APPENDIX H

SETTLEMENT ANALYSES FOR SCA

GEOSYNTEC CONSULTANTS

COMPUTATION COVER SHEET

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SETTLEMENT ANALYSES FOR SCA

PURPOSE

This package was prepared in support of the design of the Sediment Consolidation Area (SCA) for the Onondaga Lake Bottom Site, which will be constructed on Wastebed 13. The location of the SCA on Wastebed 13 is shown in Figure 1. Specifically, the purpose of this package is:

(i) to calculate foundation settlement of the existing Solvay waste (SOLW) due to liner system and geotextile tube (geo-tube) placement, and to calculate the settlement of the dredge material inside the geo-tubes before cover placement (i.e., capping);

(ii) to calculate additional foundation and dredge material settlement after capping;

(iii) to estimate the post-settlement grades in the east and west sumps to confirm that positive drainage towards the sumps will be maintained during operations, closure, and post-closure; and

(iv) to estimate the post-settlement grades for the liner system and the cover system, and to estimate tensile strains for the liner system. The performance of the liner system and the final cover system is then evaluated to verify that:

a. positive drainage is maintained towards the liquids management collection sumps;

b. positive drainage is maintained on the final cover surface; and

c. maximum tensile strains in the liner geosynthetic components do not exceed the maximum allowable tensile strains.

METHODOLOGY

Consolidation Settlement

Settlements of the SOLW and the dredge material in geo-tubes were calculated using equations for conventional one-dimensional (1-D) consolidation theory used in

geotechnical engineering [Holtz and Kovacs, 1981]. Settlements of the SOLW and dredge material in geo-tubes are caused by the following mechanisms:

- primary compression of the SOLW and the dredge material in geo-tubes due to overburden loading imposed by the SCA perimeter dikes, the liner system, the dredge material, and the final cover system; and
- secondary compression resulting from the plastic realignment of the fabric (i.e., creep) of SOLW and the dredge material in geo-tubes under the sustained loading.

The general forms of the settlement equations are given below:

Primary Settlement

$$S_p = \mathrm{C}_{r\varepsilon}\,\mathrm{H}\log\left(\frac{\sigma'_{vo} + \Delta\sigma'_v}{\sigma'_{vo}}\right) \quad \text{for } \sigma'_{vo} + \Delta\sigma'_v \le \sigma'_p \text{ ..... (1)}$$

$$S_p = \mathrm{C}_{r\varepsilon}\,\mathrm{H}\log\left(\frac{\sigma'_p}{\sigma'_{vo}}\right) + \mathrm{C}_{c\varepsilon}\,\mathrm{H}\log\left(\frac{\sigma'_{vo} + \Delta\sigma'_v}{\sigma'_p}\right) \quad \text{for } \sigma'_{vo} \le \sigma'_p \text{ and } \sigma'_{vo} + \Delta\sigma'_v > \sigma'_p \text{ . (2A)}$$

$$S_p = \mathrm{C}_{c\varepsilon}\,\mathrm{H}\log\left(\frac{\sigma'_{vo} + \Delta\sigma'_v}{\sigma'_{vo}}\right) \quad \text{for } \sigma'_{vo} \ge \sigma'_p \text{ .....(2B)}$$

Secondary Settlement

$$S_s = \mathrm{C}_{\alpha\varepsilon}\,\mathrm{H}\log\left(\frac{t_2}{t_1}\right) \text{ ..... (3)}$$

Total Settlement

$$S = S_p + S_s \text{ ..... (4)}$$

Where,

S_p = primary settlement;
S_s = secondary settlement;
S = total settlement;
$C_{c\varepsilon}$ = modified compression index;
$C_{r\varepsilon}$ = modified recompression index;

$C_{\alpha\varepsilon}$ = modified secondary compression index;
H = initial thickness of compressible layer;
σ'_{vo} = initial effective overburden stress;
σ'_p = preconsolidation pressure;
$\Delta\sigma'_v$ = increase in effective stress due to the loadings;
t_1 = time for completion of primary compression (assumed 0.5 years in this analysis). The time for completion of primary compression was estimated to range from several months (based on field settlement pilot study) to several years (based on laboratory consolidation tests). For the purpose of this calculation package, the time for completion of primary compression was assumed to be 0.5 years; and
t_2 = time when settlement due to secondary compression is computed (i.e., assuming 4 years to place geo-tubes, 1 year to place cover, and 30 years after closure, the t_2 is assumed to be 35 years for this analysis).

It is noted that the foundation and dredge material settlements were calculated for two time periods, at the time of closure (i.e., after geo-tube placement is complete but before the final cover has been constructed) and 30 years after closure.

During the operating period of 4 years, the foundation settlement was calculated assuming that all phases of geo-tubes were placed at the beginning of operations. The dredge material settlement was calculated assuming that the geo-tubes were placed on a yearly basis for 4 years (i.e., a quarter of the geo-tubes were placed at the beginning of year 1; a quarter of the tubes were placed at the beginning of year 2; etc.). For purposes of this analysis, a 4-year geo-tube placement approach was assumed so that the settlement due to the placement of geo-tubes on top of previously-placed geo-tubes could be incorporated into the calculations. The actual geo-tube phasing will be developed based on many considerations, including operational needs, observations during operations, etc.

For the after capping settlement calculations, the deformed geometry of the liner system, SCA perimeter dike, and the geo-tubes computed from the settlement analyses at closure (i.e., before cover placement) became the initial geometry. The proposed final cover system loading was assumed to be placed at the beginning of year 5. The foundation and dredge material settlement after closure was calculated due to the placement of the proposed final cover. The continued secondary settlement of foundation and dredge material due to the placement of the liner system, dike, and geo-tubes was also incorporated into the settlement evaluation.

Settlement Computation Model

Foundation and cover settlements were calculated using two different models, the surface settlement model (SSM) and the cross-section settlement model (CSM). The SSM produces post-settlement elevation and settlement (i.e., isopach) contour maps for a deformed surface. The CSM produces similar results along a cross section. The main difference between SSM and CSM is that the CSM considers the load-induced stress distribution within the foundation SOLW and the dredge material in geo-tubes while the SSM does not. CSM also models the geometries of the outermost geo-tubes as a series of vertical terraces to mimic the actual shape, while SSM models the outermost geo-tubes as a smooth surface using the composite slopes. The post-settlement contour maps produced using the SSM were used to evaluate: (i) whether positive drainage is maintained towards the east and west sumps; and (ii) whether positive drainage is maintained in the liner system and the final cover system. The post-settlement section figures produced using the CSM were used to evaluate the maximum strain in the geosynthetic components.

Surface Settlement Model (SSM)

Foundation and dredge material settlement based on SSM was calculated using EXCEL® spreadsheets. The details regarding loading and timing for the SSM calculations are provided in subsequent sections. A general summary of the steps used to perform the settlement calculations is presented as follows:

Step 1. Calculation points (approximately 2,300 for this analysis) were selected within the SCA footprint in order to represent the geometries of various surfaces (e.g., low permeability soil layer [LPSL]). For each calculation point, the northing, easting, and the elevation values of various surfaces were selected and stored.

Step 2. For each calculation point, the subsurface profile beneath the liner system (i.e., the SOLW) and the dredge material above the liner system were identified and broken into distinct layers (i.e., sub-layers) of specific thickness and material properties, and the center elevation of each sub-layer was identified.

Step 3. The initial effective vertical stress, the increase in the effective vertical stress, and the final effective vertical stress were calculated at the center of each sub-layer in the SOLW and dredge material in geo-tubes for each of the loadings described in subsequent sections.

Step 4. Using Equations 1 through 4, the settlements for each sub-layer in SOLW were calculated. The total foundation settlement at a calculation point was found by summing the contribution of the settlement from each of the SOLW sub-layers beneath the bottom of the liner system.

Step 5. Post-settlement elevations of each SOLW sub-layer were obtained by subtracting the corresponding foundation settlement from its corresponding pre-settlement elevation.

Step 6. Using Equations 1 through 4, the settlement for each dredge material sub-layer within the geo-tubes was calculated. The total settlement of the geo-tube surface at a calculation point was found by summing the contribution of the total foundation settlement and the settlement from each of the dredge material sub-layers within the geo-tubes.

Step 7. Post-settlement elevations of each surface were obtained by subtracting the settlement from the pre-settlement elevation at each point.

Step 8. Post-settlement elevation or settlement isopach contour maps were created using the post-settlement or elevation data from all calculation points for the surface of concern.

Cross-section Settlement Model (CSM)

Since CSM can consider the Boussinesq stress distribution in the modeling layers, it is more accurate than SSM at modeling post-settlement strain along the liner system. Foundation and dredge material settlements based on CSM were calculated using EXCEL® spreadsheets. The steps for CSM are generally the same or similar to those for SSM and are presented as follows:

Step 1. Similar, but only a series of calculation points were taken from a cross section line. For the two cross-sections analyzed in this package, the number of calculation points ranged between 90 and 100.

Step 2. Same.

Step 3. Similar, except the increase in effective vertical stress was computed separately by considering the stress distribution based on Boussinesq theory.

Step 4. Same.

Step 5. Same.

Step 6. Same.

Step 7. Same.

Step 8. Pre- and post-settlement top of base liner elevations between a pair of adjacent calculation points were used to assess the pre- and post-settlement length of the liner between the two calculation points. The difference in length relative to the initial length between the calculation points was used to assess the calculated incremental strain in the liner system according to the following equation:

$$\varepsilon = \frac{L_0 - L_f}{L_o} \times 100 \text{ (percent)} \quad \text{.....} (5)$$

Where:

ε = strain in the liner system (- indicates tension, + indicates compression);

L_f = final length between calculation points based on post-settlement elevations; and

L_o = initial length between calculation points based on pre-settlement elevations.

The estimated tensile strains were compared to the conservatively recommended allowable tensile strain of 5% [Berg and Bonaparte, 1993] for the liner system geomembrane.

Tensile Strain Adjustment

The post-settlement liner tensile strain was evaluated for two time periods, at closure (before cover placement) and 30 years after closure. The calculated tensile strains at 30 years after closure are based on the liner condition at closure; however, the liner segments may already have been stretched during the operations period. Therefore, the calculated tensile strains at 30 years after closure need to be adjusted to include additional tensile strains during the operations period.

Assuming ε_1 and ε_2 represent the tensile strains calculated for the operations and post-closure periods, respectively.

$$\varepsilon_1 = \frac{L_0 - L_1}{L_o} = 1 - \frac{L_1}{L_o}, \quad \frac{L_1}{L_o} = 1 - \varepsilon_1 \quad \text{.....} (6)$$

$$\varepsilon_2 = \frac{L_1 - L_2}{L_1} = 1 - \frac{L_2}{L_1}, \quad \frac{L_2}{L_1} = 1 - \varepsilon_2 \quad \text{..... (7)}$$

Where:

L_o = initial length between calculation points based on pre-settlement elevations;

L_1 = final length between calculation points based on post-settlement elevations at closure;

L_2 = final length between calculation points based on post-settlement elevations 30 years after closure;

Assuming $\varepsilon_2^{'}$ represent the adjusted post-closure tensile strains.

$$\varepsilon_2^{'} = \frac{L_0 - L_2}{L_o} = 1 - \frac{L_2}{L_o} = 1 - \frac{L_2}{L_1} \times \frac{L_1}{L_o} \quad \text{..... (8)}$$

Substituting Equations 6 and 7 into Equation 8:

$$\begin{aligned} \varepsilon_2^{'} &= 1 - (1 - \varepsilon_2) \times (1 - \varepsilon_1) \\ &= 1 - 1 + \varepsilon_1 + \varepsilon_2 - \varepsilon_1 \varepsilon_2 \\ &= \varepsilon_1 + \varepsilon_2 - \varepsilon_1 \varepsilon_2 \quad \text{..... (9)} \end{aligned}$$

Since ε_1 and ε_2 are typically relatively small numbers (i.e., couple of percent), the term $\varepsilon_1\varepsilon_2$ is very small and can be removed from Equation 9. Thus, Equation 9 can be simplified as:

$$\varepsilon_2^{'} = \varepsilon_1 + \varepsilon_2 \quad \text{..... (10)}$$

Secondary Settlement Time Ratio

The secondary settlement components of the foundation and dredge material settlements were calculated for two time periods, at closure (before cover placement) and 30 years after closure. For the post-closure period, the calculated secondary settlement represents additional secondary settlement after closure.

Foundation SOLW

For the foundation SOLW, there are two loadings considered in the settlement analyses. The first one is the liner system and dredge material in geo-tubes loading placed at the beginning of the operations period (i.e., beginning of year 1), and the second one is the proposed final cover loading placed at closure (beginning of year 5). For each sub-layer in the foundation SOLW, it is assumed that the secondary settlement during the post-closure period is a continuation of the secondary settlement triggered by the placement of the dredge material in the geo-tubes. In other words, the secondary settlement during the post-closure period was assumed to not restart due to the placement of the proposed final cover.

Therefore, the additional secondary settlement during the post-closure period can be calculated as:

$$S_{post-closure} = \mathrm{C}_{\alpha\varepsilon}\ \mathrm{H} \log\left(\frac{T_3}{T_1}\right) - \mathrm{C}_{\alpha\varepsilon}\ \mathrm{H} \log\left(\frac{T_2}{T_1}\right) \quad \text{..... (11)}$$

Where:

$S_{post\text{-}closure}$ = additional secondary settlement during the post-closure period;
$C_{\alpha\varepsilon}$ = modified secondary compression index;
H = initial thickness of compressible layer;
T_1 = time for completion of primary compression (assumed 0.5 year);
T_2 = time at closure (assumed 4 years); and
T_3 = time 30 years after closure (assumed 35 years).

Equation 11 can be reorganized as:

$$\begin{aligned} S_{post-closure} &= \mathrm{C}_{\alpha\varepsilon}\ \mathrm{H} \left[\log\left(\frac{T_3}{T_1}\right) - \log\left(\frac{T_2}{T_1}\right)\right] \\ &= \mathrm{C}_{\alpha\varepsilon}\ \mathrm{H}\ \left[\log(T_3) - \log(T_1) - \log(T_2) + \log(T_1)\right] \\ &= \mathrm{C}_{\alpha\varepsilon}\ \mathrm{H}\ \left[\log(T_3) - \log(T_2)\right] \\ &= \mathrm{C}_{\alpha\varepsilon}\ \mathrm{H} \log\left(\frac{T_3}{T_2}\right) \quad \text{..... (12)} \end{aligned}$$

Observing Equations 11 and 12, the secondary settlement during the post-closure period can be calculated in one step per Equation 12 instead of in two steps per Equation 11. Comparing Equations 3 and 12, it can be assumed that the equivalent t_2/t_1 ratio in Equation 3 can be expressed as T_3/T_2 (i.e., 35/4=8.75) for secondary settlement of foundation SOLW.

Dredge Material in Geo-tubes

For the settlement of dredge material in geo-tubes, it was assumed that the geo-tubes were placed on a yearly basis for four years (i.e., a quarter of the geo-tubes were placed at the beginning of year 1; a quarter of the tubes were placed at the beginning of year 2; etc.). Per Equation 12, the equivalent time ratios can be calculated as 35/4 (8.75) for year 1 geo-tubes, 34/3 (11.33) for year 2 geo-tubes, 33/2 (16.5) for year 3 geo-tubes, and 32/1 (32) for year 4 geo-tubes.

ANALYSIS CASES

The following cases were analyzed using the SSM:

CASE 1: Settlement analysis for top of LPSL at the end of the operations period (i.e., end of year 4);

CASE 2: Settlement analysis for top of dredge material in geo-tubes at the end of the operations period (i.e., end of year 4);

CASE 3: Settlement analysis for top of LPSL 30 years after closure (i.e., end of year 35);

CASE 4: Settlement analysis for top of final cover 30 years after closure (i.e., end of year 35);

The following cases were analyzed using the CSM:

CASE 5: Settlement analysis for top of LPSL at the end of the operations period (i.e., end of year 4) along two cross sections [Figure 1];

CASE 6: Settlement analysis for top of dredge material in geo-tubes at the end of the operations period (i.e., end of year 4) along two cross sections [Figure 1]; and

CASE 7: Settlement analysis for top of LPSL 30 years after closure (i.e., end of year 35) along two cross sections [Figure 1].

SUBSURFACE STRATIGRAPHY

Detailed information regarding the subsurface stratigraphy was presented in a calculation package titled "*Subsurface Stratigraphy Model of Wastebed 13 for the Design of Sediment Consolidation Area*" (referred to as the Data Package). In summary, the subsurface stratigraphy consists primarily of three types of material: the SOLW, the dike soil, and the foundation soil, as shown schematically in Figure 2. The SOLW was divided into three zones (i.e., Zone 1, Zone 2, and Zone 3, as shown in Figure 2) based on the distinctive characteristics of each zone.

The groundwater table was assumed to be at elevation 375 ft as presented in the Data Package.

MATERIAL PROPERTIES

Detailed information regarding the material properties (i.e., unit weight and/or compressibility parameters) of the SOLW and the Wastebed 13 perimeter dike soil was also presented in the Data Package. The unit weight of the dredge material was estimated to be approximately 86 pcf based on lab results. The compressibility parameters of the dredge material are calculated and presented in Attachment 1 of this package. The unit weights of the soil liner, gravel drainage layer, and the final cover system were assumed to be 120 pcf.

Table 1 summarizes the material properties of the SOLW, soil liner, gravel layer, dredge material, final cover, and SCA perimeter dike soil.

SETTLEMENT CALCULATION SURFACES AND CROSS SECTIONS

Surface Settlement Model (SSM)

The pre-settlement grading plans of various SCA surfaces needed in the SSM (including from bottom to top: bottom of foundation SOLW, bottom of LPSL [i.e., existing grade], top of LPSL, top of gravel, and the potential top of geo-tube year 1, top of geo-tube year 2, top of geo-tube year 3, and top of geo-tube year 4 surfaces) are presented in Figures 3 through 10. The locations of the 2,300+ settlement calculation points are shown in

Figure 11. These calculation points were used to represent modeling surfaces. The pre-settlement proposed final cover grading plan was developed based on the deformed (i.e., settled) shape of the top of geo-tube year 4 surface; therefore, it includes settlement due to liner and geo-tube placement but not final cover placement. The proposed final cover surface was designed to provide positive drainage of surface water with a minimum of 0.5% slope and a thickness of approximately 33 inches on top of the geo-tubes (i.e., 3-inch leveling layer, 24-inch protection soil layer, and 6 inches of topsoil).

Cross-section Settlement Model (CSM)

Two Cross Sections, A and B, were analyzed using the CSM. The locations of Cross Sections A and B are shown in Figure 1.

RESULTS

Surface Settlement Model (SSM)

CASE 1

The settlement isopach and post-settlement elevation maps for the top of LPSL (or bottom of gravel layer) at the end of operations period (i.e., end of year 4) are shown in Figures 12 and 13, respectively. The estimated settlement includes primary and secondary settlement of SOLW that occurred between the beginning of year 1 and the end of year 4. Per Figure 12, within the top deck area, the majority of the settlements are approximately 9 ft to 11 ft with the area above the subsurface berm having settlements ranging from 5 ft to 8 ft. Figure 13 indicates that the gravel layer functions as needed at the end of operations period (i.e., end of year 4) because there is no slope reversal or local ponding and liquid can freely drain towards the two collection sump areas. The spreadsheet output for settlement analysis for 10 representative calculation points (i.e., 1001 through 1010) is presented in Attachment 2. The locations of calculation points 1001 through 1010 are shown in Figure 11.

CASE 2

The settlement isopach and post-settlement elevation maps for the top of geo-tubes at the end of operations period (i.e., end of year 4) are shown in Figures 14 and 15, respectively. The estimated settlement includes primary and secondary settlement of

dredge material in geo-tubes that occurred between the beginning of year 1 and the end of year 4. Per Figure 14, within the top deck area, the majority of the settlements are approximately 9 ft to 14 ft with the area above the subsurface berm having settlements ranging from 5 ft to 9 ft. Figure 15 indicates that positive drainage is generally maintained in the southern part of the top deck area, along the northern edge, and along the area above the subsurface berm. Areas with relatively flat slopes are formed near the general vicinity of the two collection sumps. With the placement of the proposed final cover (Figure 16), the relatively flat slopes on top of the geo-tubes in these areas can be addressed, and a minimum of 0.5% positive slopes can be provided. The spreadsheet output for settlement analysis for 10 representative calculation points (i.e., 1001 through 1010) is presented in Attachment 3.

CASE 3

The settlement isopach and post-settlement elevation maps for the top of LPSL (or bottom of gravel layer) at 30 years after closure (i.e., end of year 35) are shown in Figures 17 and 18, respectively. It should be noted the settlement calculated for this case consists of: (i) the primary settlement of the SOLW due to the placement of the proposed final cover; and (ii) the continued secondary settlement of the SOLW between the beginning of year 5 and the end of year 35 due to the placement of the liner system, SCA perimeter dike, and the geo-tubes that occurred during years 1 through 4. Per Figure 17, within the top deck area, the majority of the settlements are approximately 1 ft to 2 ft with the area above the subsurface berm having settlements ranging from 0.5 ft to 1 ft. Figure 18 indicates that the gravel layer still functions as required at year 35 because there is no slope reversal or local ponding and liquid can freely drain toward the two collection sump areas. The spreadsheet output for settlement analysis for 10 representative calculation points (i.e., 1001 through 1010) is presented in Attachment 4.

CASE 4

The settlement isopach and post-settlement elevation maps for the top of final cover at the end of year 35 are shown in Figures 19 and 20, respectively. It should be noted that the starting point for this case is the deformed surfaces at the end of year 4. The settlement calculated for this case consists of: (i) the primary settlement of the dredge material in geo-tubes due to the placement of the proposed final cover; and (ii) the continued secondary

settlement of the dredge material in geo-tubes due to the placement of the geo-tubes themselves. Per Figure 19, within the top deck area, the majority of the settlements between the end of year 4 and the end of year 35 are approximately 2 ft to 4 ft. Figure 20 indicates that positive drainage is generally maintained throughout the top deck area allowing surface water to flow toward the low points along the edges. Any long term development of local low points can be addressed during maintenance. The spreadsheet output for settlement analysis for 10 representative calculation points (i.e., 1001 through 1010) is presented in Attachment 5.

Cross-section Settlement Model (CSM)

CASE 5

The stress distribution of geo-tube, liner, and SCA perimeter dike loading within the foundation SOLW along Cross Section A is shown in Figure 21. Figure 21 indicates that the load induced stress does not dissipate much in the center portion of the SCA cell because the loading condition remains relatively uniform for a long distance. The stress values do change significantly in the sideslope area and dike area due to changing load conditions within a short distance. The pre- vs. post- foundation settlement profiles at the end of year 4 along Cross Section A are shown in Figure 22 as an overall view and in Figures 23 and 24 as zoom-in view for the left and right berms and sumps, respectively. Three series of calculation results (pre-settlement slope, post-settlement slope, and post-settlement strain) are shown between two adjacent calculation points for the top of LPSL. According to Figure 22, at the end of year 4, the majority of the settlement for the top of LPSL ranged from 8 ft to 10 ft in the top deck area except above the subsurface berm area where the settlement was about 6 ft. This is consistent with the post-settlement analysis results using SSM (see CASE 1). There is generally no post-settlement liner tensile strain (negative value) underneath the top deck area except in a few localized areas with maximum tensile strain on the order of 0.5%. According to Figures 23 and 24, at the end of year 4, the post-settlement liner tensile strain values range from 0.1% to 0.6% in areas directly underneath the sideslope area, and inside the top deck area. The settlements calculated at the toe of the dike are on the order of 1.1 ft and 0.7 ft for the left (west) and right (east) berms, respectively. Also according to Figures 23 and 24, at the end of year 4, the predicted post-settlement slopes along the top of LPSL will remain positive toward the left (west) and right (east) sumps without grade reversal or local ponding. No post-settlement liner tensile strains are observed in either the sump areas or the surrounding

areas.

The stress distribution of geo-tube, liner, and SCA perimeter dike loading within the foundation SOLW along Cross Section B is shown in Figure 25. The characteristics of the stress distribution are similar to that of Cross Section A. The pre- vs. post- foundation settlement profiles at the end of year 4 along Cross Section B are shown in Figure 26 as an overall view and in Figures 27 and 28 as zoom-in view for the left and right berms, respectively. Three series of calculation results (pre-settlement slope, post-settlement slope, and post-settlement strain) are shown between two adjacent calculation points for the top of LPSL. According to Figure 26, at the end of year 4, the majority of the settlement for the top of LPSL ranged from 8 ft to 11 ft in the top deck area. This is consistent with the post-settlement analysis results using SSM (see CASE 1). There is no post-settlement liner tensile strain (negative value) in the top deck areas. According to Figures 27 and 28, at the end of year 4, the post-settlement liner tensile strain values range from 0.1% to 0.4% in the sideslope areas. The settlements calculated at the toe of the dike are on the order of 0.9 ft and 0.1 ft for the left (north) and right (south) berms, respectively. According to Figure 26, at the end of year 4, the post-settlement slopes along the top of LPSL (i.e., flow line) remain positive toward the left (west) sumps without grade reversal or local ponding. No post-settlement liner tensile strains are observed in the left sump area and the surrounding area.

The spreadsheet output for the settlement analysis for 10 representative calculation points (i.e., 26 through 35, Cross Section A) is presented in Attachment 6.

CASE 6

The pre- vs. post-settlement profiles at the end of year 4 along Cross Section A are shown in Figure 29 for various layers of geo-tubes. According to Figure 29, at the end of year 4, the majority of the settlement for the top of the geo-tubes ranged from 11 ft to 12 ft in the top deck area except the area above the subsurface berm where the settlement was about 8 ft. This is consistent with the results using SSM (see CASE 2).

The pre- vs. post-settlement profiles at the end of year 4 along Cross Section B are shown in Figure 30 for various layers of geo-tubes. According to Figure 30, at the end of year 4, the majority of the settlements for the top of geo-tube phase 4 ranged from 9 ft to 14 ft in the top deck area. This is consistent with the results using SSM (see CASE 2).

The spreadsheet output for settlement analysis for 10 representative calculation points

(i.e., 26 through 35, Cross Section A) is presented in Attachment 7.

CASE 7

The stress distribution of the proposed final cover loading within the dredge material in geo-tubes and foundation SOLW along Cross Section A is shown in Figure 31. Similar to the stress distribution due to geo-tube loading, the stress distribution due to final cover also remains relatively uniform in the center portion and highly variable in the cover sideslope and dike areas. The pre- (i.e., at the end of year 4) vs. post- (i.e., at the end of year 35) foundation settlement profiles along Cross Section A are shown in Figure 32 as an overall view and in Figures 33 and 34 as zoom-in views for the left and right berms and sumps, respectively.

Three series of calculation results (pre-settlement slope [i.e., slope at the end of year 4], post-settlement slope, and post-settlement strain) are shown between two adjacent calculation points for the top of LPSL. It should be noted that the starting point for this case is the deformed profiles at the end of year 4. The settlement calculated for this case consists of: (i) the primary settlement of the SOLW due to the placement of the proposed final cover, and (ii) the continued secondary settlement of the SOLW between the beginning of year 5 and the end of year 35 due to the placement of the liner system, SCA perimeter dike, and the geo-tubes that occurred during years 1 through 4. According to Figure 32, at the end of year 35 as compared to the end of year 4, the majority of the settlements for the top of LPSL ranged from 1 ft to 1.5 ft in the top deck area except in the area above the subsurface berm where the settlement was about 0.5 ft. This is consistent with the results using SSM (see CASE 3).

There is generally no post-settlement liner tensile strain (negative value) in the top deck areas except some localized areas with maximum tensile strain on the order of 0.6%. It should be noted that the maximum 0.6% tensile strain is the adjusted strain. It is the sum of the liner tensile strain of 0.5% at approximate distance 1,000 ft at the end of year 4 (Figure 22) and the additional liner tensile strain of 0.1% at the same location at the end of year 35 (Figure 32). According to Figures 23, 24, 33, and 34, at the end of year 35, the post-settlement liner tensile strain values (adjusted) range from 0.1% to 2.2% in areas directly underneath the cover sideslope area. The maximum adjusted 2.2% tensile strain is the sum of the liner tensile strain of 0.1% at approximate distance 1,790 ft at the end of year 4 (Figure 24) and the additional liner tensile strain of 2.1% at the same location at the

end of year 35 (Figure 34). The maximum 2.2% liner tensile strains occurred along the inner side of the dike. Also according to Figures 33 and 34, at the end of year 35, the predicted post-settlement slopes along the top of LPSL will remain positive toward the left (west) and right (east) sumps without grade reversal or local ponding. No post-settlement liner tensile strains are observed in either the sump areas or the surrounding areas.

The stress distribution of the proposed final cover loading within the dredge material in geo-tubes and foundation SOLW along Cross Section B is shown in Figure 35. The characteristics of the stress distribution are similar to that of Cross Section A. The pre- (i.e., at the end of year 4) vs. post- (i.e., at the end of year 35) foundation settlement profiles along Cross Section B are shown in Figure 36 as an overall view and in Figures 37 and 38 as zoom-in view for the left and right berms, respectively. Three series of calculation results (pre-settlement slope, post-settlement slope, and post-settlement strain) are shown between two adjacent calculation points for the top of LPSL. According to Figure 36, at the end of year 35 as compared to the end of year 4, the majority of the settlements for the top of LPSL ranged from 1 ft to 1.5 ft in the top deck area. This is consistent with the results using SSM (see CASE 3). There is no calculated post-settlement liner tensile strain in the top deck areas. According to Figures 27, 28, 37 and 38, at the end of year 35, the post-settlement liner tensile strain values (adjusted) range from 0.1% to 1.0% in areas directly underneath the cover sideslope area. The maximum adjusted 1.0% tensile strain is the sum of the liner compressive strain of 0.9% at approximate distance 210 ft at the end of year 4 (Figure 27) and the additional liner tensile strain of 1.9% at the same location at the end of year 35 (Figure 37). The maximum liner tensile strains occurred along the inner side of the dike. According to Figure 36, at the end of year 35, the post-settlement slopes along the top of LPSL (i.e., flow line) remain positive toward the left (west) sumps without grade reversal or local ponding. No post-settlement liner tensile strains are observed in the left sump area and the surrounding area.

The spreadsheet output for settlement analysis for 10 representative calculation points (i.e., 26 through 35, Cross Section A) is presented in Attachment 8.

SSM and CSM Comparison

As mentioned before, the main difference between the SSM and CSM is that CSM considers the load-induced stress distribution within the foundation SOLW and the dredge material in geo-tubes while the SSM does not. To better illustrate the difference, the post-

settlement top of LPSL calculated without considering stress distribution is shown on Figure 39 along with the analysis results considering the stress distribution for Cross Section A at the end of year 4.

It is noted that under the top deck area (i.e., between distance 300 ft and 600 ft), the post-settlement Top of LPSL with or without stress distribution are almost identical indicating that the load-induced stress dissipate very little in this area. However, these two lines vary in the sideslope area and the perimeter berm area. In the sideslope area (i.e., between distance 160 ft and 260 ft), the post-settlement Top of LPSL line without stress distribution has many near vertical drops at the same location where the loading condition changes significantly, while the Top of LPSL line with stress distribution transitions smoothly regardless of a change in loading condition. At the toe of the gravel layer (i.e., distance 160 ft), the Top of LPSL line without stress distribution predicts less settlement (approximately 1.3 ft) as compared to the Top of LPSL line with stress distribution. This is because the stress condition underneath this location is also affected by the stress distribution from adjacent geo-tube loading. Similarly, at the toe of the perimeter berm (i.e., distance 75 ft), the Top of LPSL line without stress distribution predicts no settlement while the Top of LPSL line with stress distribution predicts 1 ft of settlement.

SSM and CSM results are very similar in the top deck area of the SCA but do differ somewhat in the sideslope and perimeter berm areas, which have more complicated loadings, more potential for liner strain, and represent a relatively small portion of the SCA. Therefore, it is considered appropriate to use SSM to estimate the overall surface settlement for the SCA and to use CSM in the sideslope and perimeter berm areas to estimate liner strain. This is consistent with the approach presented herein.

CONCLUSIONS

The analyses provided herein indicate that

(i) The anticipated foundation settlement during the operations period is 9 ft to 11 ft, and the anticipated settlement of dredge material in the geo-tubes during the operations period is 2.0 ft on average with a maximum of 4.0 ft.

(ii) Relatively small foundation and cover settlements are anticipated during the post-closure period. The additional foundation settlement during the post-closure period is estimated to be 1 ft to 2 ft. The additional cover settlement

(i.e., settlement of dredge material in the geo-tubes) during the post-closure period is estimated to be 1.5 ft on average with a maximum of 3.0 ft.

(iii) The liquid collection layer (i.e., the gravel layer) is anticipated to function properly by allowing liquid to freely flow to the sump areas during the closure and post-closure periods. The settlement calculations predict no slope reversal or local ponding.

(iv) The maximum tensile strain on the liner system, which was calculated to be 2.2% during the closure and post-closure periods, is less than the allowable tensile strain of 5% for liner geomembrane. For the closure and post-closure periods, there was little or no liner tensile strain calculated for the majority of the liner system underneath the top deck area. According to the results, liner tensile strains were typically observed under the sideslope and in the dike areas. The maximum liner tensile strains typically occur on the inner side of dike sideslope areas.

(v) The east and the west sumps are anticipated to function properly by maintaining positive drainage toward both sump areas during the closure and post-closure periods. The settlement calculations predict no slope reversal, local ponding, or tensile liner strain in both sump areas and the surrounding areas.

(vi) The proposed final cover is expected to perform properly during the post-closure period by maintaining positive drainage slopes. Any long term development of local low points can be addressed during maintenance.

REFERENCES

Berg, R.R. and Bonaparte, R., "*Long-Term Allowable Tensile Stresses for Polyethylene Geomembranes*," Geotextiles and Geomembranes, Vol. 12, 1993, pp. 287-306.

Holtz, R.D., and Kovacs, W.D. "*An Introduction to Geotechnical Engineering*," Prentice-Hall Inc., Englewood Cliffs, N.J., 1981.

Tables

Table 1. Summary of Material Properties for Settlement Calculation

Material		Total Unit Weight (γ_i, pcf)	Overconsolidation Ratio (OCR)	Modified Compression Index ($C_{c\varepsilon}$)	Modified Recompression Index ($C_{r\varepsilon}$)	Coefficient of Secondary Compression ($C_{\alpha\varepsilon}$)(1)
SOLW	Zone 1	82	4.5 for D=0~10 ft 2.0 for D=10~20 ft 1.0 for D>20 ft	0.34	0.015	0.13% for $\sigma_v^{'}/\sigma_p^{'} \leq 1.0$ 0.83% for $\sigma_v^{'}/\sigma_p^{'} > 1.0$
	Zone 2			0.46	0.014	0.11% for $\sigma_v^{'}/\sigma_p^{'} \leq 1.0$ 0.91% for $\sigma_v^{'}/\sigma_p^{'} > 1.0$
	Zone 3			0.38	0.021	0.07% for $\sigma_v^{'}/\sigma_p^{'} \leq 1.0$ 0.70% for $\sigma_v^{'}/\sigma_p^{'} > 1.0$
Dike Soil, Soil Liner and Final Cover		120	N/A	N/A	N/A	N/A
Dredge Material		86	1.0	0.291	0.0045	0.08% for $\sigma_v^{'}/\sigma_p^{'} \leq 1.0$ 0.60% for $\sigma_v^{'}/\sigma_p^{'} > 1.0$
Gravel		120	N/A	N/A	N/A	N/A

(1) $\sigma_v^{'} = \sigma_{v0}^{'} + \Delta\sigma_v^{'}$ is the final effective vertical stress in SOLW; $\sigma_p^{'}$ is the pre-consolidation pressure.

Figures

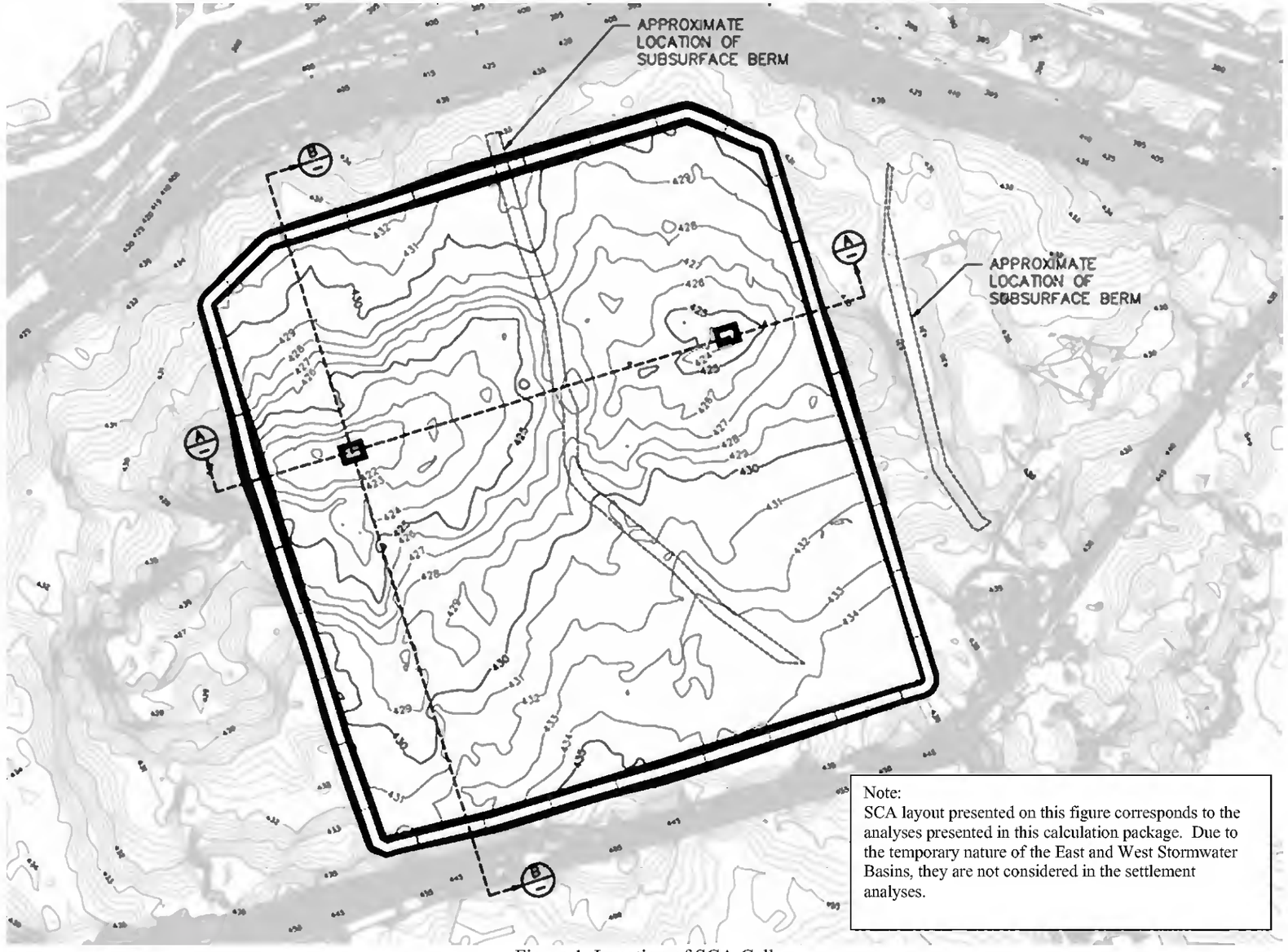


Figure 1. Location of SCA Cell

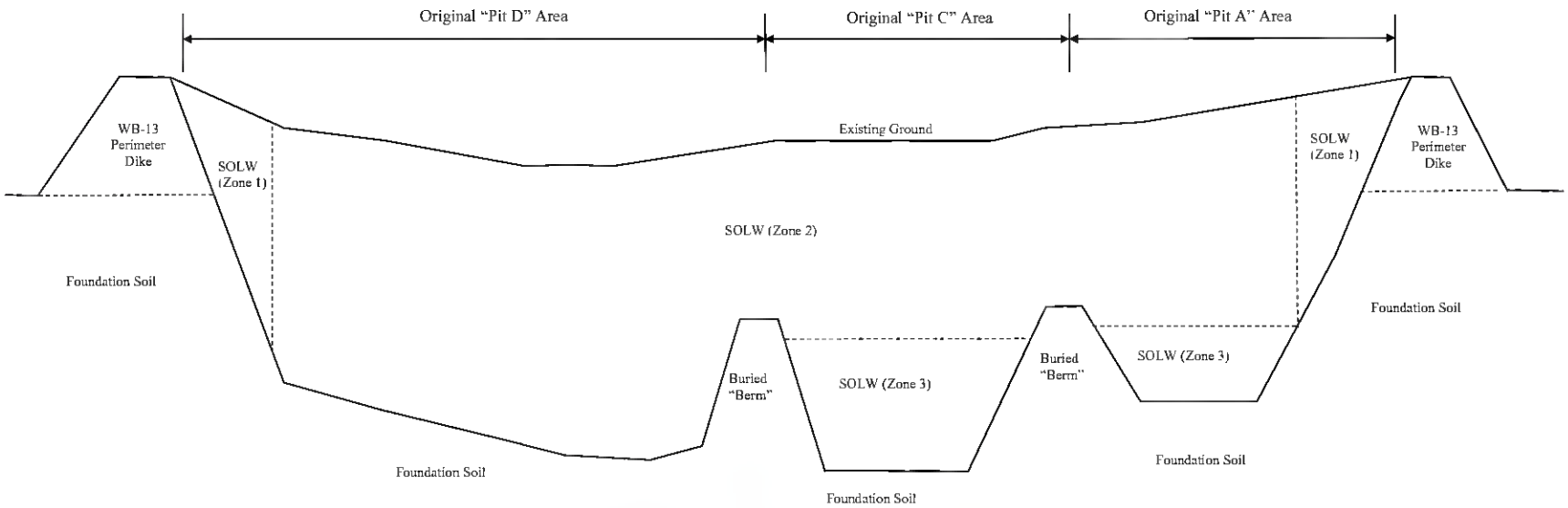
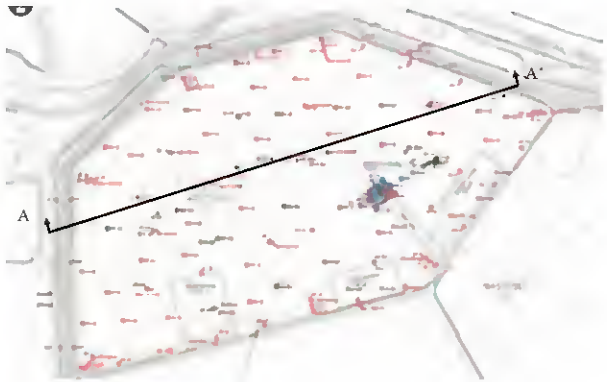


Figure 2. Schematic of Subsurface Profile
[not to scale; for the purpose of showing subsurface stratigraphy only; location of the section is shown below]



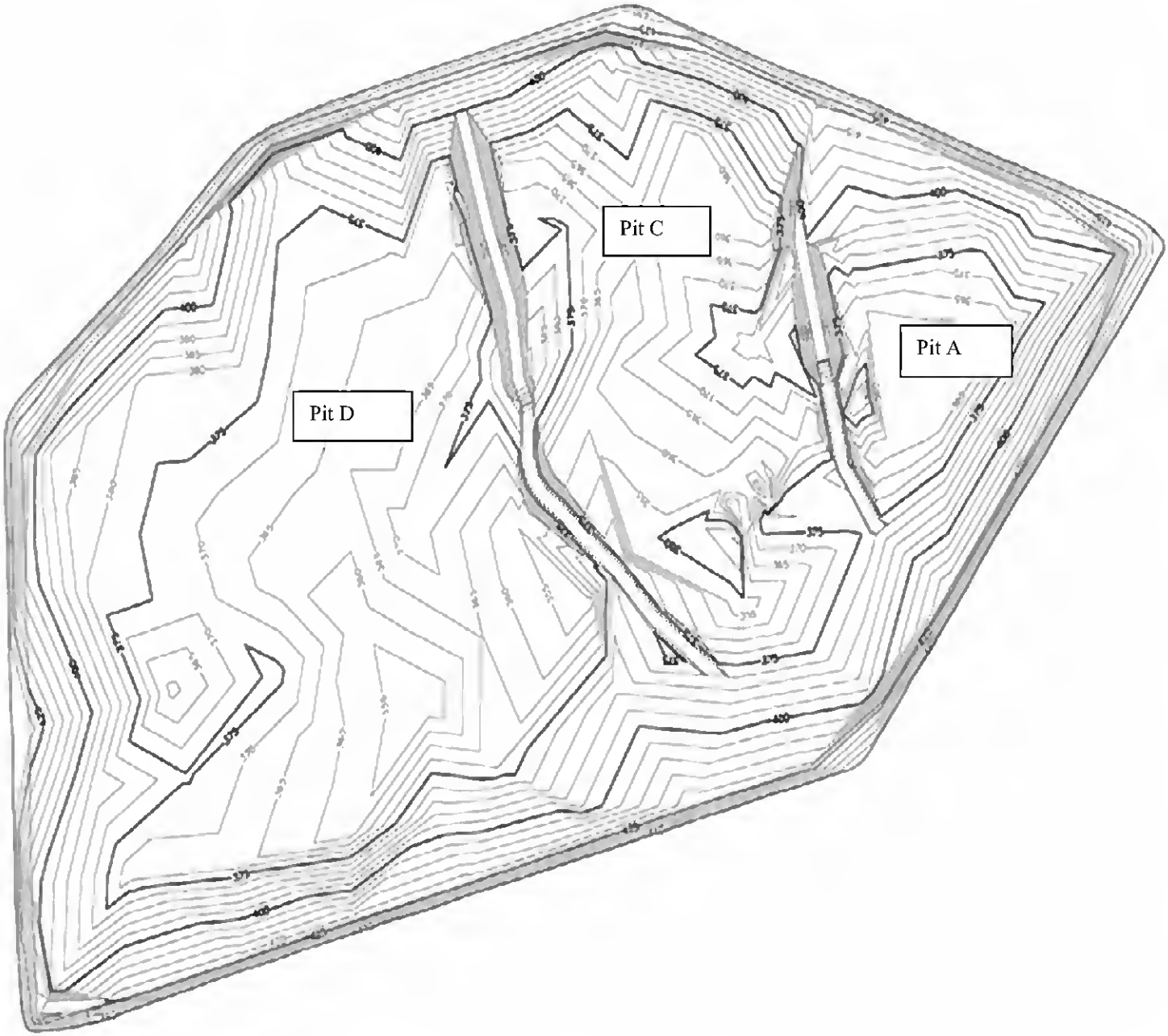


Figure 3. SCA Bottom of Foundation SOLW Grading Plan

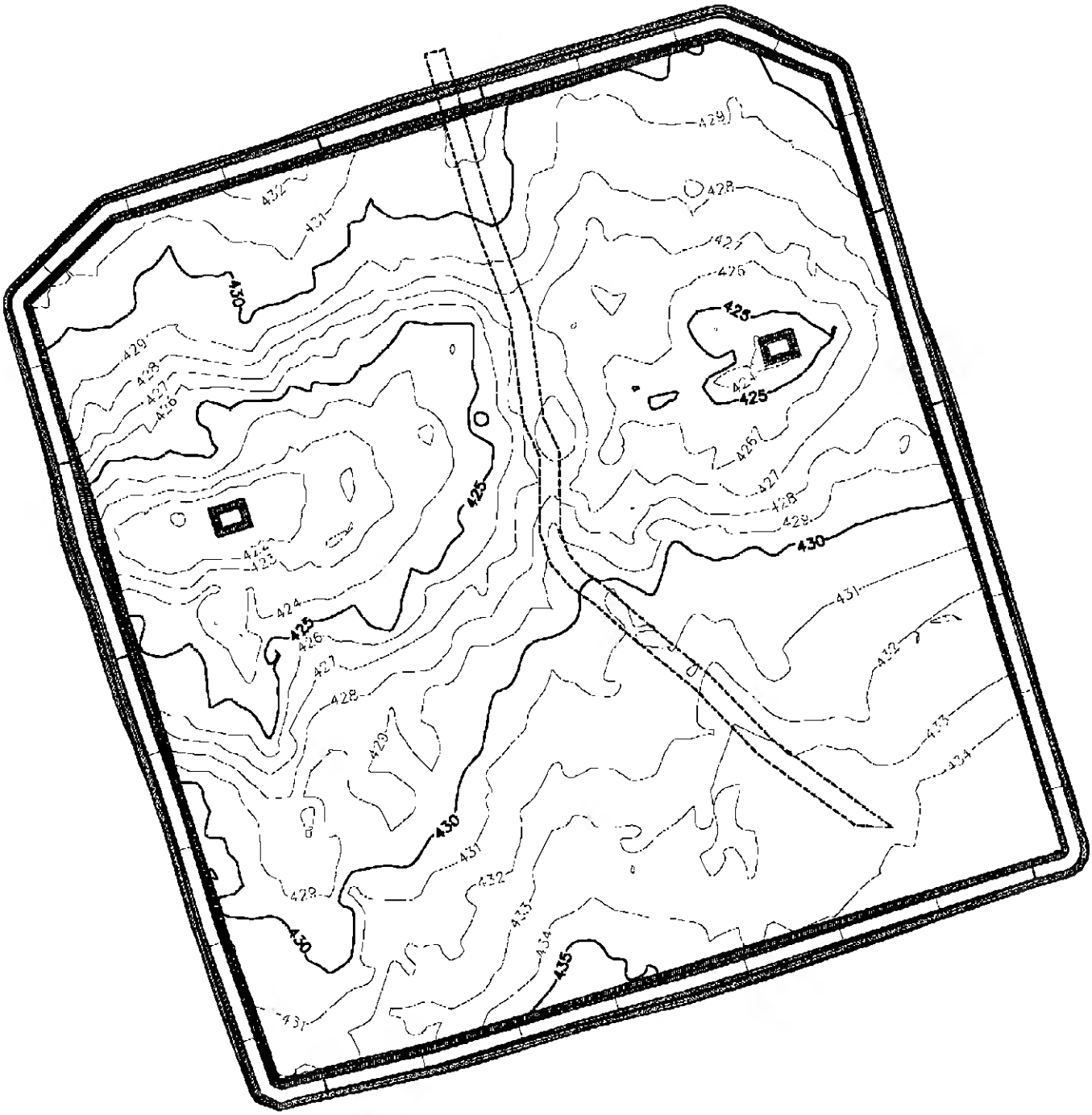


Figure 4. SCA Pre-Settlement Bottom of LPSL Grading Plan (i.e., existing grade)

