draws down the level in the pump chamber and stops operation automatically.	
57. Measure water depth (_____ ft) when pump stops and compare to that measured in earlier System CAT step.	
⇒ *Check PLC Power Failure Mode*	
58. Verify that the uninterruptable power supply in Control Panel *-CP-001 is on.	
59. At Local Panel *-LP-001, turn off the breaker for Control Panel *-CP-001.	
60. Place *-HS-207 in the AUTO position	
61. Using the yard hydrant, fill the pump chamber to a minimum of 3 feet above the bottom of the sump.	
62. Confirm with power off to the PLC, that Pump *-P-207 is not actuated to run.	
63. Place *-HS-207 in the OFF position	
64. At Local Panel *-LP-001, turn on the breaker for Control Panel *-CP-001.	
65. Place *-HS-207 in the AUTO position to pump out the majority of water in the pump chamber.	
66. At Control Panel *-CP-001, use the reset button and confirm that alarms associated with Pump *-P-207 are cleared.	
Remove Temporary Equipment	
67. Remove the temporary hose and fitting used to deliver water to the combined sump.	

Test No. SystemCAT-P-207-A	Project Name: *IDF*	Project No.: 184570.A3.13.01
System Construction Acceptance Test of Combined Sump Pump: 219A-LH-P-207 IDF Cell No. 1		Completed By
Construction Acceptance Test	By (Print Name & Sign)	Date
Performed:		
Witnessed:		
Insp. Coord. Rep.:		

Exceptions/Discrepancies

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Test No. SystemCAT-P-302-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of Leachate Transfer Pump: 219A1-LH-P-302 **IDF Cell No. 1**	Completed By

Test Purpose

This test will check the manual operation of the leachate transfer pump 219A1-LH-P-302. The test will also check for proper operation of the hardwire interlocks and the applicable programmable logic controller (PLC) functions associated with the pump. Note that there is not an automatic operation mode for this pump.

Equipment Identification and Notes

1. Note that for the remainder of this Construction Acceptance Test procedure, an asterisk "*" will be used in place of the prefix 219A1-LH for most instruments, valves, process piping, and equipment. As an example, *-P-302 will be used in place of 219A1-LH-P-302.
2. The leachate transfer pump in the leachate transfer building (LTB) is manually controlled by panel *-LCP-005 located in the LTB.
3. Equipment/instrumentation associated with the leachate transfer pump testing includes:
   a. Leachate Transfer Pump *-P-302 and associated flowmeter *-FIT-302.
   b. Local Control Panel *-LCP-005.
   c. Motor Control Center (MCC) 219A-LH-MCC-001.
   d. Control Panel 219A-LH-CP-001.
   e. Combined Sump Pump 219A-LH-P-207
   f. Leachate Storage Tank 219A201-LH-TK-300
   g. Level Element 219A201-LH-LE-301

Additional Definitions and Abbreviations

1. Crest Pad Building (CPB).
2. Water Column (WC).

Document Pump Tested

1. Manufacturer Name: _____
2. Model No. :_____
3. Serial No.:_____

Precautions and Limitations

1. If leaking is observed at LTB or combined sump during testing, shut down test and repair leak.	
2. Cell No. 1 Leachate Storage Tank will be used in this test for providing flow to and receiving flow from Pump *-P-302. Verify there is a minimum of 2 feet depth of raw water in the leachate tank.	
3. IDF project safety program shall be followed during this test procedure.	

Prerequisites

1. Review test procedures in Pre-Job Briefing on day of test.	
2. Confirm the following procedure is complete: CAT-PC-302-A (leachate transfer pump testing).	
3. Confirm the following procedure is complete: CAT-PC-207-A (combined sump pump testing).	
4. Verify Cell No. 1 Leachate Storage Tank is available for use as part of this system CAT procedure.	
5. Confirm that piping, valves and electrical equipment associated with this test procedure is labeled or tagged.	
6. Confirm that Construction General Contractor (CGC) staff will conduct the CAT. Confirm the test will be witnessed by representatives of the CGC and the Construction Manager.	
7. Verify RW is available from the yard hydrants on the IDF site.	

Test No. SystemCAT-P-302-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of Leachate Transfer Pump: 219A1-LH-P-302 IDF Cell No. 1	Completed By
8. Confirm that the following relevant documents are available during this testing: P&IDs (H-2-830854 sheets 1 & 2) Electrical wiring and connection diagrams for control panels *-LCP-005, 219A-LH-CP-001 and Motor Control Center (MCC) 219A-LH-MCC-001 Leachate transfer pump manufacturer's information and O&M Manual. System/Pump curve data IDF Master Equipment List	
9. Assure that the following equipment is staged and ready to support this testing procedure: a. Temporary flexible hoses and piping/fittings as necessary to deliver water from the quick disconnect valve *-V-036 to a concrete sump located in the truck loading station. The hoses, pipes and fittings shall have a pressure rating equal to or greater than the permanent piping to which it is connected. b. A solid wall section of Schedule 40 or 80 PVC pipe of the same diameter and length as the stilling well used in the Cell No. 1 Leachate Storage Tank for installation of Level Element 219A201-LH-LE-301. One end of the pipe will have a ball valve (designated as Temp Valve 1). The other end of the pipe shall have a tee mounted with its run in line with the pipe centerline. The pipe section will be used for testing one of the pump interlocks.	
10. Turn off the circuit breaker in 219A-LH-MCC-001 for Pump 219A-LH-P-202	
11. Turn off the circuit breaker in 219A-LH-MCC-001 for Pump 219A-LH-P-203.	
12. Turn off the circuit breaker in 219A-LH-MCC-001 for Pump 219A-LH-P-204.	
13. Turn off the circuit breaker in 219A-LH-MCC-001 for Pump 219A-LH-P-205.	
14. Turn on the circuit breaker in 219A-LH-MCC-001 for Pump 219A-LH-P-207.	
15. Turn off the circuit breaker in 219A-LH-MCC-001 for Pump 219A-LH-P-302.	
16. Turn *-HS-302 OFF in *-LCP-005 for Pump *-P-302.	
17. Open and tag out the Cell No. 1 pump disconnect *-SW-302, located inside the LTB.	
18. Open valve *-V-027.	
19. Open valve *-V-043.	
20. Close valve *-V-041.	
21. Open valve *-V-029.	
22. Open valve *-V-040.	
23. Close valve *-V-037.	
24. Close valve *-V-025.	
25. Open valve *-V-036.	
26. Open valve 219A-LH-V-031.	
27. Confirm 219A-LH-MCC-001 is energized.	
28. Confirm Control Panel 219A-LH-CP-001 is energized.	
29. Confirm Control Panel *-LCP-005 is energized.	
Instructions	
**-P-302 – Manual ON/OFF Operation*	
1. Install the necessary fittings and minimum 6 inch diameter flex hose as necessary to connect to the quick disconnect on valve *-V-036 at the truck loading station.	
2. Install the other end of the minimum 6 inch diameter flex hose within the west sump of the truck loading pad.	
3. Secure hose in place.	
4. Secure the PVC pipe section with valve and tee attached (see Equipment Required) in a vertical position (with valve on lower end of the pipe) next to the installation of 219A201-LH-LE-301 at the Leachate Storage Tank.	
5. Close valve (Temp Valve 1) on the temporary pipe	
6. Install 219A201-LH-LE-301 in the temporary pipe.	
7. Through the branch of the tee on the temporary pipe, slowly add water into the temporary pipe until the water depth in the pipe is approximately 2 feet.	

Test No. SystemCAT-P-302-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of Leachate Transfer Pump: 219A1-LH-P-302 IDF Cell No. 1	Completed By
8. Select Cell No. 1 Combined Sump Pump's hand switch, 219A-LH-HS-207, to AUTO position. This pump control hand switch is located on the front of 219A-LH-MCC-001 in the CPB.	
9. Close the circuit breaker in 219A-LH-MCC-001 for Pump 219A-LH-P-302.	
10. Remove tag and close leachate transfer pump disconnect switch *-SW-302.	
11. Operate Pump *-P-302 by selecting hand switch *-HS-302 located on *-LCP-005 to the ON (manual) position.	
12. Visually note the water level in the combined sump pump chamber and verify that water is being pumped by the Combined Sump Pump 219A-LH-P-207.	
13. Record the flow total reading from 219A-LH-CP-001 for Pump *-P-302. Flow totalizer reading = _____ gallons at _____(insert time of day)	
14. To assure that the combined sump pumping capacity is not exceeded, use valve *-V-036 to throttle the discharge of Pump *-P-302 to between 200 and 250 gpm.	
15. Record the pump hour meter reading from 219A-LH -CP-001 for Pump *-P-302. Hour meter reading = _____ hrs at _____(insert time of day)	
16. After a minimum of 10 minutes more of pump operation, record the flow totalizer and hour meter readings. Flow totalizer reading = _____ gallons at _____(insert time of day) Hour meter reading = _____ hrs at _____(insert time of day)	
17. Verify that the flow totalizer and hour readings have increased properly.	
18. Record the flow rate reading from *-FIT-302 on 219A-LH-CP-001. Flow rate reading : _____ gpm	
19. At Control Panel 219A-LH-CP-001, confirm that the ON status for Pump *-P-302 is being displayed.	
20. Select hand switch *-HS-302 at *-LCP-005 for *-P-302 to the OFF position and verify no discharge at truck loading station.	
21. Allow combined sump pump 219A-LH-P-207 to drain pump chamber and automatically turn off.	
22. Select hand switch, 219A-LH-HS-207 to OFF position.	
*Test of interlock for Pump *-P-302 while it is in manual mode – Pump Shut Off Interlock (note that the interlock numbers are from the IDF Process and Instrumentation Drawings and may not be sequential)*	
⇒ Interlock 4 (Dwg H-2-830854 Sheets 1 and 2).	
23. Position bypass hand switch 219A201-LH-HS-301 to the ON (CLOSED) position.	
24. Select hand switch, 219A-LH-HS-207 to AUTO position.	
25. Select hand switch *-HS-302 at *-LCP-005 for *-P-302 to the ON position and visually verify water is being discharged to the combined sump.	
26. While Pump *-P-302 is operating, use the valve (Temp Valve 1) at the bottom of the temporary pipe (with Level Element 219A201-LH-LE-301 mounted inside) at the Leachate Storage Tank to drain out water until the water level is reaches the level where 219A201-LH-LSLL-301 causes Pump *-P-302 to shut off.	
27. Close Temp Valve 1 on the temporary pipe.	
28. Confirm that the pump has stopped operation by watching the flow rate reading on *-FIT-302 drop to approximately 0 gpm.	
29. Add water to the temporary pipe through its tee and raise the water level up to a minimum of 2 feet.	
30. Confirm that Pump *-P-302 restarts.	
31. Press the reset button on Control Panel 219A-LH-CP-001, and see that the low-low level alarm clears from 219A201-LH-LE-301.	
32. Turn the hand switch *-HS-302 to the OFF position.	
Check Flow Failure Alarm	
33. Open (de-energize) the fuse at 219A-LH-CP-001 for the loop power to *-FIT-302.	

