

CALCULATION COVER SHEET

Project Waste Solidification Building		Calculation No. K-CLC-F-00076	Project Number Y473
Title Waste Solidification Building (WSB) Soft Zone Settlement		Functional Classification SS	Sheet 1 of 11
		Discipline Geotechnical	
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Computer Program No. <div style="text-align: right;"><input checked="" type="checkbox"/> N/A</div>		Version / Release No. N/A	
Purpose and Objective The purpose of this calculation was to evaluate the settlement due to the compression of soft zones for the Waste Solidification Building (WSB).		<div style="text-align: center;"> UNCLASSIFIED DOES NOT CONTAIN UNCLASSIFIED CONTROLLED NUCLEAR INFORMATION ADC & Reviewing Official: <i>[Signature]</i> (Name and Title) Date: 7-26-07 GEOTECHNICAL ENGINEERING </div>	
Summary of Conclusion Refer to Results and Conclusions Section.			
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1. Introduction

This calculation evaluates the settlement due to the compression of soft zones for the Waste Solidification Building (F Area).

2. Input and Assumptions

2.1 Facility Data

The WSB is approximately located within the following Savannah River Site (SRS) coordinates:

N78400, E55500

N78590, E55665.

The WSB finished floor elevation is 301 feet mean sea level, MSL (Ref. 1). The mat foundation is assumed to be 3 feet thick.

2.2 Geotechnical Investigation

Soft zone thicknesses were determined based on existing cone penetration tests (CPTs) and standard penetration tests (SPTs), see Table 1.

- 35 CPTs (Ref. 2, 3, and 4)
- 8 SPTs (Ref. 2 and 3)

2.3 Soft Zone Properties

The properties of the soft zone soils beneath the WSB are assumed to be the same as the soft zone properties beneath the Pit Disassembly and Conversion Facility (PDCF): normally consolidated upper soft zone soils and lower soft zone soils with OCR of 0.7. The compression ratio of the upper and lower soft zone soils at PDCF are 0.23 and 0.2, respectively. However, for the purposes of PDCF soft zone analysis, all soft zone soils were assumed to have an OCR 0.7 and a compression ratio of 0.24; providing a conservative estimate of soft zone settlement (Ref. 3).

3. Computation

This section will provide the evaluation of the design settlement based on the compression of soft zones due to a seismic event.

3.1 Soft Zone Delineation

Soft zones are identified using CPT corrected tip stress of less than 15 tsf within the Santee Formation and layers stratigraphically lower. The thickness of the soft zone is summation of the less than 15 tsf material. Only CPTs with total soft zone thicknesses of two feet or more were considered. The tops of the Santee Formation range from approximately 197 to 173 MSL (Ref. 5). Existing standard penetration tests (SPTs) were also utilized to determine the thicknesses of soft zones at WSB; blow counts (N values) less than 5 were considered to be indicative of soft zones. Soft zones were identified in 14 geotechnical investigative pushes and Table 2

summarizes the soft zones identified in the area of the WSB. Figure 1 illustrates the locations and thickness of the soft zones located at WSB. The maximum soft zone thickness beneath the WSB is 4.7 feet and the maximum soft zone thickness within approximately 75 feet of the WSB is 5.0 feet thick.

The top elevations of the soft zones located at WSB range from approximately 197 to 172 feet, msl.

3.2 Soft Zone Settlement

The PDCF soft zone settlements were based on the soft zone properties presented in section 2.3. These soft zones were assumed to be approximately 50 feet wide and infinite in length such that the resulting settlement may be estimated as an inverted Gaussian distribution, based on the soft ground tunneling approach. The PDCF settlement curve was based on a soft zone 7.6 feet thick and approximately 89 feet deep (Ref. 3).

Since the soft zone properties beneath the PDCF and the WSB are assumed to be equal and the thickest soft zone beneath the WSB is thinner than the soft zone utilized at PDCF to generate the settlement profile, the PDCF soft zone settlement profile may be utilized at the WSB to provide a conservative estimate of soft zone compression. The PDCF soft zone settlement profile indicated in Table 3 and Figure 2 will directly apply at the WSB. The soft zones at WSB are deeper (minimum 100 feet deep) than the soft zone used to generate the PDCF settlement curve, therefore providing an additional level of conservatism since surface settlements decrease with increasing depth.

4. Results and Conclusions

The following conclusions have been made.