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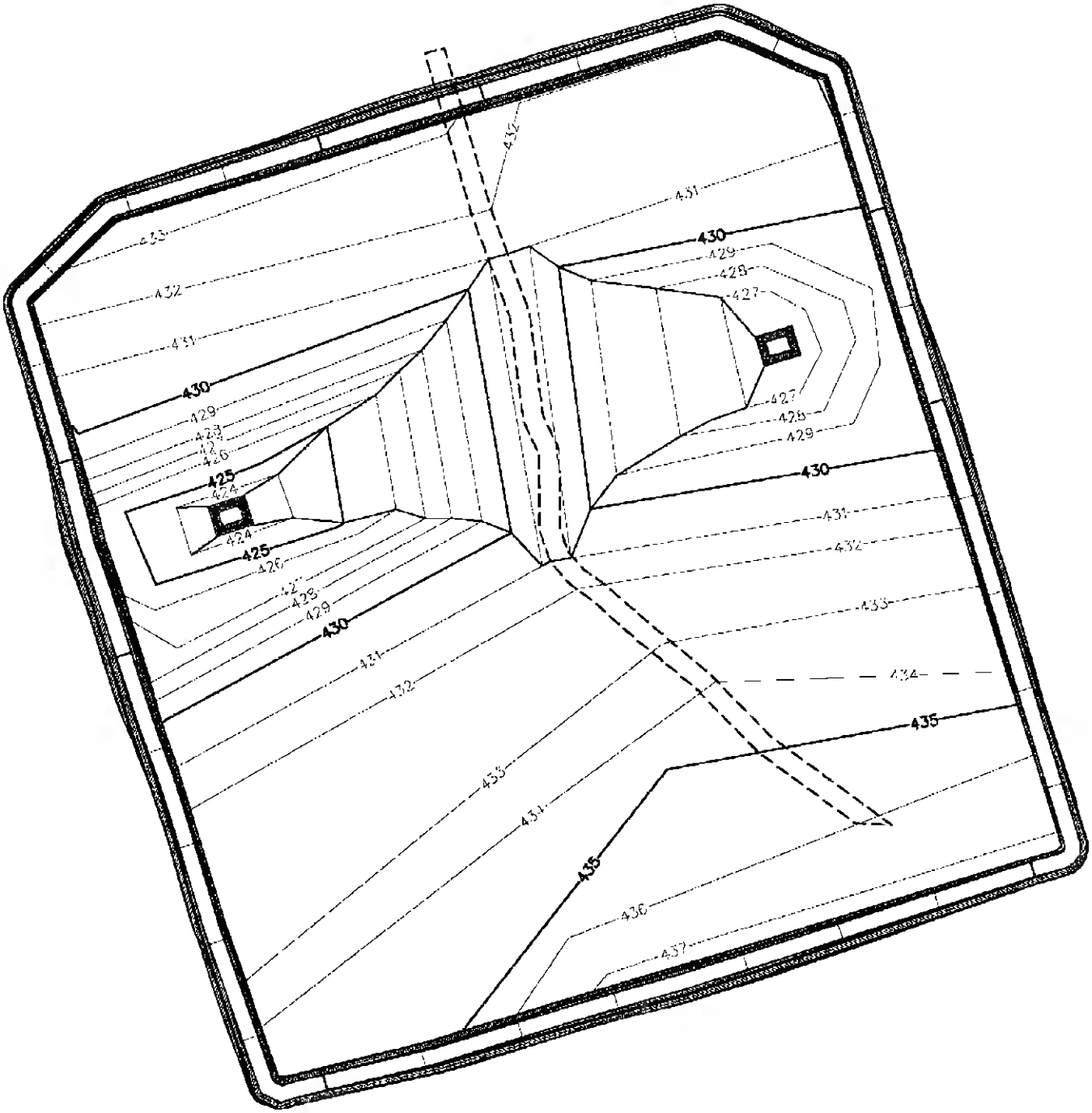

Figure 5. SCA Pre-Settlement Top of LPSL Grading Plan

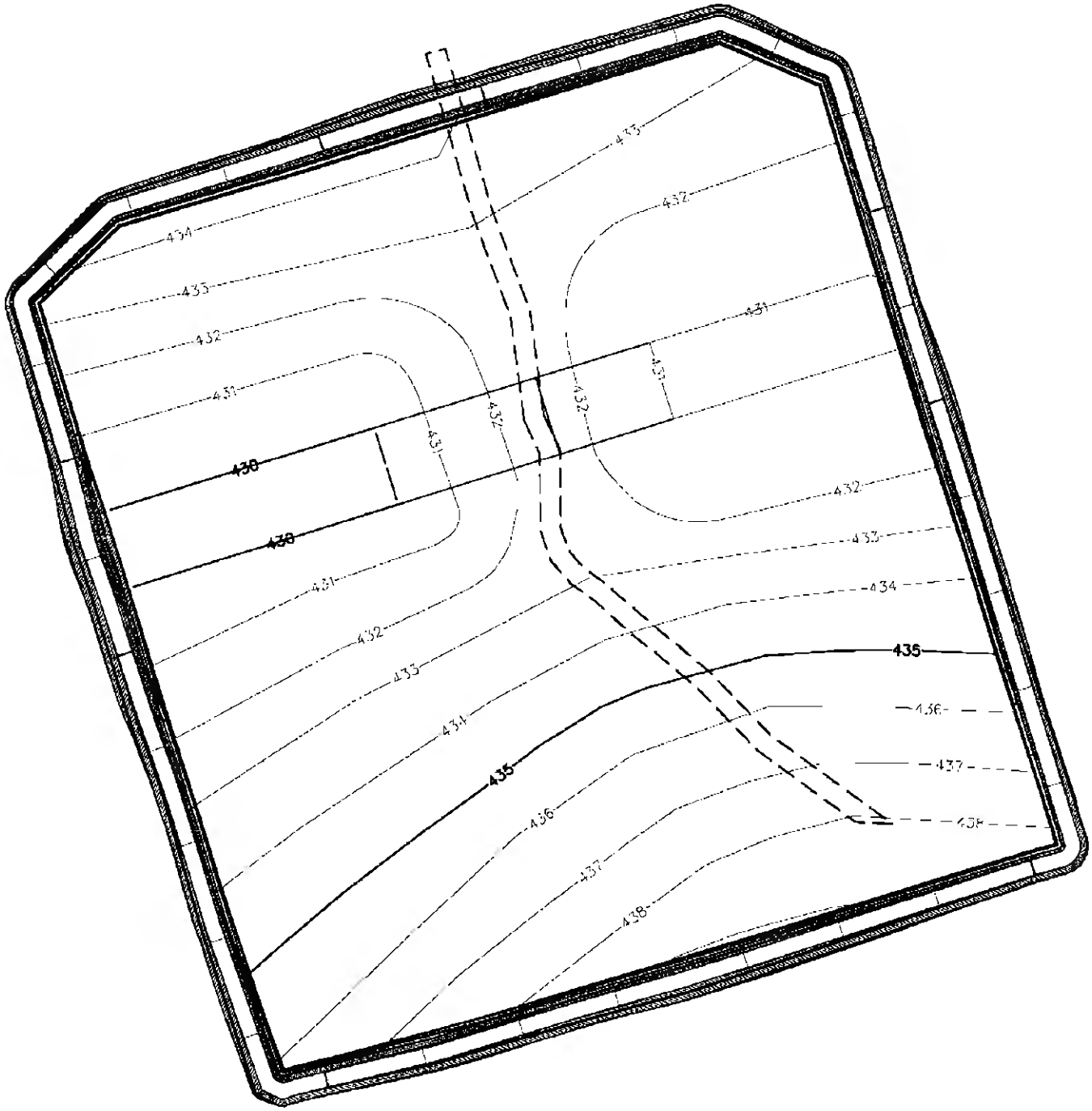

Figure 6. SCA Pre-Settlement Top of Gravel Grading Plan

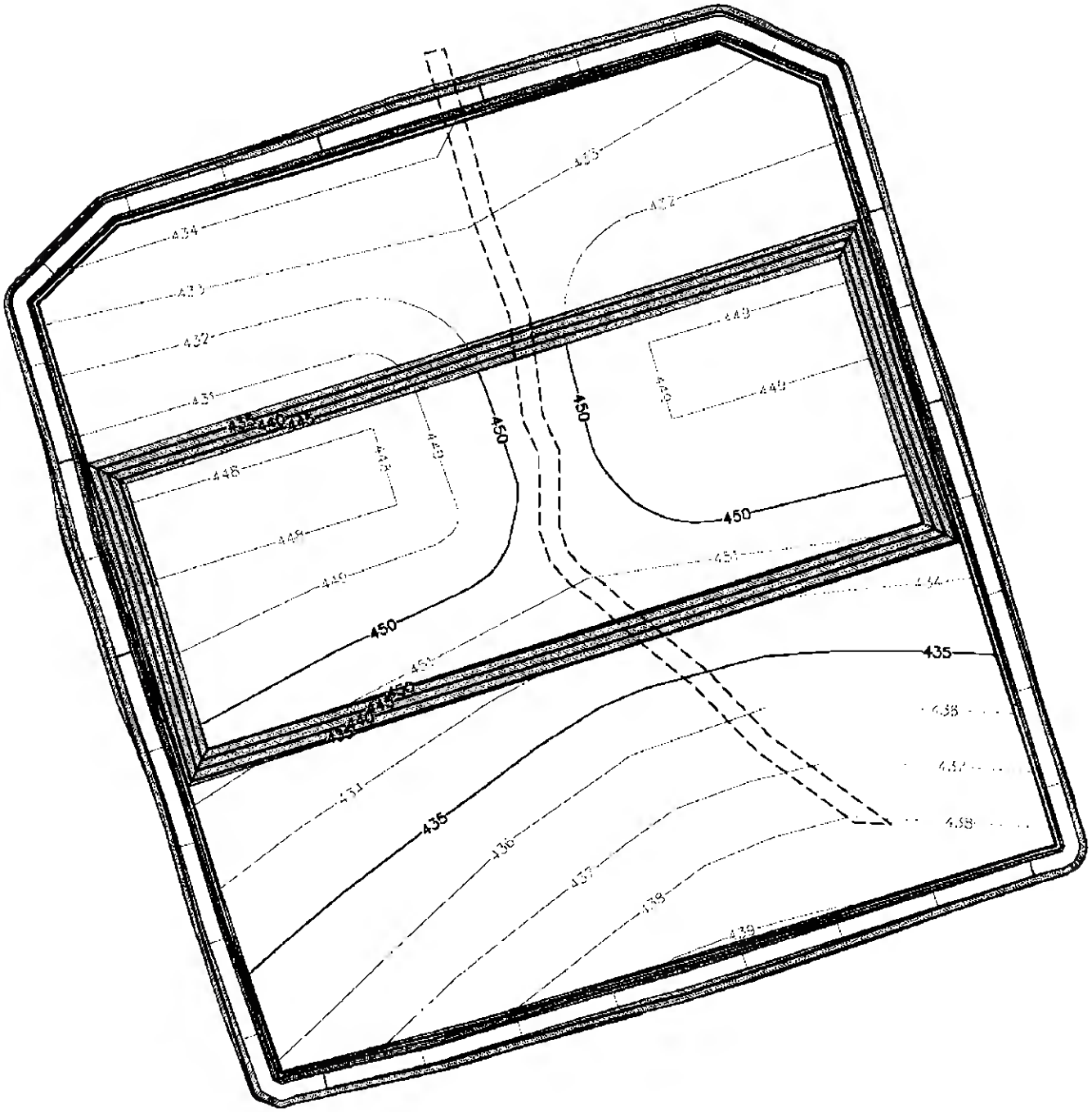

Figure 7. SCA Pre-Settlement Potential Top of Geo-tube Year 1 Grading Plan

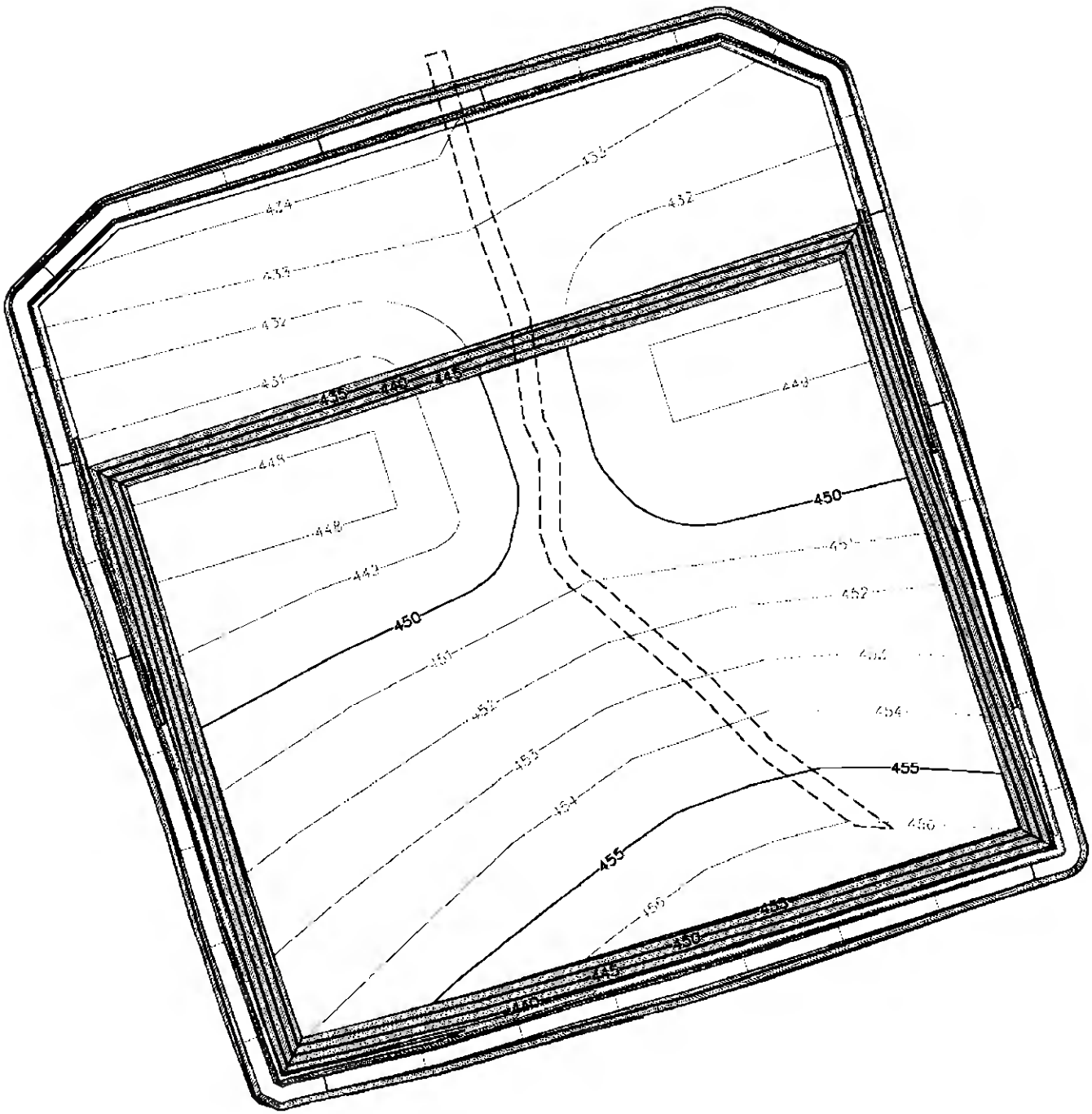

Figure 8. SCA Pre-Settlement Potential Top of Geo-tube Year 2 Grading Plan

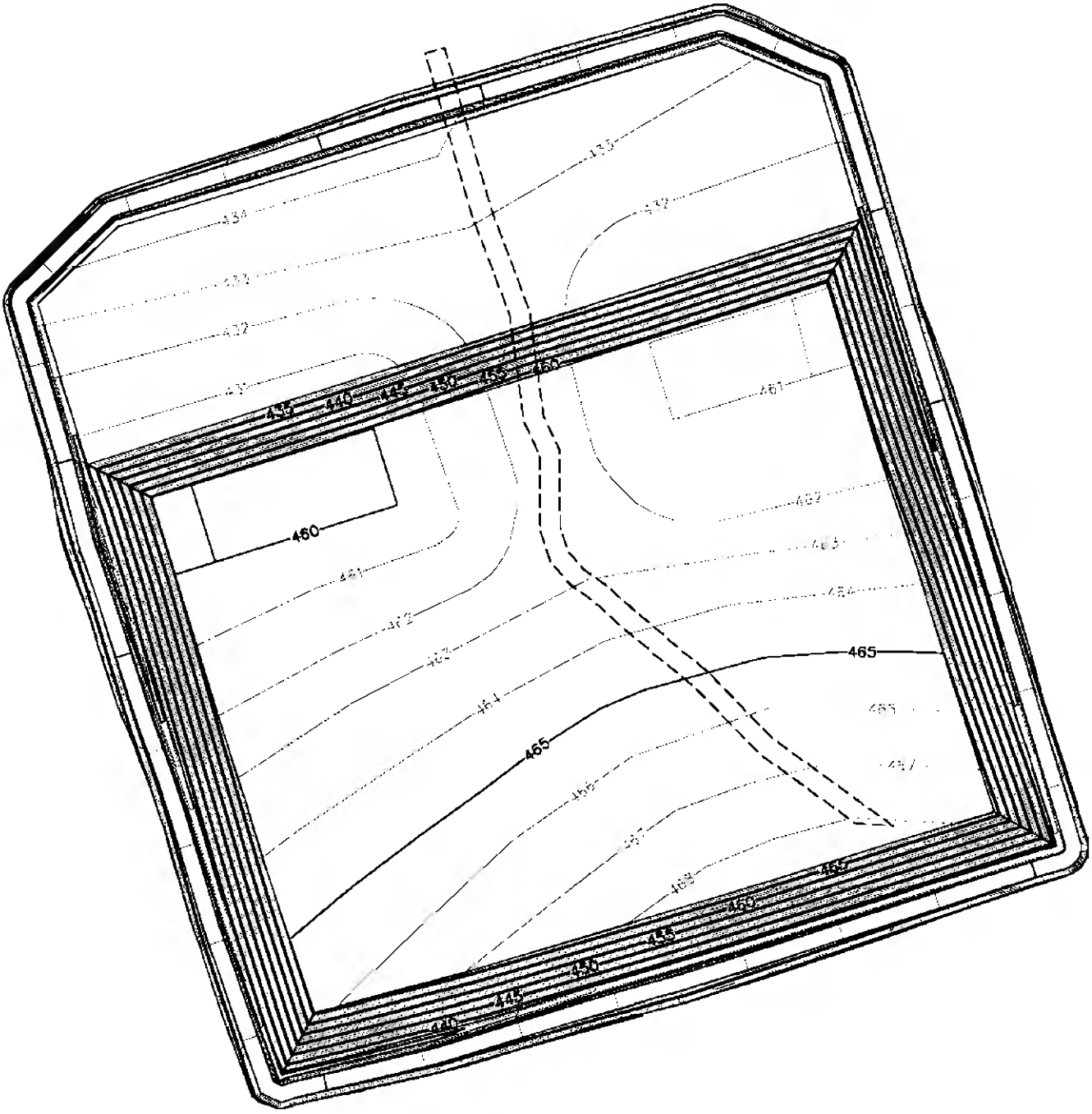

Figure 9. SCA Pre-Settlement Potential Top of Geo-tube Year 3 Grading Plan

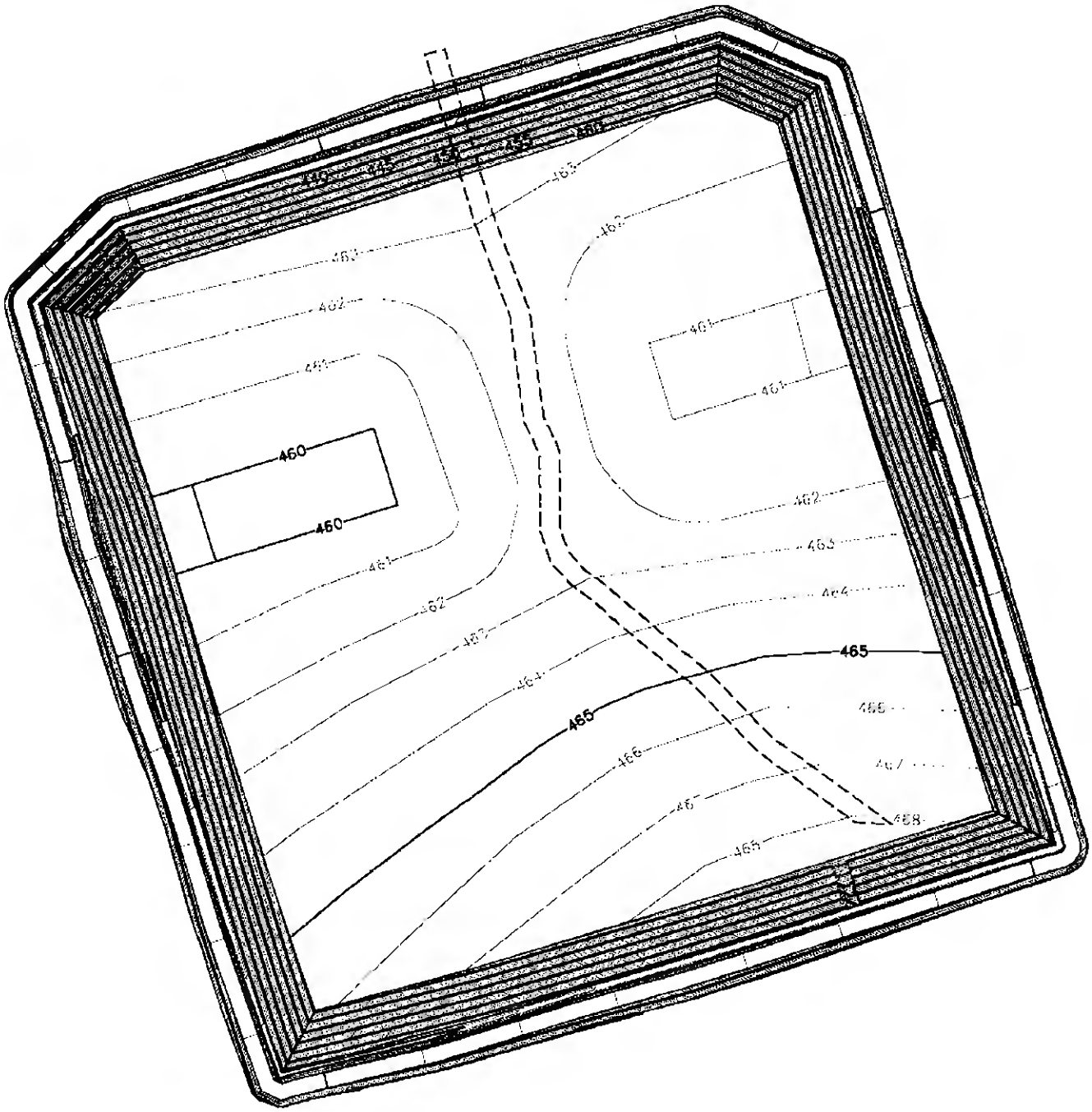

Figure 10. SCA Pre-Settlement Potential Top of Geo-tube Year 4 Grading Plan

Written by:	Yiwen Cao	Date:	12/17/2009	Reviewed by:	R. Kulasingam/Jay Beech	Date:	12/17/2009
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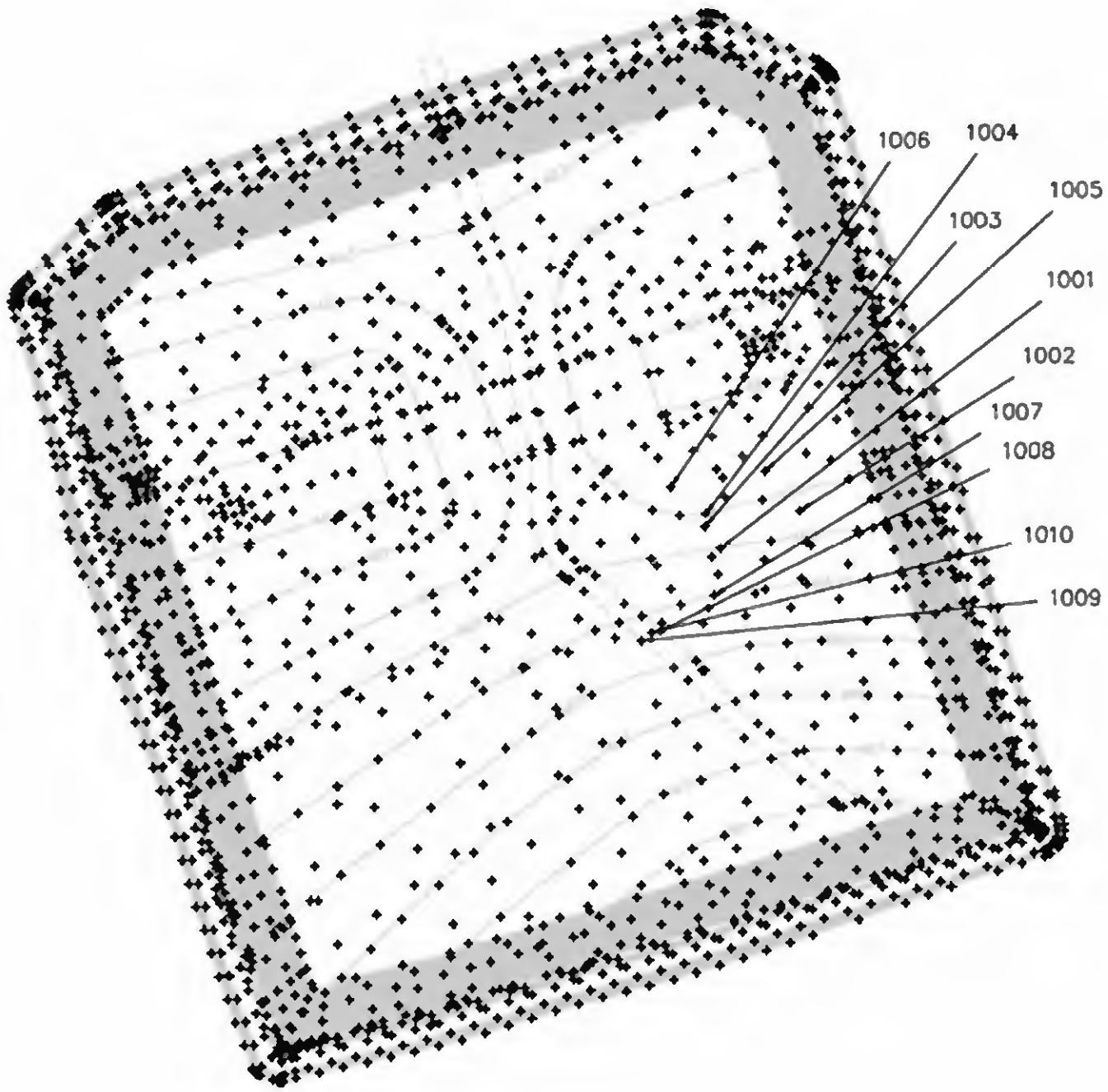

Figure 11. Settlement Calculation Points Shown on Top of Potential Geo-tube Year 4 Grading Plan

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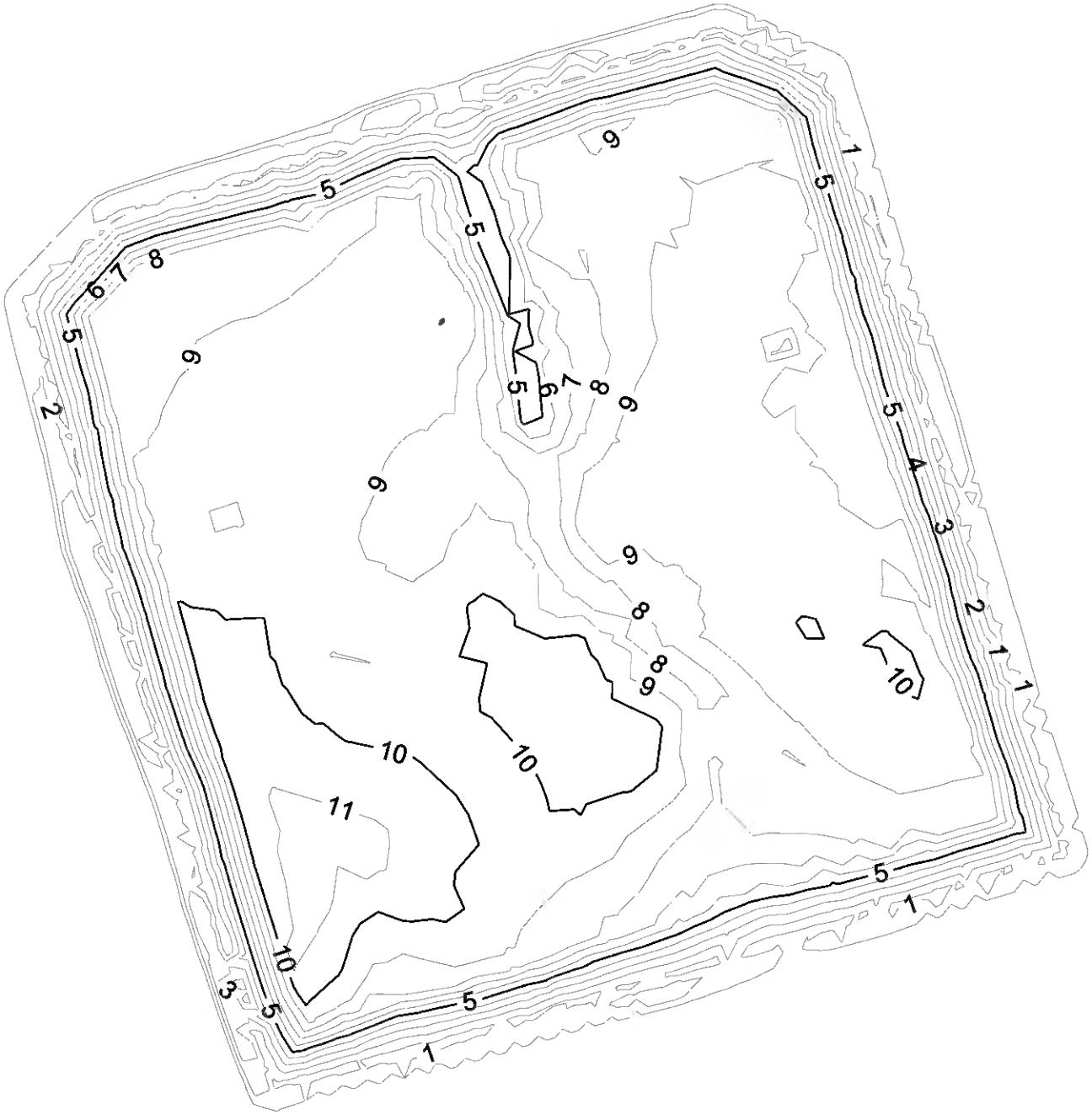

Figure 12. CASE 1: Top of LPSL Settlement from beginning of Year 1 to End of Year 4

Figure 13. CASE 1: Top of LPSL Post-Settlement Elevation at the End of Year 4

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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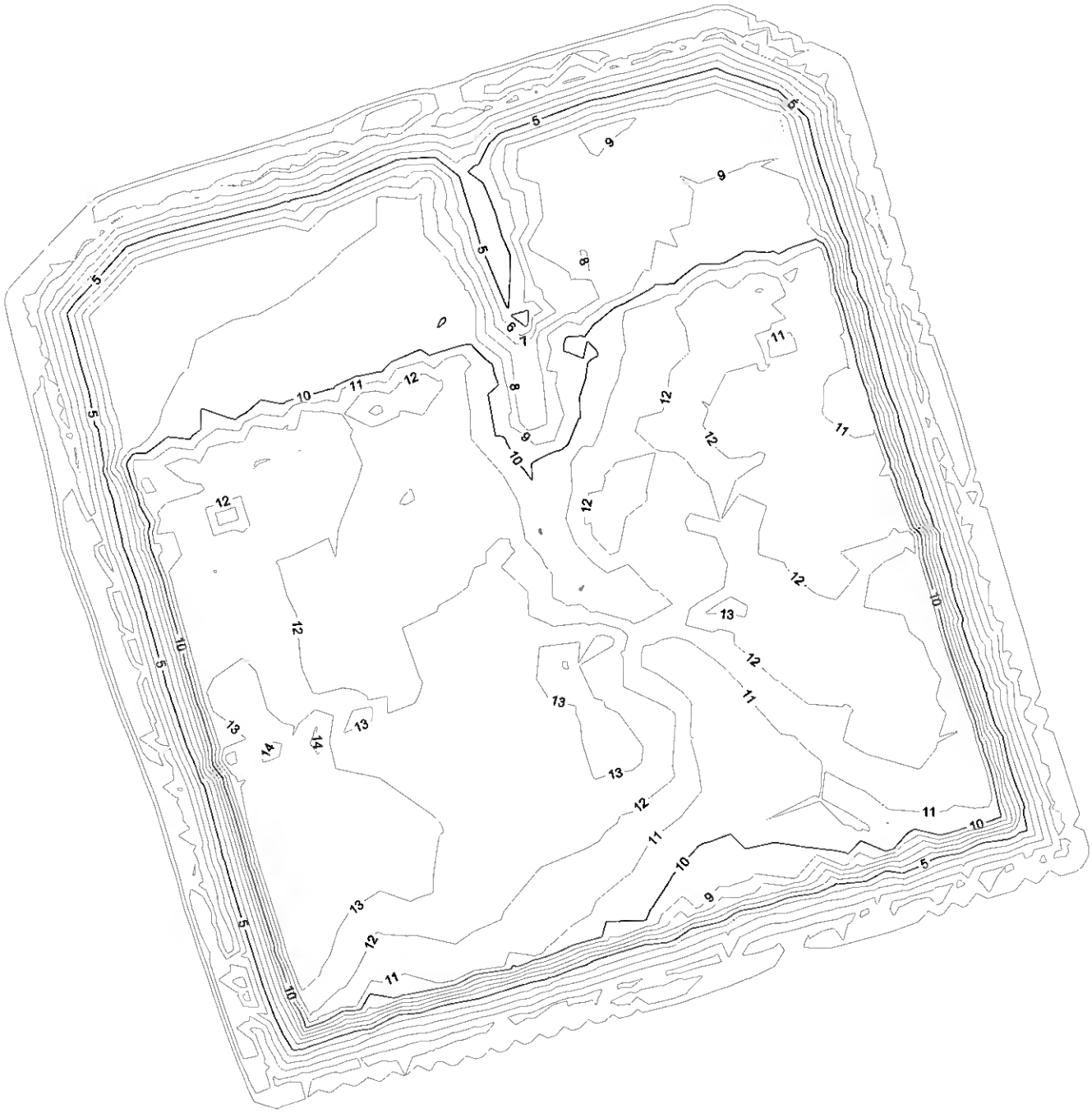


Figure 14. CASE 2: Top of Dredge Material in Geo-tubes Settlement from beginning of Year 1 to End of Year 4

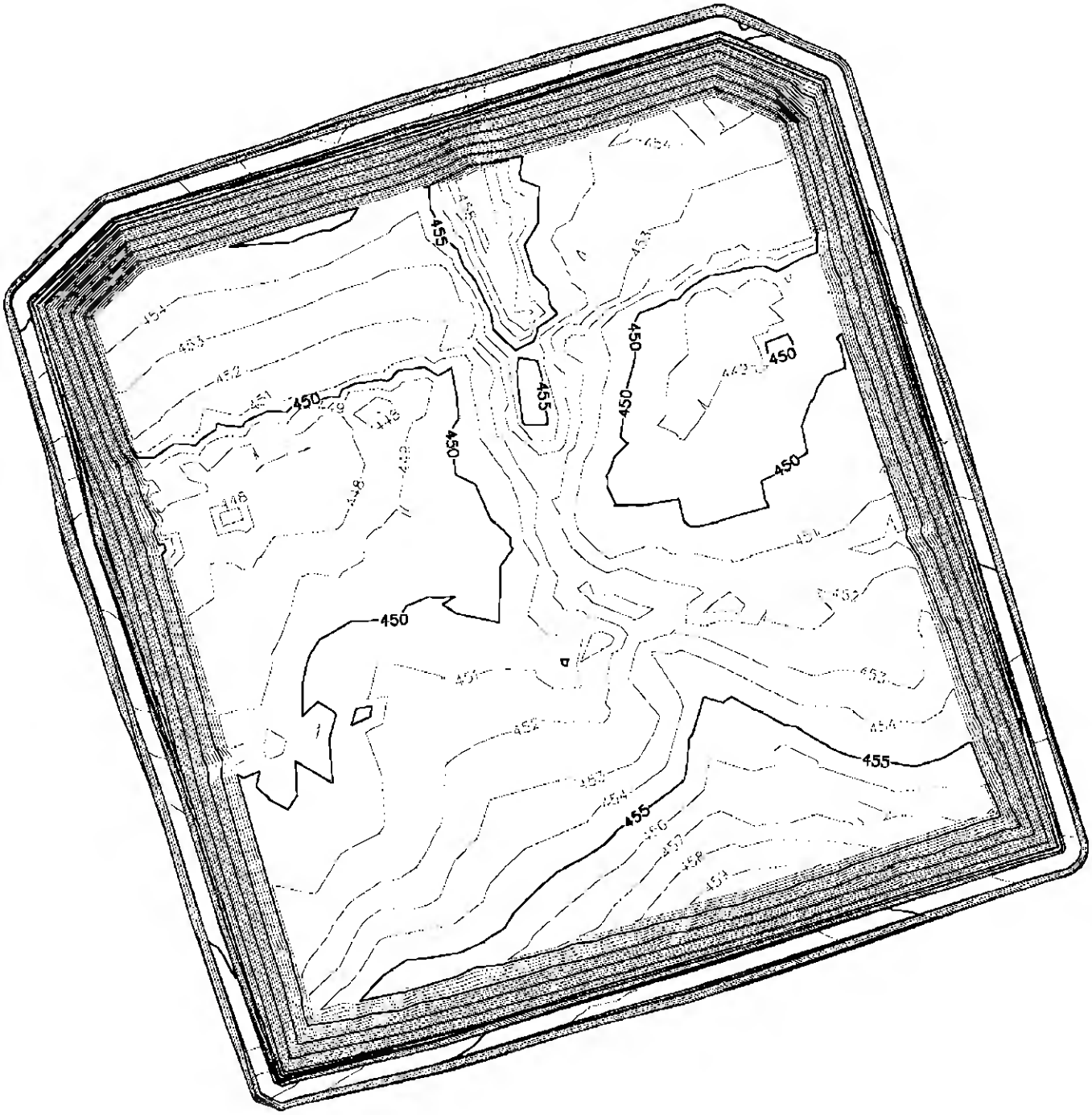


Figure 15. CASE 2: Top of Dredge Material in Geo-tubes Post-Settlement Elevation at the End of Year 4

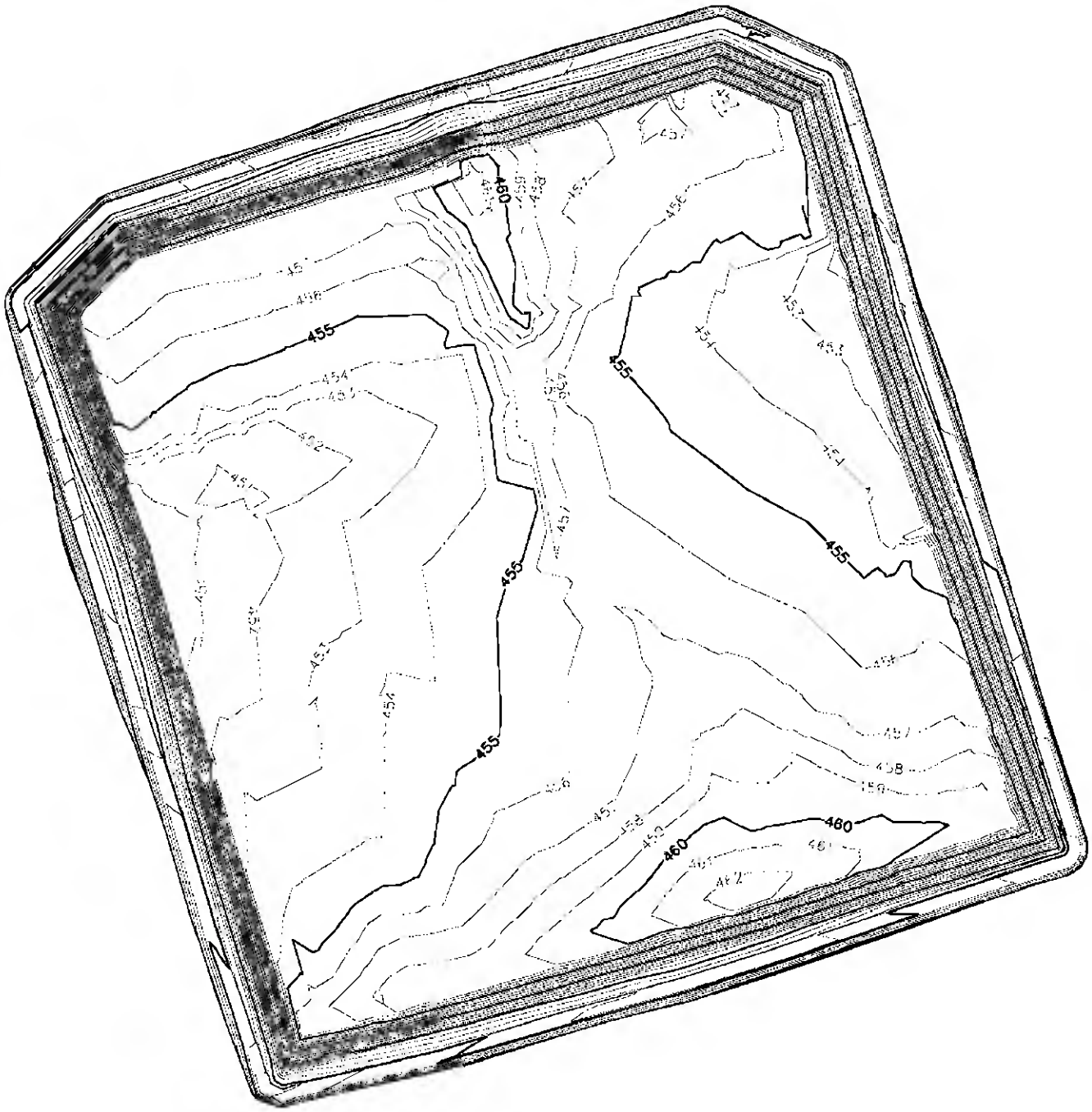


Figure 16. Proposed Pre-settlement Final Cover System Grading Plan at Beginning of Year 5

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

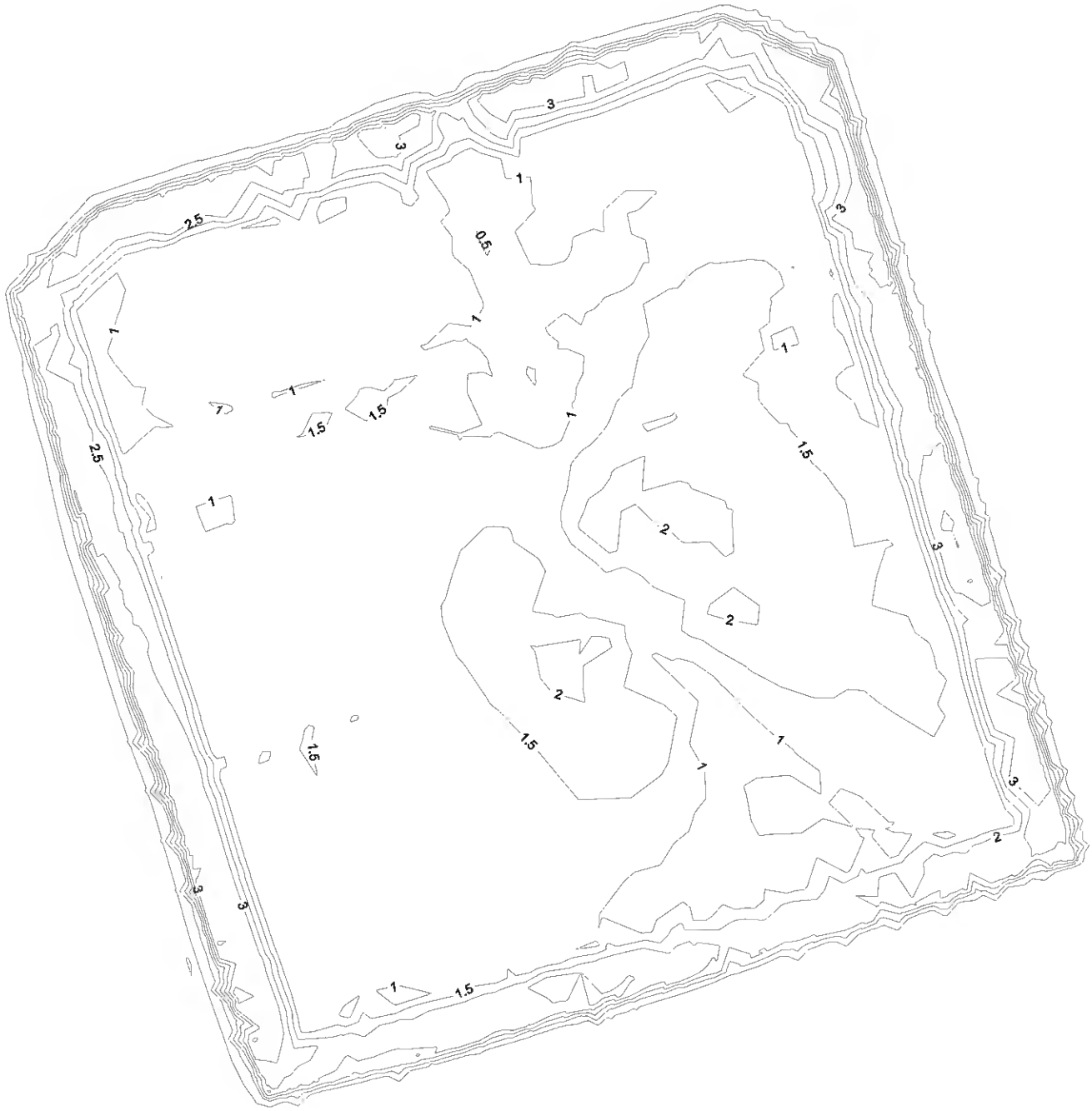


Figure 17. CASE 3: Top of LPSL Settlement from End of Year 4 to End of Year 35

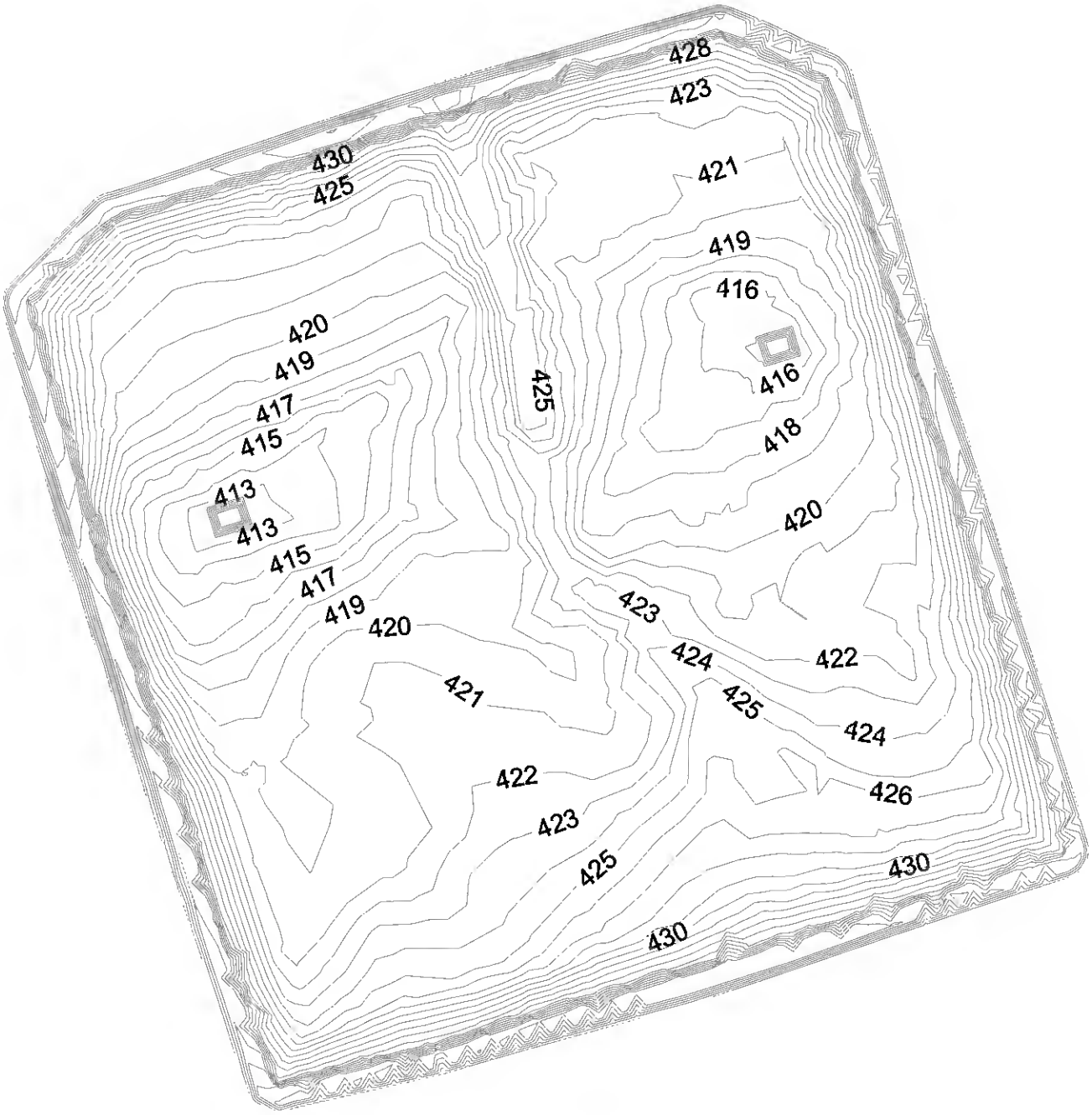


Figure 18. CASE 3: Top of LPSL Post-Settlement Elevations at End of Year 35

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

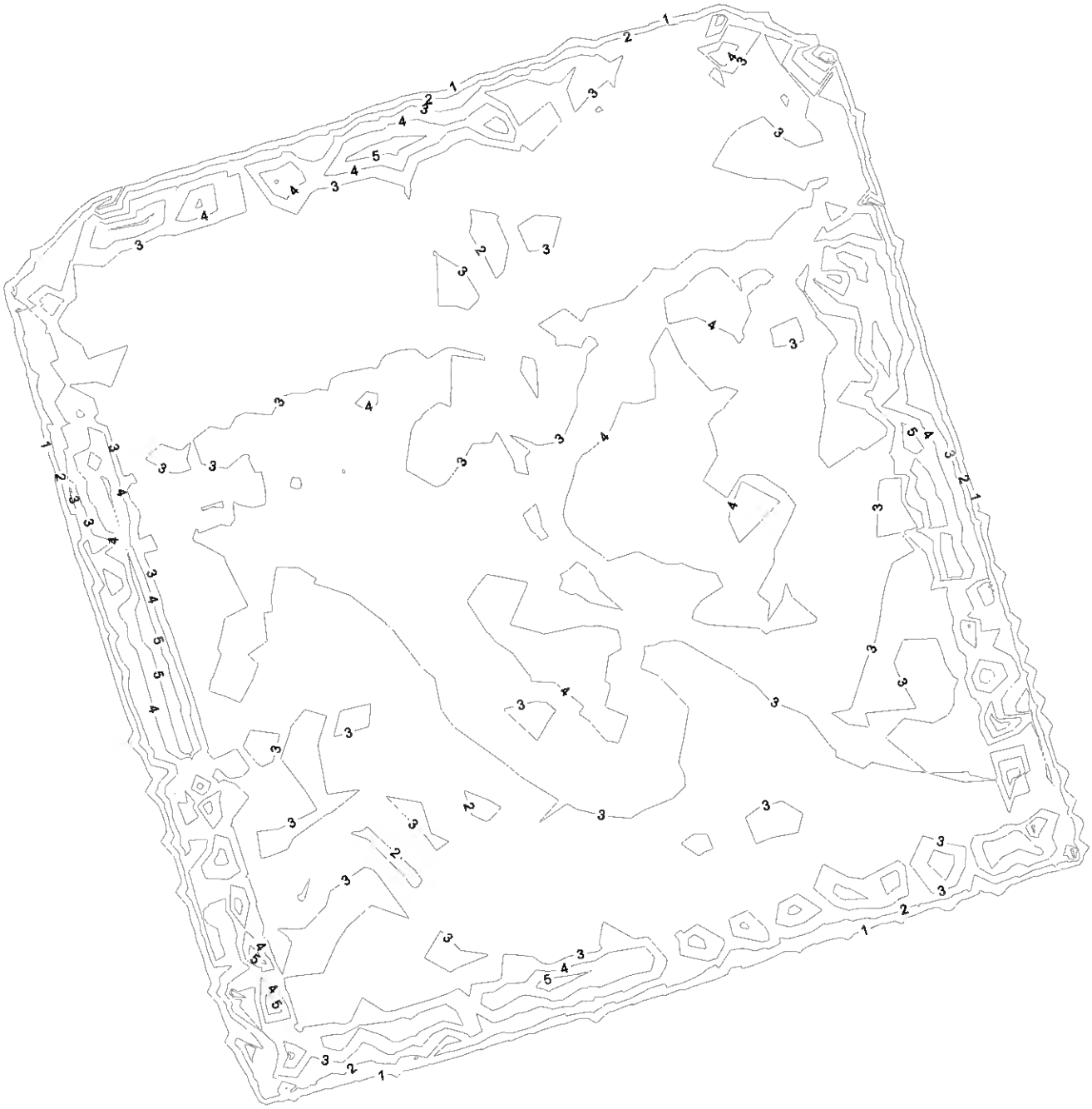


Figure 19. CASE 4: Top of Final Cover Settlement from End of Year 4 to End of Year 35