Test No. SystemCAT-P-302-A	Project Name: *IDF*	Project No.: 184570.A3.13.01

System Construction Acceptance Test of Leachate Transfer Pump: 219A1-LH-P-302 IDF Cell No. 1	Completed By
34. Monitor Control Panel 219A-LH-CP-001 to see that a flow signal failure alarm occurs.	
35. Confirm that as a result of the flow failure alarm, *-P-302 is automatically shut off.	
36. Close (energize) the fuse at 219A-LH-CP-001 for the loop power to *-FIT-302.	
37. Push the reset button on 219A-LH-CP-001 to clear the flow signal failure alarm.	
Remove Temporary Equipment	
38. Close valve *-V-036.	
39. Remove the temporary hose from valve *-V-036	
40. Replace grates removed from the truck loading station slab for this test.	

Construction Acceptance Test	By (Print Name & Sign)	Date
Performed:		
Witnessed:		
Insp. Coord. Rep.:		

Exceptions/Discrepancies

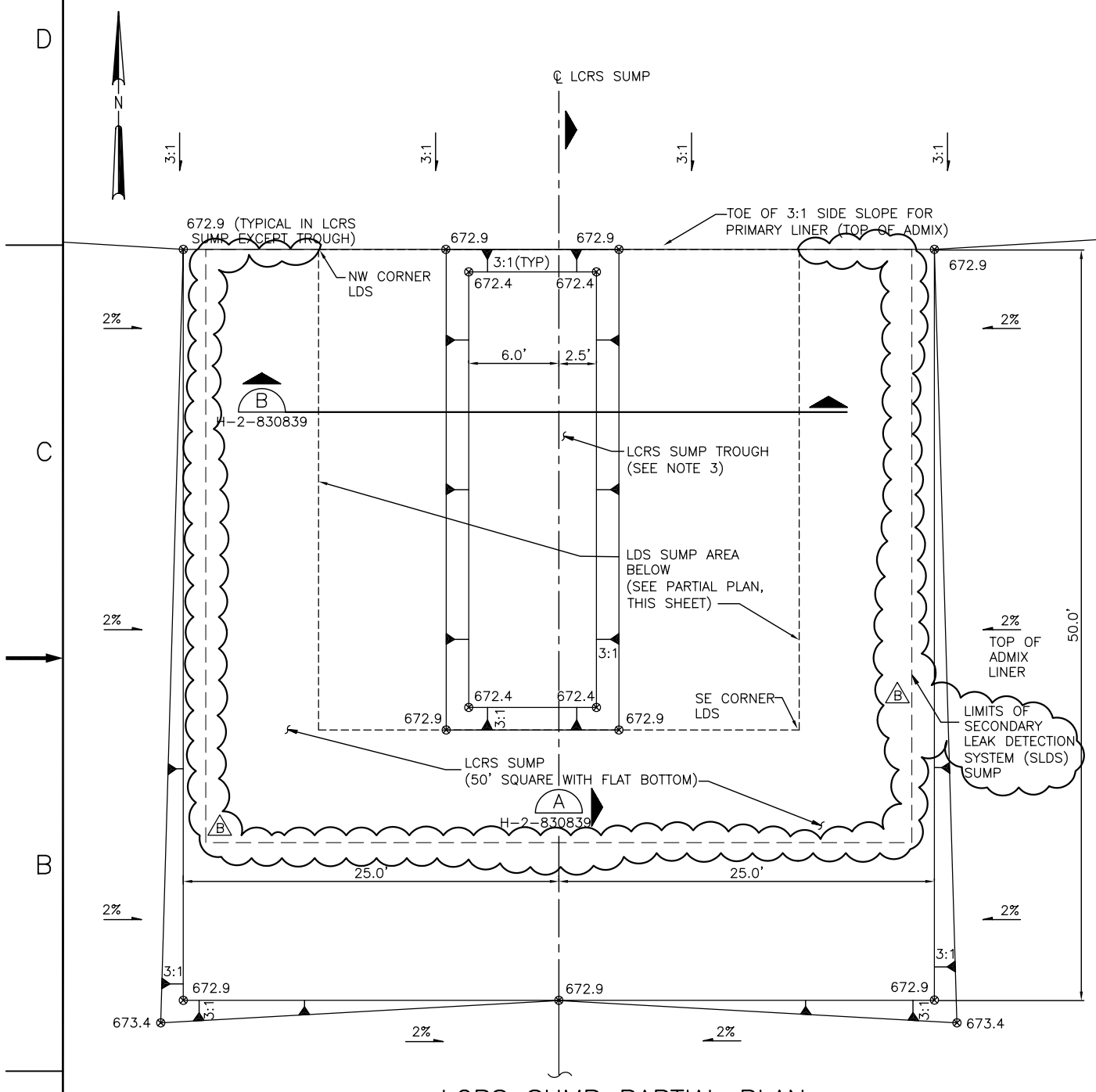
IDF CONSTRUCTION INSPECTION PLAN, RPP-18490, REV. 0
Errata
April 19, 2004

Section of Report	Location of Change	Changes
CIP	Cover page	PE Stamp Signature/Date
	2nd page	Updated to reflect Attachment 6 included
	Table of Contents	Updated
	Section 1.2	Attachment 6 revised
	Section 3, Intro bullet list	Attachment 6 revised
	Section 3.4	3rd paragraph revised to reflect inclusion of Attachment 6
Attachment 1	Cover page	Date
	2nd page	PE Stamp Signature/Date
	Acronyms	'SLDS' (Secondary leak detection system) added to list
	Section 1.2.3	2 bullets added, 1 bullet revised to add SLDS
	Section 1.4.2	'SLDS' added to 1st bulleted paragraph
	Section 1.61	'SLDS' added to 2nd paragraph, 1 bullet added, 1 bullet revised
	Section 2.5	Sentence revised in 1st paragraph
	Section 2.6	'SLDS' added to 2nd set of bullets and table 2-7 revised
	Section 4.3	Bullet added in last section for secondary leak detection system geomembrane
	Section 7.1	'SLDS' added and sentence revised
	Section 7.1.7	Revised fourth sentence to clarify weld beads removal in all riser pipes
	Section 7.1.8	2nd set of bullets revised to add SLDS
Attachment 2	Cover page	Date
	2nd page	PE Stamp Signature/Date
	Acronyms	'SLDS' (Secondary leak detection system) added to list
	Section 1.2.3	2 bullets added, 1 bullet revised to add SLDS

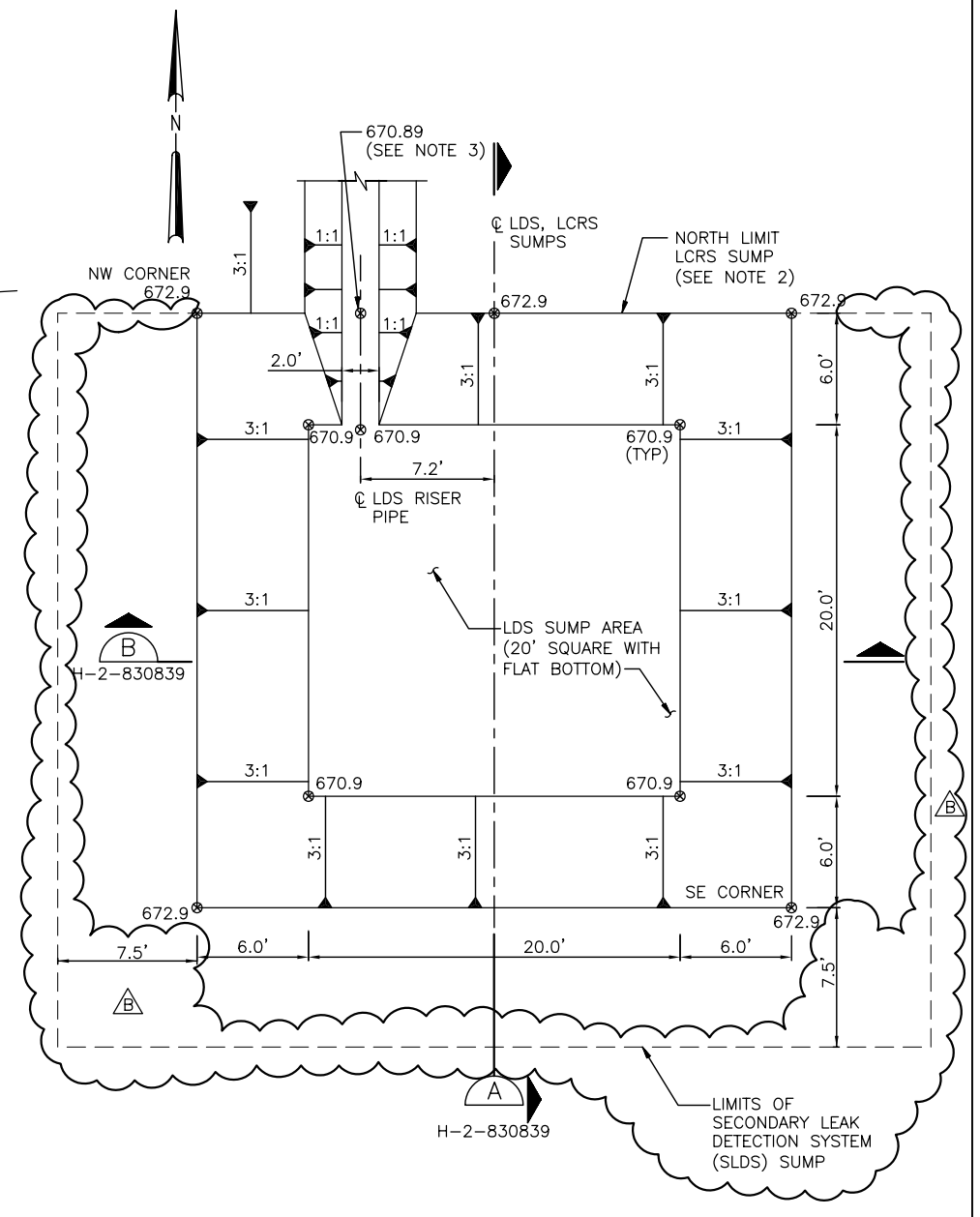
Section of Report	Location of Change	Changes
	Section 1.4.2	'SLDS' added to 1st bulleted paragraph
	Section 1.61	'SLDS' added to 2nd paragraph, 1 bullet added, 1 bullet revised
	Section 2.5	Sentence revised in 1st paragraph
	Section 2.6	'SLDS' added to bullets and Table 2-6 revised
	Section 4.3	Bullet added in last section for secondary leak detection system geomembrane
	Section 7.1.7	Revised fourth sentence to clarify weld beads removal in all riser pipes
	Section 7.1.8	2nd set of bullets revised to add SLDS
Attachment 3	Section 2315 (Operational Layer Material (SLDS))	Added 'two per lift' to cell L15
	Section 3300 (Concrete Sump Water Tightness)	Changed cell L131 to read 'Coating of truck loading slabs, building slabs,and the surfaces of associated sumps. CAT procedure prepared for watertightness of sumps in crest pad building, leachate transfer building and at truck loading slab. Note: test/inspection requirement in specification added by addendum.
	Section 11306 (Verify Rise Pipe Transition)	Added 'function test not part of CAT; verify for LCRS, LDS and SLDS pipes with pump/level transducer insertion' to cell L141
	Section 13205 (Electronic Leak Location Survey)	Added 'Per CQC section in 13205 perform on primary and secondary tank liner prior to floating cover installation' to cell L161
Attachment 4		No changes
Attachment 5		No changes
Attachment 6	All	Entire attachment replaced - specific revisions not highlighted in tracked changes