- The PDCF soft zone settlement trough may be directly applied to the WSB.
- The maximum surface settlement generated is 2.8 inches, as shown in Table 3.
- The surface settlements generated within this calculation are based on several conservatisms and actual settlements are expected to be less than those predicted in this calculation.

5. References

1. C-CG-F-00159, Rev. A, Waste Solidification Building Site Plot Plan Civil, June 2007.
2. K-TRT-F-00001, F-Area Northeast Expansion Report, Rev. 1, January 2001.
3. C-ESR-F-00014, Rev. 0, PDCF Geotechnical Report, MACTEC Engineering and Consulting, Inc. July 2003.
4. Applied Research Associates, 2004. Transmittal letter from Ryan Langlois to I. Bruce Triplett, WSRC subcontract AC07778N, Task 25, February 18, 2004.
5. K-CLC-F-00075, Rev. 0, Subsurface Stratigraphy for Waste Solidification Building, April 2007.

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Tables

Table 1: CPTs and SPTs Utilized to Identify Soft Zones

Original ID	ID	N	E	Ref.
CPTs				
CPT 175	FNEC 175	78770	55451	Ref. 2
CPT 176	FNEC 176	78770	55583	Ref. 2
CPT 177	FNEC 177	78770	55715	Ref. 2
CPT 178	FNEC 178	78640	55385	Ref. 2
CPT 179	FNEC 179	78640	55518	Ref. 2
CPT 180	FNEC 180	78640	55650	Ref. 2
CPT 181	FNEC 181	78510	55330	Ref. 2
CPT 182	FNEC 182	78510	55451	Ref. 2
CPT 183	FNEC 183	78510	55583	Ref. 2
CPT 185	FNEC 185	78380	55385	Ref. 2
CPT 186	FNEC 186	78380	55518	Ref. 2
CPT 189	FNEC 189	78250	55451	Ref. 2
CPT-A-09A	FPDCA 9a	78639	55782	Ref. 3
CPT-A-11	FPDCA 11	78510	55715	Ref. 3
CPT-A-12	FPDCA 12	78510	55847	Ref. 3
CPT-A-14	FPDCA14	78413	55783	Ref. 3
CPT-A-15	FPDCA 15	78380	55650	Ref. 3
CPT-A-17	FPDCA 17	78273	55413	Ref. 3
CPT-A-18	FPDCA 18	78295	55495	Ref. 3
CPT-A-19	FPDCA 19	78295	55580	Ref. 3
CPT-A-20	FPDCA 20	78250	55715	Ref. 3
CPT-A-24	FPDCA 24	78235	55665	Ref. 3
CPT-A-25	FPDCA 25	78225	55448	Ref. 3
CPT-A-26	FPDCA 26	78319	55618	Ref. 3
CPT-A-39	FPDCA 39	78575	55513	Ref. 3
FCPT-C12	FPDCF 12	78300	55845	Ref. 3
FCPT-SZ-31	FPDCF-SZ31	78413	55812	Ref. 3
FCPT-SZ-32	FPDCF-SZ32	78388	55769	Ref. 3
FCPT-SZ-33	FPDCF-SZ33	78438	55769	Ref. 3
FWSBC-01	FWSBC1	78579	55582	Ref. 4
FWSBC2	FWSBC2	78569	55652	Ref. 4
FWSBC3	FWSBC3	78478	55611	Ref. 4
FWSBC4	FWSBC4	78429	55582	Ref. 4
FWSBC5	FWSBC5	78346	55577	Ref. 4
FWSBC-06	FWSBC6	78465	55499	Ref. 4
Borings				
FB-20/20A	FB-20/20A	78642	55518	Ref. 2
FB-28	FB-28	78382	55388	Ref. 2
BA-5	FPDCBA 5	78770	55583	Ref. 3
BA-9	FPDCBA 9	78639	55776	Ref. 3
BA-11	FPDCBA 11	78510	55584	Ref. 3
BA-14	FPDCBA 14	78512	55710	Ref. 3
BA-15	FPDCBA 15	78217	55442	Ref. 3
BA-16	FPDCBA 16	78246	55659	Ref. 3