Written by:	Yiwen Cao	Date:	12/17/2009	Reviewed by:	R. Kulasingam/Jay Beech	Date:	12/17/2009

Client:	Honeywell	Project:	Onondaga Lake SCA Final Design	Project/ Proposal No.:	GJ4299	Task No.:	04

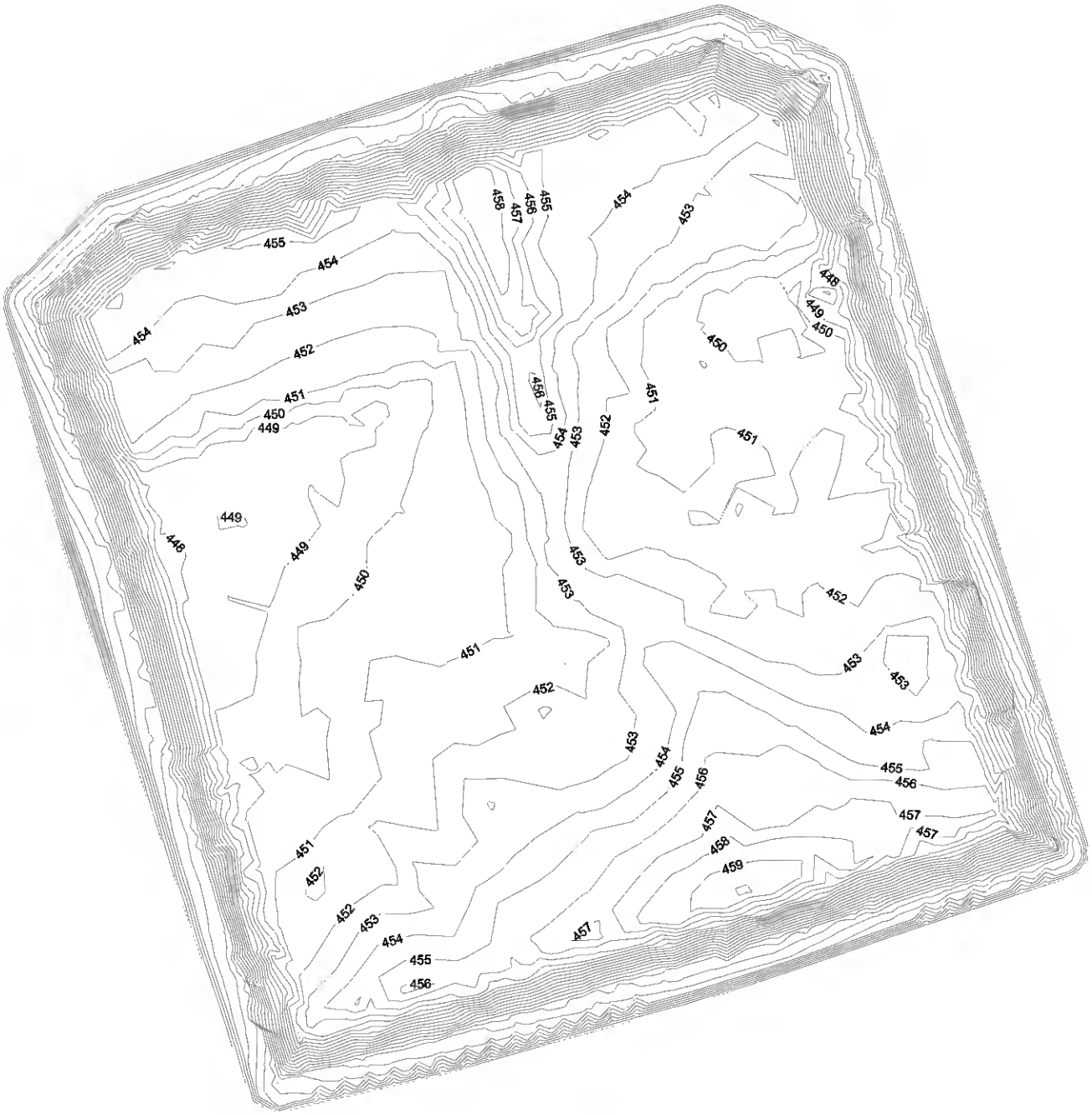


Figure 20. CASE 4: Top of Final Cover Post-Settlement Elevations at End of Year 35

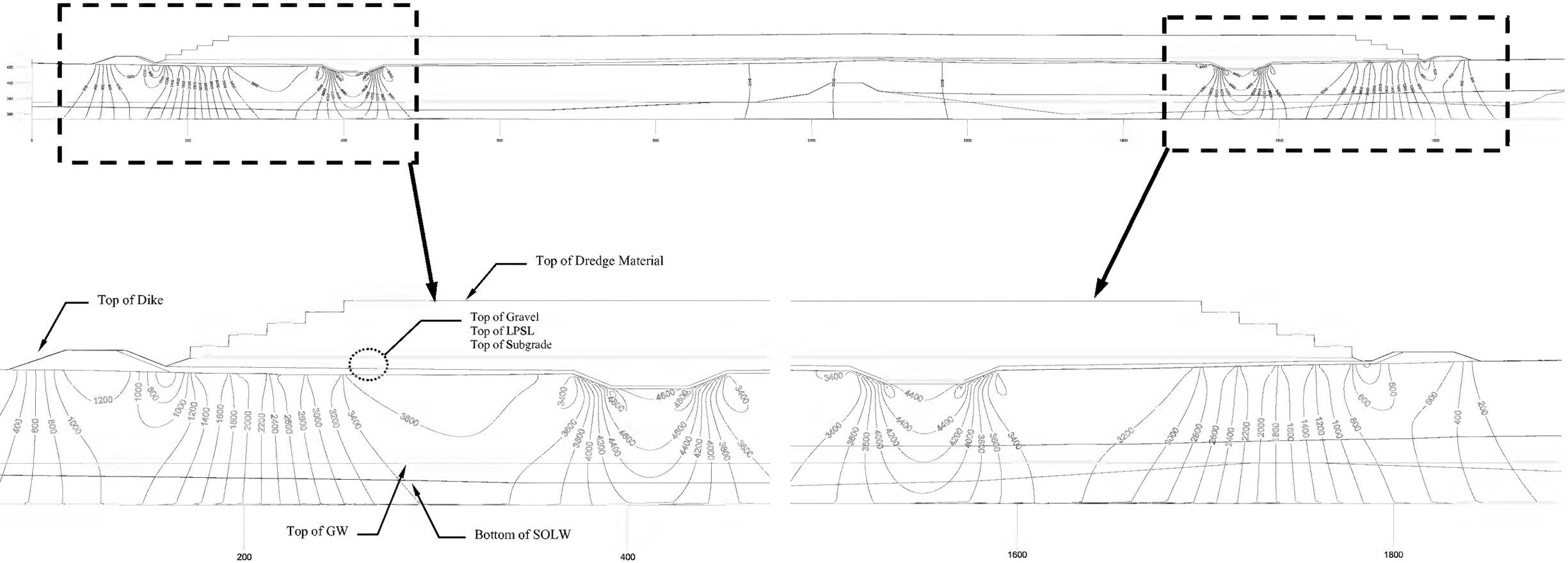
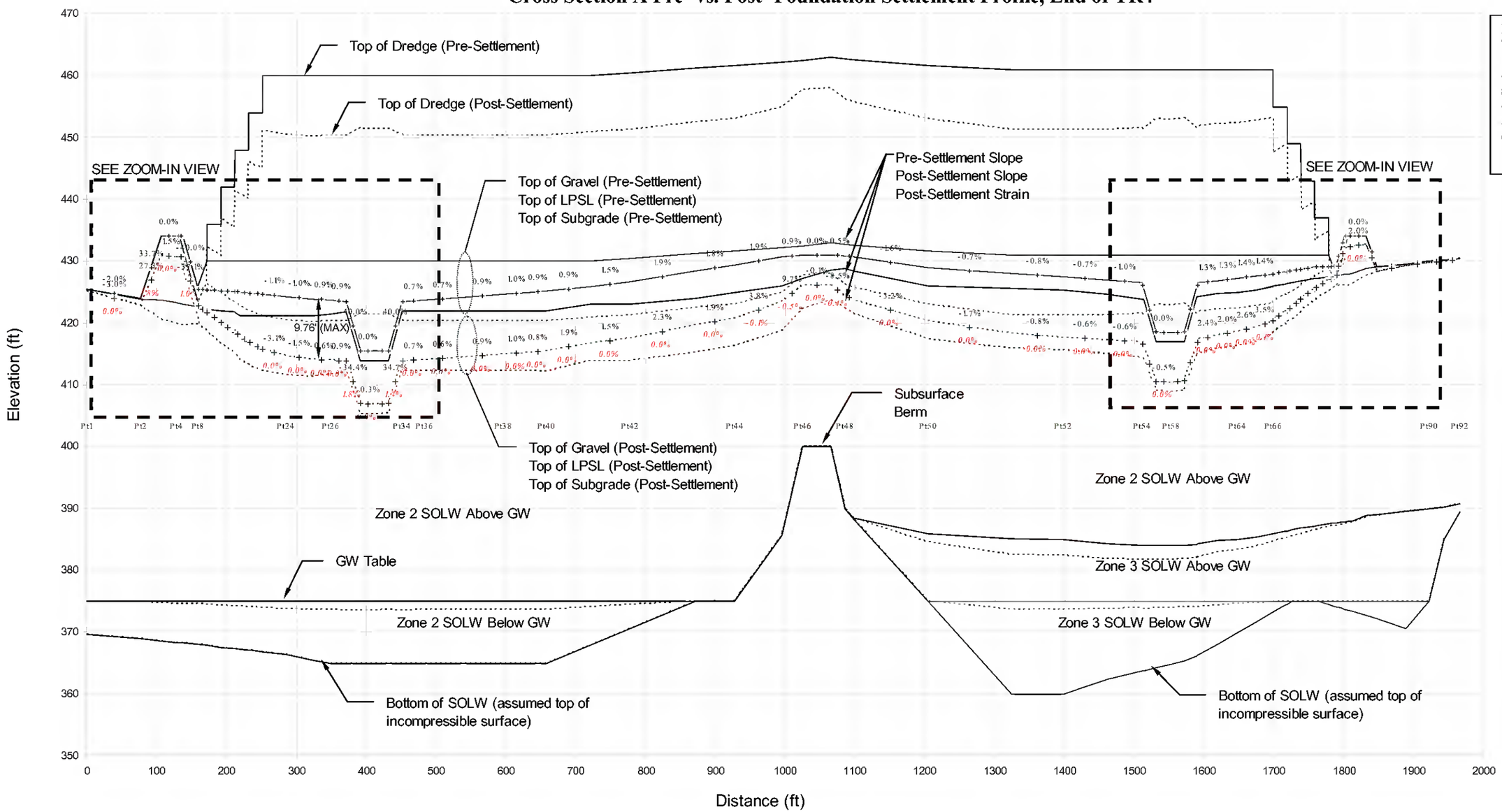


Figure 21. CASE 5: Stress Distribution of Geo-tubes, Liner, and Dike Loading along Cross Section A (units in psf)

Written by: Yiwen Cao Date: 12/17/2009 Reviewed by: R. Kulasingam/Jay Beech Date: 12/17/2009

Client: Honeywell Project: Onondaga Lake SCA Final Design Project/ Proposal No.: GJ4299 Task No.: 04

Cross Section A Pre- vs. Post- Foundation Settlement Profile, End of YR4



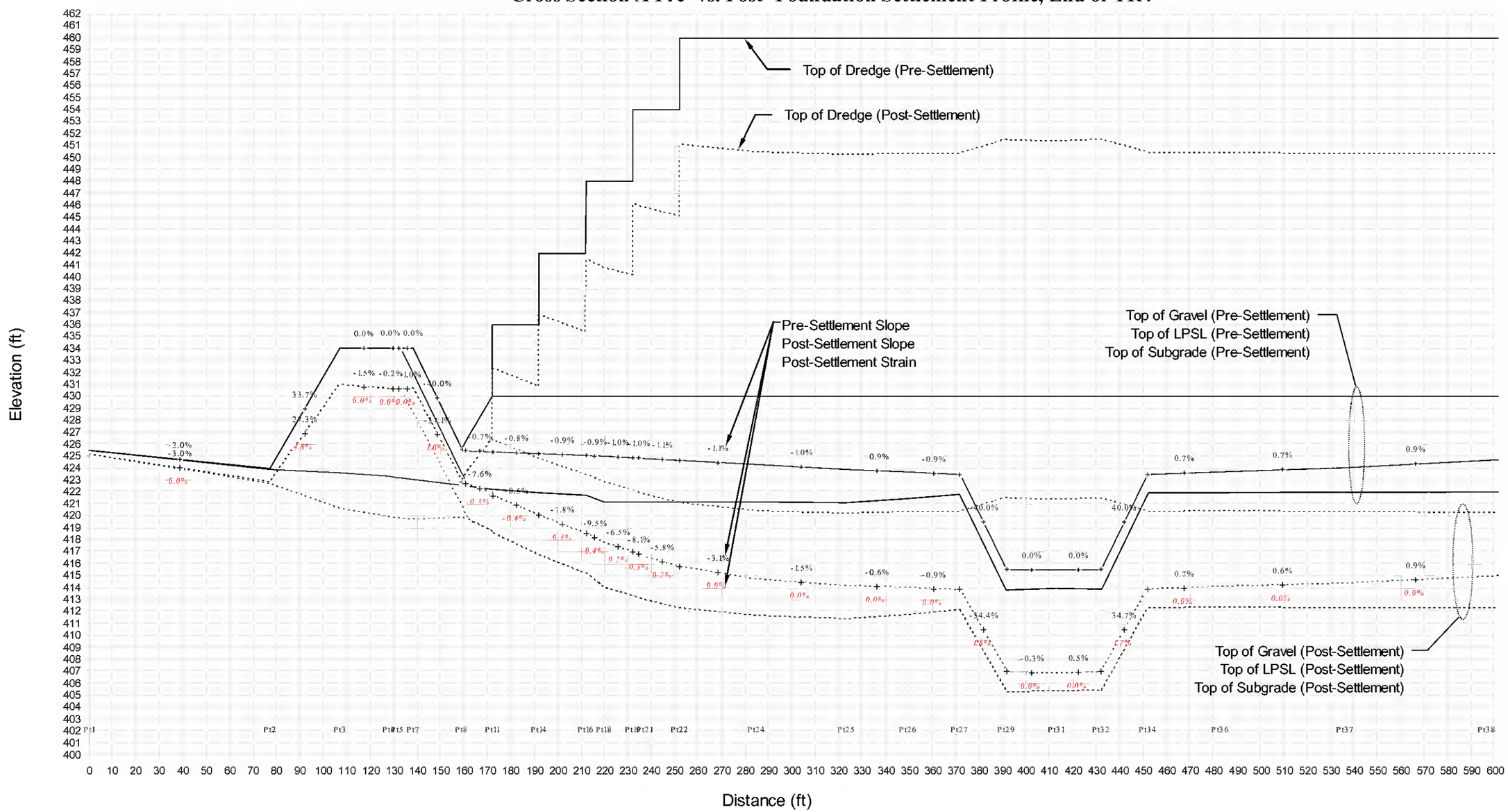
NOTE:
The compressibility of dredge materials in geo-tubes was not considered in the foundation settlement analysis because they are considered as load. Please see Case 6 analysis results for calculated top of dredge post-settlement elevations.

Figure 22. CASE 5: Foundation Settlement Analysis Result for Cross Section A (Overall View)

Written by: Yiwen Cao Date: 12/17/2009 Reviewed by: R. Kulasingam/Jay Beech Date: 12/17/2009

Client: Honeywell Project: Onondaga Lake SCA Final Design Project/ Proposal No.: GJ4299 Task No.: 04

Cross Section A Pre- vs. Post- Foundation Settlement Profile, End of YR4



NOTE:
The compressibility of dredge material in geo-tubes was not considered in the foundation settlement analysis because they are considered as load. Please see Case 6 analysis results for calculated top of dredge post-settlement elevations.

Figure 23. CASE 5: Foundation Settlement Analysis Result for Cross Section A (Zoom-in View, Left Berm and Sump)

Written by: Yiwen Cao Date: 12/17/2009 Reviewed by: R. Kulasingam/Jay Beech Date: 12/17/2009

Client: Honeywell Project: Onondaga Lake SCA Final Design Project/ Proposal No.: GJ4299 Task No.: 04

Cross Section A Pre- vs. Post- Foundation Settlement Profile, End of YR4

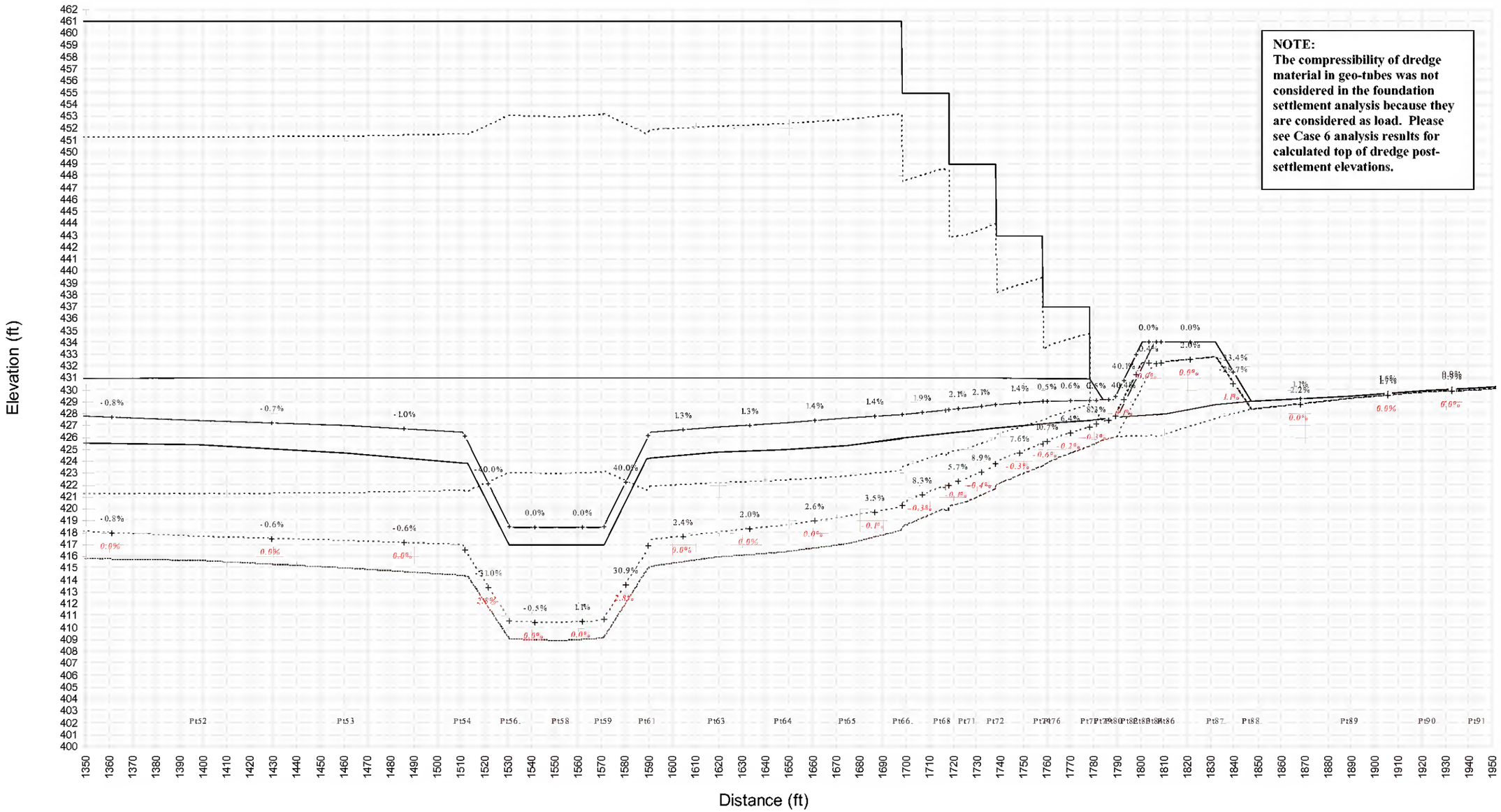


Figure 24. CASE 5: Foundation Settlement Analysis Result for Cross Section A (Zoom-in View, Right Berm and Sump)

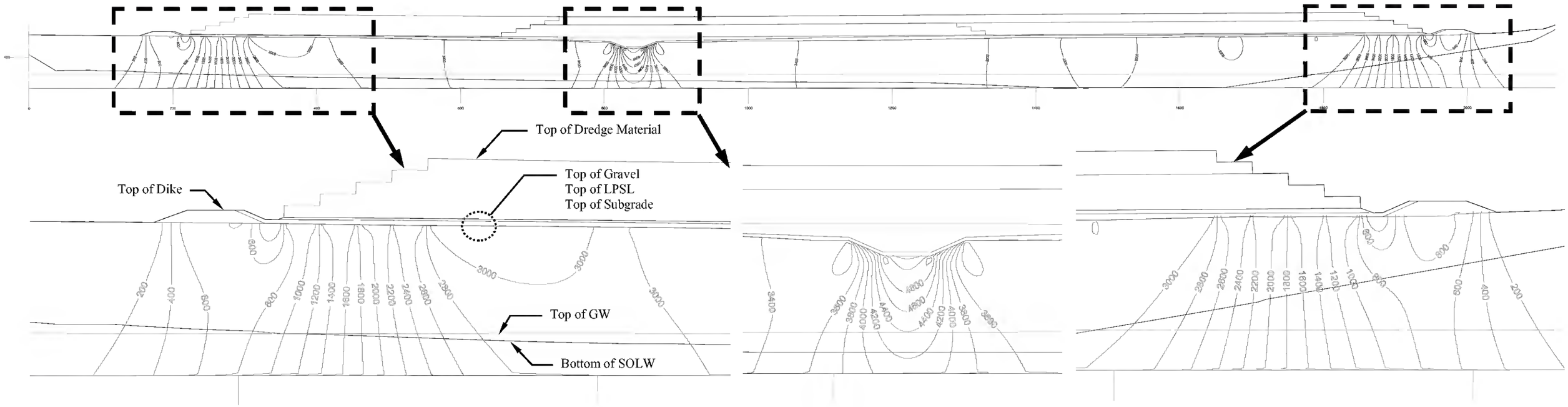
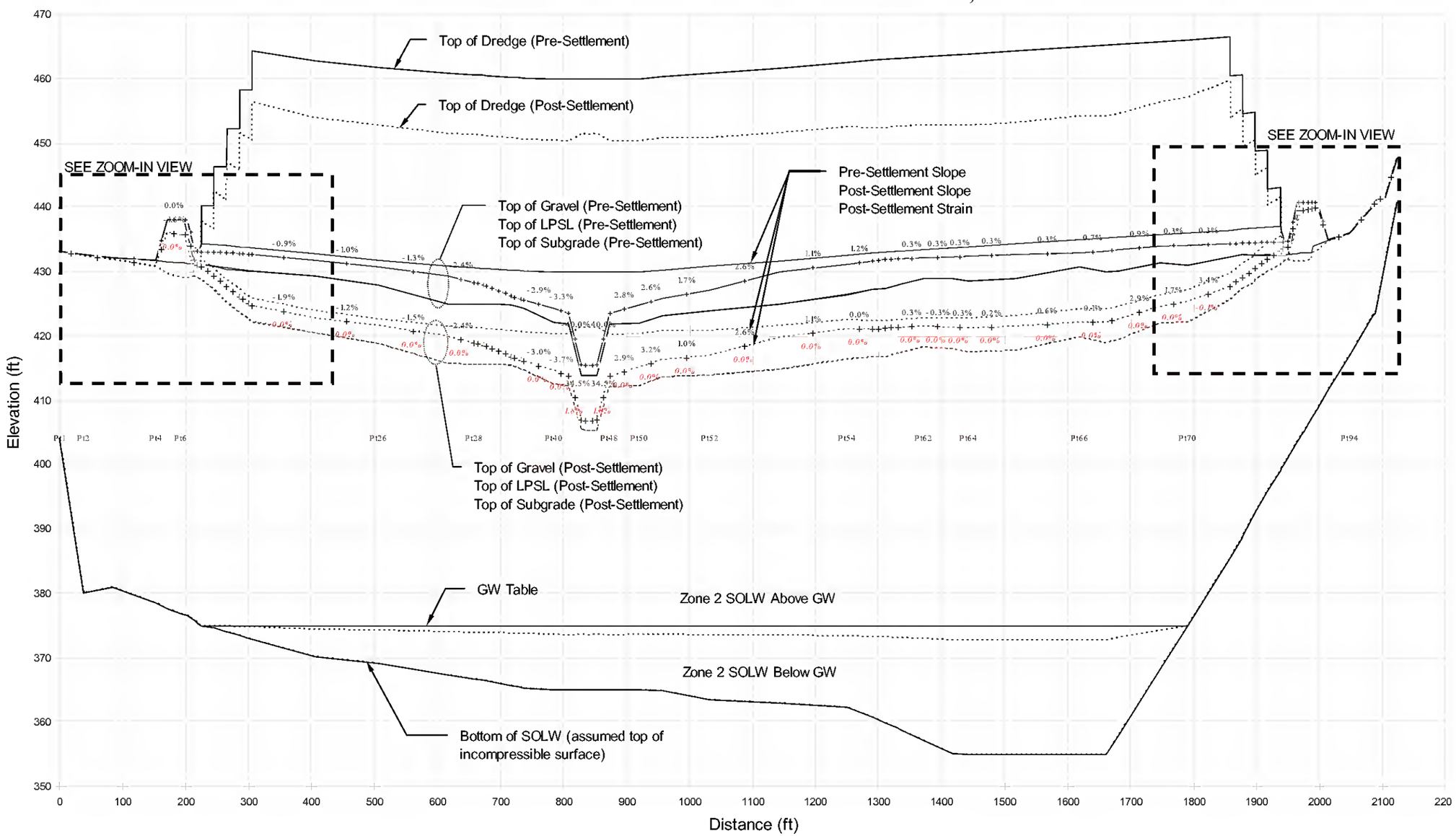


Figure 25. CASE 5: Stress Distribution of Geo-tube, Liner, and Dike Loading along Cross Section B (units in psf)

Written by: Yiwen Cao Date: 12/17/2009 Reviewed by: R. Kulasingam/Jay Beech Date: 12/17/2009

Client: Honeywell Project: Onondaga Lake SCA Final Design Project/ Proposal No.: GJ4299 Task No.: 04

Cross Section B Pre- vs. Post- Foundation Settlement Profile, End of YR4



NOTE:
The compressibility of dredge material in geo-tubes was not considered in the foundation settlement analysis because they are considered as load. Please see Case 6 analysis results for calculated top of dredge post-settlement elevations.

Figure 26. CASE 5: Foundation Settlement Analysis Result for Cross Section B (Overall View)

Written by: Yiwen Cao Date: 12/17/2009 Reviewed by: R. Kulasingam/Jay Beech Date: 12/17/2009

Client: Honeywell Project: Onondaga Lake SCA Final Design Project/ Proposal No.: GJ4299 Task No.: 04

Cross Section B Pre- vs. Post- Foundation Settlement Profile, End of YR4

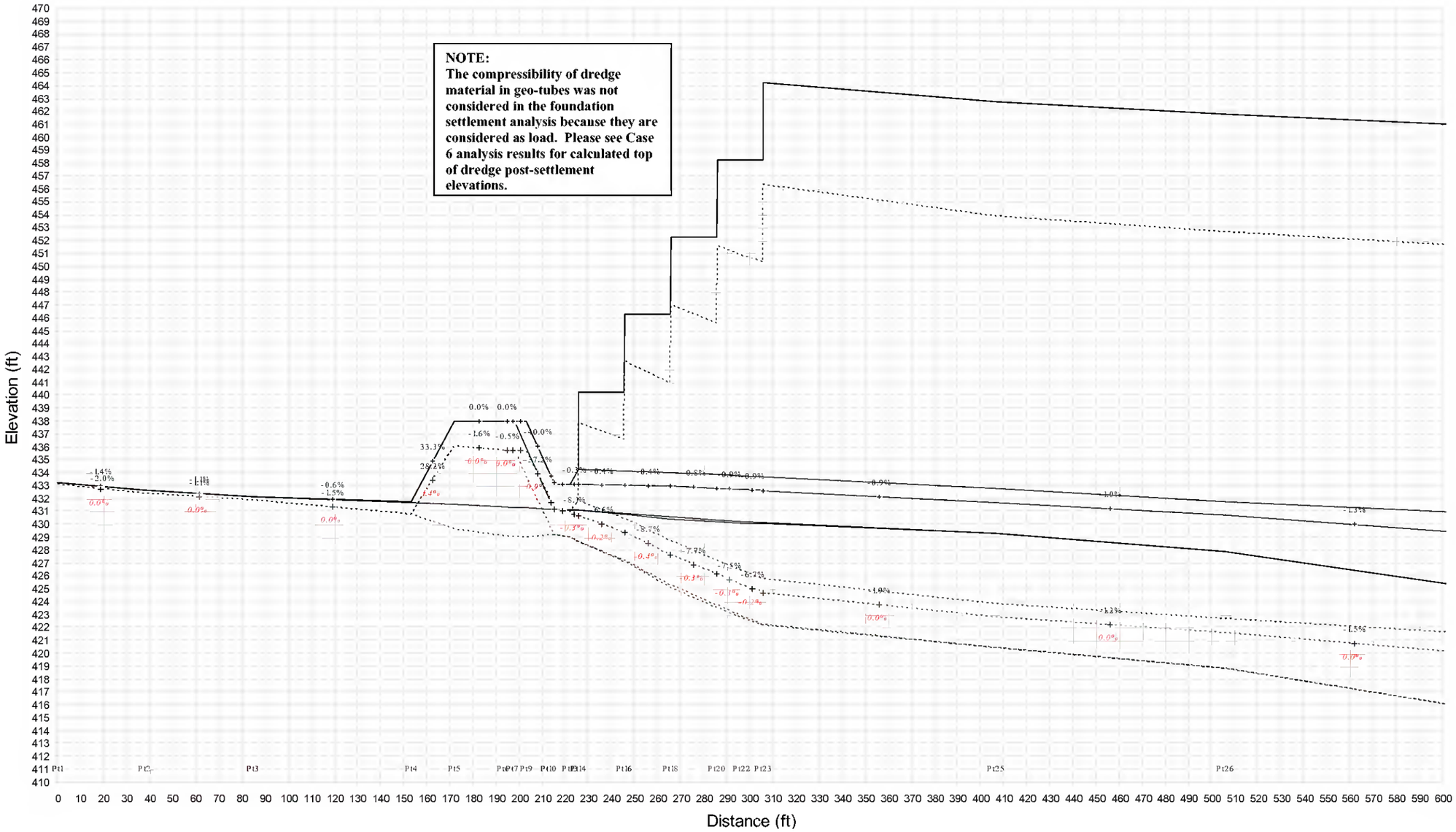


Figure 27. CASE 5: Foundation Settlement Analysis Result for Cross Section B (Zoom-in View, Left Berm)

Written by: Yiwen Cao Date: 12/17/2009 Reviewed by: R. Kulasingam/Jay Beech Date: 12/17/2009

Client: Honeywell Project: Onondaga Lake SCA Final Design Project/ Proposal No.: GJ4299 Task No.: 04

Cross Section B Pre- vs. Post- Foundation Settlement Profile, End of YR4

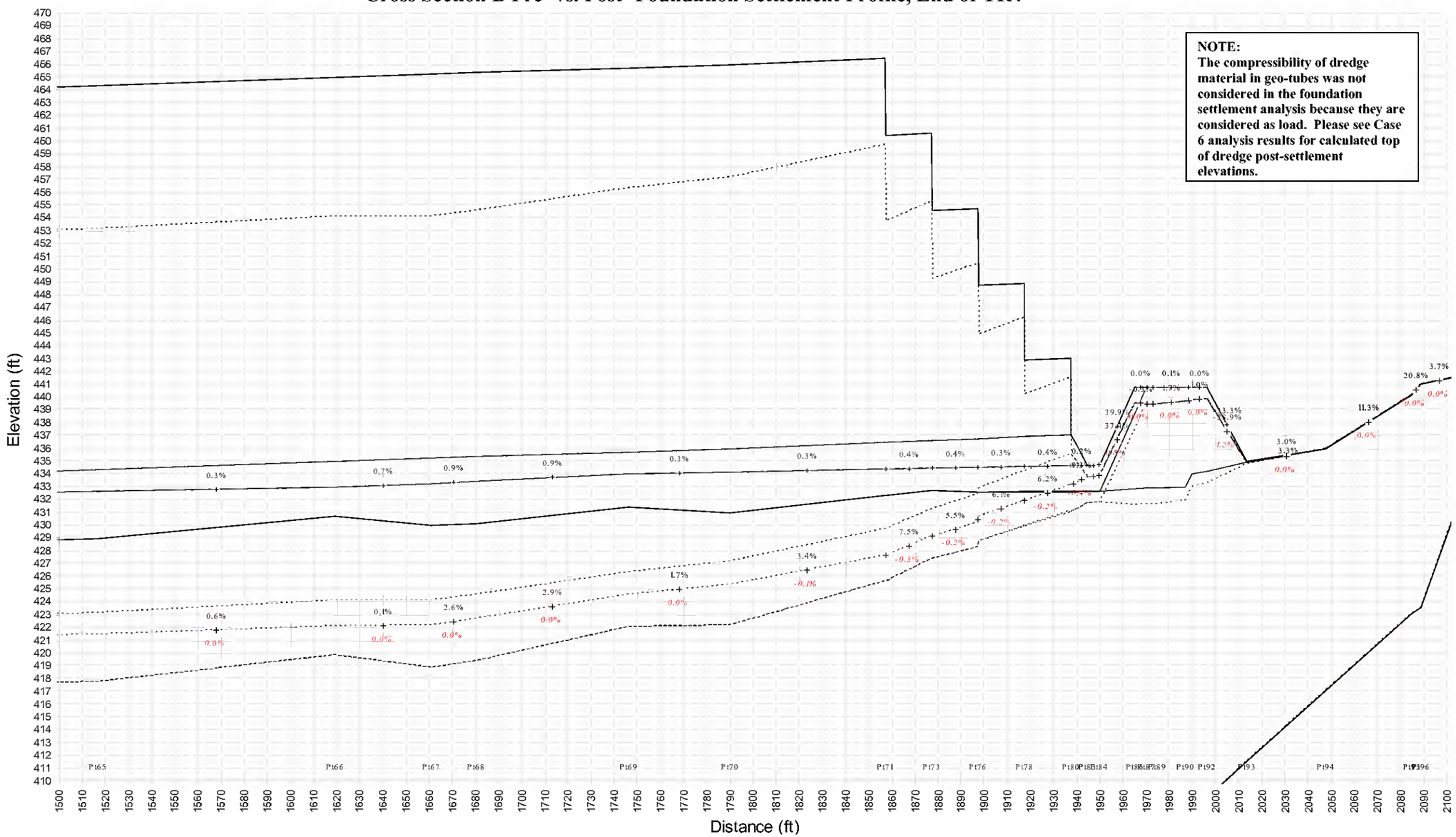


Figure 28. CASE 5: Foundation Settlement Analysis Result for Cross Section B (Zoom-in View, Right Berm)

Written by: Yiwen Cao Date: 12/17/2009 Reviewed by: R. Kulasingam/Jay Beech Date: 12/17/2009

Client: Honeywell Project: Onondaga Lake SCA Final Design Project/ Proposal No.: GJ4299 Task No.: 04

Cross Section A Pre- vs. Post- Cover Settlement Profile, End of YR4

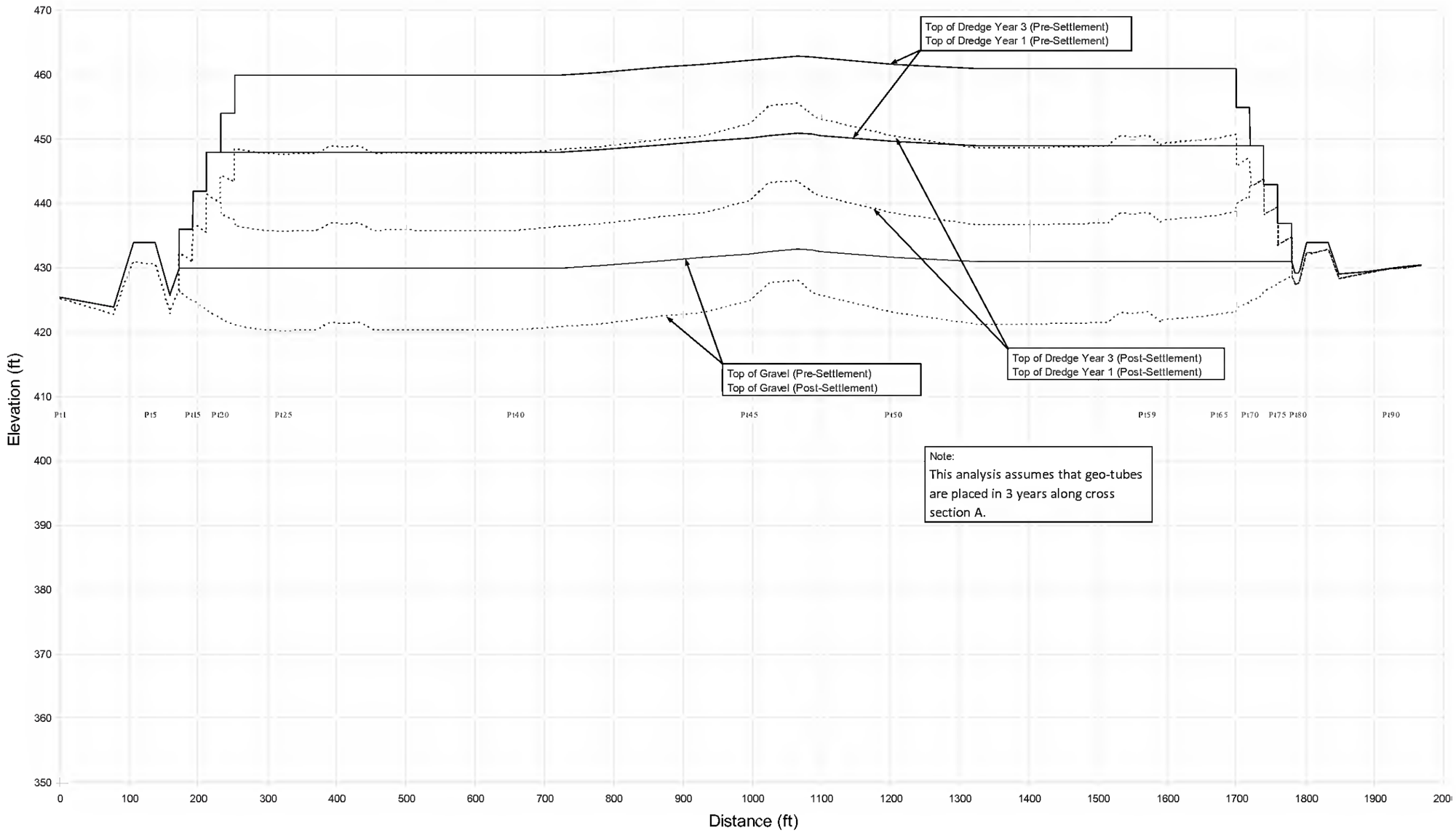


Figure 29. CASE 6: Cover Settlement Analysis Result for Cross Section A

Written by: Yiwen Cao Date: 12/17/2009 Reviewed by: R. Kulasingam/Jay Beech Date: 12/17/2009

Client: Honeywell Project: Onondaga Lake SCA Final Design Project/ Proposal No.: GJ4299 Task No.: 04

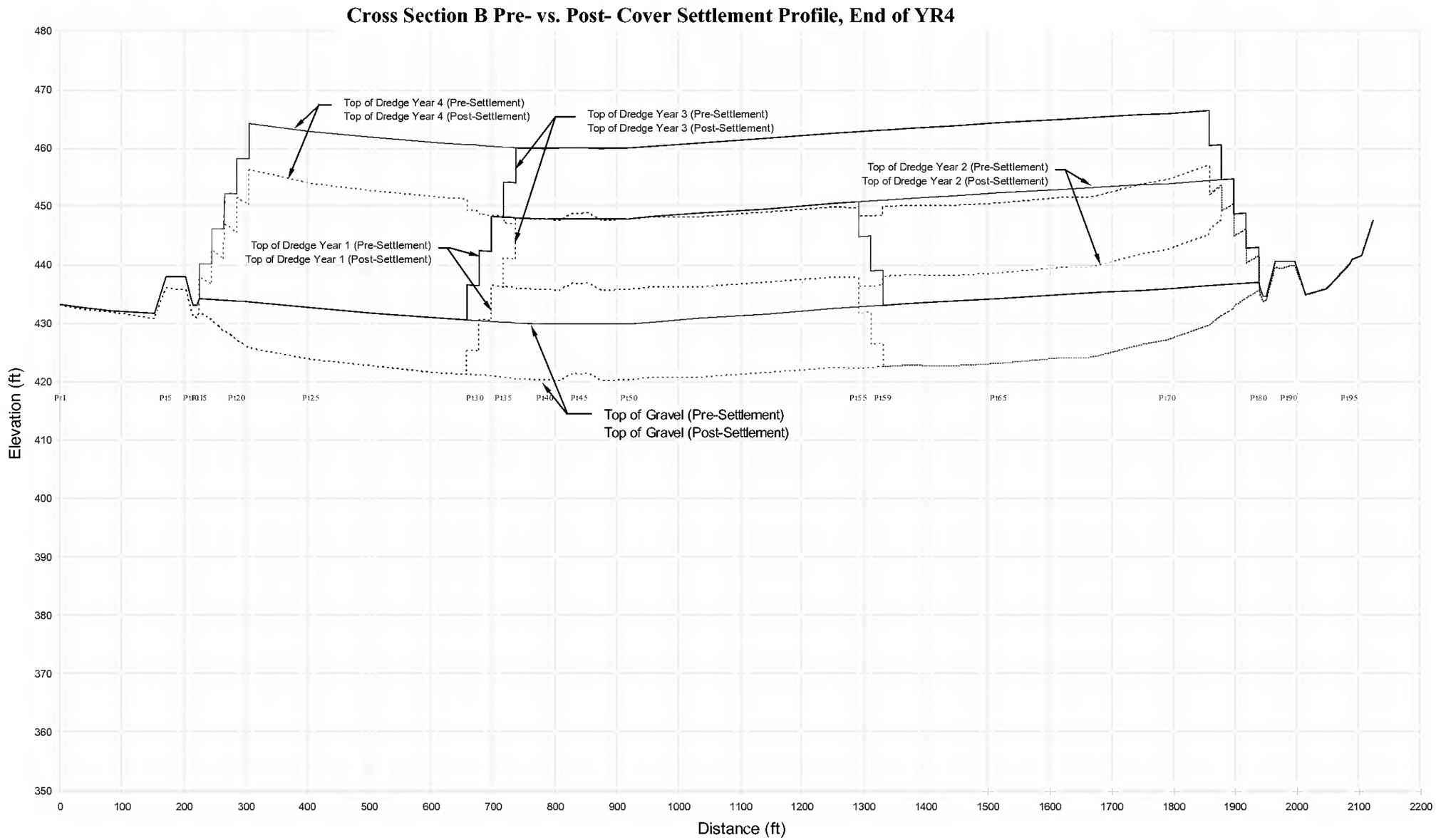


Figure 30. CASE 6: Cover Settlement Analysis Result for Cross Section B

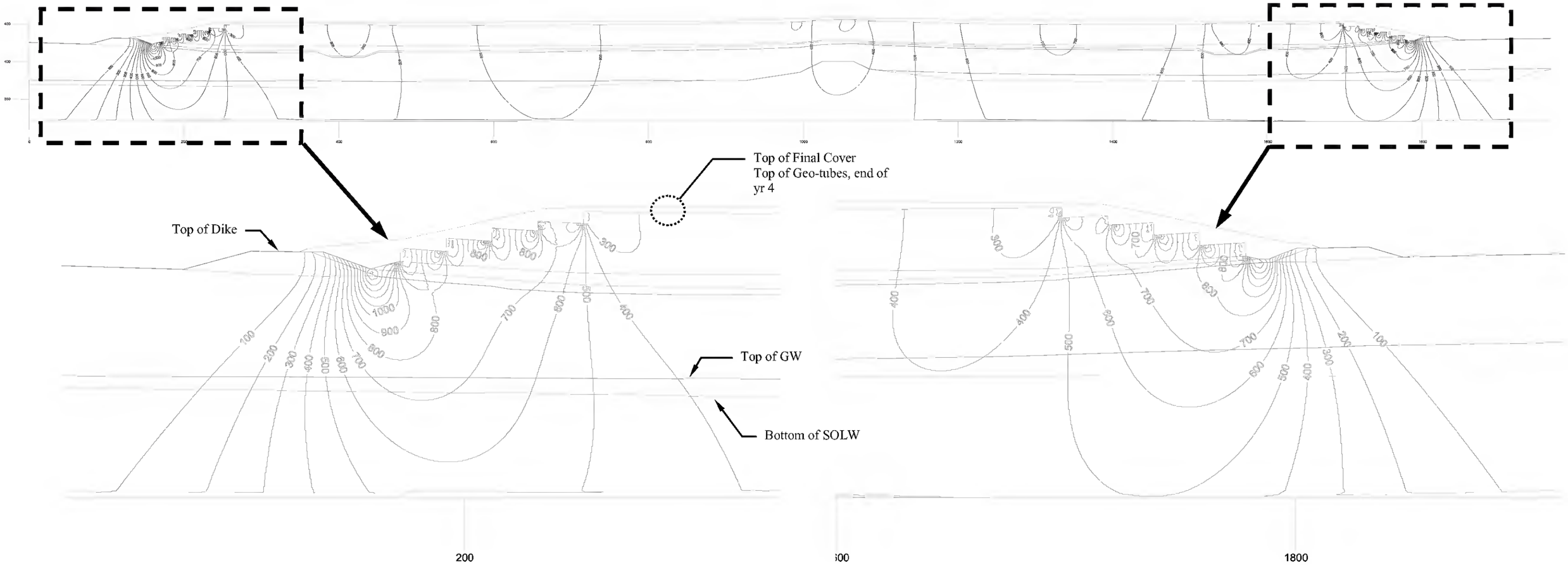


Figure 31. CASE 7: Stress Distribution of Proposed Final Cover Loading along Cross Section A (units in psf)