DWG NO H-2-830836 SH 1 OF 1 REV B

FOR BIDDING PURPOSES ONLY
NOT FOR CONSTRUCTION



LCRS SUMP PARTIAL PLAN
1" = 5'-0" H-2-830836



LDS SUMP PARTIAL PLAN
1" = 5'-0"

LCRS SUMP PARTIAL PLAN NOTES:

1. GRADES SHOWN ARE TOP OF ADMIX LINER EXCEPT WITHIN LCRS SUMP TROUGH AND LDS SUMP AREAS. WITHIN LCRS SUMP TROUGH AND LDS SUMP AREAS GRADES SHOWN ARE TOP OF PRIMARY GEOMEMBRANE. SEE LDS SUMP PARTIAL PLAN FOR TOP OF ADMIX GRADES IN THIS AREA.
2. FOR SUBGRADE CONTROL LINE BELOW LCRS SUMP, SEE DETAILS 1 AND 2 ON DWG. H-2-830829, SHEET 1 OR 2.
3. SEE SPECIFICATION SECTION 02661 FOR GEOMEMBRANE PANEL LAYOUT REQUIREMENTS FOR LCRS SUMP TROUGH.

LDS SUMP PARTIAL PLAN NOTES:

1. GRADES SHOWN ARE TOP OF ADMIX LINER.
2. PRIMARY AND SECONDARY GEOMEMBRANE GRADES MATCH AT EL 672.89 (TYP ALL SIDES OF LDS SUMP). CONTINUE 3:1 SLOPE TO ANCHOR TRENCH AT PERIMETER DIKE.
3. START 3:1 SLOPE AT TRENCH BOTTOM. BEGIN TRANSITION TO MAINTAIN 2'-0" DEPTH BELOW PRIMARY LINER GRADES SHOWN ON H-2-830836
4. FOR SUBGRADE CONTROL LINES BELOW LDS SUMP, SEE DETAILS 1 AND 2 ON DWG. H-2-830829, SHEET 1 OR 2.

BLDG. NO. 200E

INDEX NO. 0111

THIS SPACE RESERVED FOR BUILDING AND INDEX NUMBERS

MICHAEL W. REIMBOLD STATE OF WASHINGTON 28614 REGISTERED PROFESSIONAL ENGINEER
EXPIRES 12/24/

CH2MHILL

DWG NO	TITLE	REF NUMBER	TITLE
DRAWING TRACEABILITY LIST		REFERENCES	
		NEXT USED ON	

REV NO	DESCRIPTION	REV BY DATE	ENGR COMPANY
B	ADDITION OF SLDS	4/19/04	M REIMBOLD CH2Mhill

REVISIONS

NAME	DATE	COMPANY
DRAWN BY R LATTA		CH2Mhill
DFTG APPROVED M REIMBOLD		CH2Mhill
DESIGN AUTHORITY E GIRGIS		

U.S. DEPARTMENT OF ENERGY
Office of River Protection

TITLE
IDF
CELLS 1 AND 2
SUMP PARTIAL PLANS

SIZE	BLDG NO	INDEX NO	DWG NO	REV
D	200E	0111	H-2-830837	B

SCALE 1'=100' EDT 634144 SHEET 1 OF 1

XXXX PLOTID XXXX ORP_TB_D [12-02].DWG

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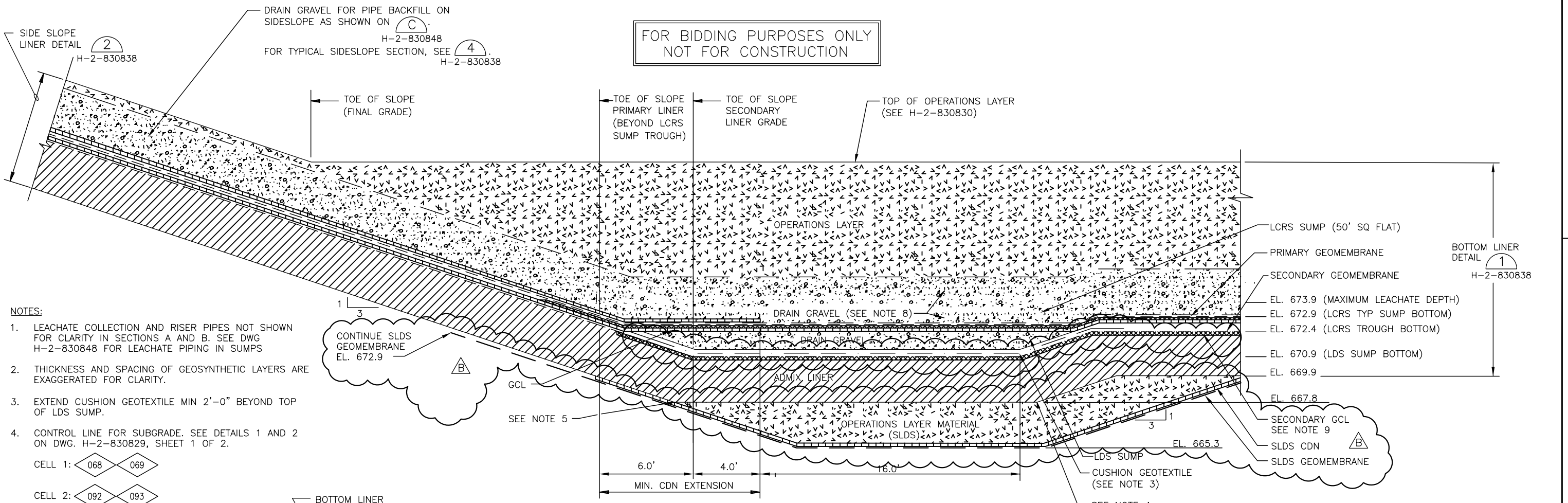
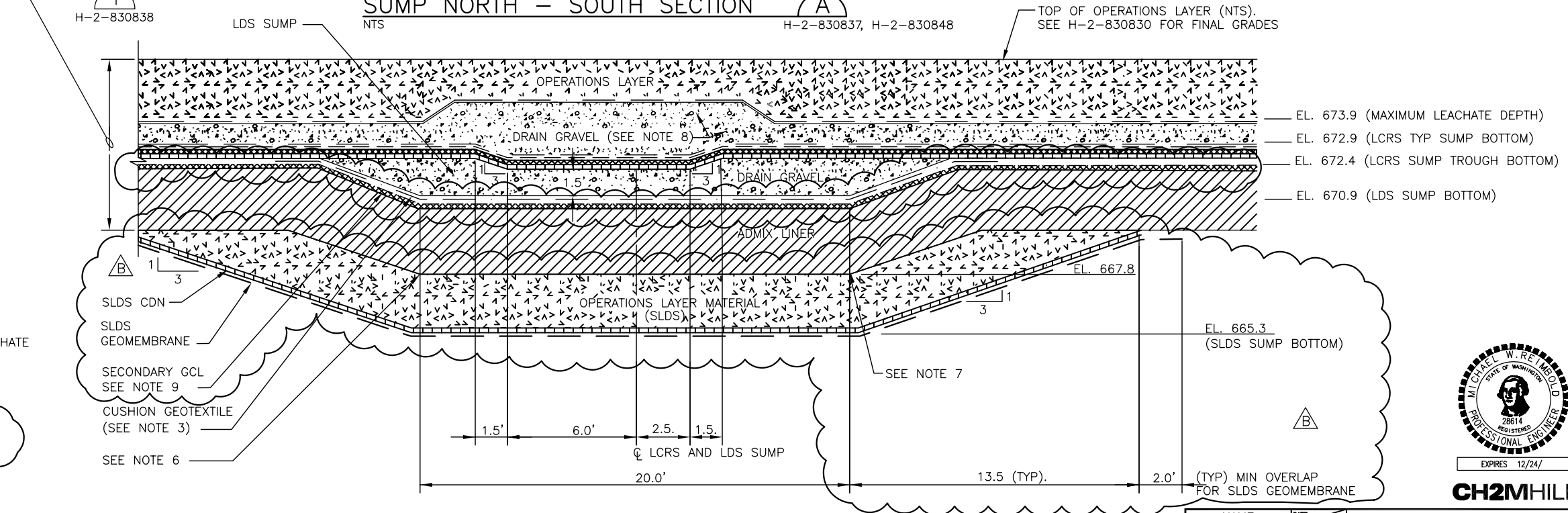


SUMP NORTH – SOUTH SECTION A
NTS H-2-830837, H-2-830848

NOTES:

1. LEACHATE COLLECTION AND RISER PIPES NOT SHOWN FOR CLARITY IN SECTIONS A AND B. SEE DWG H-2-830848 FOR LEACHATE PIPING IN SUMPS
2. THICKNESS AND SPACING OF GEOSYNTHETIC LAYERS ARE EXAGGERATED FOR CLARITY.
3. EXTEND CUSHION GEOTEXTILE MIN 2'-0" BEYOND TOP OF LDS SUMP.
4. CONTROL LINE FOR SUBGRADE. SEE DETAILS 1 AND 2 ON DWG. H-2-830829, SHEET 1 OF 2.
   CELL 1: 068 069
   CELL 2: 092 093
5. CONTROL LINE FOR SUBGRADE
   CELL 1: 067 070
   CELL 2: 091 094
6. CONTROL LINE FOR SUBGRADE
   CELL 1: 067 068
   CELL 2: 091 092
7. CONTROL LINE FOR SUBGRADE
   CELL 1: 069 070
   CELL 2: 093 094
8. INCREASE GRAVEL THICKNESS IN VICINITY OF LEACHATE COLLECTION AND RISER PIPES IN LCRS SUMP AS SHOWN IN B H-2-830848 AND D H-2-830845
9. PROVIDE GCL BENEATH SECONDARY GEOMEMBRANE WITHIN LIMITS OF SLDS SUMP SHOWN ON DWG H-2-830837. B



SUMP EAST – WEST SECTION B
NTS H-2-830837

DWG NO	TITLE	REF NUMBER	TITLE
DRAWING TRACEABILITY LIST		REFERENCES	
		NEXT USED ON	

REV NO	DESCRIPTION	REV BY DATE	ENGR	COMPANY
B	ADDITION OF SLDS	4/19/04	M REIMBOLD	CH2MHill

REVISIONS

NAME	DATE	COMPANY
DRAWN BY R LATTA		CH2MHill
DPTG APPROVED M REIMBOLD		CH2MHill
DESIGN AUTHORITY E GIRGIS		

MICHAEL W. REIMBOLD, STATE OF WASHINGTON, 28614 REGISTERED PROFESSIONAL ENGINEER
EXPIRES 12/24/

CH2MHILL

U.S. DEPARTMENT OF ENERGY
Office of River Protection

TITLE: IDF GEOSYNTHETICS SECTIONS AND DETAILS

SIZE	BLDG NO	INDEX NO	DWG NO	REV
D	200E	0111	H-2-830839	B

SCALE AS SHOWN EDT 634144 SHEET 1 OF 1

BLDG. NO. 200E
INDEX NO. 0111

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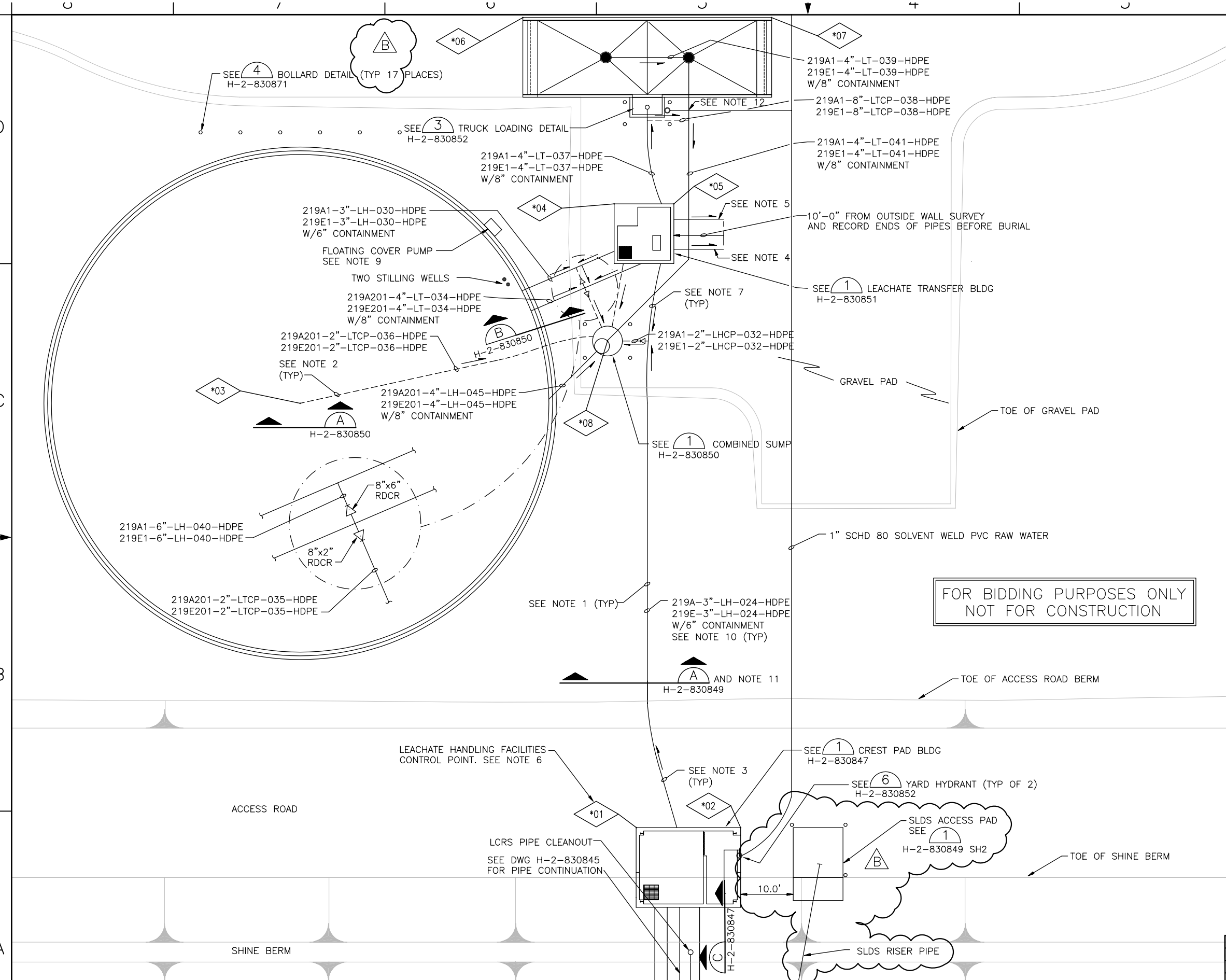
XXXX PLOTID XXXX ORP_TB_D [12-02].DWG



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NOTES:

1. PIPES SHOWN AS SOLID LINES NORTH OF CREST PAD BLDG. INDICATE BURIED DOUBLE CONTAINED LEACHATE PIPING OR RAW WATER PIPING.
2. DASHED LINE INDICATES BURIED SINGLE WALL PIPING FOR SECONDARY CONTAINMENT SYSTEMS.
3. SLOPE ALL PIPING IN DIRECTION INDICATED AT 1% SLOPE MINIMUM. FOR PRIMARY PIPE FLOW DIRECTIONS, SEE P&ID'S ON H-2-830854, SHEETS 1 THROUGH 4.
4. INSTALL HDPE CAP ON CARRIER PIPE AND FIXED END SEAL FOR SECONDARY CONTAINMENT PIPE. THIS PIPE IS PROVIDED FOR FUTURE PUMP SUCTION CONNECTION TO FUTURE LEACHATE STORAGE TANK.
5. INSTALL HDPE CAP ON CARRIER PIPE AND FIXED END SEAL FOR SECONDARY CONTAINMENT PIPE. THIS PIPE IS PROVIDED FOR FUTURE LEACHATE TRANSFER BUILDING DISCHARGE CONNECTION TO FUTURE LEACHATE STORAGE TANK.
6. SEE DWG H-2-830829, SHT 2 FOR LEACHATE HANDLING FACILITIES SURVEY CONTROL POINTS. FOR CELL 1 FACILITIES CONTROL POINTS, REPLACE "*" WITH 4; FOR CELL 2 FACILITIES CONTROL POINTS, REPLACE "*" WITH 5.

   EXAMPLE: CELL 2 *02 IS 502
7. BEND RADIUS SHALL NOT BE LESS THAN ALLOWED BY PIPE MANUFACTURER.
8. STILLING WELLS SHALL BE INSTALLED PER TANK MANUFACTURER REQUIREMENTS AT THE LOCATION SHOWN FOR ANALOG AND DISCRETE LEVEL INSTRUMENTATION.
9. FLOATING COVER PUMP AND ASSOCIATED BASEPLATE/BRACKET SHALL BE INSTALLED PER TANK MANUFACTURER REQUIREMENTS AT THE LOCATION SHOWN. THIS PUMP SHALL BE OPERATED AS REQD TO MINIMIZE DEPTH OF RAIN/SNOWMELT ACCUMULATION ON TOP OF FLOATING COVER.
10. PIPING DESIGNATIONS ARE IDENTIFIED FOR CELL 1 AND CELL 2 LEACHATE PIPELINES. THE "219A" PREFIX IS FOR CELL 1 AND THE "219E" PREFIX IS FOR CELL 2.
11. APPLIES TO ALL PIPING NORTH OF CREST PAD BUILDING INCLUDING RAW WATER PIPING EXCEPT RAW WATER PIPIING SHALL HAVE MINIMUM 3'-6" OF COVER.
12. INSTALL 1" RAW WATER PIPE A MINIMUM OF 6" BELOW 8" HDPE PIPE.