Table 2: Soft Zone Identified in the Vicinity of WSB

CPT ID	Northing	Easting	Thickness
FPDCA 11	78510	55715	3.4
FPDCA 14	78413	55783	5.3
FPDCA 17	78273	55413	9.4
FPDCA 18	78295	55495	9.1
FPDCA 19	78295	55580	3.5
FPDCA 26	78319	55618	5.0
FPDCA 39	78575	55513	2.4
FPDCF-SZ31	78413	55812	2.9
FPDCF-SZ32	78388	55769	3
FPDCF-SZ33	78438	55769	3.7
FWSBC4	78429	55582	3.8
FWSBC6	78465	55499	4.7
Boring ID	Northing	Easting	Thickness
FPDCBA 16	78246	55659	2 to 4
FB-20/20A	78642	55518	1.5 to 6
FB-28	78382	55387	1.5 to 5

Table 3: WSB Design Soft Zone Settlement Profile (Ref. 3)

Distance From Centerline (feet)	Settlement (inches)
0	-2.8
12	-2.7
20.7	-2.5
29.9	-2.2
35.3	-2.0
42.9	-1.7
47.5	-1.5
55.8	-1.2
61.4	-1.0
71.2	-0.7
79.3	-0.5
90.2	-0.3
97.9	-0.2
109.9	-0.1

Figures



Figure 1: WSB Soft Zones

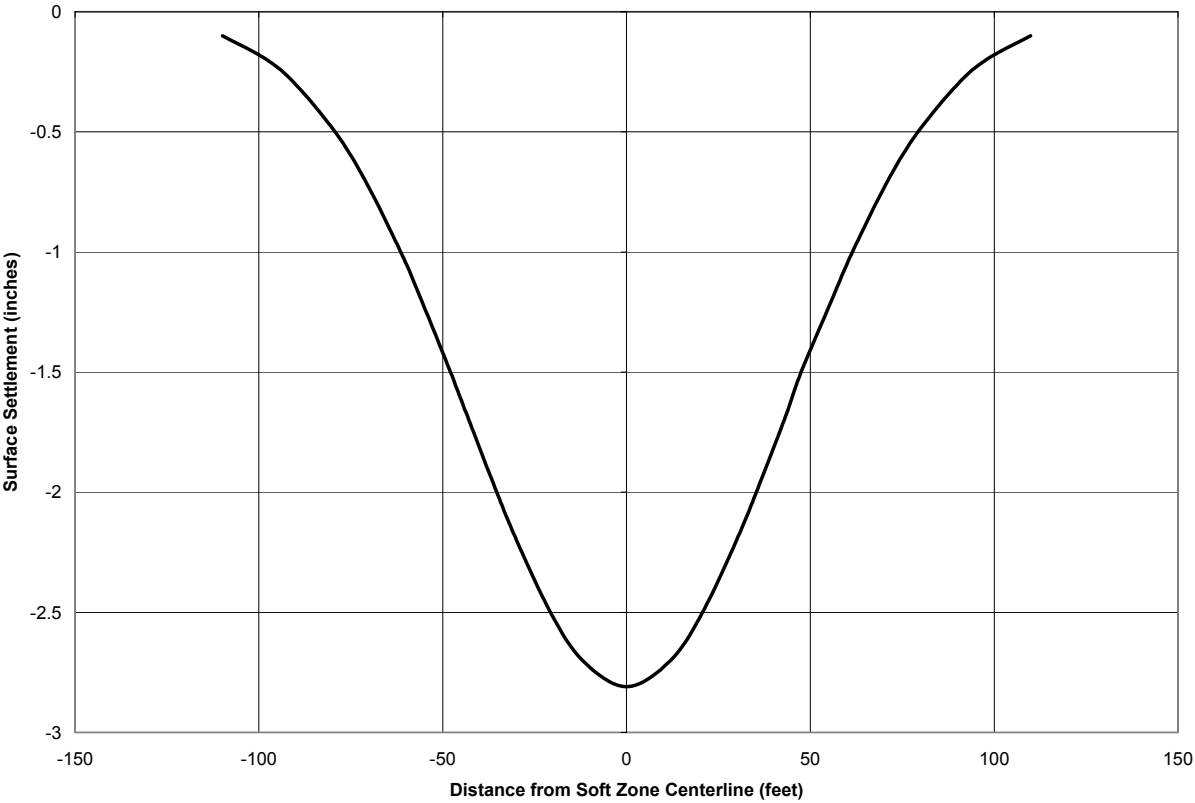


Figure 2: WSB Design Soft Zone Settlement Profile