Written by: Yiwen Cao Date: 12/17/2009 Reviewed by: R. Kulasingam/Jay Beech Date: 12/17/2009

Client: Honeywell Project: Onondaga Lake SCA Final Design Project/ Proposal No.: GJ4299 Task No.: 04

Cross Section A Pre- vs. Post- Foundation Settlement Profile, End of YR35

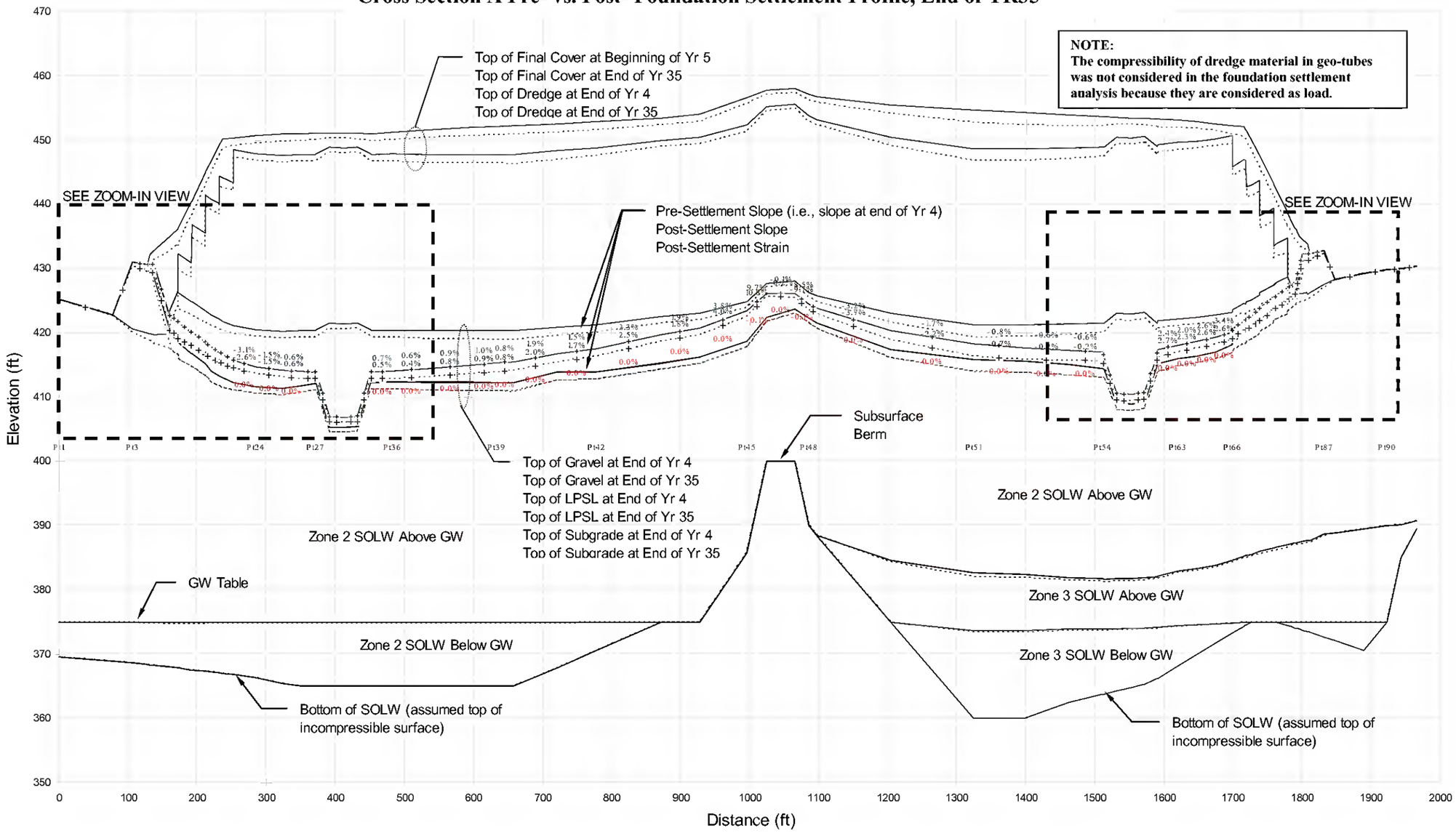


Figure 32. CASE 7: Foundation Settlement Analysis Result for Cross Section A (Overall View)

Written by: Yiwen Cao Date: 12/17/2009 Reviewed by: R. Kulasingam/Jay Beech Date: 12/17/2009

Client: Honeywell Project: Onondaga Lake SCA Final Design Project/ Proposal No.: GJ4299 Task No.: 04

Cross Section A Pre- vs. Post- Foundation Settlement Profile, End of YR35

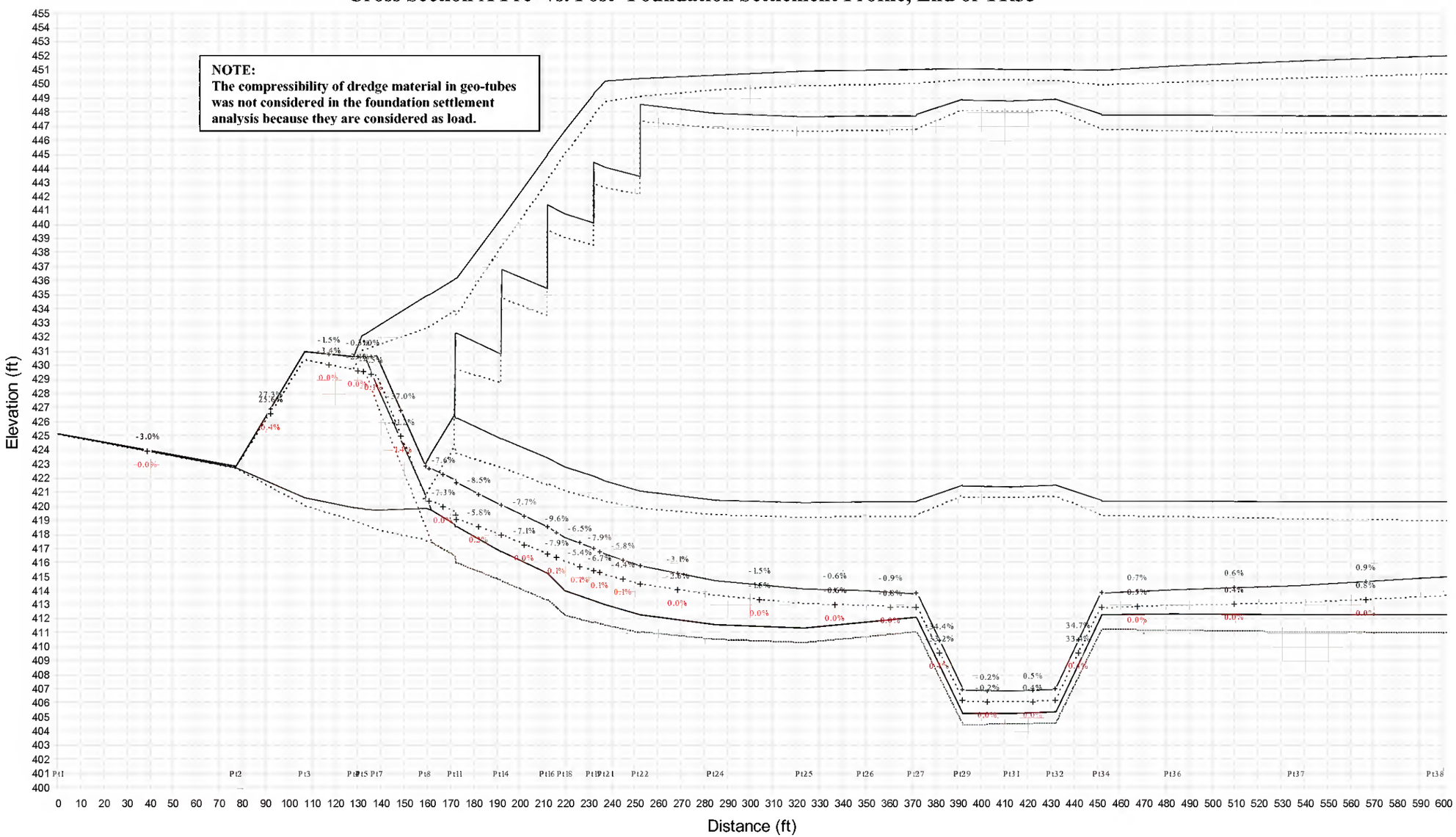


Figure 33. CASE 7: Foundation Settlement Analysis Result for Cross Section A (Left Berm and Sump)

Written by: Yiwen Cao Date: 12/17/2009 Reviewed by: R. Kulasingam/Jay Beech Date: 12/17/2009

Client: Honeywell Project: Onondaga Lake SCA Final Design Project/ Proposal No.: GJ4299 Task No.: 04

Cross Section A Pre- vs. Post- Foundation Settlement Profile, End of YR35

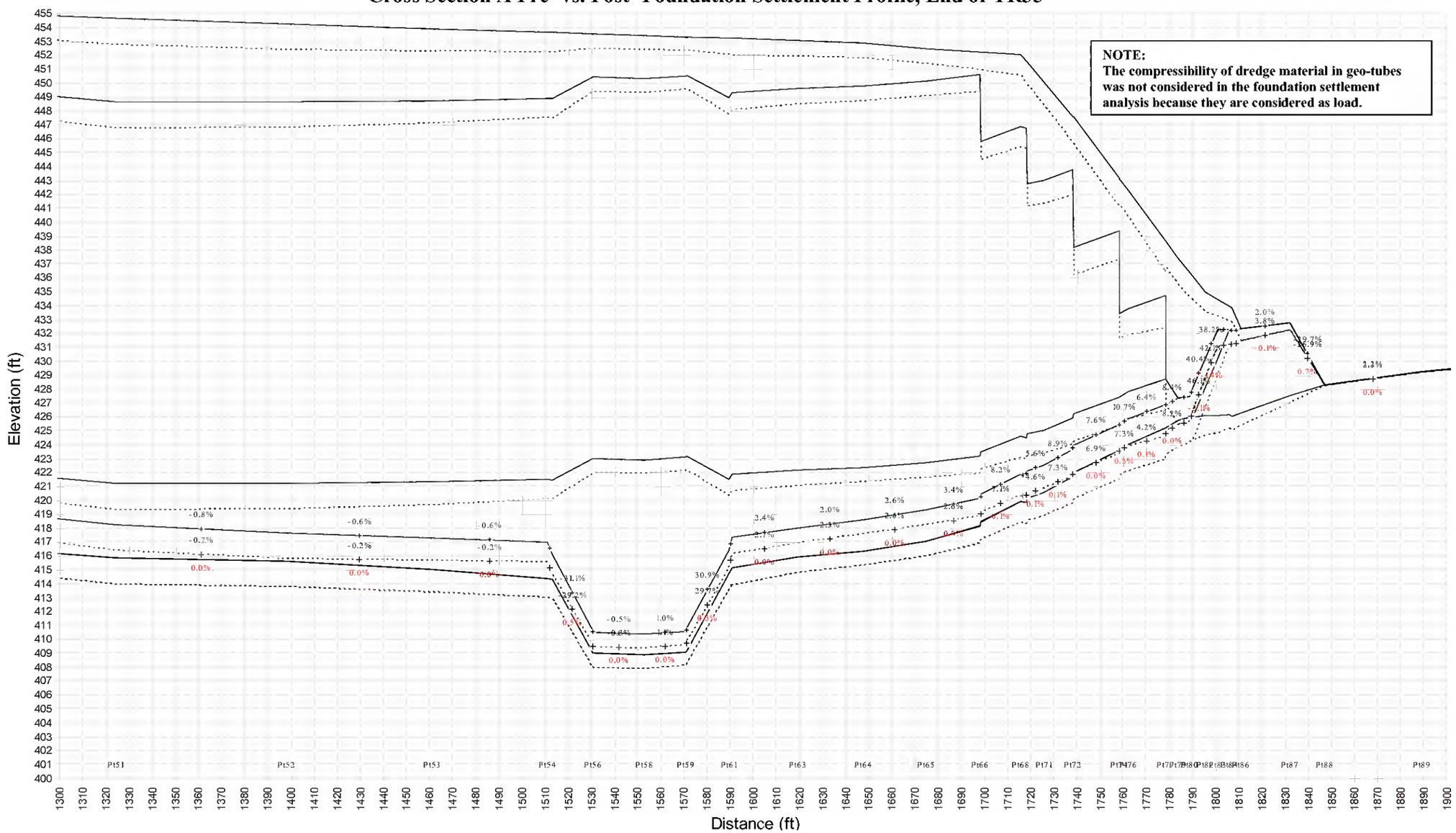


Figure 34. CASE 7: Foundation Settlement Analysis Result for Cross Section A (Right Berm and Sump)

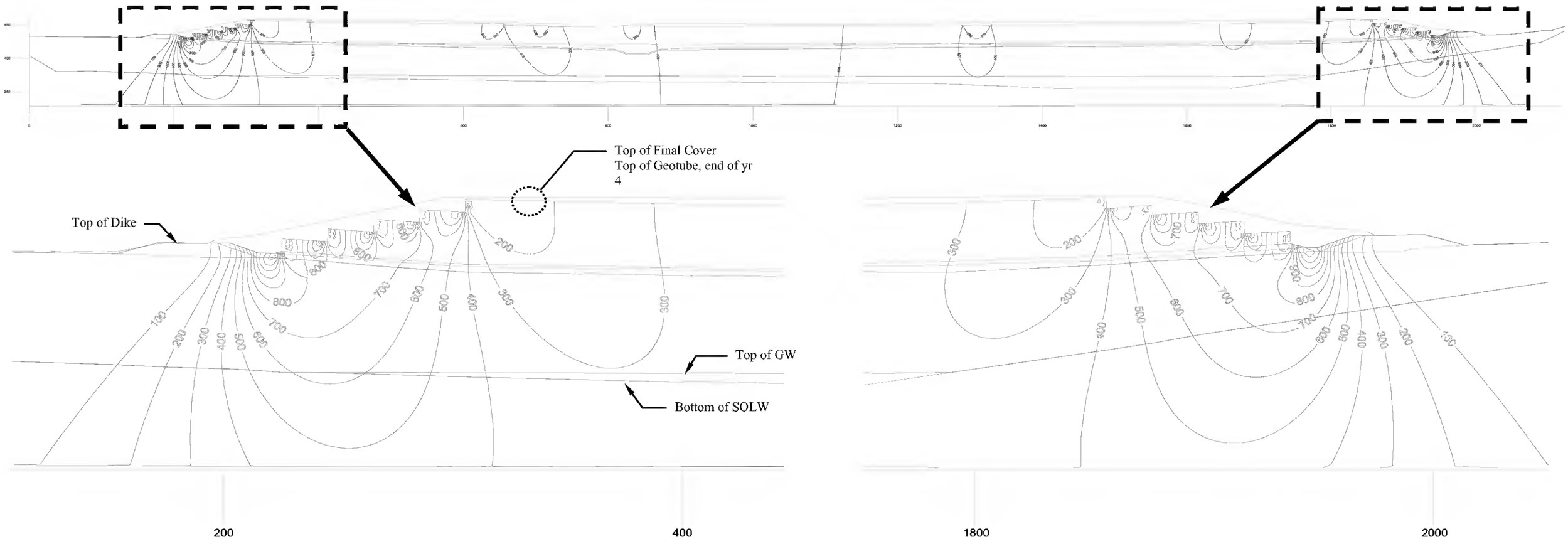


Figure 35. CASE 7: Stress Distribution of Proposed Final Cover Loading along Cross Section B (units in psf)

Written by: Yiwen Cao Date: 12/17/2009 Reviewed by: R. Kulasingam/Jay Beech Date: 12/17/2009

Client: Honeywell Project: Onondaga Lake SCA Final Design Project/ Proposal No.: GJ4299 Task No.: 04

Cross Section B Pre- vs. Post- Foundation Settlement Profile, End of YR35

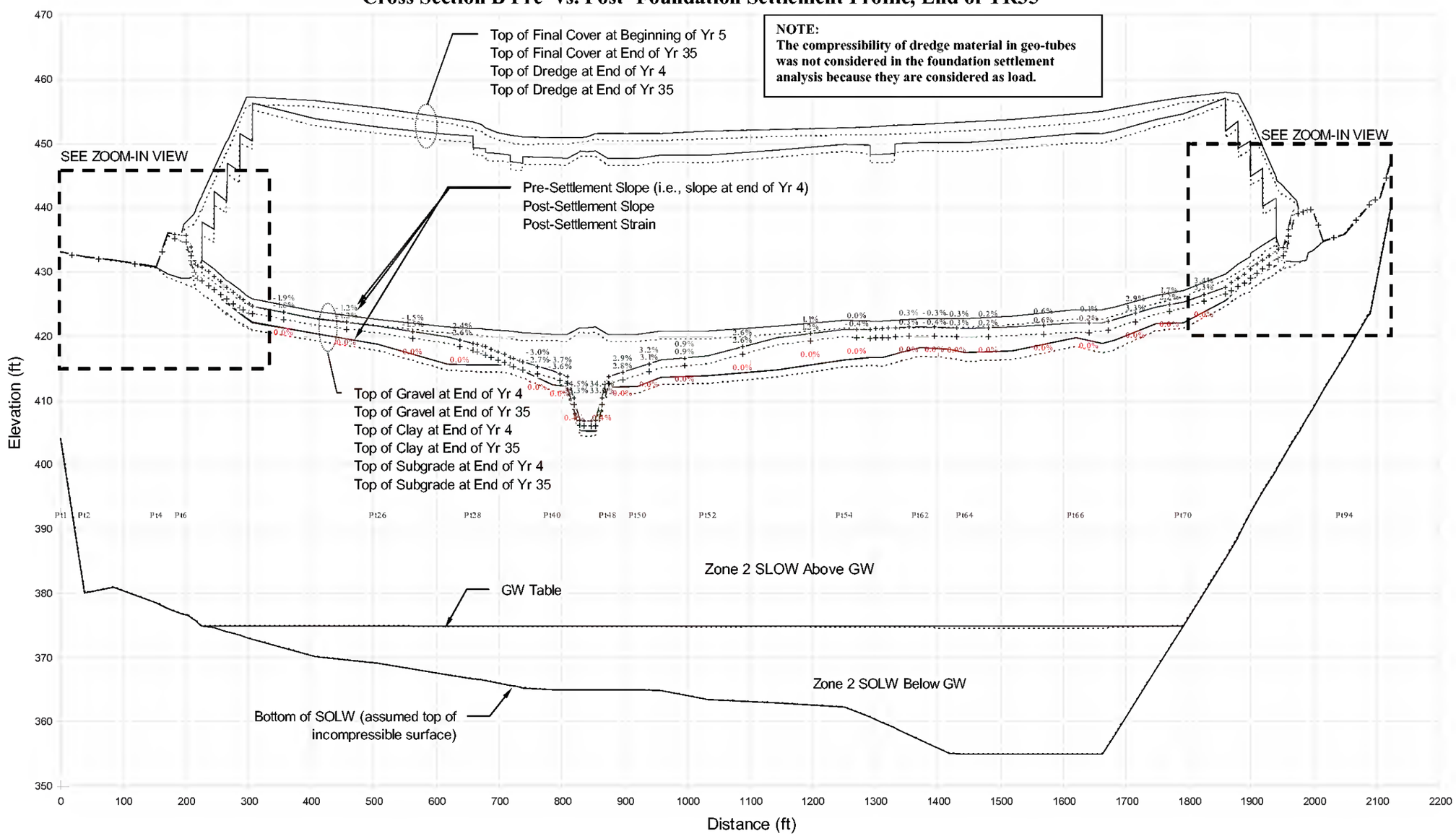


Figure 36. CASE 7: Foundation Settlement Analysis Result for Cross Section B (Overall View)

Written by: Yiwen Cao Date: 12/17/2009 Reviewed by: R. Kulasingam/Jay Beech Date: 12/17/2009

Client: Honeywell Project: Onondaga Lake SCA Final Design Project/ Proposal No.: GJ4299 Task No.: 04

Cross Section B Pre- vs. Post- Foundation Settlement Profile, End of YR35

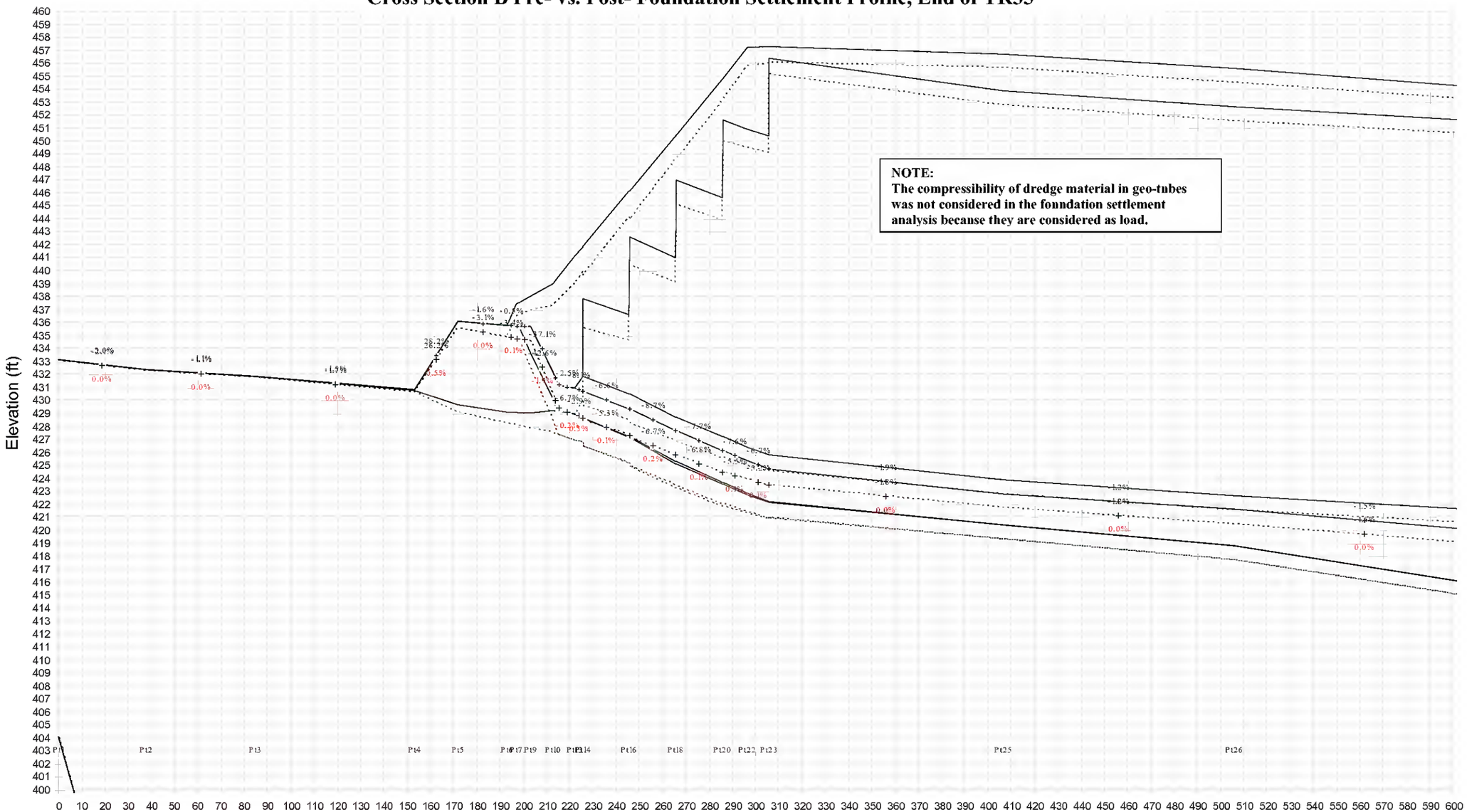


Figure 37. CASE 7: Foundation Settlement Analysis Result for Cross Section B (Left Berm)

Cross Section B Pre- vs. Post- Foundation Settlement Profile, End of YR35

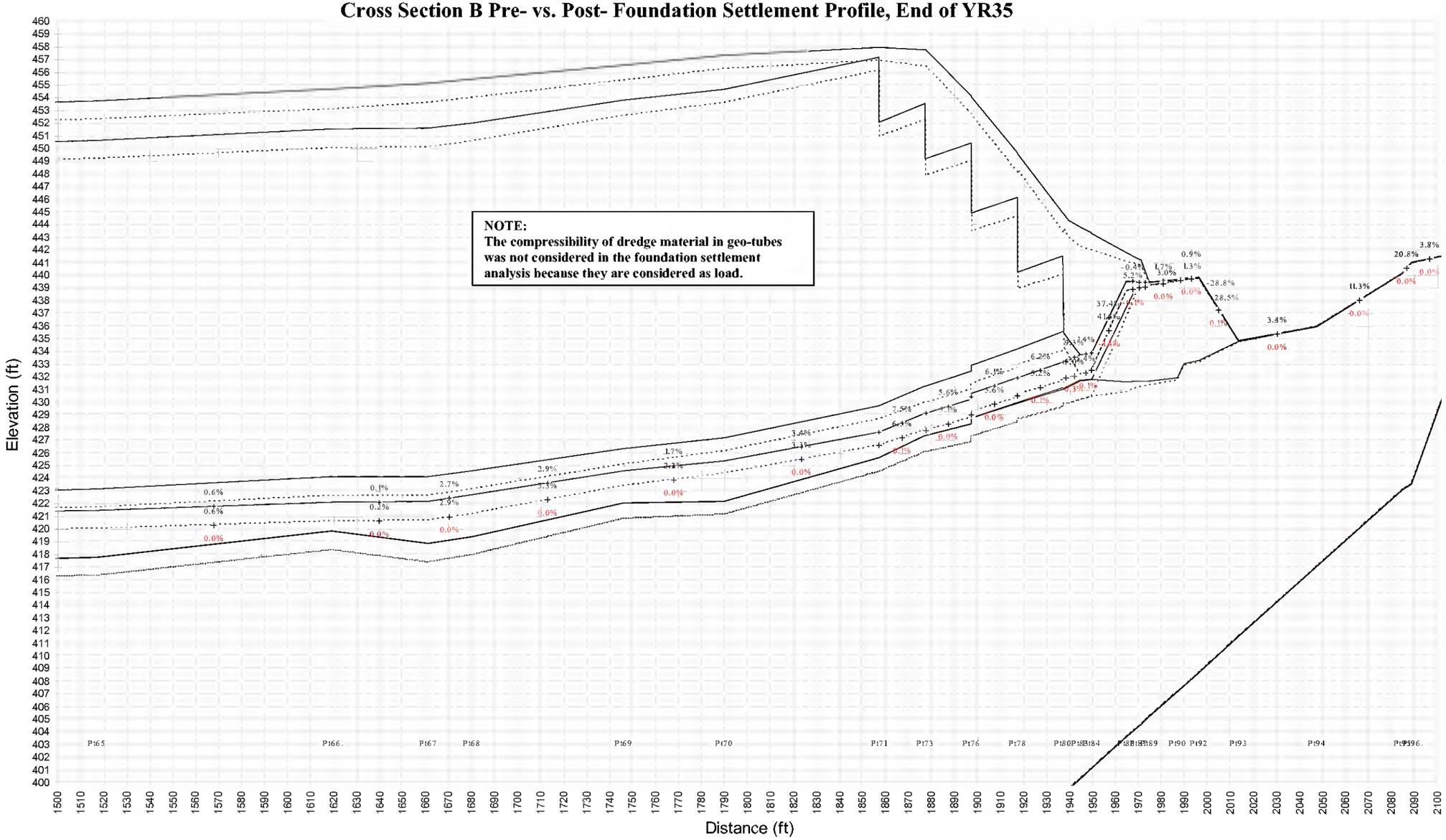


Figure 38. CASE 7: Foundation Settlement Analysis Result for Cross Section B (Right Berm)

Written by: Yiwen Cao Date: 12/17/2009 Reviewed by: R. Kulasingam/Jay Beech Date: 12/17/2009

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Cross Section A Pre- vs. Post- Foundation Settlement Profile, End of YR4

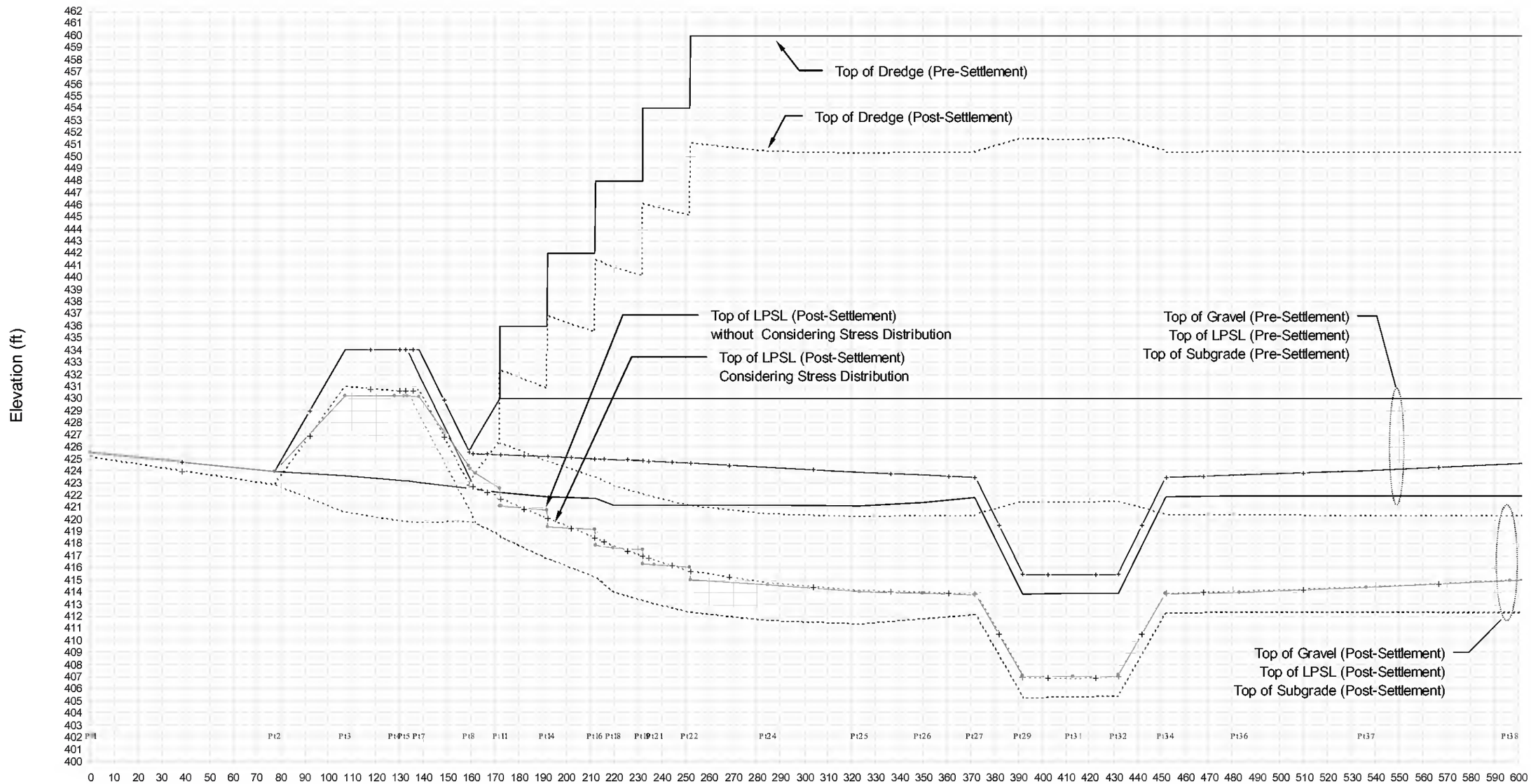

Figure 39. Comparison Between SSM and CSM for Cross Section A

Attachment 1

Calculation of Compressibility Parameters for the Settled Dredge Material

CALCULATION OF COMPRESSIBILITY PARAMETERS FOR DREDGE MATERIAL INSIDE GEO-TUBES

Three parameters were calculated from laboratory test data of samples of dredge material provided to Geosyntec by Parsons: (i) Modified Compression Index ($C_{c\varepsilon}$); (ii) Modified Recompression Index ($C_{r\varepsilon}$); and (iii) Secondary Compression Index ($C_{\alpha\varepsilon}$).

The modified Compression Index ($C_{c\varepsilon}$) and modified Recompression Index ($C_{r\varepsilon}$) were computed using Equations 1-1 and 1-2 below:

$$C_{c\varepsilon} = C_c / (1 + e_0) \quad (1\text{-}1)$$

$$C_{r\varepsilon} = C_r / (1 + e_0) \quad (1\text{-}2)$$

Where:

$C_{c\varepsilon}$ = Modified Compression Index

C_c = Compression Index

$C_{r\varepsilon}$ = Modified Recompression Index

C_r = Recompression Index

e_0 = Initial Void Ratio

Seven samples that are considered representative of the anticipated dredge material were taken from borings within Sediment Management Unit (SMU) 1 and the modified compression and recompression parameters were calculated as shown in the following table.

Location ID	Field Sample ID	Compression Index (Cc)	Recompression Index (Cr)	Initial Void Ratio (e_0)	Modified Compression Index ($C_{c\varepsilon}$)	Modified Recompression Index ($C_{r\varepsilon}$)
OL-STA-10025	OL-0052-13	2.04	0.02	4.53	0.368539	0.003831
OL-STA-10026	OL-0052-19	1.22	0.03	3.17	0.291937	0.006516
OL-STA-10019	OL-0110-30	0.08	0.01	4.24	0.014589	0.002285
OL-STA-10023	OL-0052-06	1.59	0.02	3.38	0.362000	0.005415
OL-STA-10024	OL-0052-07	1.18	0.02	3.08	0.289855	0.004684
OL-STA-10024	OL-0052-09	2.84	0.03	4.93	0.479155	0.005397
OL-STA-10014	OL-0110-08	0.94	0.01	3.05	0.233329	0.003639

Based on the results of the laboratory testing, calculated average values of $C_{c\varepsilon}$=0.291 and $C_{r\varepsilon}$=0.0045 were input into the settlement calculations.

The modified Secondary Compression Index ($C_{\alpha\varepsilon}$) was calculated based on laboratory consolidation test data provided to Geosyntec by Parsons. These test data included 12 constant load steps for each of seven samples from the SMU 1 area. The percent strain as a function of time on a logarithmic scale for each load step was graphed and the modified secondary compression index found graphically using Equation 1-3 below.

$$C_{\alpha\varepsilon} = \Delta E_x / \Delta \log_{10} t \quad C_{\alpha\varepsilon} = \Delta E_X / \Delta \log_{10} t \tag{1-3}$$

Where:

$C_{\alpha\varepsilon}$ = Modified Secondary Compression Index

ΔE_x = Change in strain

$\Delta \log_{10} t$ = Logarithmic change in time

This was repeated for every load step of the seven samples tested and results were compiled into tables. These $C_{\alpha\varepsilon}$ values were also graphed as a function of stress ratio, as shown in Figure 1-1 and a simplified design curve for $C_{\alpha\varepsilon}$ was created based upon the graphical distribution of values. The recommended secondary compression ratio for design is shown in Equations 1-4 and 1-5 below:

$$C_{\alpha\varepsilon} = 0.08\% \; for \; \frac{\sigma_v'}{P_c'} \le 1.0 \tag{1-4}$$

$$C_{\alpha\varepsilon} = 0.60\% \; for \; \frac{\sigma_v'}{P_c'} > 1.0 \tag{1-5}$$

Where:

σ_v' = Vertical Effective Stress (psf)

P_c' = Preconsolidation Pressure (psf)

This recommended design value envelope is a stair-step function based on the results of the laboratory testing. The design value of $C_{\alpha\varepsilon}$=0.08% for stress ratios smaller than 1.0

is identical to the numerical average of these tests. For stress ratios larger than 1.0, the numerical average is $C_{\alpha\varepsilon}$=0.26%, however, due to the presence of several large laboratory compression index values, the design value has been increased to a recommended design value of $C_{\alpha\varepsilon}$=0.60%. The higher design value will result in larger calculated secondary compression settlements, which is conservative.

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

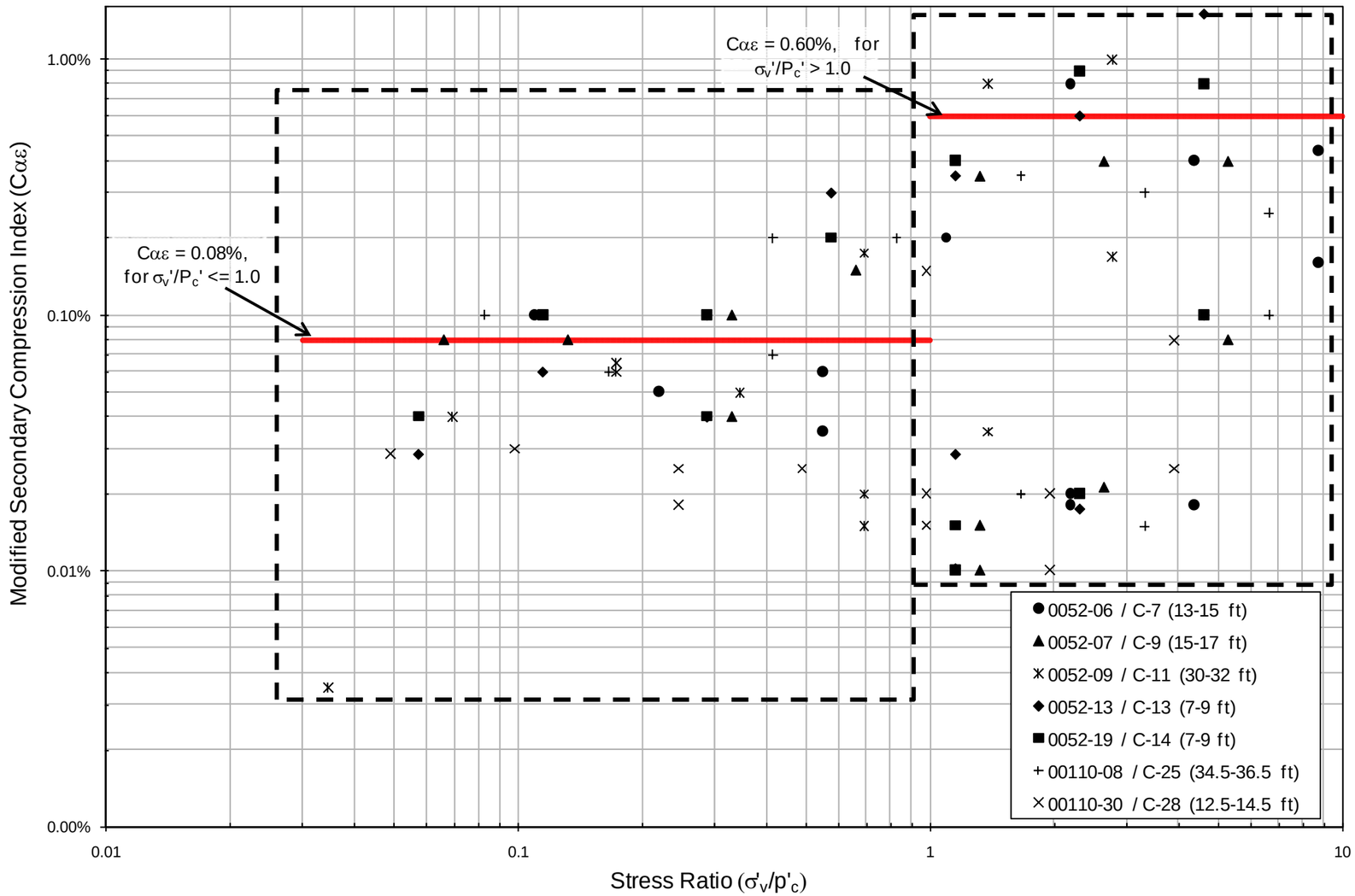

Figure 1-1: Secondary Compression Ratio of SOLW as a Function of Stress Ratio

Attachment 2

CASE 1: Settlement Analysis for Top of LPSL at the End of the Operations Period (i.e., End of Year 4)
(Points 1001 to 1010)

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Settlement Prediction Model

Programmer: **Yiwen Cao, GeoSyntec Consultants**

Version Control V 1.002 11.14.2007

Project: **Onondaga Lake SCA Final**

Notes:

Unit: **ft / psf**

Average Compaction Effort = **1440.00** kPa or psf

Consider Compaction Effort = **N** yes or no

					1001	1002	1003	1004	1005	1006	1007	1008	1009	1010
Point #					1001	1002	1003	1004	1005	1006	1007	1008	1009	1010
Distance (meter or ft)					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ELEVATION (M/FT)	Line	1	Top of Dredge		463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
	Line	2	Top of Dredge		463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
	Line	3	Top of Gravel		433.00	432.42	432.35	432.00	431.75	431.72	434.00	434.34	434.42	434.33
	Line	4	Top of Clay		431.77	431.00	431.00	430.72	430.00	430.00	432.60	433.00	433.00	433.00
	Line	5	Top of Dike		430.02	429.02	429.25	428.78	427.14	427.77	430.80	431.00	431.03	431.00
	Line	6	Top of Subgrade		430.02	429.02	429.25	428.78	427.10	427.77	430.80	431.00	431.03	431.00
	Line	7			427.67	426.67	426.89	426.43	424.75	425.41	428.45	428.65	428.03	428.65
	Line	8			425.32	424.32	424.54	424.08	422.40	423.06	426.10	426.29	425.02	426.29
	Line	9			422.96	421.96	422.18	421.72	420.05	420.71	423.74	423.94	422.02	423.94
	Line	10			420.61	419.61	419.83	419.37	417.70	418.36	421.39	421.59	419.02	421.58
	Line	11			418.26	417.26	417.47	417.02	415.35	416.00	419.04	419.23	416.02	419.23
	Line	12			415.90	414.90	415.12	414.67	413.00	413.65	416.69	416.88	413.02	416.88
	Line	13			413.55	412.55	412.76	412.31	410.65	411.30	414.33	414.53	410.02	414.52
	Line	14			411.20	410.20	410.41	409.96	408.29	408.94	411.98	412.18	407.01	412.17
	Line	15			408.84	407.85	408.05	407.61	405.94	406.59	409.63	409.82	404.01	409.82
	Line	16			406.49	405.49	405.70	405.25	403.59	404.24	407.27	407.47	401.01	407.46
	Line	17			404.14	403.14	403.34	402.90	401.24	401.89	404.92	405.12	398.01	405.11
	Line	18			401.79	400.79	400.99	400.55	398.89	399.53	402.57	402.76	395.01	402.76
	Line	19			399.43	398.43	398.63	398.19	396.54	397.18	400.21	400.41	392.01	400.40
	Line	20			397.08	396.08	396.28	395.84	394.19	394.83	397.86	398.06	389.00	398.05
	Line	21			394.73	393.73	393.92	393.49	391.84	392.48	395.51	395.71	386.00	395.70
	Line	22			392.37	391.37	391.57	391.13	389.49	390.12	393.15	393.35	383.00	393.34
	Line	23	Bottom of Zone2 Above GW		390.02	389.02	389.21	388.78	387.14	387.77	390.80	391.00	380.00	390.99
	Line	24			390.02	389.02	389.21	388.78	387.14	387.77	390.80	391.00	380.00	390.99
	Line	25	Bottom of Zone 3 Above GW		390.02	389.02	389.21	388.78	387.14	387.77	390.80	391.00	380.00	390.99
	Line	26			382.51	382.01	382.11	381.89	381.07	381.39	382.90	385.50	380.00	385.50
	Line	27	Bottom of Zone 2 Below GW		375.00	375.00	375.00	375.00	375.00	375.00	375.00	380.00	380.00	380.00
	Line	28	Top of Incompressible Layer		355.70	361.07	356.29	357.26	362.61	358.34	355.00	380.00	380.00	380.00
	Line	29	GND	for sigma_p	430.02	429.02	429.25	428.78	427.10	427.77	430.81	431.00	431.04	431.00
	Line	30	GW		375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00
	Line	31	ROCK		355.70	361.07	356.29	357.26	362.61	358.34	355.00	380.00	380.00	380.00
LAYER THICKNESS (M/FT)	Layer No.	From	To	Material										
	1	1	2	Null Layer	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2	2	3	Dredge	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
	3	3	4	Gravel	1.23	1.42	1.35	1.28	1.75	1.72	1.40	1.34	1.42	1.33
	4	4	5	Clay	1.74	1.98	1.75	1.94	2.86	2.23	1.79	2.00	1.97	2.00
	5	5	6	Dike	0.00	0.00	0.01	0.00	0.04	0.00	0.00	0.00	0.00	0.00
	6	6	7	Zone2-Above-GW-1	2.35	2.35	2.36	2.35	2.35	2.35	2.35	2.35	3.00	2.35
	7	7	8	Zone2-Above-GW-2	2.35	2.35	2.36	2.35	2.35	2.35	2.35	2.35	3.00	2.35
	8	8	9	Zone2-Above-GW-3	2.35	2.35	2.36	2.35	2.35	2.35	2.35	2.35	3.00	2.35
	9	9	10	Zone2-Above-GW-4	2.35	2.35	2.36	2.35	2.35	2.35	2.35	2.35	3.00	2.35
	10	10	11	Zone2-Above-GW-5	2.35	2.35	2.36	2.35	2.35	2.35	2.35	2.35	3.00	2.35
	11	11	12	Zone2-Above-GW-6	2.35	2.35	2.36	2.35	2.35	2.35	2.35	2.35	3.00	2.35
	12	12	13	Zone2-Above-GW-7	2.35	2.35	2.36	2.35	2.35	2.35	2.35	2.35	3.00	2.35
	13	13	14	Zone2-Above-GW-8	2.35	2.35	2.36	2.35	2.35	2.35	2.35	2.35	3.00	2.35
	14	14	15	Zone2-Above-GW-9	2.35	2.35	2.36	2.35	2.35	2.35	2.35	2.35	3.00	2.35
	15	15	16	Zone2-Above-GW-10	2.35	2.35	2.36	2.35	2.35	2.35	2.35	2.35	3.00	2.35
	16	16	17	Zone2-Above-GW-11	2.35	2.35	2.36	2.35	2.35	2.35	2.35	2.35	3.00	2.35
	17	17	18	Zone2-Above-GW-12	2.35	2.35	2.36	2.35	2.35	2.35	2.35	2.35	3.00	2.35
	18	18	19	Zone2-Above-GW-13	2.35	2.35	2.36	2.35	2.35	2.35	2.35	2.35	3.00	2.35
	19	19	20	Zone2-Above-GW-14	2.35	2.35	2.36	2.35	2.35	2.35	2.35	2.35	3.00	2.35
	20	20	21	Zone2-Above-GW-15	2.35	2.35	2.36	2.35	2.35	2.35	2.35	2.35	3.00	2.35
	21	21	22	Zone2-Above-GW-16	2.35	2.35	2.36	2.35	2.35	2.35	2.35	2.35	3.00	2.35
	22	22	23	Zone2-Above-GW-17	2.35	2.35	2.36	2.35	2.35	2.35	2.35	2.35	3.00	2.35
	23	23	24	Zone3-Above-GW-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	24	24	25	Zone3-Above-GW-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	25	25	26	Zone2-Below-GW-18	7.51	7.01	7.10	6.89	6.07	6.38	7.90	5.50	0.00	5.50
	26	26	27	Zone2-Below-GW-19	7.51	7.01	7.11	6.89	6.07	6.38	7.90	5.50	0.00	5.50
	27	27	28	Zone3-Below-GW-3	19.30	13.93	18.71	17.74	12.39	16.66	20.00	0.00	0.00	0.00
	28													
	29	29	30	Soil Above GW	55.02	54.02	54.25	53.78	52.10	52.77	55.81	56.00	56.04	56.00
	30	30	31	Soil Below GW	19.30	13.93	18.71	17.74	12.39	16.66	20.00	-5.00	-5.00	-5.00
	Thickness Check													
		From Line	To Line	SUM	107.30	101.35	106.06	104.74	99.14	103.38	109.00	84.34	84.42	84.33
		1	28	Thickness =	107.30	101.35	106.06	104.74	99.14	103.38	109.00	84.34	84.42	84.33
				Thickness Check	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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	Layer No.	Material										
UNIT WEIGHT	1	*Null Layer*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	*Dredge*	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0
	3	*Gravel*	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0
	4	*Clay*	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0
	5	*Dike*	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0
	6	*Zone2-Above-GW-1*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	7	*Zone2-Above-GW-2*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	8	*Zone2-Above-GW-3*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	9	*Zone2-Above-GW-4*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	10	*Zone2-Above-GW-5*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	11	*Zone2-Above-GW-6*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	12	*Zone2-Above-GW-7*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	13	*Zone2-Above-GW-8*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	14	*Zone2-Above-GW-9*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	15	*Zone2-Above-GW-10*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	16	*Zone2-Above-GW-11*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	17	*Zone2-Above-GW-12*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	18	*Zone2-Above-GW-13*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	19	*Zone2-Above-GW-14*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	20	*Zone2-Above-GW-15*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	21	*Zone2-Above-GW-16*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	22	*Zone2-Above-GW-17*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	23	*Zone3-Above-GW-1*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	24	*Zone3-Above-GW-2*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	25	*Zone2-Below-GW-18*	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6
	26	*Zone2-Below-GW-19*	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6
	27	*Zone3-Below-GW-3*	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6
	28											
	29	*Soil Above GW*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	30	*Soil below GW*	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6
	Layer No.	***1*** **Null Layer**										
		Initial Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
		Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
	Midpoint Elevation, (m / ft)		463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
	Initial Effective Stress, σ'_i (kPa /psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
	Final Effective Stress, σ'_f (kPa/psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method												
Modulus, E (kPa/psf)=		Strain										
		Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)												
Consolidation Properties												
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)												
OCR Manual Input Value												
OCR Computation Input												
Preconsolidation pressure, σ'_p (kPa / psf)												
Modified Primary Compression Index, $C_{c\varepsilon}$												
Modified Recompression Index, $C_{r\varepsilon}$												
Modified Secondary Compression Index, C_α												
ratio of t2 / t1												
Settlements												
Primary Settlement, (m / ft)												
Secondary Settlement (m / ft)												
Total Settlement (m / ft)												
		Elastic or Plastic (E/P)										
		Settlement of Layer 1 (m / ft)										