N

0 10 20 30
1"=10'

BLDG. NO.
219A
219A1
219A201
219E
219E1
219E201

INDEX NO.
8500

THIS SPACE RESERVED FOR BUILDING AND INDEX NUMBERS

EDMUND JOHN THOMAS
STATE OF WASHINGTON
38907
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES 8/4/

CH2MHILL

DWG NO	TITLE
DRAWING TRACEABILITY LIST	

REF NUMBER	TITLE
REFERENCES	
NEXT USED ON	

REV Rel	REV NO	DESCRIPTION	REV BY DATE		ENGR	COMPANY
MFD	B	ADDITION OF SLDS	4/19/04		E THOMAS	CH2MHill
REVISIONS						

NAME	DATE	COMPANY
DRAWN BY C BENTZ		CH2MHill
DFTG APPROVED E THOMAS		CH2MHill
DESIGN AUTHORITY E GIRGIS		

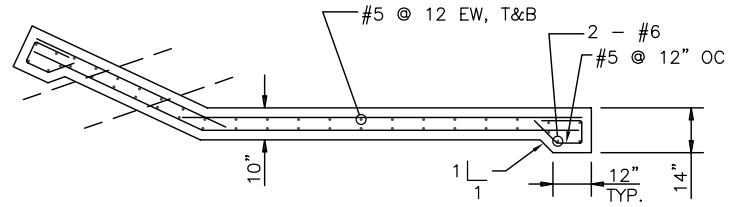
U.S. DEPARTMENT OF ENERGY
Office of River Protection

TITLE
IDF
LEACHATE TRANSFER
PIPING PLAN

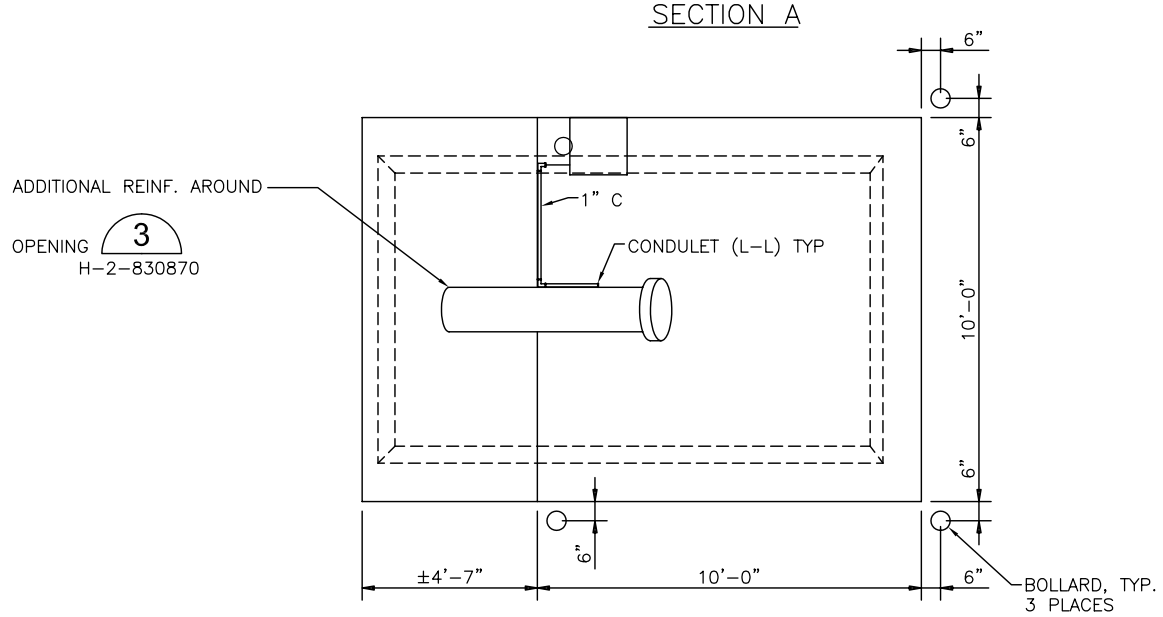
SIZE	BLDG NO	INDEX NO	DWG NO	REV
D	219A 219A1	8500	H-2-830846	B

SCALE AS SHOWN EDT 634144 SHEET 1 OF 1

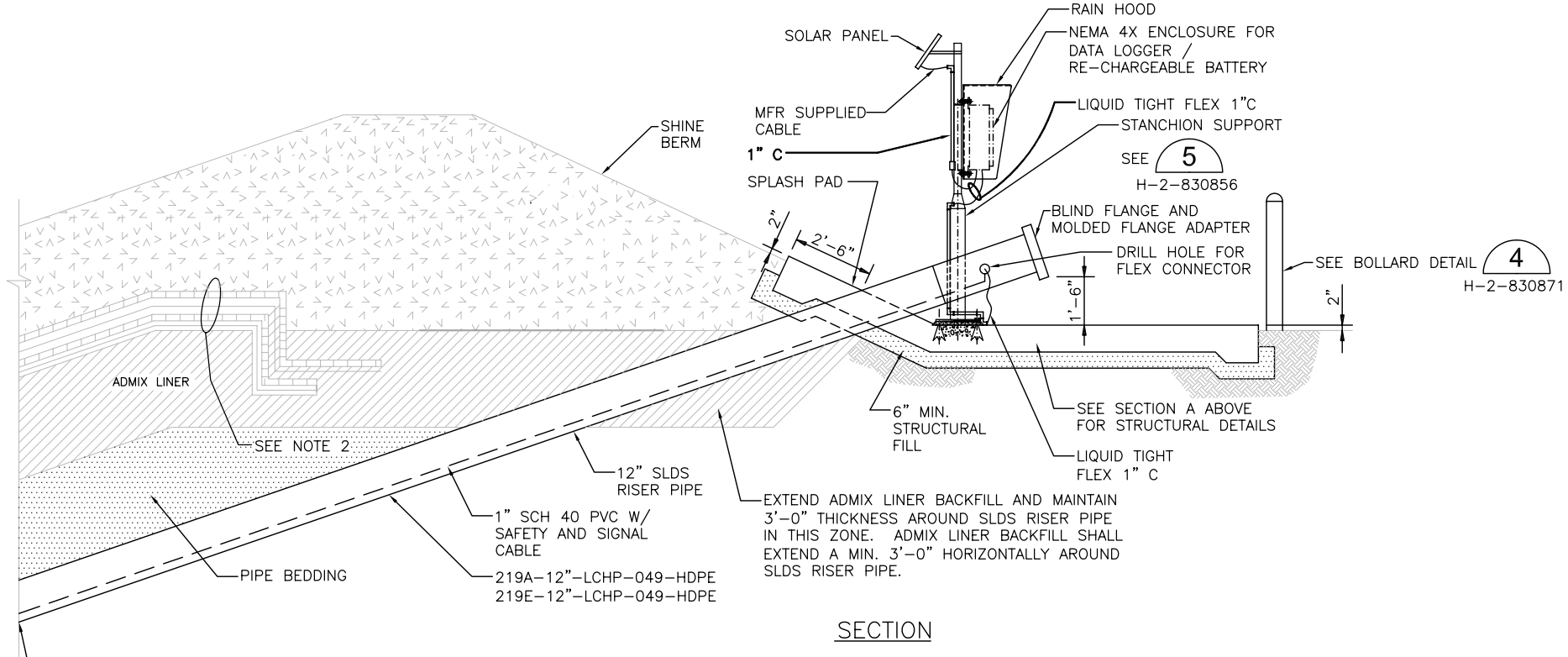
XXXX PLOTID XXXX ORP_TB_D [12-02].DWG



SECTION A



PLAN



SECTION

SEE 6 FOR LEVEL
H-2-830856
TRANSDUCER INSTALLATION IN SLDS SUMP

SLDS ACCESS PAD 1
NTS H-2-830846

NOTES:
1. SEE 2 FOR SIDE SLOPE LINER
H-2-830838
2. GEOSYNTHETIC LAYERS ARE SHOWN EXAGGERATED.

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DWG NO	TITLE	REF NUMBER	TITLE
DRAWING TRACEABILITY LIST		REFERENCES	
		NEXT USED ON	

MFD	REV NO	DESCRIPTION	REV BY DATE	ENGR	COMPANY
REV Rel	REVISIONS				

BLDG. NO. 200E

INDEX NO. 8500

THIS SPACE RESERVED FOR BUILDING AND INDEX NUMBERS

EDWARD JOHN THOMAS
STATE OF WASHINGTON
38907
REGISTERED
PROFESSIONAL ENGINEER
EXPIRES 8/4/

CH2MHILL

NAME	DATE	COMPANY
DRAWN BY D. KENDALL		CH2MHill
DFTG APPROVED E. THOMAS		CH2MHill
DESIGN AUTHORITY E GIRGIS		

U.S. DEPARTMENT OF ENERGY
Office of River Protection

TITLE
IDF
LCRS/LDS
SECTIONS AND DETAILS

SIZE	BLDG NO	INDEX NO	DWG NO	REV
D	200E	8500	H-2-830849	A

SCALE AS SHOWN EDT 634144 SHEET 2 OF

XXXX PLOTID XXXX ORP_TB_D [12-02].DWG

Integrated Disposal Facility (IDF), Schedule B – Landfill Construction
RFP No. 109793-TP
Addendum No. 2 - Attachment A

Item	Drawing/Specification	Location	Change Description	Comments
Integrated Disposal Facility (IDF), Design Drawing Set, RPP-19941, Rev. 0				
D-1	Drawing H-2-830831; Sheet 1 of 1	Cell No. 2 Facilities Access Road; Dwg Loc	Change control point "324" (for the southeast corner of the parking area that is south and east of the 219E1 transfer building) to "334".	Coordinates with IDF Cell 2 Subgrade Control on H-2-830829; Sheet 2 of 2.
D-2	Drawing H-2-830837; Sheet 1 of 1	See clouded areas.	Revise for Secondary Leak Detection System (SLDS) design modification.	See SLDS revised drawing attached to RFP Addendum No. 2.
D-3	Drawing H-2-830839; Sheet 1 of 1	See clouded areas.	Revise for SLDS design modification.	See SLDS revised drawing attached to RFP Addendum No. 2.
D-4	Drawing H-2-830846; Sheet 1 of 1	See clouded areas.	Revise for SLDS design modification.	See SLDS revised drawing attached to RFP Addendum No. 2.
D-5	Drawing H-2-830848; Sheet 1 of 1	See clouded areas.	Revise for SLDS design modification.	See SLDS revised drawing attached to RFP Addendum No. 2.
D-6	Drawing H-2-830849; Sheet 2 of 2	New sheet.	SLDS design modification.	See SLDS new drawing attached to RFP Addendum No. 2.
D-7	Drawing H-2-830854; Sheets 1 and 3	Dwg Loc 5B	Delete valve V-022	Valve not needed with addition of filter and valve V-047.
D-8	Drawing H-2-830864; Sheets 7 of 7	DETAIL 28: AIR MONITORING EQUIPMENT	Add the following to Note 1: "A MINIMUM OF 6 BOLLARDS ARE TO BE INSTALLED AT EACH MONITORING STATION LOCATION. COORDINATE FINAL LOCATION AND SPACING WITH CONSTRUCTION MANAGER PRIOR TO INSTALLATION."	Clarification of number and location of bollards for protection of air monitoring and associated utilities.
		Dwg Loc 3B	Change "BY OTHERS" TO "SUPPLIED BY OTHERS, INSTALLED BY CONTRACTOR".	Clarifies who is furnishing and installing air monitors.
D-9	Drawing H-2-830867; Sheet 1 of 1	Dwg Loc C2	Add the following to the end of the NOTES section: PIPE PENETRATION: PIPE PENETRATIONS INTO EAST AND WEST SUMPS SHALL BE SIMILAR TO DETAIL 3 ON H-2-830849.	

Item	Drawing/Specification	Location	Change Description	Comments
D-10	Drawing H-2-830868; Sheet 1 of 1	NORTH ELEVATION; Dwg Loc 5B	Revise reference to "DOWN SPOUT" as follows: "DOWN SPOUT AND GUTTER TO BE LOCATED ON SOUTH SIDE OF BUILDING. DOWN SPOUT TO BE LOCATED MIDWAY ALONG SOUTH WALL OF BUILDING".	Clarification of location of gutter and down spout to coordinate with roof slope. Down spout routed to minimize infiltration above buried pipes.
Integrated Disposal Facility (IDF), Detailed Design: Specifications, RPP-18489, Rev. 0				
CS-1	Section 02200 SITE PREPARATION	Article-RAW WATER SUPPLY (p. 1, Lines 39-41)	Delete "the rate of water withdrawal shall be limited to approximately 200 gpm through the use of an orifice plate. The plate shall be sized for a source water pressure of 115 psi." and replace it with "the total of all IDF project water usage from the raw water system shall not exceed 1500 gpm. There is no guarantee that the 1500 gpm will be available at all times or that it will be available from a single location on the IDF water system. In addition, the maximum water use limitation may be periodically reduced by the Hanford Site Water Purveyor depending on the other Hanford site demands on the raw water system and/or the availability of raw water pumping capacity within the Hanford raw water system. When using any connection to the raw water system, the Construction General Contractor shall take whatever means are necessary to operate fill stations and other connections in such a manner to prevent causing water hammer. If water usage from the system is found to cause water hammer, the Hanford Site Water Purveyor may require the use of orifice plates, changes to valve operation methods, and/or a reduction in water use at a water connection as necessary to eliminate the water hammer."	
CS-2	Section 02315	Article DEFINITIONS; p. 2 after line 33	Insert "SLDS: Secondary Leak Detection System".	SLDS design modification
CS-3	Section 02315	Article CONSTRUCTION QUALITY ASSURANCE; p. 4 after line 33	Insert "Operations Layer Material (SLDS): Two (2) per lift".	SLDS design modification
CS-4	Section 02315	p. 8	Line 25, insert ", except as specified for SLDS sump area," after lining system limits.	
			Line 26, insert "Operations layer material within SLDS sump area shall be placed in 12-inch thick lifts and compacted to 90 percent relative compaction." after first sentence.	

Item	Drawing/Specification	Location	Change Description	Comments
CS-5	Section 02319	Article DEFINITIONS; p. 1 after line 26	Insert “SLDS: Secondary Leak Detection System”.	SLDS design modification
CS-6	Section 02319	p. 2, line 32	Change title of Article to: “PREPARED SUBGRADE FOR GEOMEMBRANE (SECONDARY AND SLDS) AND SECONDARY GCL”	SLDS design modification
CS-7	Section 02319	p. 2, lines 34-35	Delete first sentence and replace with “At completion of SLDS excavation and grading (SLDS geomembrane) or admix liner placement (secondary geomembrane and GCL), prepare the subgrade surface for geomembrane or GCL placement.”	SLDS design modification
CS-8	Section 02632 Stormwater Piping	p. 2 lines 35-41	Change “Engineer” to “Construction Manager”	
CS-9	Section 02661	Article DEFINITIONS; p. 2 after line 36	Insert “ SLDS: Secondary Leak Detection System”.	SLDS design modification
CS-10	Section 02661	p. 9	Line 29, Delete “SOIL BENTONITE LINER” from article title and replace with “SUBGRADE”	SLDS design modification
			Line 32-33, first sentence, insert “subgrade” before “surface”. Delete “of the soil bentonite liner”.	
			Line 45, insert “and SLDS” between “secondary” and “geomembrane”.	
CS-11	Section 02661	p. 10	Lines 1 and 3, Delete “admix liner” and replace with “subgrade”	SLDS design modification
			Line 5, first sentence, replace “soil bentonite” with “admix”.	
CS-12	Section 02661	p. 13	Line 28, Delete “LCRS and LDS” and replace with “LCRS, LDS and SLDS”	SLDS design modification
CS-13	Section 02661	p. 22	Line 9, Insert “and operations layer material in SLDS sump” after “LDS sump”	SLDS design modification
			Lines 9-10, delete last sentence and replace with “This material shall be carefully dumped onto the cushion geotextile or SLDS CDN from a maximum height of 24 inches.”	
CS-14	Section 02661	Supplement 3, line 5	Delete “Phase I”.	Phase I designation not used.
CS-15	Section 02666 Admix Liner	p. 12 line 26	Change “CONTROL” to “ASSURANCE” in article title.	
CS-16	Section 02667	p.5	Line 21, insert “PRIMARY” before GCL in article title.	SLDS design modification

Item	Drawing/Specification	Location	Change Description	Comments
CS-16 (Cont)	Section 02667	p.5	Line 23, insert “primary” before “GCL” (note two locations to modify on line 23.)	
			Line 24, insert “LDS” before “CDN”.	
			Line 25, insert “primary” before “GCL”	
CS-17	Section 02667	p. 5, after line 26	Insert new article: <u>SURFACE PREPARATION – SECONDARY GCL</u>	SLDS design modification
CS-18	Section 09900	Article <u>CONSTRUCTION QUALITY CONTROL</u>: (P. 8)	Add the following sentence after line 40: “Perform water tightness test of concrete sumps in accordance with Component Construction Acceptance Test as provided in the Construction Inspection Plan, RPP-18490, Rev. 0.”	Currently a CAT procedure but spec did not require testing or inspection.
CS-19	Section 11306	Page 5, Line 28	Insert the following paragraph: (see insert **CS-19-A** following this addendum table).	Adds testing to verify riser pipe transitions from side slope to horizontal sump area prior to backfilling of side slope riser pipe and before pump insertion testing required in CAT procedure.
CS-20	Section 11306	Page 5, Line 29	Insert "complete" between "after" and "installation". Replace "pipe" with "pipe from the sump to the crest pad building,"	Clarifies that pump insertion testing required in CAT procedure is different than previous testing for transition from side slope to horizontal portion in sump
		Page 5, Line 39	Delete the sentence starting “Run the pumps…” and ending “until readings stabilize.”	Modification is result of CAT testing internal review.
CS-21	Section 11312	Page 5	Line 15: Delete line 15.	Modifications are results of CAT testing internal review.
			Line 17: Change “1-hour” to “1/2 hour”.	
			Line 25: Delete line 25.	
			Lines 40-45: Delete Vibration Test section, lines 40-45.	
CS-22	Section 13122 Metal Building	Article <u>WARRANTIES:</u> (p. 4)	Line 5 change warranty period from “20 years” to “5 years”. Line 8 change “20-year” to “5-year”.	Adjusts warranty period to be consistent with manufacturer
CS-23	Section 13205 Lined Bolted Steel Liquid Storage Tanks	Article QUALIFICATIONS - Drawings (p. 3; Line 9)	In front of “secondary containment system” insert “floating cover water removal system,” and in front of “level controls” insert “stilling wells for installation of”	Clarifies that fabrication drawings shall include information on the cover water removal system and provisions for level elements.

Item	Drawing/Specification	Location	Change Description	Comments
CS-24	Section 13205	Article QUALIFICATIONS - Drawings (p. 3; Line 10)	Following “Professional Engineer.”, insert “Level controls are provided by others (see section 13401 PICS).”	Clarifies that the level control instruments are provided as part of PICS.
CS-25	Section 13205	Article QUALIFICATIONS - Design Assessment Report (p. 4; Lines 2-3)	Delete “including prevention of migration of leachate out of the secondary containment system; detection” and in its place insert “, results of primary liner and secondary liner leak detection surveys,”	Clarifies description of secondary containment system and presentation of results of leak detection surveys.
CS-26	Section 13205	Article QUALIFICATIONS - Assessment Report (p. 4; Line 9)	In the phrase “either the primary or secondary containment”, delete the words “either” and “or secondary”.	Clarifies function of secondary containment system.
CS-27	Section 13205	Article QUALIFICATIONS - Assessment Report (p. 4; Line 14)	Delete “the design of any” and following the word “equipment”, insert “as shown on the Drawings”.	Clarifies required assessment of attachments to the tank.
CS-28	Section 13205	Article SUBMITTALS APPROVAL NOT REQUIRED - O&M Manual (p. 5; Line 3)	Delete “<u>and Level Indicator</u>”.	Correction. Tank level element
CS-29	Section 13205	Article SUBMITTALS- APPROVAL NOT REQUIRED - O&M Manual (p. 5; Lines 8-9)	Delete the entire sentence which begins with “As-built diagrams” and ends with “the O&M Manual.”.	Correction. Any changes to pipe locations will be included with the project as-built drawings.
CS-30	Section 13205	Article WARRANTY (p. 6; Line 32)	Following “floating cover” insert “system”.	Clarifies that the warranty will include all parts of the floating cover system.
CS-31	Section 13205	Article TANK COMPONENTS (p. 8; Line 36)	Following “and floating cover,”, insert “pipe connections, tank ladder”.	Adds tank components to the listing that are described later in the specification.
CS-32	Section 13205	Article TANK COMPONENTS – Floating Cover (p. 11; Line 26)	Replace “D103” with “D130”.	Correction of call out for AWWA standard for floating cover material.