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Layer No. *2* **Dredge**											
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Midpoint Elevation, (m / ft)		448.00	447.42	447.35	447.00	446.75	446.72	449.00	449.34	449.42	449.33
Initial Effective Stress, σ'_i (kPa /psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Final Effective Stress, σ'_f (kPa/psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)											
OCR Manual Input Value											
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)											
Modified Primary Compression Index, $C_{c\varepsilon}$											
Modified Recompression Index, $C_{r\varepsilon}$											
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$											
ratio of t2 / t1											
Settlements											
Primary Settlement, (m / ft)											
Secondary Settlement (m / ft)											
Total Settlement (m / ft)											
Elastic or Plastic (E/P)											
Settlement of Layer 2 (m / ft)											
Layer No. *3* **Gravel**											
Initial Stress Reference Layer (top of layer)		*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
Final Stress Reference Layer (top of layer)		*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
Midpoint Elevation, (m / ft)		432.38	431.71	431.67	431.36	430.88	430.86	433.30	433.67	433.71	433.66
Initial Effective Stress, σ'_i (kPa /psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Final Effective Stress, σ'_f (kPa/psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)											
OCR Manual Input Value											
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)											
Modified Primary Compression Index, $C_{c\varepsilon}$											
Modified Recompression Index, $C_{r\varepsilon}$											
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$											
ratio of t2 / t1											
Settlements											
Primary Settlement, (m / ft)											
Secondary Settlement (m / ft)											
Total Settlement (m / ft)											
Elastic or Plastic (E/P)											
Settlement of Layer 3 (m / ft)											
Layer No. *4* **Clay**											
Initial Stress Reference Layer (top of layer)		*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Final Stress Reference Layer (top of layer)		*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Midpoint Elevation, (m / ft)		430.89	430.01	430.13	429.75	428.57	428.88	431.70	432.00	432.01	432.00
Initial Effective Stress, σ'_i (kPa /psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Final Effective Stress, σ'_f (kPa/psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)											
OCR Manual Input Value											
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)											
Modified Primary Compression Index, $C_{c\varepsilon}$											
Modified Recompression Index, $C_{r\varepsilon}$											
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$											
ratio of t2 / t1											
Settlements											
Primary Settlement, (m / ft)											
Secondary Settlement (m / ft)											
Total Settlement (m / ft)											
Elastic or Plastic (E/P)											
Settlement of Layer 4 (m / ft)											

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Layer No. 5 **Dike**											
Initial Stress Reference Layer (top of layer)	5	5	5	5	5	5	5	5	5	5
Final Stress Reference Layer (top of layer)	5	5	5	5	5	5	5	5	5	5
Midpoint Elevation, (m / ft)	430.02	429.02	429.25	428.78	427.12	427.77	430.80	431.00	431.03	431.00
Initial Effective Stress, σ'_i (kPa /psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Final Effective Stress, σ'_f (kPa/psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)										
OCR Manual Input Value										
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)										
Modified Primary Compression Index, $C_{c\varepsilon}$										
Modified Recompression Index, $C_{r\varepsilon}$										
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$										
ratio of t2 / t1										
Settlements										
Primary Settlement, (m / ft)										
Secondary Settlement (m / ft)										
Total Settlement (m / ft)										
Elastic or Plastic (E/P)										
Settlement of Layer 5 (m / ft)										
Layer No. 6 **Zone2-Above-GW-1**										
Initial Stress Reference Layer (top of layer)	6	6	6	6	6	6	6	6	6	6
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	428.85	427.85	428.07	427.61	425.92	426.59	429.63	429.82	429.53	429.82
Initial Effective Stress, σ'_i (kPa /psf)	96.48	96.48	96.56	96.48	96.37	96.46	96.48	96.47	123.07	96.49
Final Effective Stress, σ'_f (kPa/psf)	3,033.81	3,084.28	3,048.57	3,062.36	3,234.78	3,151.01	3,059.94	3,077.83	3,109.71	3,075.94
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
OCR Manual Input Value	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	434	434	435	434	434	434	437	435	557	435
Modified Primary Compression Index, $C_{c\varepsilon}$	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460
Modified Recompression Index, $C_{r\varepsilon}$	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%
ratio of t2 / t1	8	8	8	8	8	8	8	8	8	8
Settlements										
Primary Settlement, (m / ft)	0.935	0.943	0.938	0.940	0.965	0.953	0.936	0.941	1.059	0.942
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.025	0.019
Total Settlement (m / ft)	0.955	0.963	0.957	0.959	0.984	0.973	0.955	0.961	1.084	0.961
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 6 (m / ft)	0.955	0.963	0.957	0.959	0.984	0.973	0.955	0.961	1.084	0.961
Layer No. 7 **Zone2-Above-GW-2**										
Initial Stress Reference Layer (top of layer)	6	6	6	6	6	6	6	6	6	6
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	426.49	425.49	425.71	425.25	423.57	424.24	427.27	427.47	426.53	427.47
Initial Effective Stress, σ'_i (kPa /psf)	289.43	289.44	289.67	289.44	289.11	289.38	289.44	289.40	369.20	289.48
Final Effective Stress, σ'_f (kPa/psf)	3,226.76	3,277.24	3,241.68	3,255.33	3,427.52	3,343.93	3,252.90	3,270.76	3,355.85	3,268.92
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
OCR Manual Input Value	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	1,302	1,302	1,304	1,302	1,301	1,302	1,306	1,303	1,664	1,303
Modified Primary Compression Index, $C_{c\varepsilon}$	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460
Modified Recompression Index, $C_{r\varepsilon}$	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%
ratio of t2 / t1	8	8	8	8	8	8	8	8	8	8
Settlements										
Primary Settlement, (m / ft)	0.448	0.455	0.450	0.452	0.476	0.465	0.451	0.454	0.448	0.454
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.025	0.019
Total Settlement (m / ft)	0.467	0.475	0.470	0.471	0.496	0.484	0.470	0.473	0.473	0.473
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 7 (m / ft)	0.467	0.475	0.470	0.471	0.496	0.484	0.470	0.473	0.473	0.473

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Layer No.	*8*	**Zone2-Above-GW-3**									
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		424.14	423.14	423.36	422.90	421.22	421.88	424.92	425.12	423.52	425.12
Initial Effective Stress, σ'_i (kPa /psf)		482.38	482.40	482.78	482.40	481.85	482.30	482.41	482.33	615.34	482.46
Final Effective Stress, σ'_f (kPa/psf)		3,419.72	3,470.20	3,434.79	3,448.29	3,620.26	3,536.85	3,445.87	3,463.69	3,601.99	3,461.90
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*4.5*	*4.5*	*4.5*	*4.5*	*4.5*	*4.5*	*4.5*	*4.5*	*4.5*	*4.5*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,171	2,171	2,173	2,171	2,168	2,170	2,174	2,171	2,772	2,172
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.235	0.242	0.237	0.239	0.262	0.251	0.238	0.241	0.185	0.241
Secondary Settlement (m / ft)		0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.025	0.019
Total Settlement (m / ft)		0.255	0.261	0.256	0.258	0.282	0.270	0.257	0.260	0.209	0.260
Elastic or Plastic (E/P)		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 8 (m / ft)		0.255	0.261	0.256	0.258	0.282	0.270	0.257	0.260	0.209	0.260
Layer No.	*9*	**Zone2-Above-GW-4**									
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		421.79	420.79	421.00	420.55	418.87	419.53	422.57	422.76	420.52	422.76
Initial Effective Stress, σ'_i (kPa /psf)		675.33	675.36	675.90	675.37	674.60	675.22	675.37	675.26	861.48	675.44
Final Effective Stress, σ'_f (kPa/psf)		3,612.67	3,663.16	3,627.91	3,641.25	3,813.00	3,729.78	3,638.83	3,656.62	3,848.12	3,654.89
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*4.5*	*4.5*	*4.5*	*4.5*	*4.5*	*4.5*	*4.5*	*4.5*	*2.0*	*4.5*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		3,039	3,039	3,042	3,039	3,036	3,039	3,042	3,039	1,724	3,040
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.103	0.109	0.104	0.106	0.129	0.118	0.106	0.108	0.494	0.108
Secondary Settlement (m / ft)		0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.025	0.019
Total Settlement (m / ft)		0.122	0.129	0.124	0.126	0.148	0.137	0.125	0.128	0.519	0.127
Elastic or Plastic (E/P)		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 9 (m / ft)		0.122	0.129	0.124	0.126	0.148	0.137	0.125	0.128	0.519	0.127
Layer No.	*10*	**Zone2-Above-GW-5**									
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		419.43	418.43	418.65	418.19	416.52	417.18	420.22	420.41	417.52	420.41
Initial Effective Stress, σ'_i (kPa /psf)		868.28	868.32	869.01	868.33	867.34	868.14	868.33	868.19	1,107.61	868.43
Final Effective Stress, σ'_f (kPa/psf)		3,805.62	3,856.12	3,821.02	3,834.21	4,005.74	3,922.70	3,831.79	3,849.55	4,094.26	3,847.87
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		1,737	1,737	1,738	1,737	1,735	1,736	1,738	1,737	2,217	1,737
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.379	0.385	0.381	0.382	0.403	0.393	0.382	0.384	0.381	0.384
Secondary Settlement (m / ft)		0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.025	0.019
Total Settlement (m / ft)		0.398	0.404	0.400	0.402	0.422	0.412	0.401	0.403	0.405	0.403
Elastic or Plastic (E/P)		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 10 (m / ft)		0.398	0.404	0.400	0.402	0.422	0.412	0.401	0.403	0.405	0.403

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No.	*11*	**Zone2-Above-GW-6**									
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		417.08	416.08	416.29	415.84	414.17	414.83	417.86	418.06	414.52	418.05
Initial Effective Stress, σ'_i (kPa /psf)		1,061.23	1,061.28	1,062.12	1,061.29	1,060.08	1,061.07	1,061.30	1,061.12	1,353.75	1,061.41
Final Effective Stress, σ'_f (kPa/psf)		3,998.57	4,049.08	4,014.13	4,027.17	4,198.49	4,115.62	4,024.76	4,042.48	4,340.39	4,040.85
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,122	2,123	2,124	2,123	2,120	2,122	2,124	2,123	2,709	2,123
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.308	0.314	0.309	0.311	0.331	0.321	0.310	0.313	0.295	0.313
Secondary Settlement (m / ft)		0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.025	0.019
Total Settlement (m / ft)		0.327	0.333	0.329	0.330	0.350	0.341	0.330	0.332	0.320	0.332
Elastic or Plastic (E/P)		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 11 (m / ft)		0.327	0.333	0.329	0.330	0.350	0.341	0.330	0.332	0.320	0.332
Layer No.	*12*	**Zone2-Above-GW-7**									
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		414.73	413.73	413.94	413.49	411.82	412.47	415.51	415.70	411.52	415.70
Initial Effective Stress, σ'_i (kPa /psf)		1,254.19	1,254.24	1,255.23	1,254.25	1,252.82	1,253.99	1,254.26	1,254.05	1,599.89	1,254.39
Final Effective Stress, σ'_f (kPa/psf)		4,191.52	4,242.04	4,207.25	4,220.14	4,391.23	4,308.54	4,217.72	4,235.42	4,586.53	4,233.84
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,508	2,508	2,510	2,509	2,506	2,508	2,510	2,508	3,201	2,509
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.251	0.257	0.253	0.254	0.273	0.264	0.254	0.256	0.228	0.256
Secondary Settlement (m / ft)		0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.025	0.019
Total Settlement (m / ft)		0.271	0.276	0.272	0.274	0.293	0.284	0.273	0.275	0.253	0.275
Elastic or Plastic (E/P)		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 12 (m / ft)		0.271	0.276	0.272	0.274	0.293	0.284	0.273	0.275	0.253	0.275
Layer No.	*13*	**Zone2-Above-GW-8**									
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		412.37	411.38	411.58	411.14	409.47	410.12	413.16	413.35	408.52	413.35
Initial Effective Stress, σ'_i (kPa /psf)		1,447	1,447	1,448	1,447	1,446	1,447	1,447	1,447	1,846	1,447
Final Effective Stress, σ'_f (kPa/psf)		4,384	4,435	4,400	4,413	4,584	4,501	4,411	4,428	4,833	4,427
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*1.0*	*2.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,894	2,894	2,897	2,894	2,891	2,894	2,896	2,894	1,847	2,895
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.205	0.211	0.207	0.208	0.226	0.218	0.208	0.210	0.577	0.210
Secondary Settlement (m / ft)		0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.025	0.019
Total Settlement (m / ft)		0.224	0.230	0.226	0.228	0.246	0.237	0.227	0.229	0.602	0.229
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 13 (m / ft)		0.224	0.230	0.226	0.228	0.246	0.237	0.227	0.229	0.602	0.229

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No. *14* **Zone2-Above-GW-9**											
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		410.02	409.02	409.23	408.78	407.12	407.77	410.80	411.00	405.51	410.99
Initial Effective Stress, σ'_i (kPa /psf)		1,640	1,640	1,641	1,640	1,638	1,640	1,640	1,640	2,092	1,640
Final Effective Stress, σ'_f (kPa/psf)		4,577	4,628	4,593	4,606	4,777	4,694	4,604	4,621	5,079	4,620
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	*2.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		1,640	1,640	1,641	1,640	3,277	3,280	1,641	1,640	2,093	1,640
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.482	0.488	0.484	0.485	0.187	0.178	0.485	0.487	0.532	0.487
Secondary Settlement (m / ft)		0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.025	0.019
Total Settlement (m / ft)		0.502	0.507	0.503	0.505	0.206	0.198	0.504	0.506	0.556	0.506
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 14 (m / ft)		0.502	0.507	0.503	0.505	0.206	0.198	0.504	0.506	0.556	0.506
Layer No. *15* **Zone2-Above-GW-10**											
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		407.67	406.67	406.87	406.43	404.77	405.42	408.45	408.65	402.51	408.64
Initial Effective Stress, σ'_i (kPa /psf)		1,833	1,833	1,835	1,833	1,831	1,833	1,833	1,833	2,338	1,833
Final Effective Stress, σ'_f (kPa/psf)		4,770	4,821	4,787	4,799	4,969	4,887	4,797	4,814	5,325	4,813
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		1,833	1,833	1,835	1,833	1,831	1,833	1,834	1,833	2,339	1,833
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.450	0.455	0.451	0.452	0.469	0.461	0.452	0.454	0.493	0.454
Secondary Settlement (m / ft)		0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.025	0.019
Total Settlement (m / ft)		0.469	0.474	0.471	0.472	0.488	0.480	0.471	0.473	0.518	0.473
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 15 (m / ft)		0.469	0.474	0.471	0.472	0.488	0.480	0.471	0.473	0.518	0.473
Layer No. *16* **Zone2-Above-GW-11**											
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		405.31	404.32	404.52	404.08	402.42	403.06	406.10	406.29	399.51	406.29
Initial Effective Stress, σ'_i (kPa /psf)		2,026	2,026	2,028	2,026	2,024	2,026	2,026	2,026	2,584	2,026
Final Effective Stress, σ'_f (kPa/psf)		4,963	5,014	4,980	4,992	5,162	5,080	4,990	5,007	5,571	5,006
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,026	2,026	2,028	2,026	2,024	2,026	2,027	2,026	2,585	2,026
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.421	0.426	0.423	0.424	0.440	0.432	0.424	0.425	0.460	0.425
Secondary Settlement (m / ft)		0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.025	0.019
Total Settlement (m / ft)		0.441	0.445	0.442	0.443	0.459	0.451	0.443	0.445	0.485	0.445
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 16 (m / ft)		0.441	0.445	0.442	0.443	0.459	0.451	0.443	0.445	0.485	0.445

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No. *17* **Zone2-Above-GW-12**											
Initial Stress Reference Layer (top of layer)	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	402.96	401.96	402.16	401.72	400.07	400.71	403.74	403.94	396.51	403.93
Initial Effective Stress, σ'_i (kPa /psf)	2,219	2,219	2,221	2,219	2,217	2,219	2,219	2,219	2,831	2,219
Final Effective Stress, σ'_f (kPa/psf)	5,156	5,207	5,173	5,185	5,355	5,273	5,183	5,200	5,817	5,199
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,219	2,219	2,221	2,219	2,217	2,219	2,220	2,219	2,831	2,219
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.396	0.401	0.398	0.399	0.414	0.407	0.399	0.400	0.432	0.400
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.025	0.019
Total Settlement (m / ft)	0.416	0.420	0.417	0.418	0.434	0.426	0.418	0.420	0.456	0.420
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 17 (m / ft)	0.416	0.420	0.417	0.418	0.434	0.426	0.418	0.420	0.456	0.420
Layer No. *18* **Zone2-Above-GW-13**										
Initial Stress Reference Layer (top of layer)	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	400.61	399.61	399.81	399.37	397.72	398.36	401.39	401.59	393.51	401.58
Initial Effective Stress, σ'_i (kPa /psf)	2,412	2,412	2,414	2,412	2,409	2,412	2,412	2,412	3,077	2,412
Final Effective Stress, σ'_f (kPa/psf)	5,349	5,400	5,366	5,378	5,548	5,466	5,375	5,393	6,063	5,392
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,412	2,412	2,414	2,412	2,409	2,412	2,413	2,412	3,077	2,412
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.374	0.379	0.376	0.377	0.392	0.385	0.377	0.378	0.407	0.378
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.025	0.019
Total Settlement (m / ft)	0.394	0.398	0.395	0.396	0.411	0.404	0.396	0.398	0.431	0.397
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 18 (m / ft)	0.394	0.398	0.395	0.396	0.411	0.404	0.396	0.398	0.431	0.397
Layer No. *19* **Zone2-Above-GW-14**										
Initial Stress Reference Layer (top of layer)	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	398.26	397.26	397.45	397.02	395.37	396.00	399.04	399.23	390.51	399.23
Initial Effective Stress, σ'_i (kPa /psf)	2,605	2,605	2,607	2,605	2,602	2,604	2,605	2,605	3,323	2,605
Final Effective Stress, σ'_f (kPa/psf)	5,542	5,593	5,559	5,571	5,740	5,659	5,568	5,586	6,309	5,585
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,605	2,605	2,607	2,605	2,602	2,604	2,606	2,605	3,324	2,605
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.355	0.359	0.356	0.357	0.372	0.365	0.357	0.359	0.384	0.358
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.025	0.019
Total Settlement (m / ft)	0.374	0.379	0.376	0.377	0.391	0.384	0.376	0.378	0.409	0.378
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 19 (m / ft)	0.374	0.379	0.376	0.377	0.391	0.384	0.376	0.378	0.409	0.378

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No.	*20*	**Zone2-Above-GW-15**									
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		395.90	394.90	395.10	394.66	393.02	393.65	396.68	396.88	387.50	396.87
Initial Effective Stress, σ'_i (kPa /psf)		2,798	2,798	2,800	2,798	2,795	2,797	2,798	2,798	3,569	2,798
Final Effective Stress, σ'_f (kPa/psf)		5,735	5,786	5,752	5,764	5,933	5,852	5,761	5,779	6,556	5,778
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,798	2,798	2,800	2,798	2,795	2,797	2,799	2,798	3,570	2,798
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.337	0.342	0.339	0.340	0.354	0.347	0.339	0.341	0.365	0.341
Secondary Settlement (m / ft)		0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.025	0.019
Total Settlement (m / ft)		0.357	0.361	0.358	0.359	0.373	0.366	0.359	0.360	0.389	0.360
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 20 (m / ft)		0.357	0.361	0.358	0.359	0.373	0.366	0.359	0.360	0.389	0.360
Layer No.	*21*	**Zone2-Above-GW-16**									
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		393.55	392.55	392.74	392.31	390.67	391.30	394.33	394.53	384.50	394.52
Initial Effective Stress, σ'_i (kPa /psf)		2,991	2,991	2,993	2,991	2,987	2,990	2,991	2,990	3,815	2,991
Final Effective Stress, σ'_f (kPa/psf)		5,928	5,979	5,945	5,957	6,126	6,045	5,954	5,972	6,802	5,971
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,991	2,991	2,993	2,991	2,987	2,990	2,992	2,991	3,816	2,991
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.322	0.326	0.323	0.324	0.337	0.331	0.324	0.325	0.347	0.325
Secondary Settlement (m / ft)		0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.025	0.019
Total Settlement (m / ft)		0.341	0.345	0.342	0.343	0.357	0.350	0.343	0.344	0.371	0.344
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 21 (m / ft)		0.341	0.345	0.342	0.343	0.357	0.350	0.343	0.344	0.371	0.344
Layer No.	*22*	**Zone2-Above-GW-17**									
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		391.20	390.20	390.39	389.96	388.32	388.95	391.98	392.18	381.50	392.17
Initial Effective Stress, σ'_i (kPa /psf)		3,184	3,184	3,186	3,184	3,180	3,183	3,184	3,183	4,061	3,184
Final Effective Stress, σ'_f (kPa/psf)		6,121	6,172	6,138	6,150	6,319	6,238	6,147	6,165	7,048	6,164
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		3,184	3,184	3,186	3,184	3,180	3,183	3,185	3,184	4,062	3,184
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.307	0.311	0.308	0.309	0.322	0.316	0.309	0.311	0.330	0.311
Secondary Settlement (m / ft)		0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.019	0.025	0.019
Total Settlement (m / ft)		0.327	0.330	0.328	0.329	0.342	0.336	0.329	0.330	0.355	0.330
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 22 (m / ft)		0.327	0.330	0.328	0.329	0.342	0.336	0.329	0.330	0.355	0.330

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No.	*23*	**Zone3-Above-GW-1**									
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		390.02	389.02	389.21	388.78	387.14	387.77	390.80	391.00	380.00	390.99
Initial Effective Stress, σ'_i (kPa /psf)		3,280	3,280	3,283	3,280	3,277	3,280	3,280	3,280	4,184	3,281
Final Effective Stress, σ'_f (kPa/psf)		6,218	6,268	6,235	6,246	6,415	6,334	6,244	6,261	7,171	6,260
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		3,280	3,280	3,283	3,280	3,277	3,280	3,281	3,280	4,185	3,281
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*
Modified Recompression Index, $C_{r\varepsilon}$		*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 23 (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No.	*24*	**Zone3-Above-GW-2**									
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		390.02	389.02	389.21	388.78	387.14	387.77	390.80	391.00	380.00	390.99
Initial Effective Stress, σ'_i (kPa /psf)		3,280	3,280	3,283	3,280	3,277	3,280	3,280	3,280	4,184	3,281
Final Effective Stress, σ'_f (kPa/psf)		6,218	6,268	6,235	6,246	6,415	6,334	6,244	6,261	7,171	6,260
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		3,280	3,280	3,283	3,280	3,277	3,280	3,281	3,280	4,185	3,281
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*
Modified Recompression Index, $C_{r\varepsilon}$		*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 24 (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No.	*25*	**Zone2-Below-GW-18**									
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		386.27	385.52	385.66	385.34	384.11	384.58	386.85	388.25	380.00	388.24
Initial Effective Stress, σ'_i (kPa /psf)		3,353.78	3,349.03	3,352.55	3,347.87	3,336.09	3,342.23	3,357.79	3,333.73	4,184.32	3,334.57
Final Effective Stress, σ'_f (kPa/psf)		6,291.11	6,336.82	6,304.56	6,313.76	6,474.50	6,396.78	6,321.25	6,315.09	7,170.96	6,314.02
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		3,588	3,568	3,574	3,563	3,525	3,541	3,605	3,506	4,185	3,506
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.846	0.807	0.808	0.790	0.739	0.756	0.890	0.648	0.000	0.647
Secondary Settlement (m / ft)		0.062	0.058	0.058	0.057	0.050	0.052	0.065	0.045	0.000	0.045
Total Settlement (m / ft)		0.907	0.865	0.867	0.847	0.789	0.809	0.955	0.694	0.000	0.693
Elastic or Plastic (E/P)											
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 25 (m / ft)		0.907	0.865	0.867	0.847	0.789	0.809	0.955	0.694	0.000	0.693

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No. *26* **Zone2-Below-GW-19**											
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		378.76	378.51	378.55	378.45	378.04	378.19	378.95	382.75	380.00	382.75
Initial Effective Stress, σ'_i (kPa /psf)		3,500.97	3,486.42	3,491.81	3,482.92	3,455.06	3,467.37	3,512.63	3,441.53	4,184.32	3,442.27
Final Effective Stress, σ'_f (kPa/psf)		6,438.31	6,474.22	6,443.82	6,448.80	6,593.47	6,521.93	6,476.09	6,422.89	7,170.96	6,421.72
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		4,204	4,143	4,157	4,128	4,023	4,065	4,253	3,957	4,185	3,957
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.648	0.633	0.630	0.621	0.605	0.609	0.673	0.537	0.000	0.536
Secondary Settlement (m / ft)		0.062	0.058	0.058	0.057	0.050	0.052	0.065	0.045	0.000	0.045
Total Settlement (m / ft)		0.710	0.690	0.688	0.678	0.655	0.662	0.738	0.582	0.000	0.581
Elastic or Plastic (E/P)		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 26 (m / ft)		0.710	0.690	0.688	0.678	0.655	0.662	0.738	0.582	0.000	0.581
Layer No. *27* **Zone3-Below-GW-3**											
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		365.35	368.04	365.65	366.13	368.81	366.67	365.00	380.00	380.00	380.00
Initial Effective Stress, σ'_i (kPa /psf)		3,763.71	3,691.63	3,744.79	3,724.29	3,635.97	3,693.22	3,786.05	3,495.43	4,184.32	3,496.13
Final Effective Stress, σ'_f (kPa/psf)		6,701.05	6,679.43	6,696.81	6,690.18	6,774.38	6,747.77	6,749.51	6,476.79	7,170.96	6,475.57
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		4,701	4,566	4,631	4,584	4,394	4,490	4,773	4,182	4,185	4,182
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*
Modified Recompression Index, $C_{r\varepsilon}$		*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		1.168	0.901	1.175	1.140	0.907	1.150	1.186	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.122	0.088	0.118	0.112	0.078	0.105	0.126	0.000	0.000	0.000
Total Settlement (m / ft)		1.290	0.989	1.293	1.253	0.985	1.255	1.313	0.000	0.000	0.000
Elastic or Plastic (E/P)		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 27 (m / ft)		1.290	0.989	1.293	1.253	0.985	1.255	1.313	0.000	0.000	0.000

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

	Layer No.	Material										
LAYER SETTLEMENT	1	*Null Layer*										
	2	*Dredge*										
	3	*Gravel*										
	4	*Clay*										
	5	*Dike*										
	6	*Zone2-Above-GW-1*	0.955	0.963	0.957	0.959	0.984	0.973	0.955	0.961	1.084	0.961
	7	*Zone2-Above-GW-2*	0.467	0.475	0.470	0.471	0.496	0.484	0.470	0.473	0.473	0.473
	8	*Zone2-Above-GW-3*	0.255	0.261	0.256	0.258	0.282	0.270	0.257	0.260	0.209	0.260
	9	*Zone2-Above-GW-4*	0.122	0.129	0.124	0.126	0.148	0.137	0.125	0.128	0.519	0.127
	10	*Zone2-Above-GW-5*	0.398	0.404	0.400	0.402	0.422	0.412	0.401	0.403	0.405	0.403
	11	*Zone2-Above-GW-6*	0.327	0.333	0.329	0.330	0.350	0.341	0.330	0.332	0.320	0.332
	12	*Zone2-Above-GW-7*	0.271	0.276	0.272	0.274	0.293	0.284	0.273	0.275	0.253	0.275
	13	*Zone2-Above-GW-8*	0.224	0.230	0.226	0.228	0.246	0.237	0.227	0.229	0.602	0.229
	14	*Zone2-Above-GW-9*	0.502	0.507	0.503	0.505	0.206	0.198	0.504	0.506	0.556	0.506
	15	*Zone2-Above-GW-10*	0.469	0.474	0.471	0.472	0.488	0.480	0.471	0.473	0.518	0.473
	16	*Zone2-Above-GW-11*	0.441	0.445	0.442	0.443	0.459	0.451	0.443	0.445	0.485	0.445
	17	*Zone2-Above-GW-12*	0.416	0.420	0.417	0.418	0.434	0.426	0.418	0.420	0.456	0.420
	18	*Zone2-Above-GW-13*	0.394	0.398	0.395	0.396	0.411	0.404	0.396	0.398	0.431	0.397
	19	*Zone2-Above-GW-14*	0.374	0.379	0.376	0.377	0.391	0.384	0.376	0.378	0.409	0.378
	20	*Zone2-Above-GW-15*	0.357	0.361	0.358	0.359	0.373	0.366	0.359	0.360	0.389	0.360
	21	*Zone2-Above-GW-16*	0.341	0.345	0.342	0.343	0.357	0.350	0.343	0.344	0.371	0.344
	22	*Zone2-Above-GW-17*	0.327	0.330	0.328	0.329	0.342	0.336	0.329	0.330	0.355	0.330
	23	*Zone3-Above-GW-1*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	24	*Zone3-Above-GW-2*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	25	*Zone2-Below-GW-18*	0.907	0.865	0.867	0.847	0.789	0.809	0.955	0.694	0.000	0.693
	26	*Zone2-Below-GW-19*	0.710	0.690	0.688	0.678	0.655	0.662	0.738	0.582	0.000	0.581
	27	*Zone3-Below-GW-3*	1.290	0.989	1.293	1.253	0.985	1.255	1.313	0.000	0.000	0.000
	28											
	29	*Soil Above GW*										
	30	*Soil Below GW*										
		TOTAL SETTLEMENT	**9.55**	**9.27**	**9.51**	**9.47**	**9.11**	**9.26**	**9.68**	**7.99**	**7.84**	**7.99**
POST-SETTLEMENT ELEVATION(M/FT)	Line	1	453.45	453.15	452.83	452.53	452.64	452.46	454.32	456.35	456.58	456.34
	Line	2	453.45	453.15	452.83	452.53	452.64	452.46	454.32	456.35	456.58	456.34
	Line	3	423.45	423.15	422.83	422.53	422.64	422.46	424.32	426.35	426.58	426.34
	Line	4	422.22	421.73	421.49	421.25	420.89	420.74	422.92	425.01	425.16	425.01
	Line	5	420.48	419.75	419.74	419.32	418.03	418.51	421.12	423.01	423.19	423.01
	Line	6	420.48	419.75	419.73	419.32	417.99	418.51	421.12	423.01	423.19	423.01
	Line	7	419.08	418.36	418.33	417.92	416.62	417.13	419.72	421.61	421.27	421.62
	Line	8	417.19	416.48	416.45	416.04	414.77	415.26	417.84	419.73	418.75	419.74
	Line	9	415.09	414.39	414.35	413.95	412.70	413.18	415.74	417.64	415.95	417.64
	Line	10	412.86	412.16	412.12	411.72	410.50	410.96	413.52	415.42	413.47	415.42
	Line	11	410.91	410.22	410.16	409.77	408.57	409.02	411.56	413.47	410.87	413.47
	Line	12	408.88	408.19	408.14	407.74	406.57	407.01	409.54	411.45	408.19	411.45
	Line	13	406.80	406.12	406.05	405.67	404.51	404.94	407.46	409.37	405.44	409.37
	Line	14	404.67	403.99	403.93	403.54	402.41	402.82	405.33	407.25	403.04	407.24
	Line	15	402.82	402.15	402.07	401.69	400.26	400.67	403.49	405.40	400.60	405.40
	Line	16	400.94	400.27	400.19	399.81	398.40	398.80	401.60	403.52	398.11	403.52
	Line	17	399.02	398.36	398.28	397.90	396.51	396.89	399.69	401.61	395.60	401.61
	Line	18	397.09	396.43	396.34	395.96	394.59	394.97	397.76	399.68	393.05	399.67
	Line	19	395.13	394.47	394.38	394.01	392.65	393.02	395.80	397.72	390.48	397.72
	Line	20	393.15	392.50	392.40	392.03	390.69	391.05	393.82	395.75	387.89	395.74
	Line	21	391.15	390.51	390.40	390.04	388.71	389.06	391.83	393.76	385.28	393.75
	Line	22	389.14	388.50	388.39	388.03	386.72	387.06	389.82	391.75	382.65	391.74
	Line	23	387.11	386.48	386.36	386.00	384.71	385.04	387.79	389.72	380.00	389.72
	Line	24	387.11	386.48	386.36	386.00	384.71	385.04	387.79	389.72	380.00	389.72
	Line	25	387.11	386.48	386.36	386.00	384.71	385.04	387.79	389.72	380.00	389.72
	Line	26	380.51	380.33	380.12	379.96	379.43	379.47	380.85	384.92	380.00	384.91
	Line	27	373.71	374.01	373.71	373.75	374.01	373.75	373.69	380.00	380.00	380.00
	Line	28	355.70	361.07	356.29	357.26	362.61	358.34	355.00	380.00	380.00	380.00
	Line	29										
	Line	30										
	Line	31										

Attachment 3

CASE 2: Settlement Analysis for Top of Dredge Material in Geo-tubes at the End of the Operations Period (i.e., End of Year 4)
(Points 1001 to 1010)

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Settlement Prediction Model

Programmer: **Yiwen Cao, GeoSyntec Consultants**

Version Control V 1.002 11.14.2007

Project: **Onondaga Lake SCA Final**

Notes:

Unit: **ft / psf**

Average Compaction Effort = **1440.00** kPa or psf

Consider Compaction Effort = **N** yes or no

					1001	1002	1003	1004	1005	1006	1007	1008	1009	1010
Point #					1001	1002	1003	1004	1005	1006	1007	1008	1009	1010
Distance (meter or ft)					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ELEVATION (M/FT)	Line	1	Top of Year 4 Dredge		463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
	Line	2	Top of Year 4 Dredge		463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
	Line	3			463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
	Line	4			463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
	Line	5			463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
	Line	6			463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
	Line	7			463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
	Line	8	Top of Year 3 Dredge		463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
	Line	9			461.29	460.71	460.63	460.29	460.04	460.01	462.29	462.63	462.70	462.61
	Line	10			459.57	458.99	458.92	458.57	458.32	458.29	460.57	460.91	460.99	460.90
	Line	11			457.86	457.28	457.20	456.86	456.61	456.58	458.86	459.20	459.27	459.18
	Line	12			456.14	455.57	455.49	455.14	454.89	454.86	457.14	457.49	457.56	457.47
	Line	13			454.43	453.85	453.77	453.43	453.18	453.15	455.43	455.77	455.85	455.76
	Line	14			452.71	452.14	452.06	451.71	451.47	451.43	453.71	454.06	454.13	454.04
	Line	15	Top of Year 2 Dredge		451.00	450.42	450.35	450.00	449.75	449.72	452.00	452.34	452.42	452.33
	Line	16			451.00	450.42	450.35	450.00	449.75	449.72	450.34	449.77	449.85	449.76
	Line	17			451.00	450.42	450.35	450.00	449.75	449.72	448.68	447.20	447.27	447.18
	Line	18			451.00	450.42	450.35	450.00	449.75	449.72	447.03	444.63	444.70	444.61
	Line	19			451.00	450.42	450.35	450.00	449.75	449.72	445.37	442.06	442.13	442.04
	Line	20			451.00	450.42	450.35	450.00	449.75	449.72	443.71	439.49	439.56	439.47
	Line	21			451.00	450.42	450.35	450.00	449.75	449.72	442.05	436.91	436.99	436.90
	Line	22	Top of Year 1 Dredge		451.00	450.42	450.35	450.00	449.75	449.72	440.39	434.34	434.42	434.33
	Line	23			448.00	447.42	447.35	447.00	446.75	446.72	439.33	434.34	434.42	434.33
	Line	24			445.00	444.42	444.35	444.00	443.75	443.72	438.26	434.34	434.42	434.33
	Line	25			442.00	441.42	441.35	441.00	440.75	440.72	437.20	434.34	434.42	434.33
	Line	26			439.00	438.42	438.35	438.00	437.75	437.72	436.13	434.34	434.42	434.33
	Line	27			436.00	435.42	435.35	435.00	434.75	434.72	435.07	434.34	434.42	434.33
	Line	28	Top of Gravel(Top of Incompressil		433.00	432.42	432.35	432.00	431.75	431.72	434.00	434.34	434.42	434.33
	Line	29	GND	for sigma_p	430.02	429.02	429.25	428.78	427.10	427.77	430.81	431.00	431.04	431.00
	Line	30	GW		375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00
	Line	31	ROCK		355.70	361.07	356.29	357.26	362.61	358.34	355.00	380.00	380.00	380.00
LAYER THICKNESS (M/FT)	Layer No.	From	To	Material										
	1	1	2	Null Layer	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2	2	3	YR4-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3	3	4	YR4-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4	4	5	YR4-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5	5	6	YR4-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6	6	7	YR4-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7	7	8	YR4-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8	8	9	YR3-1	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	9	9	10	YR3-2	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	10	10	11	YR3-3	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	11	11	12	YR3-4	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	12	12	13	YR3-5	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	13	13	14	YR3-6	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	14	14	15	YR3-7	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	15	15	16	YR2-1	0.00	0.00	0.00	0.00	0.00	0.00	1.66	2.57	2.57	2.57
	16	16	17	YR2-2	0.00	0.00	0.00	0.00	0.00	0.00	1.66	2.57	2.57	2.57
	17	17	18	YR2-3	0.00	0.00	0.00	0.00	0.00	0.00	1.66	2.57	2.57	2.57
	18	18	19	YR2-4	0.00	0.00	0.00	0.00	0.00	0.00	1.66	2.57	2.57	2.57
	19	19	20	YR2-5	0.00	0.00	0.00	0.00	0.00	0.00	1.66	2.57	2.57	2.57
	20	20	21	YR2-6	0.00	0.00	0.00	0.00	0.00	0.00	1.66	2.57	2.57	2.57
	21	21	22	YR2-7	0.00	0.00	0.00	0.00	0.00	0.00	1.66	2.57	2.57	2.57
	22	22	23	YR1-1	3.00	3.00	3.00	3.00	3.00	3.00	1.07	0.00	0.00	0.00
	23	23	24	YR1-2	3.00	3.00	3.00	3.00	3.00	3.00	1.07	0.00	0.00	0.00
	24	24	25	YR1-3	3.00	3.00	3.00	3.00	3.00	3.00	1.07	0.00	0.00	0.00
	25	25	26	YR1-4	3.00	3.00	3.00	3.00	3.00	3.00	1.07	0.00	0.00	0.00
	26	26	27	YR1-5	3.00	3.00	3.00	3.00	3.00	3.00	1.07	0.00	0.00	0.00
	27	27	28	YR1-6	3.00	3.00	3.00	3.00	3.00	3.00	1.07	0.00	0.00	0.00
	28													
	29													
	30													
	Thickness Check													
		From Line	To Line	SUM	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
		1	28	Thickness =	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
				Thickness Check	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

UNIT WEIGHT	Layer No.	Material										
	1	*Null Layer*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
	2	*YR4-1*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	3	*YR4-2*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	4	*YR4-3*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	5	*YR4-4*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	6	*YR4-5*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	7	*YR4-6*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	8	*YR3-1*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	9	*YR3-2*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	10	*YR3-3*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	11	*YR3-4*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	12	*YR3-5*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	13	*YR3-6*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	14	*YR3-7*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	15	*YR2-1*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	16	*YR2-2*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	17	*YR2-3*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	18	*YR2-4*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	19	*YR2-5*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	20	*YR2-6*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	21	*YR2-7*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	22	*YR1-1*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	23	*YR1-2*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	24	*YR1-3*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	25	*YR1-4*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	26	*YR1-5*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	27	*YR1-6*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	28											
	29		*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	30	*Soil below GW*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*
	Layer No.	***1*** **Null Layer**										
		Initial Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
		Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
	Midpoint Elevation, (m / ft)		463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
	Initial Effective Stress, σ'_i (kPa /psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
	Final Effective Stress, σ'_f (kPa/psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method												
Modulus, E (kPa/psf)=		Strain										
		Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)												
Consolidation Properties												
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)												
OCR Manual Input Value												
OCR Computation Input												
Preconsolidation pressure, σ'_p (kPa / psf)												
Modified Primary Compression Index, $C_{c\varepsilon}$												
Modified Recompression Index, $C_{r\varepsilon}$												
Modified Secondary Compression Index, C_α												
ratio of t2 / t1												
Settlements												
Primary Settlement, (m / ft)												
Secondary Settlement (m / ft)												
Total Settlement (m / ft)												
		Elastic or Plastic (E/P)										
		Settlement of Layer 1 (m / ft)										

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No.	*2*	**YR4-1**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
Initial Effective Stress, σ'_i (kPa /psf)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Final Effective Stress, σ'_f (kPa/psf)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*
ratio of t2 / t1		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 2 (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No.	*3*	**YR4-2**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
Initial Effective Stress, σ'_i (kPa /psf)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Final Effective Stress, σ'_f (kPa/psf)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*
ratio of t2 / t1		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 3 (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No.	*4*	**YR4-3**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
Initial Effective Stress, σ'_i (kPa /psf)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Final Effective Stress, σ'_f (kPa/psf)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*
ratio of t2 / t1		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 4 (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No.	*5*	**YR4-4**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
Initial Effective Stress, σ'_i (kPa /psf)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Final Effective Stress, σ'_f (kPa/psf)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*
ratio of t2 / t1		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 5 (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No.	*6*	**YR4-5**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
Initial Effective Stress, σ'_i (kPa /psf)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Final Effective Stress, σ'_f (kPa/psf)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*
ratio of t2 / t1		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 6 (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No.	*7*	**YR4-6**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		463.00	462.42	462.35	462.00	461.75	461.72	464.00	464.34	464.42	464.33
Initial Effective Stress, σ'_i (kPa /psf)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Final Effective Stress, σ'_f (kPa/psf)		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*
ratio of t2 / t1		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)											
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 7 (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No. *8* **YR3-1**											
Initial Stress Reference Layer (top of layer)		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		462.14	461.57	461.49	461.14	460.89	460.86	463.14	463.49	463.56	463.47
Initial Effective Stress, σ'_i (kPa /psf)		73.71	73.71	73.71	73.71	73.71	73.71	73.71	73.71	73.71	73.71
Final Effective Stress, σ'_f (kPa/psf)		73.71	73.71	73.71	73.71	73.71	73.71	73.71	73.71	73.71	73.71
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		74	74	74	74	74	74	74	74	74	74
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*
ratio of t2 / t1		*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Total Settlement (m / ft)		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 8 (m / ft)		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Layer No. *9* **YR3-2**											
Initial Stress Reference Layer (top of layer)		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		460.43	459.85	459.77	459.43	459.18	459.15	461.43	461.77	461.85	461.76
Initial Effective Stress, σ'_i (kPa /psf)		221.14	221.14	221.14	221.14	221.14	221.14	221.14	221.14	221.14	221.14
Final Effective Stress, σ'_f (kPa/psf)		221.14	221.14	221.14	221.14	221.14	221.14	221.14	221.14	221.14	221.14
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		221	221	221	221	221	221	221	221	221	221
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*
ratio of t2 / t1		*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Total Settlement (m / ft)		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 9 (m / ft)		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Layer No. *10* **YR3-3**											
Initial Stress Reference Layer (top of layer)		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		458.71	458.14	458.06	457.71	457.47	457.43	459.71	460.06	460.13	460.04
Initial Effective Stress, σ'_i (kPa /psf)		368.57	368.57	368.57	368.57	368.57	368.57	368.57	368.57	368.57	368.57
Final Effective Stress, σ'_f (kPa/psf)		368.57	368.57	368.57	368.57	368.57	368.57	368.57	368.57	368.57	368.57
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		369	369	369	369	369	369	369	369	369	369
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*
ratio of t2 / t1		*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Total Settlement (m / ft)		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 10 (m / ft)		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No. *11* **YR3-4**											
Initial Stress Reference Layer (top of layer)	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	457.00	456.42	456.35	456.00	455.75	455.72	458.00	458.34	458.42	458.33
Initial Effective Stress, σ'_i (kPa /psf)	516.00	516.00	516.00	516.00	516.00	516.00	516.00	516.00	516.00	516.00
Final Effective Stress, σ'_f (kPa/psf)	516.00	516.00	516.00	516.00	516.00	516.00	516.00	516.00	516.00	516.00
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	516	516	516	516	516	516	516	516	516	516
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*
ratio of t2 / t1	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Total Settlement (m / ft)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 11 (m / ft)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Layer No. *12* **YR3-5**										
Initial Stress Reference Layer (top of layer)	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	455.29	454.71	454.63	454.29	454.04	454.01	456.29	456.63	456.70	456.61
Initial Effective Stress, σ'_i (kPa /psf)	663.43	663.43	663.43	663.43	663.43	663.43	663.43	663.43	663.43	663.43
Final Effective Stress, σ'_f (kPa/psf)	663.43	663.43	663.43	663.43	663.43	663.43	663.43	663.43	663.43	663.43
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	663	663	663	663	663	663	663	663	663	663
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*
ratio of t2 / t1	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Total Settlement (m / ft)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 12 (m / ft)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Layer No. *13* **YR3-6**										
Initial Stress Reference Layer (top of layer)	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	453.57	452.99	452.92	452.57	452.32	452.29	454.57	454.91	454.99	454.90
Initial Effective Stress, σ'_i (kPa /psf)	811	811	811	811	811	811	811	811	811	811
Final Effective Stress, σ'_f (kPa/psf)	811	811	811	811	811	811	811	811	811	811
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	811	811	811	811	811	811	811	811	811	811
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*
ratio of t2 / t1	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Total Settlement (m / ft)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 13 (m / ft)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No.	*14*	YR3-7									
Initial Stress Reference Layer (top of layer)	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	451.86	451.28	451.20	450.86	450.61	450.58	452.86	453.20	453.27	453.18
Initial Effective Stress, σ'_i (kPa /psf)	958	958	958	958	958	958	958	958	958	958
Final Effective Stress, σ'_f (kPa/psf)	958	958	958	958	958	958	958	958	958	958
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	958	958	958	958	958	958	958	958	958	958
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*	*0.08%*
ratio of t2 / t1	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Total Settlement (m / ft)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 14 (m / ft)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Layer No.	*15*	YR2-1									
Initial Stress Reference Layer (top of layer)	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	451.00	450.42	450.35	450.00	449.75	449.72	451.17	451.06	451.13	451.04
Initial Effective Stress, σ'_i (kPa /psf)	0	0	0	0	0	0	71	111	111	111
Final Effective Stress, σ'_f (kPa/psf)	1,032	1,032	1,032	1,032	1,032	1,032	1,103	1,143	1,143	1,143
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	71	111	111	111
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.575	0.760	0.760	0.760
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.012	0.012	0.012
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.582	0.772	0.772	0.772
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 15 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.582	0.772	0.772	0.772
Layer No.	*16*	YR2-2									
Initial Stress Reference Layer (top of layer)	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	451.00	450.42	450.35	450.00	449.75	449.72	449.51	448.49	448.56	448.47
Initial Effective Stress, σ'_i (kPa /psf)	0	0	0	0	0	0	214	332	332	332
Final Effective Stress, σ'_f (kPa/psf)	1,032	1,032	1,032	1,032	1,032	1,032	1,246	1,364	1,364	1,364
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	214	332	332	332
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.370	0.460	0.460	0.460
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.012	0.012	0.012
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.377	0.472	0.472	0.472
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 16 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.377	0.472	0.472	0.472