Item	Drawing/Specification	Location	Change Description	Comments
CS-33	Section 13205	Article TANK COMPONENTS – Floating Cover (p. 11; Line 29)	Replace “center and perimeter vents” with “a center vent”.	Correction. Floating cover will have only a center vent.
CS-34	Section 13205	Article TANK COMPONENTS – Floating Cover (p. 11; Line 31)	Delete the words “and pump”.	Clarification. Cover will drain to its perimeter.
CS-35	Section 13205	Article TANK COMPONENTS – Floating Cover (p. 11; Line 32)	Following “pumped out.” insert “Cover vent shall include a base plate to prevent tipping due to wind or snow load.”	Clarifies requirement for design of cover vent.
CS-36	Section 13205	Article TANK COMPONENTS – Pipe Connections (p. 12; Line 27)	Following this line, insert as a new paragraph the following: “Tank Ladder: Provide a hot-dipped galvanized steel ladder for access to the floating cover pump. The ladder shall be attached at the top of the tank wall and at its base to the concrete ringwall. The ladder shall be of sufficient height to allow viewing of the floating cover system and its pump. The ladder shall be located adjacent to the tank level element installation.”	Adds requirement for an access ladder.
CS-37	Section 13205	Article TANK COMPONENTS – Foundation (p. 12; Line 45)	Following the last sentence, insert “Ringwall design is shown on Drawings.”	Clarifies that the ringwall design is not to be completed by the tank manufacturer but is already included in the Drawings.
CS-38	Section 13205	Article TANK INSTALLATION (p. 13, Line 11)	Following the work “recommendations,” insert, “including their guidance on environmental factors that could affect the tank installation.”	
CS-39	Section 13205	Article CONSTRUCTION QUALITY CONTROL – Tank Liner Inspection (p. 14; Line 24)	Following this line, insert as a new paragraph “Electronic Leak Location Survey: Prior to installing the floating cover, complete an electronic leak location survey of the secondary and primary liners.”.	Addresses requirements for the leak location survey.
CS-40	Section 13205	Article CONSTRUCTION QUALITY CONTROL – Tank Tightness Testing (p. 14; Lines 40 and 41)	Delete the sentence which begins with “At the end” and ends with “check for leakage.”	The electronic leak location survey will occur prior to floating cover installation and to starting the tank tightness test.

Item	Drawing/Specification	Location	Change Description	Comments
CS-41	Section 13401	Supplement 1	p. 2 Insert new item number 91 between item numbers 42 and 4 (see insert **CS-41-A** following this addendum table).	SLDS design modification
			p. 3 Insert new item number 92 between item numbers 55 and 7 (see insert **CS-41-B** following this addendum table).	
CS-42	Section 13401, Supplement 2	p. 30, line 11	Insert new component specification for Y178A Programmable Data Logger, Integral solar Powered (see insert **CS-42-A** following this addendum table).	SLDS design modification
CS-43	Section 15021 HDPE Pipe	Article SUBMITTALS – APPROVAL NOT REQUIRED (Lines 17 through 31)	Move fusion equipment descriptive literature, including technician certifications to Article SUBMITTALS – APPROVAL REQUIRED	Change needed to ensure appropriate level of review.
CS-44	Section 15021 HDPE Pipe	Article INSTALLATION – Weld Beads (p. 7 of 8; Line 33)	Add the following to the end of the first sentence: "and the horizontal and vertical sections of the LCRS level transducer pipe and SLDS pipe."	Change needed to ensure these riser pipes are included for weld bead removal. Facilitates transducer insertion and removal process.
Statement of Work For Construction; Requisition No. 109793, Integrated Disposal Facility (IDF), Project; Schedule B – Landfill Construction, Rev. 0				
SW-1	Section 01010	1.3.2	Insert: "installation of the Secondary Leak Detection System (SLDS)", after "installation of the leak detection system (LDS),"	SLDS design modification
SW-2	Section 01010	1.4.2.14	Delete: **"Contractor shall note that this work cannot proceed until the required Hanford Facility Dangerous Waste Permit, for the Integrated Disposal Facility, identified in the 01065 Section of the SOW is issued. Issuance of the permit is anticipated to occur on August 23, 2004".**	Eliminates dependence upon issuance of required permit prior to initiating landfill excavation activities.
SW-3	Section 01010	New paragraph	Add new paragraph 1.4.2.34: "Contractor shall furnish, install and test the Secondary Leak Detection System (SLDS) in accordance with the SOW, Construction Specifications, Drawings, and the CIP".	SLDS design modification
SW-4	Section 01010	1.5.2.3	Replace paragraph in its entirety to read: "Integrated Disposal Facility (IDF) Detailed Design: Construction Inspection Plan (CIP); RPP-18490, Rev. 0, including CQA plans for Cell 1 and 2 (Attachments 1 and 2), CQA/CQC Testing and Inspection Lists (Attachment 3), Technical Specification Submittal List (Attachment 4), Component Construction Acceptance Tests (C-Cats) (Attachment 5), System Construction Acceptance Tests (S-Cats) (Attachment 6)".	Final versions of S-CATS are included in revised version of CIP.

Item	Drawing/Specification	Location	Change Description	Comments
SW-5	Section 01010	1.5.3.1	Replace paragraph in its entirety to read: "Company Safety Manual – available on Company website at http://www.hanford.gov/chgcp/"	Safety Procedures applicable to Contractors are now available online.
SW-6	Section 01010	1.6.1.B	Add new Bullet below existing bullet. New bullet to read: "● Contractor shall install Air Monitor stations N532, N533, and N534 in accordance with drawings H-2-830858, sht. 2, and H-2-830864, sht. 7, Detail 28. Contractor shall provide temporary power to the Air Monitoring stations to ensure continuous (24 hrs/day – 7 days/week) operation of the Air Monitoring stations until permanent power is installed. Air Stations are required to be operational to satisfy requirements of Interim Milestone No. 02. Permanent power to the Air Monitoring stations shall be in accordance with Drawings and Specifications and shall be considered part of 1.6.C "Project Completion Milestone" below". Note: Contractor has two options for providing temporary power to the Air Monitoring stations. The two options are outlined in insert **SW-6-A** following this addendum table.	Clarification required to ensure 1-yr pre-operational collection of data.
SW-7	Section 01065	1.4.1	Replace paragraph in its entirety to read: "Hanford Facility Dangerous Waste Permit, Integrated Disposal Facility: **Required prior to Contractor initiating construction of the critical systems; leachate collection systems, liner (including pug mill testing) and leak detection systems (including secondary leak detection system) and any work activities which requires; Inspection, Testing, or verification by the CQA Certifying Engineer as specified in the CIP**. Permit is anticipated to be issued on October 8, 2004 by the Washington State Department of Ecology (Ecology).	Required due to changes incorporated into Rev. 1 of the required permit application.
SW-8	Section 01110	1.1.1	Revise: "CH2M Hill (Company) Procedure HNF-IP-0842 (RPP Administrative Procedures), Volume 9 Safety" replace with: **"CH2M Hill Safety Manual – Available online at http://www.hanford.gov/chgcp/"**	Safety Manual is now available online.

Item	Drawing/Specification	Location	Change Description	Comments
SW-9	Section 01110	1.2.2.2	Revise 1st Sentence to read: "Safety and Health Program: Submit letter verifying that Contractor will utilize Company identified Safety Manual relating to environment, safety, and health as its own, or submit copy of Contractor proposed Safety and Health Program equivalent to Company Safety Manual for review/approval".	Procedures identified have been replaced with Safety Manual available online.
SW-10	Section 01110	1.5.1	Revise last sentence to read: "Any work which disturbs asbestos or asbestos containing materials (ACM) shall be controlled and performed in accordance with Company Safety Manual, Section 4, article 4.37, Asbestos Control – Construction Industry.	Procedures identified have been replaced with Safety Manual available online.
SW-11	Section 01130	1.1.1	Revise: "Company Procedure HNF-IP-0842 (RPP Administrative Procedures) replace with: **"CH2M Hill Safety Manual – Available online at http://www.hanford.gov/chgcp/"**	Procedures identified have been replaced with Safety Manual available online.
SW-12	Section 01130	1.4.1	Revise 1st Paragraph to read: "Handle and dispose of waste in accordance with applicable federal, state, and local laws, regulations, requirements, and Company Safety Manual as appropriate".	Procedures identified have been replaced with Safety Manual available online.
SW-13	Section 01130	1.5.1	Replace paragraph in its entirety to read: "Accumulate asbestos material at worksite in accordance with Company Safety Manual, Section 4, Article 4.37, Asbestos Control – Construction Industry. Company will package and dispose of at a TSCA approved disposal facility".	Procedures identified have been replaced with Safety Manual available online.

INSERT CS-19-A:

Prior to the pump and level transducer insertion tests identified in the Component CAT procedures, verify the LCRS, LDS, and SLDS riser pipe transition from the side slope to the horizontal portion of the riser pipe is adequate for leachate pump and level transducer insertion. Perform the pump/level transducer insertion tests prior to backfilling and after the riser pipe installation is finished from within the sump to a location approximately 50 feet up the side slope. Perform the pump/level transducer insertion tests using the associated leachate pump or level transducer for each riser. In addition to the level transducer insertion for the SLDS riser pipe, test the transition using the LDS low-flow leachate pump as well. If actual level transducers or leachate pumps are not available at the time of the testing, "dummy" level transducers and pumps can be used per approval from CHG construction manager.

INSERT CS-41-A:

Item: 91
Rev: 0
Tag 1: 219(Y)
Tag 2: LH
Tag 3: LCP
Tag 4: 208

Description: Secondary Leachate Collection System Local Control Panel
Description: Enclosure
Drawing: H-2-830854 sheet 1 of 4
Component Number: Reference 13401 PICS
Process Ranges: NA
Eng. Units: NA
Detail: H-2-830849 sheet 2 of 2
Comments: 16”W x 18”H x 9”D NEMA 4X – fiberglass reinforced polyester, with Data logger, input/output channel, signal converter, communications, rechargeable battery, and charge controller.

INSERT CS-41-B:

Item: 92
Rev: 0
Tag 1: 219(Y)
Tag 2: LH
Tag 3: LT
Tag 4: 108
Description: Secondary Leachate Collection System
Description: Submersible Pressure Transducer
Drawing: H-2-830854 sheet 1 of 4
Component Number: L42
Process Ranges: 0 to 26.75
Eng. Units: Inches
Detail: Detail No., 6 on Dwg. H-2-830856
Comments: Signal interface shall be 12V dc supply instead of 24V dc

INSERT CS-42-A:

Y178A Programmable Data Logger, Integral Solar Powered:

General:

Function: Programmable data logger and system capable of interfacing with process measurements loop powered analog device(s) for the purpose of measuring, collecting, storing and serially transferring process level data with externally connected programming and storage device (i.e. laptop computer).

Type: Microprocessor based.

Parts: Data logger, input/output channel, signal converter, communications, rechargeable battery, solar panel, charge controller, enclosure, and programming and data retrieval software. Vendor shall provide complete system meeting the intent of these specifications and contract drawings.

Service: Interface with Level/Element Transmitter, Submersible, Wastewater (Reference Section 13401 PICS Component L42 for detail information, Druck PTX 1290 and STE110 Level Element/Transmitter Submersible 12 V dc compatible or equal).

Performance:

Environmental:

Operating Temperature: Minus 25 to plus 50 degrees C, with gel cell battery, minus 40 to plus 60 degrees C.

Relative Humidity: 5 to 95 percent, non-condensing.

Central Processing Unit (CPU):

Processor: Hitachi 6303.

Memory: table based memory structure 62,000 data points.

Real time clock.

Diagnostic LEDs.

12-bit A/D converter.

16kB active program.

128kB operating and flash final storage.

Comm Port: 9-pin D type connector for RS232 interface with PC; up to 9600 baud selectable baud rates.

Manufacturer and Model: Campbell Scientific; CR510 Series.

Input/Output Channel:

Analog Inputs:

Two (2) differential or four (4) single ended configured.

Range: 0 to 2.5 V dc.

Accuracy: +/-0.25 percent.

Resolution: 0.33 uV.

Sample Rates: 2.72 ms adjustable.

Manufacturer and Model: Campbell Scientific; Model CR510.

Terminal Input Channel Converter:

Convert 4-20mA to datalogger input range of 0 to 2.5V dc.

Shunt Resistor: 100 ohms.

Tolerance: +/- 0.01 percent.

Power: 0.25 watts.

Manufacturer and Model: Campbell Scientific; Model CURS100.

DC Power Supply:

Solar Panel, Regulator and Mounts:

Solar panel converting sunlight to DC power.

Voltage Peak: 16.8 volts.

Current at Peak, amps:1.19 amps.

Peak Power: 20 watts.

Manufacturer and Model: Campbell Scientific; Model MSX20R.

Rechargeable Power Supply with Batteries:

Rechargeable power supply capable of recharging batteries from solar power.

Sealed Rechargeable batteries providing 7.0 AHRS nominal output at 20 Degree C.

Float charged by solar panel.

Manufacturer and Model: Campbell Scientific; Model PS100.

Enclosure: NEMA 4X - fiberglass reinforced polyester (FRP) 16 inches wide by 18 inches high by 9 inches deep (minimum) sized to accommodate datalogger, input/output channels, DC power supply, and sensor terminations.

Enclosure Mounting: Wall or pipe mounting as required.

Power Requirements: 5.4V dc to 16V dc.

Software Language: Microsoft Windows based Pakbus operating system, and Datalogger Support and editing software and licenses complete and latest versions.

Support: Two (2) eight hour days in support of installation, startup, calibration, and testing of complete system.

Training: One (1) eight hour day in support of OWNER training on operations, set-up, data retrieval, and troubleshooting of complete system.

Warranty: Three (3) years complete system beginning after system installation is complete and tested.

Manufacturers and Products: Columbia Scientific; CR510 Series.

INSERT SW-6-A:

OPTION 1 – EXPEDITED CONSTRUCTION OF EACH LOCAL AIR MONITORING FACILITY USING TEMPORARY PORTABLE GAS ENGINE GENERATORS TO SUPPLY POWER

Purchase and install at each of the three (3) air monitoring stations, a temporary portable gas engine generator for the purpose of providing 120V ac single phase power to air monitors and associated outdoor light fixtures. Temporary portable gas engine generators shall operate 24 hours/7 days a week, while permanent power construction is under way per construction Schedule B. Option 1 Scope of Work is as follows:

- Expedite construction of the air monitoring stations (i.e. equipment metal supports, concrete slabs, pole foundations, embedded conduits, equipment installation and mounting) as shown on drawing H-2-830864 Sheet 7, Detail 28. Do not terminate conduit and cable connections between air monitoring station equipment (air monitor and light fixture) and mini-power zones panel and integral transformer.
  Note: Air monitor and outdoor light fixture will be energized by temporary portable gas engine generator while permanent construction is under way.
- Provide and install at each air monitoring station, a temporary portable gas engine generator with a five gallon gas tank, capable of providing 15 amps, 120V ac single phase power for 14.6 continuous load duty rated hours (Manufacturer and Model: TSURUMI; Model TPK-2700H-DX or equal).
- Each temporary portable gas engine generator shall be equipped with multiple NEMA 15-R grounded receptacle(s) capable of providing weather tight seals for equipment power cords.
- Provide ground electrode system for each temporary portable gas engine generator consisting of a ¾″ x 10′ Cu ground rod. Bond metal frame of temporary portable gas engine generator(s) to ground electrode system with a #6 Cu ground wire.
- Secure each temporary portable gas engine generator to earth using stakes and tie-downs or similar method.
- Construct an open sided wood structure with a roof over the top of the temporary portable gas engine generator to prevent snow/rain from falling directly on the generator and allow the generator to exhaust, cool properly, and allow access for maintenance.

- Provide and install 2- #12/3 SJO extension cords and plugs rated for continuous outdoor duty between air monitor and associated light, and temporary portable gas engine generator weather tight outlets. Use weather tight cord grips with strain reliefs at connection to air monitor and associated light.
- Provide maintenance necessary to keep each temporary portable gas engine generator operable until permanent power is complete per construction schedule.
- When permanent electrical facilities upstream of the air monitors are constructed per the construction schedule, de-terminate the temporary portable gas engine generator extension cords, remove the generator support and weather enclosure. Complete permanent installation of conduits and cables and grounding between air monitoring station mini power zone and associated equipment per drawing H-2-830864 Sheet 7, Detail 28.

OPTION 2 – EXPEDITED CONSTRUCTION OF AIR MONITORING FACILITIES USING TEMPORARY TIE-IN TO IDF OIL FILLED PAD MOUNT TRANSFORMER TO SUPPLY POWER

Expedite construction of facilities providing power to each air monitoring station. Expedited construction includes the installation of conduit duct banks, conductors, handholes, local air monitoring system power panels, local lighting, and equipment supports as shown in the IDF Construction Documents with the following exceptions:

- Expedited construction shall be in advance of construction for IDF Cell No. 1 and Cell No. 2 Crest Pad Buildings, Leachate Storage Tanks, Leachate Transfer Buildings, and possibly road/berm work.
- Temporary service equipment shall be installed adjacent to the IDF oil filled pad mount service transformer and vault (transformer and vault installed under Schedule A package) for the purpose of energizing air monitoring system equipment.
- Temporary service equipment shall consist of the following:
  - Temporary Service Panel: Square D Class 1670 NF Merchandised Panel board: 125 amp, 3-phase, 4 wire, service rated, outdoor rain tight NEMA3R 18 circuit, # MH32WP.
  - Temporary Service Panel Breakers: Square D Class EGB 35kAIC ratings; 1- #EGB34125 - 125 amp 3-pole main breaker, 1-#EGB34060 - 60 amp three-pole branch breaker, 1-#EGB34030 - 30 amp three-pole branch breaker.
  - Secondary Surge Arrestor: Square-D #SDSA3650.
  - Temp Wireway: Outdoor Rain tight NEMA 3R - 8" x 8" x 5' Square-D #LDRB85M and Closing Plate(s) 2 each #LDRB8CP .
  - 1 - 2" Conduit from Temporary Service Panel/Wireway to IDF Oil Filled Transformer Utility Vault 219-LH-HH-005 [2" C, 3#1/0, 1#1/0N] (power to energize temporary panel).
  - 2 - 2" Conduits from Temporary Service Panel/Wireway to IDF Oil Filled Transformer Utility Vault 219-LH-HH-005 [2" C, 3#2/0, 1#1G].

- Provide service ground for temporary service panel consisting of #2 copper and two 3/4" x 10' Cu ground rods.

- Temporarily route three phase 480V, 3 wire power [3#2/0, 1#1G] conductors for operation of Cell No. 2 area Air Monitors N533 and N534 from temporary service equipment (energized by IDF oil filled pad mount service transformer) to air monitoring system mini-power zone single phase transformers via handholes:
  - Install temporary [2″ C, 3#2/0, 1#1G] between temporary service equipment and 219-LH-HH-005.
  - Use spare 4″ conduit C146C to install [3#2/0, 1#1G] between 219-LH-HH-005 and 219-LH-HH-006
  - Use spare 4″ conduit C148A to install [3#2/0, 1#1G] between 219-LH-HH-006 and 219E-LH-HH-002
  - Install permanent [2″ C, 3#2/0, 1#1G] and spare per Construction Documents between 219E-LH-HH-002 and 219-LH-HH-010
  - Install permanent [2″ C, 3#2/0, 1#1G] and spare per Construction Documents between 219-LH-HH-010 and 219-LH-HH-011
  - Install permanent [2″ C, 3#2/0, 1#1G] and spare per Construction Documents between 219-LH-HH-011 and 219-LH-HH-012
  - Install permanent [2″ C, 3#2/0, 1#1G] and spare per Construction Documents between 219-LH-HH-012 and 219-LH-HH-013
  - Install permanent [2″ C, 3#2/0, 1#1G] and spare per Construction Documents between 219-LH-HH-013 and 219-LH-HH-014

- Temporarily route three phase 480V, 3 wire power [2″ C, 3#2/0, 1#1G] conductors for operation of Air Monitor N532 from temporary service equipment (energized by IDF oil filled pad mount service transformer) to air monitoring system mini-power zone single phase transformers via handholes:
  - Install temporary [2″ C, 3#2/0, 1#1G] between temporary service equipment and 219-LH-HH-005
  - Use spare 4″ conduit C146D to install [3#2/0, 1#1G] between 219-LH-HH-005 and 219-LH-HH-006
  - Use spare 4″ conduit C147A to install [3#2/0, 1#1G] between 219-LH-HH-006 and 219A-LH-HH-002
  - Install permanent [2″ C, 3#2/0, 1#1G] and spare per Construction Documents between 219A-LH-HH-002 and 219-LH-HH-007
  - Install permanent [2″ C, 3#2/0, 1#1G] and spare per Construction Documents between 219-LH-HH-007 and 219-LH-HH-008
  - Install permanent [2″ C, 3#2/0, 1#1G] and spare per Construction Documents between 219-LH-HH-008 and 219-LH-HH-009

- *Note: After completion of IDF Crest Pad Buildings and permanent interior electrical service equipment installation (i.e. 219A-LH-MCC-001, 219E-LH-MCC-001), re-route air monitoring system power cables from temporary service equipment back to appropriate Motor Control Centers (i.e. 219A-LH-MCC-001, 219E-LH-MCC-001) implementing the intent of the permanent construction documents.*
- Coordinate with Construction Manager (who will in turn coordinate with Fluor Hanford Utility) for work related to service transformer.