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No. *17* **YR2-3**											
Initial Stress Reference Layer (top of layer)	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	451.00	450.42	450.35	450.00	449.75	449.72	447.85	445.91	445.99	445.90
Initial Effective Stress, σ'_i (kPa /psf)	0	0	0	0	0	0	356	553	553	553
Final Effective Stress, σ'_f (kPa/psf)	1,032	1,032	1,032	1,032	1,032	1,032	1,388	1,585	1,585	1,585
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	356	553	553	553
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.285	0.343	0.343	0.343
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.012	0.012	0.012
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.293	0.355	0.355	0.355
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 17 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.293	0.355	0.355	0.355
Layer No. *18* **YR2-4**										
Initial Stress Reference Layer (top of layer)	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	451.00	450.42	450.35	450.00	449.75	449.72	446.20	443.34	443.42	443.33
Initial Effective Stress, σ'_i (kPa /psf)	0	0	0	0	0	0	499	774	774	774
Final Effective Stress, σ'_f (kPa/psf)	1,032	1,032	1,032	1,032	1,032	1,032	1,531	1,806	1,806	1,806
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	499	774	774	774
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.235	0.276	0.276	0.276
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.012	0.012	0.012
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.243	0.288	0.288	0.288
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 18 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.243	0.288	0.288	0.288
Layer No. *19* **YR2-5**										
Initial Stress Reference Layer (top of layer)	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	451.00	450.42	450.35	450.00	449.75	449.72	444.54	440.77	440.85	440.76
Initial Effective Stress, σ'_i (kPa /psf)	0	0	0	0	0	0	642	995	995	995
Final Effective Stress, σ'_f (kPa/psf)	1,032	1,032	1,032	1,032	1,032	1,032	1,674	2,027	2,027	2,027
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	642	995	995	995
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.201	0.231	0.231	0.231
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.012	0.012	0.012
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.209	0.243	0.243	0.243
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 19 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.209	0.243	0.243	0.243

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No. *20* **YR2-6**											
Initial Stress Reference Layer (top of layer)		*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		451.00	450.42	450.35	450.00	449.75	449.72	442.88	438.20	438.27	438.18
Initial Effective Stress, σ'_i (kPa /psf)		0	0	0	0	0	0	784	1,216	1,216	1,216
Final Effective Stress, σ'_f (kPa/psf)		1,032	1,032	1,032	1,032	1,032	1,032	1,816	2,248	2,248	2,248
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		0	0	0	0	0	0	784	1,216	1,216	1,216
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.176	0.200	0.200	0.200
Secondary Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.012	0.012	0.012
Total Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.184	0.212	0.212	0.212
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 20 (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.184	0.212	0.212	0.212
Layer No. *21* **YR2-7**											
Initial Stress Reference Layer (top of layer)		*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		451.00	450.42	450.35	450.00	449.75	449.72	441.22	435.63	435.70	435.61
Initial Effective Stress, σ'_i (kPa /psf)		0	0	0	0	0	0	927	1,437	1,437	1,437
Final Effective Stress, σ'_f (kPa/psf)		1,032	1,032	1,032	1,032	1,032	1,032	1,959	2,469	2,469	2,469
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		0	0	0	0	0	0	927	1,437	1,437	1,437
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.157	0.176	0.176	0.176
Secondary Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.008	0.012	0.012	0.012
Total Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.165	0.188	0.188	0.188
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 21 (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.165	0.188	0.188	0.188
Layer No. *22* **YR1-1**											
Initial Stress Reference Layer (top of layer)		*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		449.50	448.92	448.85	448.50	448.25	448.22	439.86	434.34	434.42	434.33
Initial Effective Stress, σ'_i (kPa /psf)		129	129	129	129	129	129	46	0	0	0
Final Effective Stress, σ'_f (kPa/psf)		1,161	1,161	1,161	1,161	1,161	1,161	2,076	2,580	2,580	2,580
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		129	129	129	129	129	129	46	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.834	0.834	0.834	0.834	0.834	0.834	0.514	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.016	0.016	0.016	0.016	0.016	0.016	0.006	0.000	0.000	0.000
Total Settlement (m / ft)		0.850	0.850	0.850	0.850	0.850	0.850	0.520	0.000	0.000	0.000
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 22 (m / ft)		0.850	0.850	0.850	0.850	0.850	0.850	0.520	0.000	0.000	0.000

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Layer No. *23* **YR1-2**											
Initial Stress Reference Layer (top of layer)	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	446.50	445.92	445.85	445.50	445.25	445.22	438.80	434.34	434.42	434.33
Initial Effective Stress, σ'_i (kPa /psf)	387	387	387	387	387	387	137	0	0	0
Final Effective Stress, σ'_f (kPa/psf)	1,419	1,419	1,419	1,419	1,419	1,419	2,168	2,580	2,580	2,580
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	387	387	387	387	387	387	137	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.493	0.493	0.493	0.493	0.493	0.493	0.372	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.016	0.016	0.016	0.016	0.016	0.016	0.006	0.000	0.000	0.000
Total Settlement (m / ft)	0.509	0.509	0.509	0.509	0.509	0.509	0.378	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 23 (m / ft)	0.509	0.509	0.509	0.509	0.509	0.509	0.378	0.000	0.000	0.000
Layer No. *24* **YR1-3**										
Initial Stress Reference Layer (top of layer)	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	443.50	442.92	442.85	442.50	442.25	442.22	437.73	434.34	434.42	434.33
Initial Effective Stress, σ'_i (kPa /psf)	645	645	645	645	645	645	229	0	0	0
Final Effective Stress, σ'_f (kPa/psf)	1,677	1,677	1,677	1,677	1,677	1,677	2,259	2,580	2,580	2,580
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	645	645	645	645	645	645	229	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.363	0.363	0.363	0.363	0.363	0.363	0.309	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.016	0.016	0.016	0.016	0.016	0.016	0.006	0.000	0.000	0.000
Total Settlement (m / ft)	0.379	0.379	0.379	0.379	0.379	0.379	0.314	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 24 (m / ft)	0.379	0.379	0.379	0.379	0.379	0.379	0.314	0.000	0.000	0.000
Layer No. *25* **YR1-4**										
Initial Stress Reference Layer (top of layer)	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	440.50	439.92	439.85	439.50	439.25	439.22	436.66	434.34	434.42	434.33
Initial Effective Stress, σ'_i (kPa /psf)	903.00	903.00	903.00	903.00	903.00	903.00	320.75	0.00	0.00	0.00
Final Effective Stress, σ'_f (kPa/psf)	1,935.00	1,935.00	1,935.00	1,935.00	1,935.00	1,935.00	2,350.90	2,580.00	2,580.00	2,580.00
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	903	903	903	903	903	903	321	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.289	0.289	0.289	0.289	0.289	0.289	0.269	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.016	0.016	0.016	0.016	0.016	0.016	0.006	0.000	0.000	0.000
Total Settlement (m / ft)	0.306	0.306	0.306	0.306	0.306	0.306	0.274	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 25 (m / ft)	0.306	0.306	0.306	0.306	0.306	0.306	0.274	0.000	0.000	0.000

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No.	*26*	**YR1-5**									
Initial Stress Reference Layer (top of layer)	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	437.50	436.92	436.85	436.50	436.25	436.22	435.60	434.34	434.42	434.33
Initial Effective Stress, σ'_i (kPa /psf)	1,161.00	1,161.00	1,161.00	1,161.00	1,161.00	1,161.00	412.39	0.00	0.00	0.00
Final Effective Stress, σ'_f (kPa/psf)	2,193.00	2,193.00	2,193.00	2,193.00	2,193.00	2,193.00	2,442.54	2,580.00	2,580.00	2,580.00
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	1,161	1,161	1,161	1,161	1,161	1,161	412	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.241	0.241	0.241	0.241	0.241	0.241	0.240	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.016	0.016	0.016	0.016	0.016	0.016	0.006	0.000	0.000	0.000
Total Settlement (m / ft)	0.258	0.258	0.258	0.258	0.258	0.258	0.246	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 26 (m / ft)	0.258	0.258	0.258	0.258	0.258	0.258	0.246	0.000	0.000	0.000
Layer No.	*27*	**YR1-6**									
Initial Stress Reference Layer (top of layer)	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	434.50	433.92	433.85	433.50	433.25	433.22	434.53	434.34	434.42	434.33
Initial Effective Stress, σ'_i (kPa /psf)	1,419.00	1,419.00	1,419.00	1,419.00	1,419.00	1,419.00	504.03	0.00	0.00	0.00
Final Effective Stress, σ'_f (kPa/psf)	2,451.00	2,451.00	2,451.00	2,451.00	2,451.00	2,451.00	2,534.18	2,580.00	2,580.00	2,580.00
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	1,419	1,419	1,419	1,419	1,419	1,419	504	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.207	0.207	0.207	0.207	0.207	0.207	0.218	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.016	0.016	0.016	0.016	0.016	0.016	0.006	0.000	0.000	0.000
Total Settlement (m / ft)	0.224	0.224	0.224	0.224	0.224	0.224	0.224	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 27 (m / ft)	0.224	0.224	0.224	0.224	0.224	0.224	0.224	0.000	0.000	0.000

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

LAYER SETTLEMENT	Layer No.	Material										
	1	*Null Layer*										
	2	*YR4-1*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3	*YR4-2*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	4	*YR4-3*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	5	*YR4-4*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	6	*YR4-5*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	7	*YR4-6*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	8	*YR3-1*	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	9	*YR3-2*	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	10	*YR3-3*	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	11	*YR3-4*	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	12	*YR3-5*	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	13	*YR3-6*	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	14	*YR3-7*	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
	15	*YR2-1*	0.000	0.000	0.000	0.000	0.000	0.000	0.582	0.772	0.772	0.772
	16	*YR2-2*	0.000	0.000	0.000	0.000	0.000	0.000	0.377	0.472	0.472	0.472
	17	*YR2-3*	0.000	0.000	0.000	0.000	0.000	0.000	0.293	0.355	0.355	0.355
	18	*YR2-4*	0.000	0.000	0.000	0.000	0.000	0.000	0.243	0.288	0.288	0.288
	19	*YR2-5*	0.000	0.000	0.000	0.000	0.000	0.000	0.209	0.243	0.243	0.243
	20	*YR2-6*	0.000	0.000	0.000	0.000	0.000	0.000	0.184	0.212	0.212	0.212
	21	*YR2-7*	0.000	0.000	0.000	0.000	0.000	0.000	0.165	0.188	0.188	0.188
	22	*YR1-1*	0.850	0.850	0.850	0.850	0.850	0.850	0.520	0.000	0.000	0.000
	23	*YR1-2*	0.509	0.509	0.509	0.509	0.509	0.509	0.378	0.000	0.000	0.000
	24	*YR1-3*	0.379	0.379	0.379	0.379	0.379	0.379	0.314	0.000	0.000	0.000
	25	*YR1-4*	0.306	0.306	0.306	0.306	0.306	0.306	0.274	0.000	0.000	0.000
	26	*YR1-5*	0.258	0.258	0.258	0.258	0.258	0.258	0.246	0.000	0.000	0.000
	27	*YR1-6*	0.224	0.224	0.224	0.224	0.224	0.224	0.224	0.000	0.000	0.000
	28	*Additional Foundation Settlement*	9.545	9.274	9.514	9.468	9.109	9.259	9.683	7.992	7.836	7.988
	29											
	30											
		TOTAL SETTLEMENT	**12.08**	**11.81**	**12.05**	**12.00**	**11.64**	**11.79**	**13.70**	**10.53**	**10.37**	**10.52**
POST-SETTLEMENT ELEVATION(M/FT)	Line	1 Top of Year 4 Dredge	450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
	Line	2 Top of Year 4 Dredge	450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
	Line	3	450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
	Line	4	450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
	Line	5	450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
	Line	6	450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
	Line	7	450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
	Line	8 Top of Year 3 Dredge	450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
	Line	9	449.21	448.90	448.59	448.29	448.40	448.22	448.59	452.10	452.33	452.09
	Line	10	447.50	447.19	446.87	446.57	446.69	446.50	446.88	450.39	450.62	450.38
	Line	11	445.78	445.48	445.16	444.86	444.97	444.79	445.16	448.67	448.91	448.66
	Line	12	444.07	443.76	443.45	443.15	443.26	443.08	443.45	446.96	447.19	446.95
	Line	13	442.36	442.05	441.73	441.43	441.54	441.36	441.74	445.25	445.48	445.24
	Line	14	440.64	440.34	440.02	439.72	439.83	439.65	440.02	443.53	443.76	443.52
	Line	15 Top of Year 2 Dredge	438.93	438.62	438.31	438.01	438.12	437.94	438.31	441.82	442.05	441.81
	Line	16	438.93	438.62	438.31	438.01	438.12	437.94	437.23	440.02	440.25	440.01
	Line	17	438.93	438.62	438.31	438.01	438.12	437.94	435.95	437.92	438.15	437.91
	Line	18	438.93	438.62	438.31	438.01	438.12	437.94	434.59	435.71	435.94	435.69
	Line	19	438.93	438.62	438.31	438.01	438.12	437.94	433.17	433.42	433.65	433.41
	Line	20	438.93	438.62	438.31	438.01	438.12	437.94	431.72	431.09	431.32	431.08
	Line	21	438.93	438.62	438.31	438.01	438.12	437.94	430.25	428.73	428.96	428.72
	Line	22 Top of Year 1 Dredge	438.93	438.62	438.31	438.01	438.12	437.94	428.76	426.35	426.58	426.34
	Line	23	436.78	436.47	436.16	435.86	435.97	435.79	428.21	426.35	426.58	426.34
	Line	24	434.29	433.98	433.67	433.37	433.48	433.30	427.52	426.35	426.58	426.34
	Line	25	431.67	431.36	431.04	430.75	430.86	430.67	426.77	426.35	426.58	426.34
	Line	26	428.97	428.67	428.35	428.05	428.16	427.98	425.98	426.35	426.58	426.34
	Line	27	426.23	425.92	425.61	425.31	425.42	425.24	425.16	426.35	426.58	426.34
	Line	28 Top of Gravel(Top of Incompressil	423.45	423.15	422.83	422.53	422.64	422.46	424.32	426.35	426.58	426.34
	Line	29										
	Line	30										
	Line	31										

Attachment 4

CASE 3: Settlement Analysis for Top of LPSL 30 Years after Closure (i.e., End of Year 35) (Points 1001 to 1010)

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Settlement Prediction Model

Programmer: **Yiwen Cao, GeoSyntec Consultants**

Version Control V 1.002 11.14.2007

Project: **Onondaga Lake SCA Final**

Notes:

Unit: **ft / psf**

Average Compaction Effort = **1440.00** kPa or psf

Consider Compaction Effort = **N** yes or no

Point #				**1001**	**1002**	**1003**	**1004**	**1005**	**1006**	**1007**	**1008**	**1009**	**1010**
Distance (meter or ft)				*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
ELEVATION (M/FT)	Line	1	Top of Final Cover	*455.76*	*454.88*	*455.64*	*455.51*	*454.68*	*455.50*	*456.35*	*457.00*	*457.01*	*457.01*
	Line	2	Top of Dredge	*450.92*	*450.62*	*450.30*	*450.00*	*450.11*	*449.93*	*450.30*	*453.82*	*454.05*	*453.80*
	Line	3	Top of Gravel	*423.45*	*423.15*	*422.83*	*422.53*	*422.64*	*422.46*	*424.32*	*426.35*	*426.58*	*426.34*
	Line	4	Top of Clay	*422.22*	*421.73*	*421.49*	*421.25*	*420.89*	*420.74*	*422.92*	*425.01*	*425.16*	*425.01*
	Line	5	Top of Dike	*420.48*	*419.75*	*419.74*	*419.32*	*418.03*	*418.51*	*421.12*	*423.01*	*423.19*	*423.01*
	Line	6	Top of Subgrade	*420.48*	*419.75*	*419.73*	*419.32*	*417.99*	*418.51*	*421.12*	*423.01*	*423.19*	*423.01*
	Line	7		*418.52*	*417.79*	*417.77*	*417.36*	*416.03*	*416.54*	*419.16*	*421.05*	*420.65*	*421.05*
	Line	8		*416.55*	*415.84*	*415.80*	*415.40*	*414.07*	*414.57*	*417.20*	*419.09*	*418.11*	*419.09*
	Line	9		*414.59*	*413.88*	*413.84*	*413.44*	*412.12*	*412.60*	*415.24*	*417.14*	*415.57*	*417.14*
	Line	10		*412.63*	*411.92*	*411.88*	*411.48*	*410.16*	*410.63*	*413.28*	*415.18*	*413.03*	*415.18*
	Line	11		*410.67*	*409.96*	*409.92*	*409.52*	*408.20*	*408.67*	*411.32*	*413.22*	*410.49*	*413.22*
	Line	12		*408.70*	*408.01*	*407.95*	*407.56*	*406.24*	*406.70*	*409.36*	*411.26*	*407.95*	*411.26*
	Line	13		*406.74*	*406.05*	*405.99*	*405.60*	*404.29*	*404.73*	*407.40*	*409.30*	*405.41*	*409.30*
	Line	14		*404.78*	*404.09*	*404.03*	*403.64*	*402.33*	*402.76*	*405.44*	*407.34*	*402.87*	*407.34*
	Line	15		*402.81*	*402.14*	*402.06*	*401.68*	*400.37*	*400.79*	*403.47*	*405.39*	*400.32*	*405.39*
	Line	16		*400.85*	*400.18*	*400.10*	*399.72*	*398.41*	*398.82*	*401.51*	*403.43*	*397.78*	*403.43*
	Line	17		*398.89*	*398.22*	*398.14*	*397.76*	*396.46*	*396.85*	*399.55*	*401.47*	*395.24*	*401.47*
	Line	18		*396.92*	*396.27*	*396.17*	*395.80*	*394.50*	*394.88*	*397.59*	*399.51*	*392.70*	*399.51*
	Line	19		*394.96*	*394.31*	*394.21*	*393.84*	*392.54*	*392.92*	*395.63*	*397.55*	*390.16*	*397.55*
	Line	20		*393.00*	*392.35*	*392.25*	*391.88*	*390.58*	*390.95*	*393.67*	*395.59*	*387.62*	*395.59*
	Line	21		*391.04*	*390.39*	*390.29*	*389.92*	*388.63*	*388.98*	*391.71*	*393.64*	*385.08*	*393.64*
	Line	22		*389.07*	*388.44*	*388.32*	*387.96*	*386.67*	*387.01*	*389.75*	*391.68*	*382.54*	*391.68*
	Line	23	Bottom of Zone2 Above GW	*387.11*	*386.48*	*386.36*	*386.00*	*384.71*	*385.04*	*387.79*	*389.72*	*380.00*	*389.72*
	Line	24		*387.11*	*386.48*	*386.36*	*386.00*	*384.71*	*385.04*	*387.79*	*389.72*	*380.00*	*389.72*
	Line	25	Bottom of Zone 3 Above GW	*387.11*	*386.48*	*386.36*	*386.00*	*384.71*	*385.04*	*387.79*	*389.72*	*380.00*	*389.72*
	Line	26		*380.41*	*380.25*	*380.04*	*379.88*	*379.36*	*379.40*	*380.74*	*384.86*	*380.00*	*384.86*
	Line	27	Bottom of Zone 2 Below GW	*373.71*	*374.01*	*373.71*	*373.75*	*374.01*	*373.75*	*373.69*	*380.00*	*380.00*	*380.00*
	Line	28	Top of Incompressible Layer	*355.70*	*361.07*	*356.29*	*357.26*	*362.61*	*358.34*	*355.00*	*380.00*	*380.00*	*380.00*
	Line	29	GND for sigma_p	*430.02*	*429.02*	*429.25*	*428.78*	*427.10*	*427.77*	*430.81*	*431.00*	*431.04*	*431.00*
	Line	30	GW	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*
	Line	31	ROCK	*355.70*	*361.07*	*356.29*	*357.26*	*362.61*	*358.34*	*355.00*	*380.00*	*380.00*	*380.00*
LAYER THICKNESS (M/FT)	Layer No.	From	To / Material										
	1	*1*	*2* *Cover*	*4.84*	*4.26*	*5.34*	*5.51*	*4.57*	*5.57*	*6.05*	*3.18*	*2.96*	*3.21*
	2	*2*	*3* *Dredge*	*27.47*	*27.47*	*27.47*	*27.47*	*27.47*	*27.47*	*25.98*	*27.47*	*27.47*	*27.46*
	3	*3*	*4* *Gravel*	*1.23*	*1.42*	*1.34*	*1.28*	*1.75*	*1.72*	*1.40*	*1.34*	*1.42*	*1.33*
	4	*4*	*5* *Clay*	*1.74*	*1.98*	*1.75*	*1.93*	*2.86*	*2.23*	*1.80*	*2.00*	*1.97*	*2.00*
	5	*5*	*6* *Dike*	*0.00*	*0.00*	*0.01*	*0.00*	*0.04*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	6	*6*	*7* *Zone2-Above-GW-1*	*1.96*	*1.96*	*1.96*	*1.96*	*1.96*	*1.97*	*1.96*	*1.96*	*2.54*	*1.96*
	7	*7*	*8* *Zone2-Above-GW-2*	*1.96*	*1.96*	*1.96*	*1.96*	*1.96*	*1.97*	*1.96*	*1.96*	*2.54*	*1.96*
	8	*8*	*9* *Zone2-Above-GW-3*	*1.96*	*1.96*	*1.96*	*1.96*	*1.96*	*1.97*	*1.96*	*1.96*	*2.54*	*1.96*
	9	*9*	*10* *Zone2-Above-GW-4*	*1.96*	*1.96*	*1.96*	*1.96*	*1.96*	*1.97*	*1.96*	*1.96*	*2.54*	*1.96*
	10	*10*	*11* *Zone2-Above-GW-5*	*1.96*	*1.96*	*1.96*	*1.96*	*1.96*	*1.97*	*1.96*	*1.96*	*2.54*	*1.96*
	11	*11*	*12* *Zone2-Above-GW-6*	*1.96*	*1.96*	*1.96*	*1.96*	*1.96*	*1.97*	*1.96*	*1.96*	*2.54*	*1.96*
	12	*12*	*13* *Zone2-Above-GW-7*	*1.96*	*1.96*	*1.96*	*1.96*	*1.96*	*1.97*	*1.96*	*1.96*	*2.54*	*1.96*
	13	*13*	*14* *Zone2-Above-GW-8*	*1.96*	*1.96*	*1.96*	*1.96*	*1.96*	*1.97*	*1.96*	*1.96*	*2.54*	*1.96*
	14	*14*	*15* *Zone2-Above-GW-9*	*1.96*	*1.96*	*1.96*	*1.96*	*1.96*	*1.97*	*1.96*	*1.96*	*2.54*	*1.96*
	15	*15*	*16* *Zone2-Above-GW-10*	*1.96*	*1.96*	*1.96*	*1.96*	*1.96*	*1.97*	*1.96*	*1.96*	*2.54*	*1.96*
	16	*16*	*17* *Zone2-Above-GW-11*	*1.96*	*1.96*	*1.96*	*1.96*	*1.96*	*1.97*	*1.96*	*1.96*	*2.54*	*1.96*
	17	*17*	*18* *Zone2-Above-GW-12*	*1.96*	*1.96*	*1.96*	*1.96*	*1.96*	*1.97*	*1.96*	*1.96*	*2.54*	*1.96*
	18	*18*	*19* *Zone2-Above-GW-13*	*1.96*	*1.96*	*1.96*	*1.96*	*1.96*	*1.97*	*1.96*	*1.96*	*2.54*	*1.96*
	19	*19*	*20* *Zone2-Above-GW-14*	*1.96*	*1.96*	*1.96*	*1.96*	*1.96*	*1.97*	*1.96*	*1.96*	*2.54*	*1.96*
	20	*20*	*21* *Zone2-Above-GW-15*	*1.96*	*1.96*	*1.96*	*1.96*	*1.96*	*1.97*	*1.96*	*1.96*	*2.54*	*1.96*
	21	*21*	*22* *Zone2-Above-GW-16*	*1.96*	*1.96*	*1.96*	*1.96*	*1.96*	*1.97*	*1.96*	*1.96*	*2.54*	*1.96*
	22	*22*	*23* *Zone2-Above-GW-17*	*1.96*	*1.96*	*1.96*	*1.96*	*1.96*	*1.97*	*1.96*	*1.96*	*2.54*	*1.96*
	23	*23*	*24* *Zone3-Above-GW-1*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	24	*24*	*25* *Zone3-Above-GW-2*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	25	*25*	*26* *Zone2-Below-GW-18*	*6.70*	*6.24*	*6.33*	*6.13*	*5.35*	*5.65*	*7.05*	*4.86*	*0.00*	*4.86*
	26	*26*	*27* *Zone2-Below-GW-19*	*6.70*	*6.24*	*6.32*	*6.13*	*5.35*	*5.64*	*7.05*	*4.86*	*0.00*	*4.86*
	27	*27*	*28* *Zone3-Below-GW-3*	*18.01*	*12.94*	*17.42*	*16.49*	*11.40*	*15.41*	*18.69*	*0.00*	*0.00*	*0.00*
	28												
	29	*29*	*30* Soil Above GW	*55.02*	*54.02*	*54.25*	*53.78*	*52.10*	*52.77*	*55.81*	*56.00*	*56.04*	*56.00*
	30	*30*	*31* Soil Below GW	*19.30*	*13.93*	*18.71*	*17.74*	*12.39*	*16.66*	*20.00*	*-5.00*	*-5.00*	*-5.00*
	Thickness Check												
		From Line	To Line / SUM	*100.06*	*93.81*	*99.35*	*98.25*	*92.07*	*97.16*	*101.35*	*77.00*	*77.01*	*77.01*
		1	*28* Thickness =	*100.06*	*93.81*	*99.35*	*98.25*	*92.07*	*97.16*	*101.35*	*77.00*	*77.01*	*77.01*
			Thickness Check	***OK***	***OK***	***OK***	***OK***	***OK***	***OK***	***OK***	***OK***	***OK***	***OK***

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

UNIT WEIGHT	Layer No.	Material										
	1	*Cover*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*
	2	*Dredge*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	3	*Gravel*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*
	4	*Clay*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*
	5	*Dike*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*
	6	*Zone2-Above-GW-1*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	7	*Zone2-Above-GW-2*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	8	*Zone2-Above-GW-3*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	9	*Zone2-Above-GW-4*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	10	*Zone2-Above-GW-5*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	11	*Zone2-Above-GW-6*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	12	*Zone2-Above-GW-7*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	13	*Zone2-Above-GW-8*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	14	*Zone2-Above-GW-9*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	15	*Zone2-Above-GW-10*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	16	*Zone2-Above-GW-11*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	17	*Zone2-Above-GW-12*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	18	*Zone2-Above-GW-13*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	19	*Zone2-Above-GW-14*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	20	*Zone2-Above-GW-15*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	21	*Zone2-Above-GW-16*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	22	*Zone2-Above-GW-17*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	23	*Zone3-Above-GW-1*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	24	*Zone3-Above-GW-2*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	25	*Zone2-Below-GW-18*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*
	26	*Zone2-Below-GW-19*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*
	27	*Zone3-Below-GW-3*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*
	28											
	29	*Soil Above GW*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	30	*Soil below GW*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*
	Layer No.	***1*** **Cover**										
		Initial Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
		Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
	Midpoint Elevation, (m / ft)		453.34	452.75	452.97	452.76	452.40	452.72	453.33	455.41	455.53	455.41
	Initial Effective Stress, σ'_i (kPa /psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
	Final Effective Stress, σ'_f (kPa/psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method												
Modulus, E (kPa/psf)=		Strain										
		Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)												
Consolidation Properties												
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)												
OCR Manual Input Value												
OCR Computation Input												
Preconsolidation pressure, σ'_p (kPa / psf)												
Modified Primary Compression Index, $C_{c\varepsilon}$												
Modified Recompression Index, $C_{r\varepsilon}$												
Modified Secondary Compression Index, C_α												
ratio of t2 / t1												
Settlements												
Primary Settlement, (m / ft)												
Secondary Settlement (m / ft)												
Total Settlement (m / ft)												
		Elastic or Plastic (E/P)										
		Settlement of Layer 1 (m / ft)										

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Layer No. *2* **Dredge**											
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Midpoint Elevation, (m / ft)		437.19	436.89	436.57	436.27	436.38	436.20	437.31	440.09	440.32	440.07
Initial Effective Stress, σ'_i (kPa /psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Final Effective Stress, σ'_f (kPa/psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)											
OCR Manual Input Value											
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)											
Modified Primary Compression Index, $C_{c\varepsilon}$											
Modified Recompression Index, $C_{r\varepsilon}$											
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$											
ratio of t2 / t1											
Settlements											
Primary Settlement, (m / ft)											
Secondary Settlement (m / ft)											
Total Settlement (m / ft)											
Elastic or Plastic (E/P)											
Settlement of Layer 2 (m / ft)											
Layer No. *3* **Gravel**											
Initial Stress Reference Layer (top of layer)		*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
Final Stress Reference Layer (top of layer)		*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
Midpoint Elevation, (m / ft)		422.84	422.44	422.16	421.89	421.77	421.60	423.62	425.68	425.87	425.68
Initial Effective Stress, σ'_i (kPa /psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Final Effective Stress, σ'_f (kPa/psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)											
OCR Manual Input Value											
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)											
Modified Primary Compression Index, $C_{c\varepsilon}$											
Modified Recompression Index, $C_{r\varepsilon}$											
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$											
ratio of t2 / t1											
Settlements											
Primary Settlement, (m / ft)											
Secondary Settlement (m / ft)											
Total Settlement (m / ft)											
Elastic or Plastic (E/P)											
Settlement of Layer 3 (m / ft)											
Layer No. *4* **Clay**											
Initial Stress Reference Layer (top of layer)		*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Final Stress Reference Layer (top of layer)		*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Midpoint Elevation, (m / ft)		421.35	420.74	420.62	420.29	419.46	419.63	422.02	424.01	424.18	424.01
Initial Effective Stress, σ'_i (kPa /psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Final Effective Stress, σ'_f (kPa/psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)											
OCR Manual Input Value											
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)											
Modified Primary Compression Index, $C_{c\varepsilon}$											
Modified Recompression Index, $C_{r\varepsilon}$											
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$											
ratio of t2 / t1											
Settlements											
Primary Settlement, (m / ft)											
Secondary Settlement (m / ft)											
Total Settlement (m / ft)											
Elastic or Plastic (E/P)											
Settlement of Layer 4 (m / ft)											

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Layer No.	*5*	**Dike**									
Initial Stress Reference Layer (top of layer)	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
Final Stress Reference Layer (top of layer)	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*	*5*
Midpoint Elevation, (m / ft)	420.48	419.75	419.74	419.32	418.01	418.51	421.12	423.01	423.19	423.01
Initial Effective Stress, σ'_i (kPa /psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Final Effective Stress, σ'_f (kPa/psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)										
OCR Manual Input Value										
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)										
Modified Primary Compression Index, $C_{c\varepsilon}$										
Modified Recompression Index, $C_{r\varepsilon}$										
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$										
ratio of t2 / t1										
Settlements										
Primary Settlement, (m / ft)										
Secondary Settlement (m / ft)										
Total Settlement (m / ft)										
Elastic or Plastic (E/P)										
Settlement of Layer 5 (m / ft)										
Layer No.	*6*	**Zone2-Above-GW-1**									
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	419.50	418.77	418.75	418.34	417.01	417.53	420.14	422.03	421.92	422.03
Initial Effective Stress, σ'_i (kPa /psf)	2,799.30	2,850.66	2,814.90	2,827.98	3,000.68	2,917.14	2,698.66	2,843.51	2,873.38	2,841.45
Final Effective Stress, σ'_f (kPa/psf)	3,380.10	3,361.86	3,455.70	3,489.18	3,549.08	3,585.54	3,424.66	3,225.11	3,228.58	3,226.65
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*4.5*	*4.5*	*4.5*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	1,726	1,681	1,722	1,713	1,654	1,679	1,750	3,310	3,364	3,310
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.11%*	*0.11%*	*0.11%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.074	0.064	0.080	0.082	0.066	0.081	0.093	0.001	0.002	0.002
Secondary Settlement (m / ft)	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.002	0.003	0.002
Total Settlement (m / ft)	0.091	0.081	0.097	0.099	0.082	0.098	0.110	0.004	0.004	0.004
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 6 (m / ft)	0.091	0.081	0.097	0.099	0.082	0.098	0.110	0.004	0.004	0.004
Layer No.	*7*	**Zone2-Above-GW-2**									
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	417.54	416.81	416.79	416.38	415.05	415.56	418.18	420.07	419.38	420.07
Initial Effective Stress, σ'_i (kPa /psf)	2,960.26	3,011.14	2,975.86	2,988.70	3,161.21	3,078.59	2,859.43	3,004.08	3,081.71	3,002.02
Final Effective Stress, σ'_f (kPa/psf)	3,541.06	3,522.34	3,616.66	3,649.90	3,709.61	3,746.99	3,585.43	3,385.68	3,436.91	3,387.22
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,048	2,002	2,043	2,034	1,975	2,002	2,072	1,792	1,912	1,792
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.070	0.061	0.076	0.078	0.063	0.077	0.089	0.047	0.055	0.047
Secondary Settlement (m / ft)	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.022	0.017
Total Settlement (m / ft)	0.087	0.078	0.093	0.095	0.079	0.094	0.105	0.064	0.077	0.064
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 7 (m / ft)	0.087	0.078	0.093	0.095	0.079	0.094	0.105	0.064	0.077	0.064

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No.	*8*	**Zone2-Above-GW-3**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		415.57	414.86	414.82	414.42	413.10	413.59	416.22	418.11	416.84	418.11
Initial Effective Stress, σ'_i (kPa /psf)		3,121.22	3,171.62	3,136.82	3,149.42	3,321.74	3,240.03	3,020.20	3,164.66	3,290.04	3,162.60
Final Effective Stress, σ'_f (kPa/psf)		3,702.02	3,682.82	3,777.62	3,810.62	3,870.14	3,908.43	3,746.20	3,546.26	3,645.24	3,547.80
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,370	2,323	2,365	2,356	2,296	2,325	2,394	2,113	2,328	2,113
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.067	0.058	0.073	0.075	0.060	0.074	0.084	0.045	0.052	0.045
Secondary Settlement (m / ft)		0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.022	0.017
Total Settlement (m / ft)		0.084	0.075	0.090	0.091	0.077	0.091	0.101	0.061	0.074	0.062
Elastic or Plastic (E/P)		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 8 (m / ft)		0.084	0.075	0.090	0.091	0.077	0.091	0.101	0.061	0.074	0.062
Layer No.	*9*	**Zone2-Above-GW-4**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		413.61	412.90	412.86	412.46	411.14	411.62	414.26	416.16	414.30	416.16
Initial Effective Stress, σ'_i (kPa /psf)		3,282.18	3,332.10	3,297.78	3,310.14	3,482.26	3,401.47	3,180.97	3,325.23	3,498.37	3,323.17
Final Effective Stress, σ'_f (kPa/psf)		3,862.98	3,843.30	3,938.58	3,971.34	4,030.66	4,069.87	3,906.97	3,706.83	3,853.57	3,708.37
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,692	2,644	2,687	2,677	2,617	2,648	2,715	2,434	2,745	2,434
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.064	0.056	0.070	0.071	0.057	0.071	0.081	0.043	0.049	0.043
Secondary Settlement (m / ft)		0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.022	0.017
Total Settlement (m / ft)		0.081	0.073	0.086	0.088	0.074	0.087	0.097	0.059	0.071	0.060
Elastic or Plastic (E/P)		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 9 (m / ft)		0.081	0.073	0.086	0.088	0.074	0.087	0.097	0.059	0.071	0.060
Layer No.	*10*	**Zone2-Above-GW-5**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		411.65	410.94	410.90	410.50	409.18	409.65	412.30	414.20	411.76	414.20
Initial Effective Stress, σ'_i (kPa /psf)		3,443.15	3,492.57	3,458.75	3,470.86	3,642.79	3,562.92	3,341.74	3,485.81	3,706.70	3,483.75
Final Effective Stress, σ'_f (kPa/psf)		4,023.95	4,003.77	4,099.55	4,132.06	4,191.19	4,231.32	4,067.74	3,867.41	4,061.90	3,868.95
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		3,014	2,965	3,009	2,999	2,939	2,971	3,037	2,756	3,162	2,756
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.061	0.053	0.067	0.068	0.055	0.068	0.077	0.041	0.046	0.041
Secondary Settlement (m / ft)		0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.022	0.017
Total Settlement (m / ft)		0.078	0.070	0.083	0.085	0.072	0.085	0.094	0.057	0.068	0.058
Elastic or Plastic (E/P)		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 10 (m / ft)		0.078	0.070	0.083	0.085	0.072	0.085	0.094	0.057	0.068	0.058

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No.	*11*	**Zone2-Above-GW-6**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		409.68	408.99	408.93	408.54	407.22	407.68	410.34	412.24	409.22	412.24
Initial Effective Stress, σ'_i (kPa /psf)		3,604.11	3,653.05	3,619.71	3,631.58	3,803.32	3,724.36	3,502.51	3,646.38	3,915.03	3,644.32
Final Effective Stress, σ'_f (kPa/psf)		4,184.91	4,164.25	4,260.51	4,292.78	4,351.72	4,392.76	4,228.51	4,027.98	4,270.23	4,029.52
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	*1.0*	*1.0*	*2.0*	*1.0*	*2.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		1,668	1,643	1,666	1,660	3,260	1,647	1,679	3,077	1,789	3,077
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.059	0.051	0.064	0.065	0.053	0.065	0.074	0.039	0.044	0.039
Secondary Settlement (m / ft)		0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.022	0.017
Total Settlement (m / ft)		0.075	0.068	0.081	0.082	0.069	0.082	0.091	0.056	0.066	0.056
Elastic or Plastic (E/P)		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 11 (m / ft)		0.075	0.068	0.081	0.082	0.069	0.082	0.091	0.056	0.066	0.056
Layer No.	*12*	**Zone2-Above-GW-7**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		407.72	407.03	406.97	406.58	405.27	405.71	408.38	410.28	406.68	410.28
Initial Effective Stress, σ'_i (kPa /psf)		3,765.07	3,813.53	3,780.67	3,792.30	3,963.85	3,885.80	3,663.27	3,806.96	4,123.35	3,804.90
Final Effective Stress, σ'_f (kPa/psf)		4,345.87	4,324.73	4,421.47	4,453.50	4,512.25	4,554.20	4,389.27	4,188.56	4,478.55	4,190.10
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		1,829	1,804	1,827	1,821	1,790	1,808	1,840	1,699	1,998	1,699
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.056	0.049	0.061	0.063	0.051	0.062	0.071	0.037	0.042	0.038
Secondary Settlement (m / ft)		0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.022	0.017
Total Settlement (m / ft)		0.073	0.066	0.078	0.080	0.067	0.079	0.088	0.054	0.064	0.055
Elastic or Plastic (E/P)		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 12 (m / ft)		0.073	0.066	0.078	0.080	0.067	0.079	0.088	0.054	0.064	0.055
Layer No.	*13*	**Zone2-Above-GW-8**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		405.76	405.07	405.01	404.62	403.31	403.74	406.42	408.32	404.14	408.32
Initial Effective Stress, σ'_i (kPa /psf)		3,926	3,974	3,942	3,953	4,124	4,047	3,824	3,968	4,332	3,965
Final Effective Stress, σ'_f (kPa/psf)		4,507	4,485	4,582	4,614	4,673	4,716	4,550	4,349	4,687	4,351
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		1,990	1,964	1,987	1,981	1,951	1,970	2,001	1,859	2,206	1,859
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.054	0.047	0.059	0.061	0.049	0.060	0.068	0.036	0.040	0.036
Secondary Settlement (m / ft)		0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.022	0.017
Total Settlement (m / ft)		0.071	0.064	0.076	0.077	0.066	0.077	0.085	0.053	0.062	0.053
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 13 (m / ft)		0.071	0.064	0.076	0.077	0.066	0.077	0.085	0.053	0.062	0.053

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No.	*14*	**Zone2-Above-GW-9**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		403.80	403.12	403.05	402.66	401.35	401.78	404.46	406.37	401.60	406.37
Initial Effective Stress, σ'_i (kPa /psf)		4,087	4,134	4,103	4,114	4,285	4,209	3,985	4,128	4,540	4,126
Final Effective Stress, σ'_f (kPa/psf)		4,668	4,646	4,743	4,775	4,833	4,877	4,711	4,510	4,895	4,511
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,151	2,125	2,148	2,142	2,111	2,131	2,161	2,020	2,414	2,020
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.052	0.046	0.057	0.058	0.047	0.058	0.066	0.035	0.038	0.035
Secondary Settlement (m / ft)		0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.022	0.017
Total Settlement (m / ft)		0.069	0.062	0.074	0.075	0.064	0.075	0.082	0.051	0.060	0.052
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 14 (m / ft)		0.069	0.062	0.074	0.075	0.064	0.075	0.082	0.051	0.060	0.052
Layer No.	*15*	**Zone2-Above-GW-10**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		401.83	401.16	401.08	400.70	399.39	399.81	402.49	404.41	399.05	404.41
Initial Effective Stress, σ'_i (kPa /psf)		4,248	4,295	4,264	4,274	4,445	4,370	4,146	4,289	4,748	4,287
Final Effective Stress, σ'_f (kPa/psf)		4,829	4,806	4,904	4,936	4,994	5,039	4,872	4,670	5,104	4,672
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,312	2,285	2,309	2,303	2,272	2,293	2,322	2,181	2,623	2,181
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.050	0.044	0.055	0.056	0.045	0.056	0.063	0.033	0.037	0.034
Secondary Settlement (m / ft)		0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.022	0.017
Total Settlement (m / ft)		0.067	0.061	0.072	0.073	0.062	0.073	0.080	0.050	0.058	0.050
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 15 (m / ft)		0.067	0.061	0.072	0.073	0.062	0.073	0.080	0.050	0.058	0.050
Layer No.	*16*	**Zone2-Above-GW-11**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		399.87	399.20	399.12	398.74	397.43	397.84	400.53	402.45	396.51	402.45
Initial Effective Stress, σ'_i (kPa /psf)		4,409	4,455	4,425	4,435	4,606	4,532	4,306	4,449	4,957	4,447
Final Effective Stress, σ'_f (kPa/psf)		4,990	4,967	5,065	5,096	5,154	5,200	5,032	4,831	5,312	4,832
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,473	2,445	2,470	2,464	2,432	2,454	2,483	2,341	2,831	2,341
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.049	0.042	0.053	0.054	0.044	0.054	0.061	0.032	0.035	0.032
Secondary Settlement (m / ft)		0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.022	0.017
Total Settlement (m / ft)		0.065	0.059	0.070	0.071	0.061	0.071	0.078	0.049	0.057	0.049
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 16 (m / ft)		0.065	0.059	0.070	0.071	0.061	0.071	0.078	0.049	0.057	0.049

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Layer No. *17* **Zone2-Above-GW-12**											
Initial Stress Reference Layer (top of layer)		2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)		1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)		397.91	397.24	397.16	396.78	395.48	395.87	398.57	400.49	393.97	400.49
Initial Effective Stress, σ'_i (kPa /psf)		4,570	4,616	4,585	4,596	4,766	4,693	4,467	4,610	5,165	4,608
Final Effective Stress, σ'_f (kPa/psf)		5,151	5,127	5,226	5,257	5,315	5,361	5,193	4,991	5,520	4,993
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
OCR Manual Input Value		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,634	2,606	2,631	2,624	2,593	2,616	2,644	2,502	3,039	2,502
Modified Primary Compression Index, $C_{c\varepsilon}$		0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460
Modified Recompression Index, $C_{r\varepsilon}$		0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%
ratio of t2 / t1		8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75
Settlements											
Primary Settlement, (m / ft)		0.047	0.041	0.051	0.053	0.043	0.052	0.059	0.031	0.034	0.031
Secondary Settlement (m / ft)		0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.022	0.017
Total Settlement (m / ft)		0.064	0.058	0.068	0.069	0.059	0.069	0.076	0.048	0.056	0.048
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 17 (m / ft)		0.064	0.058	0.068	0.069	0.059	0.069	0.076	0.048	0.056	0.048
Layer No. *18* **Zone2-Above-GW-13**											
Initial Stress Reference Layer (top of layer)		2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)		1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)		395.94	395.29	395.19	394.82	393.52	393.90	396.61	398.53	391.43	398.53
Initial Effective Stress, σ'_i (kPa /psf)		4,731	4,776	4,746	4,757	4,927	4,854	4,628	4,770	5,373	4,768
Final Effective Stress, σ'_f (kPa/psf)		5,312	5,288	5,387	5,418	5,475	5,523	5,354	5,152	5,729	5,154
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
OCR Manual Input Value		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,794	2,766	2,792	2,785	2,753	2,777	2,804	2,662	3,248	2,662
Modified Primary Compression Index, $C_{c\varepsilon}$		0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460
Modified Recompression Index, $C_{r\varepsilon}$		0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%
ratio of t2 / t1		8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75
Settlements											
Primary Settlement, (m / ft)		0.045	0.040	0.050	0.051	0.041	0.051	0.057	0.030	0.032	0.030
Secondary Settlement (m / ft)		0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.022	0.017
Total Settlement (m / ft)		0.062	0.057	0.066	0.068	0.058	0.068	0.074	0.047	0.054	0.047
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 18 (m / ft)		0.062	0.057	0.066	0.068	0.058	0.068	0.074	0.047	0.054	0.047
Layer No. *19* **Zone2-Above-GW-14**											
Initial Stress Reference Layer (top of layer)		2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)		1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)		393.98	393.33	393.23	392.86	391.56	391.93	394.65	396.57	388.89	396.57
Initial Effective Stress, σ'_i (kPa /psf)		4,892	4,937	4,907	4,917	5,088	5,016	4,789	4,931	5,582	4,929
Final Effective Stress, σ'_f (kPa/psf)		5,473	5,448	5,548	5,579	5,636	5,684	5,515	5,313	5,937	5,314
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
OCR Manual Input Value		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,955	2,927	2,953	2,946	2,914	2,938	2,965	2,823	3,456	2,823
Modified Primary Compression Index, $C_{c\varepsilon}$		0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460
Modified Recompression Index, $C_{r\varepsilon}$		0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%
ratio of t2 / t1		8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75
Settlements											
Primary Settlement, (m / ft)		0.044	0.039	0.048	0.049	0.040	0.049	0.055	0.029	0.031	0.029
Secondary Settlement (m / ft)		0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.022	0.017
Total Settlement (m / ft)		0.061	0.055	0.065	0.066	0.057	0.066	0.072	0.046	0.053	0.046
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 19 (m / ft)		0.061	0.055	0.065	0.066	0.057	0.066	0.072	0.046	0.053	0.046

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Layer No.	*20*	**Zone2-Above-GW-15**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		392.02	391.37	391.27	390.90	389.60	389.96	392.69	394.62	386.35	394.62
Initial Effective Stress, σ'_i (kPa /psf)		5,053	5,097	5,068	5,078	5,248	5,177	4,949	5,092	5,790	5,090
Final Effective Stress, σ'_f (kPa/psf)		5,634	5,609	5,709	5,739	5,796	5,846	5,675	5,473	6,145	5,475
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		3,116	3,087	3,114	3,107	3,075	3,100	3,126	2,984	3,664	2,984
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.043	0.037	0.047	0.048	0.039	0.048	0.054	0.028	0.030	0.029
Secondary Settlement (m / ft)		0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.022	0.017
Total Settlement (m / ft)		0.059	0.054	0.064	0.065	0.056	0.065	0.070	0.045	0.052	0.045
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 20 (m / ft)		0.059	0.054	0.064	0.065	0.056	0.065	0.070	0.045	0.052	0.045
Layer No.	*21*	**Zone2-Above-GW-16**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		390.05	389.42	389.30	388.94	387.65	387.99	390.73	392.66	383.81	392.66
Initial Effective Stress, σ'_i (kPa /psf)		5,214	5,258	5,229	5,239	5,409	5,339	5,110	5,252	5,998	5,250
Final Effective Stress, σ'_f (kPa/psf)		5,795	5,769	5,870	5,900	5,957	6,007	5,836	5,634	6,354	5,635
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		3,277	3,248	3,275	3,267	3,235	3,261	3,287	3,144	3,873	3,144
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.041	0.036	0.045	0.047	0.038	0.046	0.052	0.027	0.029	0.028
Secondary Settlement (m / ft)		0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.022	0.017
Total Settlement (m / ft)		0.058	0.053	0.062	0.063	0.055	0.063	0.069	0.044	0.051	0.044
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 21 (m / ft)		0.058	0.053	0.062	0.063	0.055	0.063	0.069	0.044	0.051	0.044
Layer No.	*22*	**Zone2-Above-GW-17**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		388.09	387.46	387.34	386.98	385.69	386.02	388.77	390.70	381.27	390.70
Initial Effective Stress, σ'_i (kPa /psf)		5,375	5,418	5,390	5,399	5,569	5,500	5,271	5,413	6,207	5,411
Final Effective Stress, σ'_f (kPa/psf)		5,955	5,930	6,031	6,061	6,118	6,169	5,997	5,794	6,562	5,796
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		3,438	3,408	3,436	3,428	3,396	3,423	3,448	3,305	4,081	3,305
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.040	0.035	0.044	0.045	0.037	0.045	0.051	0.027	0.028	0.027
Secondary Settlement (m / ft)		0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.017	0.022	0.017
Total Settlement (m / ft)		0.057	0.052	0.061	0.062	0.054	0.062	0.067	0.043	0.050	0.044
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 22 (m / ft)		0.057	0.052	0.061	0.062	0.054	0.062	0.067	0.043	0.050	0.044

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No.	*23*	**Zone3-Above-GW-1**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		387.11	386.48	386.36	386.00	384.71	385.04	387.79	389.72	380.00	389.72
Initial Effective Stress, σ'_i (kPa /psf)		5,455	5,499	5,471	5,480	5,649	5,581	5,351	5,493	6,311	5,491
Final Effective Stress, σ'_f (kPa/psf)		6,036	6,010	6,112	6,141	6,198	6,249	6,077	5,875	6,666	5,876
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		3,519	3,489	3,517	3,508	3,476	3,504	3,528	3,385	4,185	3,385
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*
Modified Recompression Index, $C_{r\varepsilon}$		*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 23 (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No.	*24*	**Zone3-Above-GW-2**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		387.11	386.48	386.36	386.00	384.71	385.04	387.79	389.72	380.00	389.72
Initial Effective Stress, σ'_i (kPa /psf)		5,455	5,499	5,471	5,480	5,649	5,581	5,351	5,493	6,311	5,491
Final Effective Stress, σ'_f (kPa/psf)		6,036	6,010	6,112	6,141	6,198	6,249	6,077	5,875	6,666	5,876
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		3,519	3,489	3,517	3,508	3,476	3,504	3,528	3,385	4,185	3,385
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*
Modified Recompression Index, $C_{r\varepsilon}$		*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)		p	p	p	p	p	p	p	p	p	p
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 24 (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No.	*25*	**Zone2-Below-GW-18**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		383.76	383.36	383.20	382.94	382.04	382.22	384.27	387.29	380.00	387.29
Initial Effective Stress, σ'_i (kPa /psf)		5,520.82	5,559.66	5,532.75	5,539.89	5,701.81	5,636.28	5,420.43	5,540.63	6,310.80	5,538.57
Final Effective Stress, σ'_f (kPa/psf)		6,101.62	6,070.86	6,173.54	6,201.09	6,250.21	6,304.68	6,146.43	5,922.23	6,666.00	5,923.77
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		3,794	3,744	3,776	3,759	3,695	3,735	3,817	3,584	4,185	3,584
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.134	0.110	0.138	0.138	0.098	0.126	0.177	0.065	0.000	0.065
Secondary Settlement (m / ft)		0.057	0.053	0.054	0.053	0.046	0.048	0.060	0.042	0.000	0.042
Total Settlement (m / ft)		0.191	0.163	0.193	0.190	0.144	0.175	0.237	0.106	0.000	0.107
Elastic or Plastic (E/P)											
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 25 (m / ft)		0.191	0.163	0.193	0.190	0.144	0.175	0.237	0.106	0.000	0.107

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No. *26* **Zone2-Below-GW-19**											
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		377.06	377.13	376.87	376.81	376.69	376.57	377.22	382.43	380.00	382.43
Initial Effective Stress, σ'_i (kPa /psf)		5,652.14	5,681.87	5,656.72	5,659.94	5,806.67	5,746.92	5,558.61	5,635.88	6,310.80	5,633.82
Final Effective Stress, σ'_f (kPa/psf)		6,232.94	6,193.07	6,297.51	6,321.14	6,355.07	6,415.32	6,284.61	6,017.48	6,666.00	6,019.02
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		4,343	4,256	4,295	4,262	4,134	4,198	4,395	3,983	4,185	3,983
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.131	0.107	0.136	0.135	0.096	0.124	0.173	0.064	0.000	0.064
Secondary Settlement (m / ft)		0.057	0.053	0.054	0.053	0.046	0.048	0.060	0.042	0.000	0.042
Total Settlement (m / ft)		0.188	0.161	0.190	0.188	0.142	0.172	0.233	0.105	0.000	0.106
Elastic or Plastic (E/P)		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 26 (m / ft)		0.188	0.161	0.190	0.188	0.142	0.172	0.233	0.105	0.000	0.106
Layer No. *27* **Zone3-Below-GW-3**											
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		364.71	367.54	365.00	365.51	368.31	366.05	364.35	380.00	380.00	380.00
Initial Effective Stress, σ'_i (kPa /psf)		5,894.30	5,869.78	5,889.42	5,881.56	5,970.82	5,953.26	5,810.86	5,683.51	6,310.80	5,681.45
Final Effective Stress, σ'_f (kPa/psf)		6,475.10	6,380.98	6,530.22	6,542.76	6,519.22	6,621.66	6,536.86	6,065.11	6,666.00	6,066.65
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		4,714	4,576	4,644	4,596	4,403	4,502	4,786	4,182	4,185	4,182
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*
Modified Recompression Index, $C_{r\varepsilon}$		*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.279	0.178	0.297	0.290	0.165	0.271	0.363	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.119	0.085	0.115	0.109	0.075	0.102	0.123	0.000	0.000	0.000
Total Settlement (m / ft)		0.398	0.264	0.412	0.399	0.240	0.372	0.486	0.000	0.000	0.000
Elastic or Plastic (E/P)		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 27 (m / ft)		0.398	0.264	0.412	0.399	0.240	0.372	0.486	0.000	0.000	0.000

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

	Layer No.	Material										
LAYER SETTLEMENT	1	*Cover*										
	2	*Dredge*										
	3	*Gravel*										
	4	*Clay*										
	5	*Dike*										
	6	*Zone2-Above-GW-1*	0.091	0.081	0.097	0.099	0.082	0.098	0.110	0.004	0.004	0.004
	7	*Zone2-Above-GW-2*	0.087	0.078	0.093	0.095	0.079	0.094	0.105	0.064	0.077	0.064
	8	*Zone2-Above-GW-3*	0.084	0.075	0.090	0.091	0.077	0.091	0.101	0.061	0.074	0.062
	9	*Zone2-Above-GW-4*	0.081	0.073	0.086	0.088	0.074	0.087	0.097	0.059	0.071	0.060
	10	*Zone2-Above-GW-5*	0.078	0.070	0.083	0.085	0.072	0.085	0.094	0.057	0.068	0.058
	11	*Zone2-Above-GW-6*	0.075	0.068	0.081	0.082	0.069	0.082	0.091	0.056	0.066	0.056
	12	*Zone2-Above-GW-7*	0.073	0.066	0.078	0.080	0.067	0.079	0.088	0.054	0.064	0.055
	13	*Zone2-Above-GW-8*	0.071	0.064	0.076	0.077	0.066	0.077	0.085	0.053	0.062	0.053
	14	*Zone2-Above-GW-9*	0.069	0.062	0.074	0.075	0.064	0.075	0.082	0.051	0.060	0.052
	15	*Zone2-Above-GW-10*	0.067	0.061	0.072	0.073	0.062	0.073	0.080	0.050	0.058	0.050
	16	*Zone2-Above-GW-11*	0.065	0.059	0.070	0.071	0.061	0.071	0.078	0.049	0.057	0.049
	17	*Zone2-Above-GW-12*	0.064	0.058	0.068	0.069	0.059	0.069	0.076	0.048	0.056	0.048
	18	*Zone2-Above-GW-13*	0.062	0.057	0.066	0.068	0.058	0.068	0.074	0.047	0.054	0.047
	19	*Zone2-Above-GW-14*	0.061	0.055	0.065	0.066	0.057	0.066	0.072	0.046	0.053	0.046
	20	*Zone2-Above-GW-15*	0.059	0.054	0.064	0.065	0.056	0.065	0.070	0.045	0.052	0.045
	21	*Zone2-Above-GW-16*	0.058	0.053	0.062	0.063	0.055	0.063	0.069	0.044	0.051	0.044
	22	*Zone2-Above-GW-17*	0.057	0.052	0.061	0.062	0.054	0.062	0.067	0.043	0.050	0.044
	23	*Zone3-Above-GW-1*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	24	*Zone3-Above-GW-2*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	25	*Zone2-Below-GW-18*	0.191	0.163	0.193	0.190	0.144	0.175	0.237	0.106	0.000	0.107
	26	*Zone2-Below-GW-19*	0.188	0.161	0.190	0.188	0.142	0.172	0.233	0.105	0.000	0.106
	27	*Zone3-Below-GW-3*	0.398	0.264	0.412	0.399	0.240	0.372	0.486	0.000	0.000	0.000
	28											
	29	*Soil Above GW*										
	30	*Soil Below GW*										
		TOTAL SETTLEMENT	**1.98**	**1.67**	**2.08**	**2.09**	**1.64**	**2.02**	**2.40**	**1.04**	**0.98**	**1.05**
POST-SETTLEMENT ELEVATION(M/FT)	Line	1	453.78	453.21	453.56	453.42	453.04	453.48	453.95	455.96	456.03	455.96
	Line	2	448.94	448.95	448.22	447.91	448.47	447.91	447.90	452.78	453.07	452.75
	Line	3	421.47	421.48	420.75	420.44	421.00	420.44	421.92	425.31	425.60	425.29
	Line	4	420.24	420.06	419.41	419.16	419.25	418.72	420.52	423.97	424.18	423.96
	Line	5	418.50	418.08	417.66	417.23	416.39	416.49	418.72	421.97	422.21	421.96
	Line	6	418.50	418.08	417.65	417.23	416.35	416.49	418.72	421.97	422.21	421.96
	Line	7	416.63	416.20	415.78	415.37	414.48	414.62	416.87	420.01	419.68	420.01
	Line	8	414.75	414.32	413.91	413.51	412.60	412.74	415.02	418.12	417.21	418.11
	Line	9	412.87	412.44	412.04	411.64	410.72	410.86	413.16	416.22	414.75	416.21
	Line	10	410.99	410.55	410.16	409.77	408.83	408.98	411.29	414.32	412.28	414.32
	Line	11	409.11	408.67	408.28	407.89	406.95	407.10	409.43	412.42	409.80	412.42
	Line	12	407.22	406.78	406.40	406.01	405.06	405.21	407.56	410.52	407.33	410.51
	Line	13	405.33	404.89	404.52	404.13	403.17	403.32	405.69	408.61	404.85	408.61
	Line	14	403.44	402.99	402.63	402.25	401.28	401.43	403.81	406.71	402.37	406.70
	Line	15	401.54	401.10	400.74	400.37	399.38	399.53	401.93	404.80	399.89	404.80
	Line	16	399.65	399.20	398.85	398.48	397.49	397.64	400.05	402.89	397.41	402.89
	Line	17	397.75	397.31	396.96	396.59	395.59	395.74	398.17	400.98	394.93	400.98
	Line	18	395.85	395.41	395.06	394.70	393.69	393.84	396.28	399.07	392.44	399.07
	Line	19	393.95	393.51	393.17	392.81	391.79	391.94	394.40	397.16	389.96	397.16
	Line	20	392.05	391.60	391.27	390.91	389.89	390.04	392.51	395.25	387.47	395.25
	Line	21	390.14	389.70	389.37	389.02	387.99	388.13	390.62	393.34	384.98	393.34
	Line	22	388.24	387.80	387.47	387.12	386.09	386.23	388.73	391.42	382.49	391.42
	Line	23	386.33	385.89	385.57	385.22	384.18	384.32	386.83	389.51	380.00	389.51
	Line	24	386.33	385.89	385.57	385.22	384.18	384.32	386.83	389.51	380.00	389.51
	Line	25	386.33	385.89	385.57	385.22	384.18	384.32	386.83	389.51	380.00	389.51
	Line	26	379.82	379.82	379.43	379.29	378.98	378.85	380.02	384.75	380.00	384.75
	Line	27	373.31	373.75	373.30	373.35	373.77	373.38	373.20	380.00	380.00	380.00
	Line	28	355.70	361.07	356.29	357.26	362.61	358.34	355.00	380.00	380.00	380.00
	Line	29										
	Line	30										
	Line	31										

Written by:	Yiwen Cao	Date:	12/17/2009	Reviewed by:	R. Kulasingam/Jay Beech	Date:	12/17/2009
Client:	Honeywell	Project:	Onondaga Lake SCA Final Design	Project/ Proposal No.:	GJ4299	Task No.:	04

Attachment 5

CASE 4: Settlement Analysis for Top of Final Cover 30 Years after Closure (i.e., End of Year 35)
(Points 1001 to 1010)

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Settlement Prediction Model

Programmer: **Yiwen Cao, GeoSyntec Consultants**

Version Control V 1.002 11.14.2007

Project: **Onondaga Lake SCA Final**

Notes:

Unit: **ft / psf**

Average Compaction Effort = **1440.00** kPa or psf

Consider Compaction Effort = **N** yes or no

					1001	1002	1003	1004	1005	1006	1007	1008	1009	1010
Point #					1001	1002	1003	1004	1005	1006	1007	1008	1009	1010
Distance (meter or ft)					0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
ELEVATION (M/FT)	Line	1	Top of Final Cover		455.76	454.88	455.64	455.51	454.68	455.50	456.35	457.00	457.01	457.01
	Line	2	Top of Year 4 Dredge		450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
	Line	3			450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
	Line	4			450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
	Line	5			450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
	Line	6			450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
	Line	7			450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
	Line	8	Top of Year 3 Dredge		450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
	Line	9			449.21	448.91	448.59	448.29	448.40	448.22	448.59	452.11	452.34	452.09
	Line	10			447.49	447.19	446.87	446.57	446.68	446.50	446.87	450.39	450.62	450.37
	Line	11			445.78	445.48	445.16	444.86	444.97	444.79	445.16	448.68	448.91	448.66
	Line	12			444.07	443.76	443.45	443.15	443.26	443.08	443.45	446.96	447.19	446.95
	Line	13			442.36	442.05	441.74	441.44	441.55	441.37	441.74	445.25	445.48	445.24
	Line	14			440.64	440.33	440.02	439.72	439.83	439.65	440.02	443.53	443.76	443.52
	Line	15	Top of Year 2 Dredge		438.93	438.62	438.31	438.01	438.12	437.94	438.31	441.82	442.05	441.81
	Line	16			438.93	438.62	438.31	438.01	438.12	437.94	436.95	439.61	439.84	439.60
	Line	17			438.93	438.62	438.31	438.01	438.12	437.94	435.58	437.40	437.63	437.39
	Line	18			438.93	438.62	438.31	438.01	438.12	437.94	434.22	435.19	435.42	435.18
	Line	19			438.93	438.62	438.31	438.01	438.12	437.94	432.85	432.98	433.21	432.97
	Line	20			438.93	438.62	438.31	438.01	438.12	437.94	431.49	430.77	431.00	430.76
	Line	21			438.93	438.62	438.31	438.01	438.12	437.94	430.12	428.56	428.79	428.55
	Line	22	Top of Year 1 Dredge		438.93	438.62	438.31	438.01	438.12	437.94	428.76	426.35	426.58	426.34
	Line	23			436.35	436.04	435.73	435.43	435.54	435.36	428.02	426.35	426.58	426.34
	Line	24			433.77	433.46	433.15	432.85	432.96	432.78	427.28	426.35	426.58	426.34
	Line	25			431.19	430.89	430.57	430.27	430.38	430.20	426.54	426.35	426.58	426.34
	Line	26			428.61	428.31	427.99	427.69	427.80	427.62	425.80	426.35	426.58	426.34
	Line	27			426.03	425.73	425.41	425.11	425.22	425.04	425.06	426.35	426.58	426.34
	Line	28	Top of Gravel(Top of Incompressil		423.45	423.15	422.83	422.53	422.64	422.46	424.32	426.35	426.58	426.34
	Line	29	GND	for sigma_p	430.02	429.02	429.25	428.78	427.10	427.77	430.81	431.00	431.04	431.00
	Line	30	GW		375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00
	Line	31	ROCK		355.70	361.07	356.29	357.26	362.61	358.34	355.00	380.00	380.00	380.00
LAYER THICKNESS (M/FT)	Layer No.	From	To	Material										
	1	1	2	Cover	4.84	4.26	5.34	5.51	4.57	5.57	6.05	3.18	2.96	3.21
	2	2	3	YR4-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3	3	4	YR4-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4	4	5	YR4-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5	5	6	YR4-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6	6	7	YR4-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7	7	8	YR4-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8	8	9	YR3-1	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	9	9	10	YR3-2	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	10	10	11	YR3-3	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	11	11	12	YR3-4	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	12	12	13	YR3-5	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	13	13	14	YR3-6	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	14	14	15	YR3-7	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	15	15	16	YR2-1	0.00	0.00	0.00	0.00	0.00	0.00	1.36	2.21	2.21	2.21
	16	16	17	YR2-2	0.00	0.00	0.00	0.00	0.00	0.00	1.36	2.21	2.21	2.21
	17	17	18	YR2-3	0.00	0.00	0.00	0.00	0.00	0.00	1.36	2.21	2.21	2.21
	18	18	19	YR2-4	0.00	0.00	0.00	0.00	0.00	0.00	1.36	2.21	2.21	2.21
	19	19	20	YR2-5	0.00	0.00	0.00	0.00	0.00	0.00	1.36	2.21	2.21	2.21
	20	20	21	YR2-6	0.00	0.00	0.00	0.00	0.00	0.00	1.36	2.21	2.21	2.21
	21	21	22	YR2-7	0.00	0.00	0.00	0.00	0.00	0.00	1.36	2.21	2.21	2.21
	22	22	23	YR1-1	2.58	2.58	2.58	2.58	2.58	2.58	0.74	0.00	0.00	0.00
	23	23	24	YR1-2	2.58	2.58	2.58	2.58	2.58	2.58	0.74	0.00	0.00	0.00
	24	24	25	YR1-3	2.58	2.58	2.58	2.58	2.58	2.58	0.74	0.00	0.00	0.00
	25	25	26	YR1-4	2.58	2.58	2.58	2.58	2.58	2.58	0.74	0.00	0.00	0.00
	26	26	27	YR1-5	2.58	2.58	2.58	2.58	2.58	2.58	0.74	0.00	0.00	0.00
	27	27	28	YR1-6	2.58	2.58	2.58	2.58	2.58	2.58	0.74	0.00	0.00	0.00
	28													
	29													
	30													
	Thickness Check													
		From Line	To Line	SUM	32.31	31.73	32.81	32.98	32.04	33.04	32.03	30.65	30.43	30.67
		1	28	Thickness =	32.31	31.73	32.81	32.98	32.04	33.04	32.03	30.65	30.43	30.67
				Thickness Check	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

	Layer No.	Material										
UNIT WEIGHT	1	*Cover*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*
	2	*YR4-1*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	3	*YR4-2*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	4	*YR4-3*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	5	*YR4-4*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	6	*YR4-5*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	7	*YR4-6*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	8	*YR3-1*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	9	*YR3-2*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	10	*YR3-3*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	11	*YR3-4*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	12	*YR3-5*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	13	*YR3-6*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	14	*YR3-7*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	15	*YR2-1*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	16	*YR2-2*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	17	*YR2-3*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	18	*YR2-4*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	19	*YR2-5*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	20	*YR2-6*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	21	*YR2-7*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	22	*YR1-1*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	23	*YR1-2*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	24	*YR1-3*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	25	*YR1-4*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	26	*YR1-5*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	27	*YR1-6*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	28											
	29		*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	30	*Soil below GW*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*
	Layer No.	***1*** **Cover**										
		Initial Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
		Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
		Midpoint Elevation, (m / ft)	453.34	452.75	452.97	452.76	452.40	452.72	453.33	455.41	455.53	455.40
		Initial Effective Stress, σ'_i (kPa /psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
		Final Effective Stress, σ'_f (kPa/psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method												
Modulus, E (kPa/psf)=		Strain										
		Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)												
Consolidation Properties												
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)												
OCR Manual Input Value												
OCR Computation Input												
Preconsolidation pressure, σ'_p (kPa / psf)												
Modified Primary Compression Index, $C_{c\varepsilon}$												
Modified Recompression Index, $C_{r\varepsilon}$												
Modified Secondary Compression Index, C_α												
ratio of t2 / t1												
Settlements												
Primary Settlement, (m / ft)												
Secondary Settlement (m / ft)												
Total Settlement (m / ft)												
		Elastic or Plastic (E/P)										
		Settlement of Layer 1 (m / ft)										

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No.	*2*	**YR4-1**									
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
Initial Effective Stress, σ'_i (kPa /psf)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Final Effective Stress, σ'_f (kPa/psf)	581.16	510.95	641.24	661.33	548.72	668.65	726.31	381.94	355.20	384.83
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 2 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No.	*3*	**YR4-2**									
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
Initial Effective Stress, σ'_i (kPa /psf)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Final Effective Stress, σ'_f (kPa/psf)	581.16	510.95	641.24	661.33	548.72	668.65	726.31	381.94	355.20	384.83
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 3 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No.	*4*	**YR4-3**									
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
Initial Effective Stress, σ'_i (kPa /psf)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Final Effective Stress, σ'_f (kPa/psf)	581.16	510.95	641.24	661.33	548.72	668.65	726.31	381.94	355.20	384.83
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 4 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No.	*5*	**YR4-4**									
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
Initial Effective Stress, σ'_i (kPa /psf)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Final Effective Stress, σ'_f (kPa/psf)	581.16	510.95	641.24	661.33	548.72	668.65	726.31	381.94	355.20	384.83
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 5 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No.	*6*	**YR4-5**									
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
Initial Effective Stress, σ'_i (kPa /psf)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Final Effective Stress, σ'_f (kPa/psf)	581.16	510.95	641.24	661.33	548.72	668.65	726.31	381.94	355.20	384.83
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 6 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No.	*7*	**YR4-6**									
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	450.92	450.62	450.30	450.00	450.11	449.93	450.30	453.82	454.05	453.80
Initial Effective Stress, σ'_i (kPa /psf)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Final Effective Stress, σ'_f (kPa/psf)	581.16	510.95	641.24	661.33	548.72	668.65	726.31	381.94	355.20	384.83
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*	*32.00*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)										
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 7 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No. *8* **YR3-1**											
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		450.06	449.76	449.44	449.14	449.25	449.07	449.44	452.96	453.19	452.94
Initial Effective Stress, σ'_i (kPa /psf)		73.65	73.71	73.65	73.65	73.65	73.65	73.65	73.71	73.71	73.65
Final Effective Stress, σ'_f (kPa/psf)		654.81	584.66	714.90	734.98	622.38	742.30	799.96	455.65	428.91	458.48
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		74	74	74	74	74	74	74	74	74	74
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1		*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*
Settlements											
Primary Settlement, (m / ft)		0.474	0.449	0.493	0.499	0.463	0.501	0.517	0.395	0.382	0.396
Secondary Settlement (m / ft)		0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Total Settlement (m / ft)		0.486	0.462	0.505	0.511	0.475	0.513	0.529	0.408	0.395	0.409
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 8 (m / ft)		0.486	0.462	0.505	0.511	0.475	0.513	0.529	0.408	0.395	0.409
Layer No. *9* **YR3-2**											
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		448.35	448.05	447.73	447.43	447.54	447.36	447.73	451.25	451.48	451.23
Initial Effective Stress, σ'_i (kPa /psf)		220.96	221.14	220.96	220.96	220.96	220.96	220.96	221.14	221.14	220.96
Final Effective Stress, σ'_f (kPa/psf)		802.12	732.09	862.20	882.29	769.68	889.61	947.27	603.08	576.34	605.79
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		221	221	221	221	221	221	221	221	221	221
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1		*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*
Settlements											
Primary Settlement, (m / ft)		0.279	0.260	0.295	0.300	0.270	0.302	0.315	0.218	0.208	0.219
Secondary Settlement (m / ft)		0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Total Settlement (m / ft)		0.292	0.272	0.308	0.313	0.283	0.314	0.328	0.230	0.220	0.231
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 9 (m / ft)		0.292	0.272	0.308	0.313	0.283	0.314	0.328	0.230	0.220	0.231
Layer No. *10* **YR3-3**											
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		446.64	446.33	446.02	445.72	445.83	445.65	446.02	449.53	449.76	449.52
Initial Effective Stress, σ'_i (kPa /psf)		368.26	368.57	368.26	368.26	368.26	368.26	368.26	368.57	368.57	368.26
Final Effective Stress, σ'_f (kPa/psf)		949.42	879.52	1,009.51	1,029.60	916.99	1,036.92	1,094.58	750.51	723.77	753.09
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		368	369	368	368	368	368	368	369	369	368
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1		*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*
Settlements											
Primary Settlement, (m / ft)		0.205	0.189	0.219	0.223	0.198	0.224	0.236	0.154	0.146	0.155
Secondary Settlement (m / ft)		0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Total Settlement (m / ft)		0.218	0.201	0.231	0.235	0.210	0.237	0.249	0.167	0.159	0.168
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 10 (m / ft)		0.218	0.201	0.231	0.235	0.210	0.237	0.249	0.167	0.159	0.168

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Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No.	*11*	**YR3-4**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		444.93	444.62	444.31	444.01	444.12	443.94	444.31	447.82	448.05	447.81
Initial Effective Stress, σ'_i (kPa /psf)		515.57	516.00	515.57	515.57	515.57	515.57	515.57	516.00	516.00	515.57
Final Effective Stress, σ'_f (kPa/psf)		1,096.73	1,026.95	1,156.81	1,176.90	1,064.29	1,184.22	1,241.88	897.94	871.20	900.40
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		516	516	516	516	516	516	516	516	516	516
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1		*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*
Settlements											
Primary Settlement, (m / ft)		0.164	0.149	0.175	0.179	0.157	0.180	0.191	0.120	0.114	0.121
Secondary Settlement (m / ft)		0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Total Settlement (m / ft)		0.176	0.162	0.188	0.191	0.170	0.193	0.203	0.133	0.126	0.133
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 11 (m / ft)		0.176	0.162	0.188	0.191	0.170	0.193	0.203	0.133	0.126	0.133
Layer No.	*12*	**YR3-5**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		443.21	442.91	442.59	442.29	442.40	442.22	442.59	446.11	446.34	446.09
Initial Effective Stress, σ'_i (kPa /psf)		662.88	663.43	662.88	662.88	662.88	662.88	662.88	663.43	663.43	662.88
Final Effective Stress, σ'_f (kPa/psf)		1,244.04	1,174.38	1,304.12	1,324.21	1,211.60	1,331.53	1,389.19	1,045.36	1,018.63	1,047.70
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		663	663	663	663	663	663	663	663	663	663
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1		*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*
Settlements											
Primary Settlement, (m / ft)		0.136	0.124	0.147	0.150	0.131	0.151	0.160	0.099	0.093	0.099
Secondary Settlement (m / ft)		0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Total Settlement (m / ft)		0.149	0.136	0.159	0.162	0.143	0.164	0.173	0.111	0.106	0.112
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 12 (m / ft)		0.149	0.136	0.159	0.162	0.143	0.164	0.173	0.111	0.106	0.112
Layer No.	*13*	**YR3-6**									
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		441.50	441.19	440.88	440.58	440.69	440.51	440.88	444.39	444.62	444.38
Initial Effective Stress, σ'_i (kPa /psf)		810	811	810	810	810	810	810	811	811	810
Final Effective Stress, σ'_f (kPa/psf)		1,391	1,322	1,451	1,472	1,359	1,479	1,536	1,193	1,166	1,195
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		810	811	810	810	810	810	810	811	811	810
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1		*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*
Settlements											
Primary Settlement, (m / ft)		0.117	0.106	0.126	0.129	0.112	0.130	0.139	0.084	0.079	0.084
Secondary Settlement (m / ft)		0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Total Settlement (m / ft)		0.130	0.119	0.139	0.142	0.125	0.143	0.151	0.096	0.091	0.097
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 13 (m / ft)		0.130	0.119	0.139	0.142	0.125	0.143	0.151	0.096	0.091	0.097

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Layer No.	*14*	**YR3-7**									
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	439.79	439.48	439.17	438.87	438.98	438.80	439.17	442.68	442.91	442.67
Initial Effective Stress, σ'_i (kPa /psf)	957	958	957	957	957	957	957	958	958	957
Final Effective Stress, σ'_f (kPa/psf)	1,539	1,469	1,599	1,619	1,506	1,626	1,684	1,340	1,313	1,342
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	957	958	957	957	957	957	957	958	958	957
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*	*16.50*
Settlements										
Primary Settlement, (m / ft)	0.103	0.093	0.111	0.114	0.098	0.115	0.122	0.073	0.068	0.073
Secondary Settlement (m / ft)	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013
Total Settlement (m / ft)	0.115	0.105	0.124	0.126	0.111	0.127	0.135	0.085	0.081	0.086
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 14 (m / ft)	0.115	0.105	0.124	0.126	0.111	0.127	0.135	0.085	0.081	0.086
Layer No.	*15*	**YR2-1**									
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	438.93	438.62	438.31	438.01	438.12	437.94	437.63	440.72	440.95	440.71
Initial Effective Stress, σ'_i (kPa /psf)	1,031	1,032	1,031	1,031	1,031	1,031	1,090	1,127	1,127	1,126
Final Effective Stress, σ'_f (kPa/psf)	1,612	1,543	1,672	1,692	1,580	1,700	1,816	1,509	1,482	1,511
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	1,031	1,032	1,031	1,031	1,031	1,031	1,090	1,127	1,127	1,126
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*11.33*	*11.33*	*11.33*	*11.33*	*11.33*	*11.33*	*11.33*	*11.33*	*11.33*	*11.33*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.088	0.082	0.077	0.082
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.014	0.014	0.014
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.097	0.096	0.091	0.096
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 15 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.097	0.096	0.091	0.096
Layer No.	*16*	**YR2-2**									
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	438.93	438.62	438.31	438.01	438.12	437.94	436.26	438.51	438.74	438.50
Initial Effective Stress, σ'_i (kPa /psf)	1,031	1,032	1,031	1,031	1,031	1,031	1,207	1,317	1,317	1,316
Final Effective Stress, σ'_f (kPa/psf)	1,612	1,543	1,672	1,692	1,580	1,700	1,933	1,699	1,672	1,701
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	1,031	1,032	1,031	1,031	1,031	1,031	1,207	1,317	1,317	1,316
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*11.33*	*11.33*	*11.33*	*11.33*	*11.33*	*11.33*	*11.33*	*11.33*	*11.33*	*11.33*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.081	0.071	0.067	0.072
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.014	0.014	0.014
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.090	0.085	0.081	0.086
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 16 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.090	0.085	0.081	0.086

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No. *17* **YR2-3**											
Initial Stress Reference Layer (top of layer)		2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)		1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)		438.93	438.62	438.31	438.01	438.12	437.94	434.90	436.30	436.53	436.29
Initial Effective Stress, σ'_i (kPa /psf)		1,031	1,032	1,031	1,031	1,031	1,031	1,324	1,507	1,507	1,506
Final Effective Stress, σ'_f (kPa/psf)		1,612	1,543	1,672	1,692	1,580	1,700	2,051	1,889	1,862	1,891
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
OCR Manual Input Value		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		1,031	1,032	1,031	1,031	1,031	1,031	1,324	1,507	1,507	1,506
Modified Primary Compression Index, $C_{c\varepsilon}$		0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291
Modified Recompression Index, $C_{r\varepsilon}$		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%
ratio of t2 / t1		11.33	11.33	11.33	11.33	11.33	11.33	11.33	11.33	11.33	11.33
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.075	0.063	0.059	0.064
Secondary Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.014	0.014	0.014
Total Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.084	0.077	0.073	0.078
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 17 (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.084	0.077	0.073	0.078
Layer No. *18* **YR2-4**											
Initial Stress Reference Layer (top of layer)		2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)		1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)		438.93	438.62	438.31	438.01	438.12	437.94	433.54	434.09	434.32	434.08
Initial Effective Stress, σ'_i (kPa /psf)		1,031	1,032	1,031	1,031	1,031	1,031	1,442	1,697	1,697	1,696
Final Effective Stress, σ'_f (kPa/psf)		1,612	1,543	1,672	1,692	1,580	1,700	2,168	2,079	2,052	2,081
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
OCR Manual Input Value		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		1,031	1,032	1,031	1,031	1,031	1,031	1,442	1,697	1,697	1,696
Modified Primary Compression Index, $C_{c\varepsilon}$		0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291
Modified Recompression Index, $C_{r\varepsilon}$		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%
ratio of t2 / t1		11.33	11.33	11.33	11.33	11.33	11.33	11.33	11.33	11.33	11.33
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.070	0.057	0.053	0.057
Secondary Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.014	0.014	0.014
Total Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.079	0.071	0.067	0.071
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 18 (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.079	0.071	0.067	0.071
Layer No. *19* **YR2-5**											
Initial Stress Reference Layer (top of layer)		2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)		1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)		438.93	438.62	438.31	438.01	438.12	437.94	432.17	431.88	432.11	431.87
Initial Effective Stress, σ'_i (kPa /psf)		1,031	1,032	1,031	1,031	1,031	1,031	1,559	1,887	1,887	1,886
Final Effective Stress, σ'_f (kPa/psf)		1,612	1,543	1,672	1,692	1,580	1,700	2,285	2,269	2,242	2,271
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
OCR Manual Input Value		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		1,031	1,032	1,031	1,031	1,031	1,031	1,559	1,887	1,887	1,886
Modified Primary Compression Index, $C_{c\varepsilon}$		0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291
Modified Recompression Index, $C_{r\varepsilon}$		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%
ratio of t2 / t1		11.33	11.33	11.33	11.33	11.33	11.33	11.33	11.33	11.33	11.33
Settlements											
Primary Settlement, (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.066	0.052	0.048	0.052
Secondary Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.014	0.014	0.014
Total Settlement (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.075	0.066	0.062	0.066
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 19 (m / ft)		0.000	0.000	0.000	0.000	0.000	0.000	0.075	0.066	0.062	0.066

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No. *20* **YR2-6**											
Initial Stress Reference Layer (top of layer)	2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	438.93	438.62	438.31	438.01	438.12	437.94	430.81	429.67	429.90	429.66
Initial Effective Stress, σ'_i (kPa /psf)	1,031	1,032	1,031	1,031	1,031	1,031	1,676	2,077	2,077	2,076
Final Effective Stress, σ'_f (kPa/psf)	1,612	1,543	1,672	1,692	1,580	1,700	2,403	2,459	2,433	2,461
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
OCR Manual Input Value	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	1,031	1,032	1,031	1,031	1,031	1,031	1,676	2,077	2,077	2,076
Modified Primary Compression Index, $C_{c\varepsilon}$	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291
Modified Recompression Index, $C_{r\varepsilon}$	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%
ratio of t2 / t1	11.33	11.33	11.33	11.33	11.33	11.33	11.33	11.33	11.33	11.33
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.062	0.047	0.044	0.048
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.014	0.014	0.014
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.071	0.061	0.058	0.062
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 20 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.071	0.061	0.058	0.062
Layer No. *21* **YR2-7**										
Initial Stress Reference Layer (top of layer)	2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	438.93	438.62	438.31	438.01	438.12	437.94	429.44	427.46	427.69	427.45
Initial Effective Stress, σ'_i (kPa /psf)	1,031	1,032	1,031	1,031	1,031	1,031	1,794	2,267	2,267	2,267
Final Effective Stress, σ'_f (kPa/psf)	1,612	1,543	1,672	1,692	1,580	1,700	2,520	2,649	2,623	2,651
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
OCR Manual Input Value	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	1,031	1,032	1,031	1,031	1,031	1,031	1,794	2,267	2,267	2,267
Modified Primary Compression Index, $C_{c\varepsilon}$	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291
Modified Recompression Index, $C_{r\varepsilon}$	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%
ratio of t2 / t1	11.33	11.33	11.33	11.33	11.33	11.33	11.33	11.33	11.33	11.33
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.059	0.044	0.041	0.044
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.009	0.014	0.014	0.014
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.067	0.058	0.055	0.058
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 21 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.067	0.058	0.055	0.058
Layer No. *22* **YR1-1**										
Initial Stress Reference Layer (top of layer)	2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	437.64	437.33	437.02	436.72	436.83	436.65	428.39	426.35	426.58	426.34
Initial Effective Stress, σ'_i (kPa /psf)	1,142	1,143	1,142	1,142	1,142	1,142	1,884	2,362	2,362	2,362
Final Effective Stress, σ'_f (kPa/psf)	1,723	1,654	1,783	1,803	1,691	1,811	2,611	2,744	2,718	2,746
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
OCR Manual Input Value	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	1,142	1,143	1,142	1,142	1,142	1,142	1,884	2,362	2,362	2,362
Modified Primary Compression Index, $C_{c\varepsilon}$	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291
Modified Recompression Index, $C_{r\varepsilon}$	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%
ratio of t2 / t1	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75
Settlements										
Primary Settlement, (m / ft)	0.134	0.121	0.145	0.149	0.128	0.150	0.031	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.015	0.015	0.015	0.015	0.015	0.015	0.004	0.000	0.000	0.000
Total Settlement (m / ft)	0.149	0.135	0.160	0.164	0.143	0.165	0.035	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 22 (m / ft)	0.149	0.135	0.160	0.164	0.143	0.165	0.035	0.000	0.000	0.000

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No. *23* **YR1-2**											
Initial Stress Reference Layer (top of layer)		2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)		1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)		435.06	434.75	434.44	434.14	434.25	434.07	427.65	426.35	426.58	426.34
Initial Effective Stress, σ'_i (kPa /psf)		1,364	1,365	1,364	1,364	1,364	1,364	1,948	2,362	2,362	2,362
Final Effective Stress, σ'_f (kPa/psf)		1,945	1,876	2,005	2,025	1,913	2,033	2,674	2,744	2,718	2,746
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
OCR Manual Input Value		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		1,364	1,365	1,364	1,364	1,364	1,364	1,948	2,362	2,362	2,362
Modified Primary Compression Index, $C_{c\varepsilon}$		0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291
Modified Recompression Index, $C_{r\varepsilon}$		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%
ratio of t2 / t1		8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75
Settlements											
Primary Settlement, (m / ft)		0.116	0.104	0.126	0.129	0.110	0.130	0.030	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.015	0.015	0.015	0.015	0.015	0.015	0.004	0.000	0.000	0.000
Total Settlement (m / ft)		0.130	0.118	0.140	0.144	0.125	0.145	0.034	0.000	0.000	0.000
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 23 (m / ft)		0.130	0.118	0.140	0.144	0.125	0.145	0.034	0.000	0.000	0.000
Layer No. *24* **YR1-3**											
Initial Stress Reference Layer (top of layer)		2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)		1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)		432.48	432.17	431.86	431.56	431.67	431.49	426.91	426.35	426.58	426.34
Initial Effective Stress, σ'_i (kPa /psf)		1,586	1,586	1,586	1,586	1,586	1,586	2,012	2,362	2,362	2,362
Final Effective Stress, σ'_f (kPa/psf)		2,167	2,097	2,227	2,247	2,135	2,254	2,738	2,744	2,718	2,746
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
OCR Manual Input Value		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		1,586	1,586	1,586	1,586	1,586	1,586	2,012	2,362	2,362	2,362
Modified Primary Compression Index, $C_{c\varepsilon}$		0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291
Modified Recompression Index, $C_{r\varepsilon}$		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%
ratio of t2 / t1		8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75
Settlements											
Primary Settlement, (m / ft)		0.102	0.091	0.111	0.114	0.097	0.115	0.029	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.015	0.015	0.015	0.015	0.015	0.015	0.004	0.000	0.000	0.000
Total Settlement (m / ft)		0.117	0.106	0.125	0.128	0.112	0.129	0.033	0.000	0.000	0.000
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 24 (m / ft)		0.117	0.106	0.125	0.128	0.112	0.129	0.033	0.000	0.000	0.000
Layer No. *25* **YR1-4**											
Initial Stress Reference Layer (top of layer)		2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)		1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)		429.90	429.60	429.28	428.98	429.09	428.91	426.17	426.35	426.58	426.34
Initial Effective Stress, σ'_i (kPa /psf)		1,807.72	1,808.08	1,807.72	1,807.72	1,807.72	1,807.72	2,075.18	2,362.42	2,362.42	2,361.56
Final Effective Stress, σ'_f (kPa/psf)		2,388.88	2,319.03	2,448.96	2,469.05	2,356.44	2,476.37	2,801.49	2,744.36	2,717.62	2,746.39
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
OCR Manual Input Value		1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		1,808	1,808	1,808	1,808	1,808	1,808	2,075	2,362	2,362	2,362
Modified Primary Compression Index, $C_{c\varepsilon}$		0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291
Modified Recompression Index, $C_{r\varepsilon}$		0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%	0.60%
ratio of t2 / t1		8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75
Settlements											
Primary Settlement, (m / ft)		0.091	0.081	0.099	0.102	0.087	0.103	0.028	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.015	0.015	0.015	0.015	0.015	0.015	0.004	0.000	0.000	0.000
Total Settlement (m / ft)		0.106	0.096	0.114	0.116	0.101	0.117	0.032	0.000	0.000	0.000
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 25 (m / ft)		0.106	0.096	0.114	0.116	0.101	0.117	0.032	0.000	0.000	0.000

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Layer No. *26* **YR1-5**											
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		427.32	427.02	426.70	426.40	426.51	426.33	425.43	426.35	426.58	426.34
Initial Effective Stress, σ'_i (kPa /psf)		2,029.60	2,029.81	2,029.60	2,029.60	2,029.60	2,029.60	2,138.82	2,362.42	2,362.42	2,361.56
Final Effective Stress, σ'_f (kPa/psf)		2,610.76	2,540.76	2,670.84	2,690.93	2,578.32	2,698.25	2,865.13	2,744.36	2,717.62	2,746.39
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,030	2,030	2,030	2,030	2,030	2,030	2,139	2,362	2,362	2,362
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.082	0.073	0.090	0.092	0.078	0.093	0.027	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.015	0.015	0.015	0.015	0.015	0.015	0.004	0.000	0.000	0.000
Total Settlement (m / ft)		0.097	0.088	0.104	0.107	0.093	0.108	0.032	0.000	0.000	0.000
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 26 (m / ft)		0.097	0.088	0.104	0.107	0.093	0.108	0.032	0.000	0.000	0.000
Layer No. *27* **YR1-6**											
Initial Stress Reference Layer (top of layer)		*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		424.74	424.44	424.12	423.82	423.93	423.75	424.69	426.35	426.58	426.34
Initial Effective Stress, σ'_i (kPa /psf)		2,251.48	2,251.55	2,251.48	2,251.48	2,251.48	2,251.48	2,202.46	2,362.42	2,362.42	2,361.56
Final Effective Stress, σ'_f (kPa/psf)		2,832.64	2,762.50	2,892.72	2,912.81	2,800.20	2,920.13	2,928.77	2,744.36	2,717.62	2,746.39
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,251	2,252	2,251	2,251	2,251	2,251	2,202	2,362	2,362	2,362
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$		*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1		*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements											
Primary Settlement, (m / ft)		0.075	0.067	0.082	0.084	0.071	0.085	0.027	0.000	0.000	0.000
Secondary Settlement (m / ft)		0.015	0.015	0.015	0.015	0.015	0.015	0.004	0.000	0.000	0.000
Total Settlement (m / ft)		0.090	0.081	0.096	0.099	0.086	0.099	0.031	0.000	0.000	0.000
Elastic or Plastic (E/P)		P	P	P	P	P	P	P	P	P	P
		1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 27 (m / ft)		0.090	0.081	0.096	0.099	0.086	0.099	0.031	0.000	0.000	0.000

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	Layer No.	Material										
LAYER SETTLEMENT	1	*Cover*										
	2	*YR4-1*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3	*YR4-2*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	4	*YR4-3*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	5	*YR4-4*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	6	*YR4-5*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	7	*YR4-6*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	8	*YR3-1*	0.486	0.462	0.505	0.511	0.475	0.513	0.529	0.408	0.395	0.409
	9	*YR3-2*	0.292	0.272	0.308	0.313	0.283	0.314	0.328	0.230	0.220	0.231
	10	*YR3-3*	0.218	0.201	0.231	0.235	0.210	0.237	0.249	0.167	0.159	0.168
	11	*YR3-4*	0.176	0.162	0.188	0.191	0.170	0.193	0.203	0.133	0.126	0.133
	12	*YR3-5*	0.149	0.136	0.159	0.162	0.143	0.164	0.173	0.111	0.106	0.112
	13	*YR3-6*	0.130	0.119	0.139	0.142	0.125	0.143	0.151	0.096	0.091	0.097
	14	*YR3-7*	0.115	0.105	0.124	0.126	0.111	0.127	0.135	0.085	0.081	0.086
	15	*YR2-1*	0.000	0.000	0.000	0.000	0.000	0.000	0.097	0.096	0.091	0.096
	16	*YR2-2*	0.000	0.000	0.000	0.000	0.000	0.000	0.090	0.085	0.081	0.086
	17	*YR2-3*	0.000	0.000	0.000	0.000	0.000	0.000	0.084	0.077	0.073	0.078
	18	*YR2-4*	0.000	0.000	0.000	0.000	0.000	0.000	0.079	0.071	0.067	0.071
	19	*YR2-5*	0.000	0.000	0.000	0.000	0.000	0.000	0.075	0.066	0.062	0.066
	20	*YR2-6*	0.000	0.000	0.000	0.000	0.000	0.000	0.071	0.061	0.058	0.062
	21	*YR2-7*	0.000	0.000	0.000	0.000	0.000	0.000	0.067	0.058	0.055	0.058
	22	*YR1-1*	0.149	0.135	0.160	0.164	0.143	0.165	0.035	0.000	0.000	0.000
	23	*YR1-2*	0.130	0.118	0.140	0.144	0.125	0.145	0.034	0.000	0.000	0.000
	24	*YR1-3*	0.117	0.106	0.125	0.128	0.112	0.129	0.033	0.000	0.000	0.000
	25	*YR1-4*	0.106	0.096	0.114	0.116	0.101	0.117	0.032	0.000	0.000	0.000
	26	*YR1-5*	0.097	0.088	0.104	0.107	0.093	0.108	0.032	0.000	0.000	0.000
	27	*YR1-6*	0.090	0.081	0.096	0.099	0.086	0.099	0.031	0.000	0.000	0.000
	28	*Additional Foundation Settlement*	1.980	1.674	2.081	2.088	1.638	2.024	2.397	1.043	0.977	1.050
	29											
	30											
		TOTAL SETTLEMENT	**4.23**	**3.75**	**4.47**	**4.53**	**3.81**	**4.48**	**4.92**	**2.79**	**2.64**	**2.80**
POST-SETTLEMENT ELEVATION(M/FT)	Line	1 Top of Final Cover	451.53	451.12	451.17	450.98	450.87	451.02	451.43	454.22	454.37	454.21
	Line	2 Top of Year 4 Dredge	446.69	446.87	445.83	445.47	446.30	445.45	445.38	451.03	451.41	451.00
	Line	3	446.69	446.87	445.83	445.47	446.30	445.45	445.38	451.03	451.41	451.00
	Line	4	446.69	446.87	445.83	445.47	446.30	445.45	445.38	451.03	451.41	451.00
	Line	5	446.69	446.87	445.83	445.47	446.30	445.45	445.38	451.03	451.41	451.00
	Line	6	446.69	446.87	445.83	445.47	446.30	445.45	445.38	451.03	451.41	451.00
	Line	7	446.69	446.87	445.83	445.47	446.30	445.45	445.38	451.03	451.41	451.00
	Line	8 Top of Year 3 Dredge	446.69	446.87	445.83	445.47	446.30	445.45	445.38	451.03	451.41	451.00
	Line	9	445.46	445.61	444.62	444.27	445.06	444.25	444.19	449.73	450.09	449.70
	Line	10	444.04	444.17	443.21	442.87	443.63	442.85	442.81	448.24	448.59	448.21
	Line	11	442.54	442.66	441.73	441.39	442.13	441.38	441.34	446.70	447.04	446.67
	Line	12	441.01	441.10	440.21	439.87	440.58	439.86	439.83	445.11	445.45	445.09
	Line	13	439.44	439.53	438.65	438.32	439.01	438.31	438.29	443.51	443.84	443.49
	Line	14	437.86	437.93	437.08	436.75	437.43	436.74	436.73	441.89	442.22	441.87
	Line	15 Top of Year 2 Dredge	436.26	436.32	435.49	435.16	435.82	435.15	435.15	440.26	440.59	440.24
	Line	16	436.26	436.32	435.49	435.16	435.82	435.15	433.89	438.15	438.47	438.13
	Line	17	436.26	436.32	435.49	435.16	435.82	435.15	432.61	436.02	436.34	436.01
	Line	18	436.26	436.32	435.49	435.16	435.82	435.15	431.33	433.89	434.20	433.87
	Line	19	436.26	436.32	435.49	435.16	435.82	435.15	430.05	431.75	432.06	431.73
	Line	20	436.26	436.32	435.49	435.16	435.82	435.15	428.76	429.61	429.91	429.59
	Line	21	436.26	436.32	435.49	435.16	435.82	435.15	427.46	427.46	427.76	427.44
	Line	22 Top of Year 1 Dredge	436.26	436.32	435.49	435.16	435.82	435.15	426.17	425.31	425.60	425.29
	Line	23	433.83	433.88	433.07	432.75	433.39	432.74	425.46	425.31	425.60	425.29
	Line	24	431.38	431.42	430.63	430.31	430.93	430.30	424.76	425.31	425.60	425.29
	Line	25	428.92	428.95	428.17	427.86	428.46	427.85	424.05	425.31	425.60	425.29
	Line	26	426.44	426.46	425.71	425.40	425.98	425.39	423.34	425.31	425.60	425.29
	Line	27	423.96	423.97	423.23	422.92	423.50	422.92	422.63	425.31	425.60	425.29
	Line	28 Top of Gravel(Top of Incompressil	421.47	421.48	420.75	420.44	421.00	420.44	421.92	425.31	425.60	425.29
	Line	29										
	Line	30										
	Line	31										

Written by:	Yiwen Cao	Date:	12/17/2009	Reviewed by:	R. Kulasingam/Jay Beech	Date:	12/17/2009
Client:	Honeywell	Project:	Onondaga Lake SCA Final Design	Project/ Proposal No.:	GJ4299	Task No.:	04

Attachment 6

CASE 5: Settlement Analysis For Top of LPSL at the End of the Operations Period (i.e., End of Year 4)
(Cross Section A, Points 26 to 35)

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Settlement Prediction Model

Programmer: **Yiwen Cao, GeoSyntec Consultants**

Version Control V 1.002 11.14.2007

Project: **Onondaga Lake SCA Final**

Notes:

Unit: **ft / psf**

Average Compaction Effort = **1440.00** kPa or psf

Consider Compaction Effort = **N** yes or no

Point #					**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**
Distance (meter or ft)					*349.52*	*371.48*	*371.77*	*391.48*	*391.77*	*412.70*	*431.77*	*432.06*	*451.77*	*452.06*
ELEVATION (M/FT)	Line	1	Top of Dredge		*460.01*	*460.01*	*460.01*	*460.01*	*460.01*	*460.01*	*460.01*	*460.01*	*460.01*	*460.01*
	Line	2	Top of Dredge		*460.01*	*460.01*	*460.01*	*460.01*	*460.01*	*460.01*	*460.01*	*460.01*	*460.01*	*460.01*
	Line	3	Top of Gravel		*430.01*	*430.01*	*430.01*	*430.01*	*430.01*	*430.01*	*430.01*	*430.01*	*430.01*	*430.01*
	Line	4	Top of Clay		*423.69*	*423.50*	*423.50*	*415.62*	*415.50*	*415.50*	*415.50*	*415.62*	*423.50*	*423.50*
	Line	5	Top of Dike		*421.45*	*421.82*	*421.70*	*413.85*	*413.85*	*413.94*	*413.93*	*413.93*	*421.82*	*421.93*
	Line	6	Top of Subgrade		*421.45*	*421.82*	*421.70*	*413.85*	*413.85*	*413.94*	*413.93*	*413.93*	*421.82*	*421.93*
	Line	7			*418.72*	*419.07*	*418.95*	*411.56*	*411.56*	*411.65*	*411.64*	*411.64*	*419.07*	*419.17*
	Line	8			*415.99*	*416.31*	*416.21*	*409.28*	*409.28*	*409.36*	*409.35*	*409.35*	*416.31*	*416.41*
	Line	9			*413.25*	*413.56*	*413.46*	*406.99*	*406.99*	*407.07*	*407.06*	*407.06*	*413.56*	*413.65*
	Line	10			*410.52*	*410.80*	*410.71*	*404.71*	*404.71*	*404.78*	*404.77*	*404.77*	*410.80*	*410.89*
	Line	11			*407.79*	*408.05*	*407.96*	*402.42*	*402.42*	*402.49*	*402.48*	*402.48*	*408.05*	*408.13*
	Line	12			*405.06*	*405.30*	*405.22*	*400.14*	*400.14*	*400.20*	*400.19*	*400.19*	*405.30*	*405.37*
	Line	13			*402.32*	*402.54*	*402.47*	*397.85*	*397.85*	*397.91*	*397.90*	*397.90*	*402.54*	*402.61*
	Line	14			*399.59*	*399.79*	*399.72*	*395.57*	*395.57*	*395.62*	*395.61*	*395.61*	*399.79*	*399.85*
	Line	15			*396.86*	*397.03*	*396.98*	*393.28*	*393.28*	*393.32*	*393.32*	*393.32*	*397.03*	*397.08*
	Line	16			*394.13*	*394.28*	*394.23*	*391.00*	*391.00*	*391.03*	*391.03*	*391.03*	*394.28*	*394.32*
	Line	17			*391.39*	*391.52*	*391.48*	*388.71*	*388.71*	*388.74*	*388.74*	*388.74*	*391.52*	*391.56*
	Line	18			*388.66*	*388.77*	*388.74*	*386.43*	*386.43*	*386.45*	*386.45*	*386.45*	*388.77*	*388.80*
	Line	19			*385.93*	*386.02*	*385.99*	*384.14*	*384.14*	*384.16*	*384.16*	*384.16*	*386.02*	*386.04*
	Line	20			*383.20*	*383.26*	*383.24*	*381.86*	*381.86*	*381.87*	*381.87*	*381.87*	*383.26*	*383.28*
	Line	21			*380.46*	*380.51*	*380.49*	*379.57*	*379.57*	*379.58*	*379.58*	*379.58*	*380.51*	*380.52*
	Line	22			*377.73*	*377.75*	*377.75*	*377.29*	*377.29*	*377.29*	*377.29*	*377.29*	*377.75*	*377.76*
	Line	23	Bottom of Zone2 Above GW		*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*
	Line	24			*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*
	Line	25	Bottom of Zone 3 Above GW		*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*
	Line	26			*370.00*	*370.00*	*370.00*	*370.00*	*370.00*	*370.00*	*370.00*	*370.00*	*370.00*	*370.00*
	Line	27	Bottom of Zone 2 Below GW		*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*
	Line	28	Top of Incompressible Layer		*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*
	Line	29	GND	for sigma_p	*421.51*	*421.84*	*421.84*	*421.86*	*421.86*	*421.91*	*421.96*	*421.96*	*422.00*	*422.00*
	Line	30	GW		*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*
	Line	31	ROCK		*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*
LAYER THICKNESS (M/FT)	Layer No.	From	To	Material										
	1	*1*	*2*	*Null Layer*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	2	*2*	*3*	*Dredge*	*30.00*	*30.00*	*30.00*	*30.00*	*30.00*	*30.00*	*30.00*	*30.00*	*30.00*	*30.00*
	3	*3*	*4*	*Gravel*	*6.32*	*6.51*	*6.51*	*14.39*	*14.51*	*14.51*	*14.51*	*14.39*	*6.51*	*6.51*
	4	*4*	*5*	*Clay*	*2.24*	*1.68*	*1.80*	*1.77*	*1.65*	*1.56*	*1.57*	*1.69*	*1.68*	*1.57*
	5	*5*	*6*	*Dike*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	6	*6*	*7*	*Zone2-Above-GW-1*	*2.73*	*2.75*	*2.75*	*2.29*	*2.29*	*2.29*	*2.29*	*2.29*	*2.75*	*2.76*
	7	*7*	*8*	*Zone2-Above-GW-2*	*2.73*	*2.75*	*2.75*	*2.29*	*2.29*	*2.29*	*2.29*	*2.29*	*2.75*	*2.76*
	8	*8*	*9*	*Zone2-Above-GW-3*	*2.73*	*2.75*	*2.75*	*2.29*	*2.29*	*2.29*	*2.29*	*2.29*	*2.75*	*2.76*
	9	*9*	*10*	*Zone2-Above-GW-4*	*2.73*	*2.75*	*2.75*	*2.29*	*2.29*	*2.29*	*2.29*	*2.29*	*2.75*	*2.76*
	10	*10*	*11*	*Zone2-Above-GW-5*	*2.73*	*2.75*	*2.75*	*2.29*	*2.29*	*2.29*	*2.29*	*2.29*	*2.75*	*2.76*
	11	*11*	*12*	*Zone2-Above-GW-6*	*2.73*	*2.75*	*2.75*	*2.29*	*2.29*	*2.29*	*2.29*	*2.29*	*2.75*	*2.76*
	12	*12*	*13*	*Zone2-Above-GW-7*	*2.73*	*2.75*	*2.75*	*2.29*	*2.29*	*2.29*	*2.29*	*2.29*	*2.75*	*2.76*
	13	*13*	*14*	*Zone2-Above-GW-8*	*2.73*	*2.75*	*2.75*	*2.29*	*2.29*	*2.29*	*2.29*	*2.29*	*2.75*	*2.76*
	14	*14*	*15*	*Zone2-Above-GW-9*	*2.73*	*2.75*	*2.75*	*2.29*	*2.29*	*2.29*	*2.29*	*2.29*	*2.75*	*2.76*
	15	*15*	*16*	*Zone2-Above-GW-10*	*2.73*	*2.75*	*2.75*	*2.29*	*2.29*	*2.29*	*2.29*	*2.29*	*2.75*	*2.76*
	16	*16*	*17*	*Zone2-Above-GW-11*	*2.73*	*2.75*	*2.75*	*2.29*	*2.29*	*2.29*	*2.29*	*2.29*	*2.75*	*2.76*
	17	*17*	*18*	*Zone2-Above-GW-12*	*2.73*	*2.75*	*2.75*	*2.29*	*2.29*	*2.29*	*2.29*	*2.29*	*2.75*	*2.76*
	18	*18*	*19*	*Zone2-Above-GW-13*	*2.73*	*2.75*	*2.75*	*2.29*	*2.29*	*2.29*	*2.29*	*2.29*	*2.75*	*2.76*
	19	*19*	*20*	*Zone2-Above-GW-14*	*2.73*	*2.75*	*2.75*	*2.29*	*2.29*	*2.29*	*2.29*	*2.29*	*2.75*	*2.76*
	20	*20*	*21*	*Zone2-Above-GW-15*	*2.73*	*2.75*	*2.75*	*2.29*	*2.29*	*2.29*	*2.29*	*2.29*	*2.75*	*2.76*
	21	*21*	*22*	*Zone2-Above-GW-16*	*2.73*	*2.75*	*2.75*	*2.29*	*2.29*	*2.29*	*2.29*	*2.29*	*2.75*	*2.76*
	22	*22*	*23*	*Zone2-Above-GW-17*	*2.73*	*2.75*	*2.75*	*2.29*	*2.29*	*2.29*	*2.29*	*2.29*	*2.75*	*2.76*
	23	*23*	*24*	*Zone3-Above-GW-1*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	24	*24*	*25*	*Zone3-Above-GW-2*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	25	*25*	*26*	*Zone2-Below-GW-18*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*
	26	*26*	*27*	*Zone2-Below-GW-19*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*
	27	*27*	*28*	*Zone3-Below-GW-3*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	28													
	29	*29*	*30*	Soil Above GW	*46.51*	*46.84*	*46.84*	*46.86*	*46.86*	*46.91*	*46.96*	*46.96*	*47.00*	*47.00*
	30	*30*	*31*	Soil Below GW	*10.00*	*10.00*	*10.00*	*10.00*	*10.00*	*10.00*	*10.00*	*10.00*	*10.00*	*10.00*
	Thickness Check													
		From Line	To Line	SUM	*95.01*	*95.01*	*95.01*	*95.01*	*95.01*	*95.01*	*95.01*	*95.01*	*95.01*	*95.01*
		1	*28*	Thickness =	*95.01*	*95.01*	*95.01*	*95.01*	*95.01*	*95.01*	*95.01*	*95.01*	*95.01*	*95.01*
				Thickness Check	***OK***	***OK***	***OK***	***OK***	***OK***	***OK***	***OK***	***OK***	***OK***	***OK***

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

UNIT WEIGHT	Layer No.	Material										
	1	*Null Layer*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	2	*Dredge*	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0	86.0
	3	*Gravel*	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0
	4	*Clay*	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0
	5	*Dike*	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0	120.0
	6	*Zone2-Above-GW-1*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	7	*Zone2-Above-GW-2*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	8	*Zone2-Above-GW-3*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	9	*Zone2-Above-GW-4*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	10	*Zone2-Above-GW-5*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	11	*Zone2-Above-GW-6*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	12	*Zone2-Above-GW-7*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	13	*Zone2-Above-GW-8*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	14	*Zone2-Above-GW-9*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	15	*Zone2-Above-GW-10*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	16	*Zone2-Above-GW-11*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	17	*Zone2-Above-GW-12*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	18	*Zone2-Above-GW-13*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	19	*Zone2-Above-GW-14*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	20	*Zone2-Above-GW-15*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	21	*Zone2-Above-GW-16*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	22	*Zone2-Above-GW-17*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	23	*Zone3-Above-GW-1*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	24	*Zone3-Above-GW-2*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	25	*Zone2-Below-GW-18*	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6
	26	*Zone2-Below-GW-19*	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6
	27	*Zone3-Below-GW-3*	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6
	28											
	29	*Soil Above GW*	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0	82.0
	30	*Soil below GW*	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6	19.6
	Layer No.	***1*** **Null Layer**										
		Initial Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
		Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
	Midpoint Elevation, (m / ft)		460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01
	Initial Effective Stress, σ'_i (kPa /psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
	Final Effective Stress, σ'_f (kPa/psf)		Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method												
Modulus, E (kPa/psf)=		Strain										
		Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)												
Consolidation Properties												
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)												
OCR Manual Input Value												
OCR Computation Input												
Preconsolidation pressure, σ'_p (kPa / psf)												
Modified Primary Compression Index, $C_{c\varepsilon}$												
Modified Recompression Index, $C_{r\varepsilon}$												
Modified Secondary Compression Index, C_α												
ratio of t2 / t1												
Settlements												
Primary Settlement, (m / ft)												
Secondary Settlement (m / ft)												
Total Settlement (m / ft)												
		Elastic or Plastic (E/P)										
		Settlement of Layer 1 (m / ft)										

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Layer No. *2* **Dredge**											
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Midpoint Elevation, (m / ft)	445.01	445.01	445.01	445.01	445.01	445.01	445.01	445.01	445.01	445.01
Initial Effective Stress, σ'_i (kPa /psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Final Effective Stress, σ'_f (kPa/psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)										
OCR Manual Input Value										
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)										
Modified Primary Compression Index, $C_{c\varepsilon}$										
Modified Recompression Index, $C_{r\varepsilon}$										
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$										
ratio of t2 / t1										
Settlements										
Primary Settlement, (m / ft)										
Secondary Settlement (m / ft)										
Total Settlement (m / ft)										
Elastic or Plastic (E/P)										
Settlement of Layer 2 (m / ft)										
Layer No. *3* **Gravel**										
Initial Stress Reference Layer (top of layer)	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
Final Stress Reference Layer (top of layer)	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
Midpoint Elevation, (m / ft)	426.85	426.76	426.76	422.82	422.76	422.76	422.76	422.82	426.76	426.76
Initial Effective Stress, σ'_i (kPa /psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Final Effective Stress, σ'_f (kPa/psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)										
OCR Manual Input Value										
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)										
Modified Primary Compression Index, $C_{c\varepsilon}$										
Modified Recompression Index, $C_{r\varepsilon}$										
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$										
ratio of t2 / t1										
Settlements										
Primary Settlement, (m / ft)										
Secondary Settlement (m / ft)										
Total Settlement (m / ft)										
Elastic or Plastic (E/P)										
Settlement of Layer 3 (m / ft)										
Layer No. *4* **Clay**										
Initial Stress Reference Layer (top of layer)	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Final Stress Reference Layer (top of layer)	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Midpoint Elevation, (m / ft)	422.57	422.66	422.60	414.74	414.68	414.72	414.72	414.78	422.66	422.72
Initial Effective Stress, σ'_i (kPa /psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Final Effective Stress, σ'_f (kPa/psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)										
OCR Manual Input Value										
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)										
Modified Primary Compression Index, $C_{c\varepsilon}$										
Modified Recompression Index, $C_{r\varepsilon}$										
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$										
ratio of t2 / t1										
Settlements										
Primary Settlement, (m / ft)										
Secondary Settlement (m / ft)										
Total Settlement (m / ft)										
Elastic or Plastic (E/P)										
Settlement of Layer 4 (m / ft)										

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Layer No. 5 **Dike**											
Initial Stress Reference Layer (top of layer)	5	5	5	5	5	5	5	5	5	5
Final Stress Reference Layer (top of layer)	5	5	5	5	5	5	5	5	5	5
Midpoint Elevation, (m / ft)	421.45	421.82	421.70	413.85	413.85	413.94	413.93	413.93	421.82	421.93
Initial Effective Stress, σ'_i (kPa /psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Final Effective Stress, σ'_f (kPa/psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)										
OCR Manual Input Value										
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)										
Modified Primary Compression Index, $C_{c\varepsilon}$										
Modified Recompression Index, $C_{r\varepsilon}$										
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$										
ratio of t2 / t1										
Settlements										
Primary Settlement, (m / ft)										
Secondary Settlement (m / ft)										
Total Settlement (m / ft)										
Elastic or Plastic (E/P)										
Settlement of Layer 5 (m / ft)										
Layer No. 6 **Zone2-Above-GW-1**										
Initial Stress Reference Layer (top of layer)	6	6	6	6	6	6	6	6	6	6
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	420.08	420.44	420.33	412.71	412.71	412.79	412.79	412.79	420.44	420.55
Initial Effective Stress, σ'_i (kPa /psf)	112	113	113	94	94	94	94	94	113	113
Final Effective Stress, σ'_f (kPa/psf)	3,723	3,437	3,437	5,157	5,285	4,633	5,256	5,256	3,424	3,435
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
OCR Manual Input Value	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	527	514	557	3,378	3,379	3,364	3,384	3,384	575	535
Modified Primary Compression Index, $C_{c\varepsilon}$	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460
Modified Recompression Index, $C_{r\varepsilon}$	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%
ratio of t2 / t1	8	8	8	8	8	8	8	8	8	8
Settlements										
Primary Settlement, (m / ft)	1.093	1.071	1.025	0.243	0.254	0.196	0.251	0.251	1.009	1.052
Secondary Settlement (m / ft)	0.022	0.023	0.023	0.019	0.019	0.019	0.019	0.019	0.023	0.023
Total Settlement (m / ft)	1.115	1.093	1.048	0.262	0.273	0.215	0.270	0.270	1.032	1.074
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 6 (m / ft)	1.115	1.093	1.048	0.262	0.273	0.215	0.270	0.270	1.032	1.074
Layer No. 7 **Zone2-Above-GW-2**										
Initial Stress Reference Layer (top of layer)	6	6	6	6	6	6	6	6	6	6
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	417.35	417.69	417.58	410.42	410.42	410.50	410.50	410.50	417.69	417.79
Initial Effective Stress, σ'_i (kPa /psf)	336	339	338	281	281	282	282	282	339	340
Final Effective Stress, σ'_f (kPa/psf)	3,940	3,638	3,691	5,381	5,381	4,844	5,352	5,352	3,660	3,661
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
OCR Manual Input Value	4.5	4.5	4.5	2.0	2.0	2.0	2.0	2.0	4.5	4.5
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	1,536	1,530	1,571	1,876	1,876	1,871	1,880	1,880	1,591	1,554
Modified Primary Compression Index, $C_{c\varepsilon}$	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460
Modified Recompression Index, $C_{r\varepsilon}$	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%
ratio of t2 / t1	8	8	8	8	8	8	8	8	8	8
Settlements										
Primary Settlement, (m / ft)	0.540	0.502	0.495	0.507	0.507	0.462	0.505	0.505	0.484	0.498
Secondary Settlement (m / ft)	0.022	0.023	0.023	0.019	0.019	0.019	0.019	0.019	0.023	0.023
Total Settlement (m / ft)	0.562	0.524	0.517	0.526	0.526	0.481	0.524	0.524	0.507	0.521
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 7 (m / ft)	0.562	0.524	0.517	0.526	0.526	0.481	0.524	0.524	0.507	0.521

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Layer No. *8* **Zone2-Above-GW-3**											
Initial Stress Reference Layer (top of layer)	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	414.62	414.93	414.83	408.14	408.14	408.21	408.21	408.21	414.93	415.03
Initial Effective Stress, σ'_i (kPa /psf)	560	565	563	468	468	470	469	469	565	566
Final Effective Stress, σ'_f (kPa/psf)	4,157	3,860	3,859	5,307	5,473	5,061	5,361	5,361	3,883	3,885
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*4.5*	*4.5*	*4.5*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*4.5*	*4.5*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,544	2,547	2,584	2,251	2,251	2,247	2,255	2,255	2,607	2,572
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.293	0.254	0.245	0.413	0.427	0.393	0.418	0.418	0.245	0.253
Secondary Settlement (m / ft)	0.022	0.023	0.023	0.019	0.019	0.019	0.019	0.019	0.023	0.023
Total Settlement (m / ft)	0.316	0.277	0.268	0.432	0.446	0.412	0.437	0.437	0.267	0.275
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 8 (m / ft)	0.316	0.277	0.268	0.432	0.446	0.412	0.437	0.437	0.267	0.275
Layer No. *9* **Zone2-Above-GW-4**										
Initial Stress Reference Layer (top of layer)	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	411.89	412.18	412.09	405.85	405.85	405.92	405.92	405.92	412.18	412.27
Initial Effective Stress, σ'_i (kPa /psf)	784	790	788	656	656	657	657	657	790	792
Final Effective Stress, σ'_f (kPa/psf)	4,362	4,109	4,107	5,424	5,502	5,309	5,476	5,476	4,130	4,102
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*4.5*	*4.5*	*4.5*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*4.5*	*4.5*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,552	3,563	3,598	2,626	2,626	2,622	2,631	2,631	3,623	3,591
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.137	0.104	0.098	0.350	0.357	0.342	0.355	0.355	0.098	0.099
Secondary Settlement (m / ft)	0.022	0.023	0.023	0.019	0.019	0.019	0.019	0.019	0.023	0.023
Total Settlement (m / ft)	0.160	0.126	0.121	0.369	0.376	0.361	0.374	0.373	0.120	0.121
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 9 (m / ft)	0.160	0.126	0.121	0.369	0.376	0.361	0.374	0.373	0.120	0.121
Layer No. *10* **Zone2-Above-GW-5**										
Initial Stress Reference Layer (top of layer)	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	409.15	409.43	409.34	403.57	403.57	403.63	403.63	403.63	409.43	409.51
Initial Effective Stress, σ'_i (kPa /psf)	1,008	1,016	1,014	843	843	845	845	845	1,016	1,019
Final Effective Stress, σ'_f (kPa/psf)	4,564	4,371	4,385	5,625	5,625	5,523	5,600	5,600	4,372	4,374
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*	*2.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,027	2,035	2,050	3,001	3,001	2,998	3,006	3,006	2,062	2,049
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.455	0.432	0.429	0.305	0.304	0.297	0.302	0.302	0.425	0.430
Secondary Settlement (m / ft)	0.022	0.023	0.023	0.019	0.019	0.019	0.019	0.019	0.023	0.023
Total Settlement (m / ft)	0.477	0.455	0.452	0.323	0.323	0.316	0.321	0.321	0.448	0.453
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 10 (m / ft)	0.477	0.455	0.452	0.323	0.323	0.316	0.321	0.321	0.448	0.453

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Layer No. *11* **Zone2-Above-GW-6**											
Initial Stress Reference Layer (top of layer)	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	406.42	406.67	406.59	401.28	401.28	401.34	401.34	401.34	406.67	406.75
Initial Effective Stress, σ'_i (kPa /psf)	1,232	1,242	1,239	1,031	1,031	1,033	1,033	1,033	1,242	1,245
Final Effective Stress, σ'_f (kPa/psf)	4,778	4,621	4,618	5,638	5,708	5,750	5,685	5,685	4,643	4,646
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*2.0*	*2.0*	*2.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	*2.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,475	2,487	2,500	1,688	1,688	1,687	1,691	1,691	2,514	2,502
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.371	0.353	0.348	0.558	0.563	0.568	0.562	0.562	0.349	0.353
Secondary Settlement (m / ft)	0.022	0.023	0.023	0.019	0.019	0.019	0.019	0.019	0.023	0.023
Total Settlement (m / ft)	0.393	0.375	0.371	0.576	0.582	0.587	0.580	0.580	0.372	0.376
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 11 (m / ft)	0.393	0.375	0.371	0.576	0.582	0.587	0.580	0.580	0.372	0.376
Layer No. *12* **Zone2-Above-GW-7**										
Initial Stress Reference Layer (top of layer)	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	403.69	403.92	403.84	399.00	399.00	399.05	399.05	399.05	403.92	403.99
Initial Effective Stress, σ'_i (kPa /psf)	1,456	1,468	1,464	1,218	1,218	1,221	1,221	1,221	1,468	1,471
Final Effective Stress, σ'_f (kPa/psf)	4,986	4,904	4,900	5,852	5,852	5,950	5,831	5,831	4,927	4,888
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*2.0*	*2.0*	*2.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	*2.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,923	2,939	2,951	1,875	1,875	1,875	1,879	1,879	2,965	2,954
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.303	0.293	0.290	0.526	0.526	0.534	0.524	0.524	0.291	0.289
Secondary Settlement (m / ft)	0.022	0.023	0.023	0.019	0.019	0.019	0.019	0.019	0.023	0.023
Total Settlement (m / ft)	0.326	0.316	0.313	0.544	0.544	0.553	0.543	0.543	0.314	0.312
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 12 (m / ft)	0.326	0.316	0.313	0.544	0.544	0.553	0.543	0.543	0.314	0.312
Layer No. *13* **Zone2-Above-GW-8**										
Initial Stress Reference Layer (top of layer)	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	400.96	401.16	401.10	396.71	396.71	396.76	396.76	396.76	401.16	401.23
Initial Effective Stress, σ'_i (kPa /psf)	1,680	1,694	1,689	1,405	1,405	1,409	1,408	1,408	1,694	1,698
Final Effective Stress, σ'_f (kPa/psf)	5,201	5,193	5,188	5,907	6,001	6,143	5,948	5,948	5,184	5,174
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	1,686	1,695	1,701	2,063	2,063	2,062	2,066	2,067	1,709	1,704
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.615	0.616	0.612	0.486	0.493	0.505	0.489	0.489	0.611	0.613
Secondary Settlement (m / ft)	0.022	0.023	0.023	0.019	0.019	0.019	0.019	0.019	0.023	0.023
Total Settlement (m / ft)	0.638	0.639	0.635	0.504	0.512	0.524	0.508	0.508	0.633	0.635
Elastic or Plastic (E/P)	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D
Settlement of Layer 13 (m / ft)	0.638	0.639	0.635	0.504	0.512	0.524	0.508	0.508	0.633	0.635

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No. *14* **Zone2-Above-GW-9**											
Initial Stress Reference Layer (top of layer)	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	398.23	398.41	398.35	394.43	394.43	394.47	394.47	394.47	398.41	398.47
Initial Effective Stress, σ'_i (kPa /psf)	1,904	1,920	1,915	1,593	1,593	1,597	1,596	1,596	1,920	1,924
Final Effective Stress, σ'_f (kPa/psf)	5,423	5,450	5,494	6,066	6,124	6,326	6,106	6,106	5,473	5,477
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	1,910	1,921	1,926	2,250	2,250	2,250	2,254	2,254	1,934	1,930
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.570	0.574	0.575	0.458	0.462	0.478	0.461	0.461	0.572	0.575
Secondary Settlement (m / ft)	0.022	0.023	0.023	0.019	0.019	0.019	0.019	0.019	0.023	0.023
Total Settlement (m / ft)	0.592	0.596	0.598	0.476	0.481	0.497	0.479	0.479	0.595	0.598
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 14 (m / ft)	0.592	0.596	0.598	0.476	0.481	0.497	0.479	0.479	0.595	0.598
Layer No. *15* **Zone2-Above-GW-10**										
Initial Stress Reference Layer (top of layer)	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	395.49	395.66	395.60	392.14	392.14	392.18	392.18	392.18	395.66	395.70
Initial Effective Stress, σ'_i (kPa /psf)	2,129	2,145	2,140	1,780	1,780	1,784	1,784	1,784	2,145	2,150
Final Effective Stress, σ'_f (kPa/psf)	5,648	5,736	5,731	6,284	6,284	6,505	6,267	6,267	5,758	5,715
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,134	2,147	2,151	2,437	2,437	2,438	2,442	2,442	2,160	2,156
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.531	0.541	0.538	0.437	0.437	0.453	0.436	0.435	0.539	0.538
Secondary Settlement (m / ft)	0.022	0.023	0.023	0.019	0.019	0.019	0.019	0.019	0.023	0.023
Total Settlement (m / ft)	0.554	0.563	0.560	0.456	0.456	0.472	0.454	0.454	0.562	0.560
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 15 (m / ft)	0.554	0.563	0.560	0.456	0.456	0.472	0.454	0.454	0.562	0.560
Layer No. *16* **Zone2-Above-GW-11**										
Initial Stress Reference Layer (top of layer)	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	392.76	392.90	392.86	389.85	389.85	389.89	389.89	389.89	392.90	392.94
Initial Effective Stress, σ'_i (kPa /psf)	2,353	2,371	2,365	1,968	1,968	1,972	1,972	1,972	2,371	2,377
Final Effective Stress, σ'_f (kPa/psf)	5,879	6,017	6,011	6,373	6,423	6,665	6,407	6,407	6,036	5,994
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,358	2,373	2,376	2,625	2,625	2,626	2,630	2,630	2,386	2,383
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.499	0.512	0.509	0.409	0.413	0.430	0.411	0.411	0.511	0.509
Secondary Settlement (m / ft)	0.022	0.023	0.023	0.019	0.019	0.019	0.019	0.019	0.023	0.023
Total Settlement (m / ft)	0.521	0.535	0.532	0.428	0.431	0.449	0.430	0.430	0.533	0.532
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 16 (m / ft)	0.521	0.535	0.532	0.428	0.431	0.449	0.430	0.430	0.533	0.532

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No. *17*	**Zone2-Above-GW-12**										
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		390.03	390.15	390.11	387.57	387.57	387.60	387.60	387.60	390.15	390.18
Initial Effective Stress, σ'_i (kPa /psf)		2,577	2,597	2,590	2,155	2,155	2,160	2,159	2,159	2,597	2,603
Final Effective Stress, σ'_f (kPa/psf)		6,108	6,267	6,308	6,588	6,588	6,835	6,574	6,574	6,285	6,291
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,582	2,598	2,602	2,812	2,812	2,814	2,818	2,818	2,612	2,609
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.470	0.484	0.486	0.392	0.392	0.410	0.391	0.391	0.483	0.485
Secondary Settlement (m / ft)		0.022	0.023	0.023	0.019	0.019	0.019	0.019	0.019	0.023	0.023
Total Settlement (m / ft)		0.492	0.507	0.509	0.411	0.411	0.429	0.410	0.410	0.506	0.508
Elastic or Plastic (E/P)		p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D
Settlement of Layer 17 (m / ft)		0.492	0.507	0.509	0.411	0.411	0.429	0.410	0.410	0.506	0.508
Layer No. *18*	**Zone2-Above-GW-13**										
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		387.30	387.39	387.36	385.28	385.28	385.31	385.31	385.31	387.39	387.42
Initial Effective Stress, σ'_i (kPa /psf)		2,801	2,823	2,816	2,342	2,342	2,348	2,347	2,347	2,823	2,830
Final Effective Stress, σ'_f (kPa/psf)		6,344	6,537	6,530	6,694	6,755	7,003	6,724	6,724	6,553	6,560
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		2,806	2,824	2,827	2,999	3,000	3,002	3,005	3,005	2,838	2,835
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.445	0.462	0.460	0.370	0.374	0.391	0.372	0.372	0.461	0.463
Secondary Settlement (m / ft)		0.022	0.023	0.023	0.019	0.019	0.019	0.019	0.019	0.023	0.023
Total Settlement (m / ft)		0.468	0.484	0.482	0.389	0.393	0.410	0.391	0.391	0.483	0.485
Elastic or Plastic (E/P)		p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D
Settlement of Layer 18 (m / ft)		0.468	0.484	0.482	0.389	0.393	0.410	0.391	0.391	0.483	0.485
Layer No. *19*	**Zone2-Above-GW-14**										
Initial Stress Reference Layer (top of layer)		*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)		*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)		384.56	384.64	384.61	383.00	383.00	383.02	383.02	383.02	384.64	384.66
Initial Effective Stress, σ'_i (kPa /psf)		3,025	3,049	3,041	2,530	2,530	2,536	2,535	2,535	3,049	3,056
Final Effective Stress, σ'_f (kPa/psf)		6,582	6,800	6,793	6,865	6,906	7,147	6,894	6,894	6,814	6,779
Elastic Method											
Modulus, E (kPa/psf)=	Strain										
	Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)											
Consolidation Properties											
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)		*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value		*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input											
Preconsolidation pressure, σ'_p (kPa / psf)		3,030	3,050	3,052	3,187	3,187	3,189	3,193	3,193	3,064	3,062
Modified Primary Compression Index, $C_{c\varepsilon}$		*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$		*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$		*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1		*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements											
Primary Settlement, (m / ft)		0.424	0.441	0.439	0.354	0.356	0.372	0.355	0.355	0.440	0.438
Secondary Settlement (m / ft)		0.022	0.023	0.023	0.019	0.019	0.019	0.019	0.019	0.023	0.023
Total Settlement (m / ft)		0.446	0.464	0.462	0.372	0.375	0.391	0.374	0.374	0.463	0.461
Elastic or Plastic (E/P)		p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D
Settlement of Layer 19 (m / ft)		0.446	0.464	0.462	0.372	0.375	0.391	0.374	0.374	0.463	0.461

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No. *20* **Zone2-Above-GW-15**											
Initial Stress Reference Layer (top of layer)	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	381.83	381.89	381.87	380.71	380.71	380.73	380.73	380.73	381.89	381.90
Initial Effective Stress, σ'_i (kPa /psf)	3,249	3,275	3,266	2,717	2,717	2,724	2,723	2,723	3,275	3,282
Final Effective Stress, σ'_f (kPa/psf)	6,814	7,042	7,074	7,076	7,076	7,312	7,065	7,065	7,055	7,062
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,254	3,276	3,277	3,374	3,374	3,377	3,381	3,381	3,289	3,288
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.403	0.421	0.422	0.341	0.341	0.356	0.340	0.340	0.420	0.422
Secondary Settlement (m / ft)	0.022	0.023	0.023	0.019	0.019	0.019	0.019	0.019	0.023	0.023
Total Settlement (m / ft)	0.426	0.444	0.445	0.360	0.360	0.375	0.359	0.359	0.443	0.444
Elastic or Plastic (E/P)	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D
Settlement of Layer 20 (m / ft)	0.426	0.444	0.445	0.360	0.360	0.375	0.359	0.359	0.443	0.444
Layer No. *21* **Zone2-Above-GW-16**										
Initial Stress Reference Layer (top of layer)	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	379.10	379.13	379.12	378.43	378.43	378.44	378.44	378.44	379.13	379.14
Initial Effective Stress, σ'_i (kPa /psf)	3,473	3,500	3,492	2,905	2,905	2,911	2,911	2,911	3,500	3,509
Final Effective Stress, σ'_f (kPa/psf)	7,054	7,296	7,287	7,196	7,230	7,453	7,221	7,221	7,307	7,315
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,478	3,502	3,503	3,562	3,562	3,565	3,569	3,569	3,515	3,514
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.386	0.404	0.402	0.324	0.326	0.340	0.325	0.325	0.403	0.404
Secondary Settlement (m / ft)	0.022	0.023	0.023	0.019	0.019	0.019	0.019	0.019	0.023	0.023
Total Settlement (m / ft)	0.408	0.427	0.425	0.343	0.345	0.359	0.344	0.344	0.425	0.427
Elastic or Plastic (E/P)	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D
Settlement of Layer 21 (m / ft)	0.408	0.427	0.425	0.343	0.345	0.359	0.344	0.344	0.425	0.427
Layer No. *22* **Zone2-Above-GW-17**										
Initial Stress Reference Layer (top of layer)	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	376.37	376.38	376.37	376.14	376.14	376.15	376.15	376.15	376.38	376.38
Initial Effective Stress, σ'_i (kPa /psf)	3,697	3,726	3,717	3,092	3,092	3,099	3,098	3,098	3,726	3,735
Final Effective Stress, σ'_f (kPa/psf)	7,293	7,544	7,535	7,402	7,402	7,617	7,394	7,394	7,553	7,527
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,702	3,728	3,728	3,749	3,749	3,753	3,757	3,757	3,741	3,741
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.370	0.388	0.386	0.313	0.313	0.327	0.312	0.312	0.387	0.386
Secondary Settlement (m / ft)	0.022	0.023	0.023	0.019	0.019	0.019	0.019	0.019	0.023	0.023
Total Settlement (m / ft)	0.393	0.411	0.409	0.332	0.332	0.345	0.331	0.331	0.409	0.408
Elastic or Plastic (E/P)	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D	p 1-D
Settlement of Layer 22 (m / ft)	0.393	0.411	0.409	0.332	0.332	0.345	0.331	0.331	0.409	0.408

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No. *23* **Zone3-Above-GW-1**											
Initial Stress Reference Layer (top of layer)	6	6	6	6	6	6	6	6	6	6
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00
Initial Effective Stress, σ'_i (kPa /psf)	3,809	3,839	3,829	3,186	3,186	3,193	3,192	3,192	3,839	3,848
Final Effective Stress, σ'_f (kPa/psf)	7,405	7,667	7,682	7,450	7,480	7,687	7,473	7,473	7,666	7,651
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
OCR Manual Input Value	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,814	3,841	3,841	3,843	3,843	3,847	3,850	3,850	3,854	3,854
Modified Primary Compression Index, $C_{c\varepsilon}$	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.380
Modified Recompression Index, $C_{r\varepsilon}$	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%
ratio of t2 / t1	8	8	8	8	8	8	8	8	8	8
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 23 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No. *24* **Zone3-Above-GW-2**										
Initial Stress Reference Layer (top of layer)	6	6	6	6	6	6	6	6	6	6
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00
Initial Effective Stress, σ'_i (kPa /psf)	3,809	3,839	3,829	3,186	3,186	3,193	3,192	3,192	3,839	3,848
Final Effective Stress, σ'_f (kPa/psf)	7,405	7,667	7,682	7,450	7,480	7,687	7,473	7,473	7,666	7,651
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
OCR Manual Input Value	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,814	3,841	3,841	3,843	3,843	3,847	3,850	3,850	3,854	3,854
Modified Primary Compression Index, $C_{c\varepsilon}$	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.380	0.380
Modified Recompression Index, $C_{r\varepsilon}$	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021	0.021
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%	0.70%
ratio of t2 / t1	8	8	8	8	8	8	8	8	8	8
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 24 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No. *25* **Zone2-Below-GW-18**										
Initial Stress Reference Layer (top of layer)	6	6	6	6	6	6	6	6	6	6
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	372.50	372.50	372.50	372.50	372.50	372.50	372.50	372.50	372.50	372.50
Initial Effective Stress, σ'_i (kPa /psf)	3,858	3,888	3,878	3,235	3,235	3,242	3,241	3,241	3,888	3,897
Final Effective Stress, σ'_f (kPa/psf)	7,469	7,724	7,714	7,514	7,514	7,713	7,508	7,508	7,732	7,741
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
OCR Manual Input Value	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,863	3,890	3,890	3,892	3,892	3,896	3,899	3,899	3,903	3,903
Modified Primary Compression Index, $C_{c\varepsilon}$	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460
Modified Recompression Index, $C_{r\varepsilon}$	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%
ratio of t2 / t1	8	8	8	8	8	8	8	8	8	8
Settlements										
Primary Settlement, (m / ft)	0.659	0.685	0.684	0.663	0.663	0.688	0.660	0.660	0.683	0.684
Secondary Settlement (m / ft)	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
Total Settlement (m / ft)	0.700	0.726	0.725	0.704	0.704	0.729	0.701	0.701	0.724	0.725
Elastic or Plastic (E/P)										
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 25 (m / ft)	0.700	0.726	0.725	0.704	0.704	0.729	0.701	0.701	0.724	0.725

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No. *26* **Zone2-Below-GW-19**											
Initial Stress Reference Layer (top of layer)	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	367.50	367.50	367.50	367.50	367.50	367.50	367.50	367.50	367.50	367.50
Initial Effective Stress, σ'_i (kPa /psf)	3,956	3,986	3,976	3,333	3,333	3,340	3,339	3,339	3,986	3,995
Final Effective Stress, σ'_f (kPa/psf)	7,587	7,841	7,831	7,570	7,570	7,743	7,565	7,565	7,848	7,857
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,961	3,988	3,988	3,990	3,990	3,994	3,997	3,997	4,001	4,001
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.649	0.675	0.674	0.645	0.645	0.667	0.643	0.643	0.673	0.674
Secondary Settlement (m / ft)	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
Total Settlement (m / ft)	0.690	0.716	0.715	0.686	0.686	0.708	0.684	0.684	0.714	0.715
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 26 (m / ft)	0.690	0.716	0.715	0.686	0.686	0.708	0.684	0.684	0.714	0.715
Layer No. *27* **Zone3-Below-GW-3**										
Initial Stress Reference Layer (top of layer)	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00
Initial Effective Stress, σ'_i (kPa /psf)	4,005	4,035	4,025	3,382	3,382	3,389	3,388	3,388	4,035	4,044
Final Effective Stress, σ'_f (kPa/psf)	7,642	7,898	7,888	7,570	7,592	7,750	7,589	7,589	7,906	7,889
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	4,010	4,037	4,037	4,039	4,039	4,043	4,046	4,046	4,050	4,050
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*
Modified Recompression Index, $C_{r\varepsilon}$	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 27 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

	Layer No.	Material										
LAYER SETTLEMENT	1	*Null Layer*										
	2	*Dredge*										
	3	*Gravel*										
	4	*Clay*										
	5	*Dike*										
	6	*Zone2-Above-GW-1*	1.115	1.093	1.048	0.262	0.273	0.215	0.270	0.270	1.032	1.074
	7	*Zone2-Above-GW-2*	0.562	0.524	0.517	0.526	0.526	0.481	0.524	0.524	0.507	0.521
	8	*Zone2-Above-GW-3*	0.316	0.277	0.268	0.432	0.446	0.412	0.437	0.437	0.267	0.275
	9	*Zone2-Above-GW-4*	0.160	0.126	0.121	0.369	0.376	0.361	0.374	0.373	0.120	0.121
	10	*Zone2-Above-GW-5*	0.477	0.455	0.452	0.323	0.323	0.316	0.321	0.321	0.448	0.453
	11	*Zone2-Above-GW-6*	0.393	0.375	0.371	0.576	0.582	0.587	0.580	0.580	0.372	0.376
	12	*Zone2-Above-GW-7*	0.326	0.316	0.313	0.544	0.544	0.553	0.543	0.543	0.314	0.312
	13	*Zone2-Above-GW-8*	0.638	0.639	0.635	0.504	0.512	0.524	0.508	0.508	0.633	0.635
	14	*Zone2-Above-GW-9*	0.592	0.596	0.598	0.476	0.481	0.497	0.479	0.479	0.595	0.598
	15	*Zone2-Above-GW-10*	0.554	0.563	0.560	0.456	0.456	0.472	0.454	0.454	0.562	0.560
	16	*Zone2-Above-GW-11*	0.521	0.535	0.532	0.428	0.431	0.449	0.430	0.430	0.533	0.532
	17	*Zone2-Above-GW-12*	0.492	0.507	0.509	0.411	0.411	0.429	0.410	0.410	0.506	0.508
	18	*Zone2-Above-GW-13*	0.468	0.484	0.482	0.389	0.393	0.410	0.391	0.391	0.483	0.485
	19	*Zone2-Above-GW-14*	0.446	0.464	0.462	0.372	0.375	0.391	0.374	0.374	0.463	0.461
	20	*Zone2-Above-GW-15*	0.426	0.444	0.445	0.360	0.360	0.375	0.359	0.359	0.443	0.444
	21	*Zone2-Above-GW-16*	0.408	0.427	0.425	0.343	0.345	0.359	0.344	0.344	0.425	0.427
	22	*Zone2-Above-GW-17*	0.393	0.411	0.409	0.332	0.332	0.345	0.331	0.331	0.409	0.408
	23	*Zone3-Above-GW-1*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	24	*Zone3-Above-GW-2*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	25	*Zone2-Below-GW-18*	0.700	0.726	0.725	0.704	0.704	0.729	0.701	0.701	0.724	0.725
	26	*Zone2-Below-GW-19*	0.690	0.716	0.715	0.686	0.686	0.708	0.684	0.684	0.714	0.715
	27	*Zone3-Below-GW-3*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	28											
	29	*Soil Above GW*										
	30	*Soil Below GW*										
		TOTAL SETTLEMENT	**9.68**	**9.68**	**9.59**	**8.49**	**8.56**	**8.61**	**8.51**	**8.51**	**9.55**	**9.63**

POST-SETTLEMENT ELEVATION (M/FT)	Line	1	Top of Dredge	450.33	450.33	450.42	451.52	451.45	451.40	451.50	451.50	450.46	450.38
	Line	2	Top of Dredge	450.33	450.33	450.42	451.52	451.45	451.40	451.50	451.50	450.46	450.38
	Line	3	Top of Gravel	420.33	420.33	420.42	421.52	421.45	421.40	421.50	421.50	420.46	420.38
	Line	4	Top of Clay	414.01	413.82	413.91	407.13	406.94	406.89	406.99	407.11	413.95	413.87
	Line	5	Top of Dike	411.77	412.14	412.11	405.36	405.29	405.33	405.42	405.42	412.27	412.30
	Line	6	Top of Subgrade	411.77	412.14	412.11	405.36	405.29	405.33	405.42	405.42	412.27	412.30
	Line	7		410.16	410.48	410.42	403.33	403.28	403.25	403.40	403.40	410.55	410.61
	Line	8		407.99	408.25	408.19	401.57	401.52	401.44	401.63	401.63	408.30	408.37
	Line	9		405.57	405.77	405.71	399.72	399.68	399.56	399.78	399.78	405.81	405.89
	Line	10		403.00	403.15	403.08	397.80	397.77	397.63	397.86	397.86	403.18	403.25
	Line	11		400.74	400.85	400.78	395.84	395.81	395.66	395.89	395.89	400.87	400.94
	Line	12		398.40	398.47	398.41	394.13	394.11	393.96	394.18	394.18	398.49	398.55
	Line	13		396.00	396.03	395.97	392.39	392.37	392.22	392.43	392.43	396.05	396.11
	Line	14		393.90	393.91	393.86	390.61	390.59	390.45	390.65	390.65	393.93	393.98
	Line	15		391.76	391.76	391.71	388.80	388.79	388.66	388.84	388.84	391.77	391.82
	Line	16		389.58	389.57	389.53	386.97	386.96	386.84	387.01	387.01	389.58	389.62
	Line	17		387.37	387.35	387.31	385.11	385.11	385.00	385.15	385.15	387.36	387.39
	Line	18		385.13	385.10	385.07	383.24	383.23	383.14	383.27	383.27	385.11	385.14
	Line	19		382.87	382.83	382.81	381.34	381.34	381.25	381.37	381.37	382.84	382.86
	Line	20		380.58	380.54	380.52	379.43	379.43	379.36	379.45	379.45	380.55	380.56
	Line	21		378.27	378.23	378.22	377.51	377.50	377.44	377.52	377.52	378.24	378.25
	Line	22		375.95	375.90	375.90	375.56	375.56	375.51	375.57	375.57	375.91	375.91
	Line	23	Bottom of Zone2 Above GW	373.61	373.56	373.56	373.61	373.61	373.56	373.62	373.62	373.56	373.56
	Line	24		373.61	373.56	373.56	373.61	373.61	373.56	373.62	373.62	373.56	373.56
	Line	25	Bottom of Zone 3 Above GW	373.61	373.56	373.56	373.61	373.61	373.56	373.62	373.62	373.56	373.56
	Line	26		369.31	369.28	369.28	369.31	369.31	369.29	369.32	369.32	369.29	369.28
	Line	27	Bottom of Zone 2 Below GW	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00
	Line	28	Top of Incompressible Layer	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00
	Line	29	GND										
	Line	30	GW										
	Line	31	ROCK										

Attachment 7

CASE 6: Settlement Analysis for Top of Dredge Material in Geo-tubes at the End of the Operations Period (i.e., End of Year 4)
(Cross Section A, Points 26 to 35)

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Settlement Prediction Model

Programmer: **Yiwen Cao, GeoSyntec Consultants**

Version Control V 1.002 11.14.2007

Project: **Onondaga Lake SCA Final**

Notes:

Unit: **ft / psf**

Average Compaction Effort = **1440.00** kPa or psf

Consider Compaction Effort = **N** yes or no

	Point #			26	27	28	29	30	31	32	33	34	35
	Distance (meter or ft)			349.52	371.48	371.77	391.48	391.77	412.70	431.77	432.06	451.77	452.06
ELEVATION (M/FT)	Line 1		Top of Year 4 Dredge	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01
	Line 2		Top of Year 4 Dredge	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01
	Line 3			460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01
	Line 4			460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01
	Line 5			460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01
	Line 6			460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01
	Line 7			460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01
	Line 8		Top of Year 3 Dredge	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01
	Line 9			458.29	458.29	458.29	458.29	458.29	458.29	458.29	458.29	458.29	458.29
	Line 10			456.58	456.58	456.58	456.58	456.58	456.58	456.58	456.58	456.58	456.58
	Line 11			454.86	454.86	454.86	454.86	454.86	454.86	454.86	454.86	454.86	454.86
	Line 12			453.15	453.15	453.15	453.15	453.15	453.15	453.15	453.15	453.15	453.15
	Line 13			451.43	451.43	451.43	451.43	451.43	451.43	451.43	451.43	451.43	451.43
	Line 14			449.72	449.72	449.72	449.72	449.72	449.72	449.72	449.72	449.72	449.72
	Line 15		Top of Year 2 Dredge	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00
	Line 16			448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00
	Line 17			448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00
	Line 18			448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00
	Line 19			448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00
	Line 20			448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00
	Line 21			448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00
	Line 22		Top of Year 1 Dredge	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00
	Line 23			445.01	445.01	445.01	445.00	445.00	445.00	445.00	445.00	445.00	445.00
	Line 24			442.01	442.01	442.01	442.01	442.01	442.01	442.01	442.01	442.01	442.01
	Line 25			439.01	439.01	439.01	439.01	439.01	439.01	439.01	439.01	439.01	439.01
	Line 26			436.01	436.01	436.01	436.01	436.01	436.01	436.01	436.01	436.01	436.01
	Line 27			433.01	433.01	433.01	433.01	433.01	433.01	433.01	433.01	433.01	433.01
	Line 28		Top of Gravel(Top of Incompressib	430.01	430.01	430.01	430.01	430.01	430.01	430.01	430.01	430.01	430.01
	Line 29		GND for sigma_p	421.51	421.84	421.84	421.86	421.86	421.91	421.96	421.96	422.00	422.00
	Line 30		GW	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00
	Line 31		ROCK	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00
LAYER THICKNESS (M/FT)	Layer No.	From	To / Material										
	1	1	2 / Null Layer	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	2	2	3 / YR4-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3	3	4 / YR4-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4	4	5 / YR4-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5	5	6 / YR4-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6	6	7 / YR4-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	7	7	8 / YR4-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	8	8	9 / YR3-1	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	9	9	10 / YR3-2	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	10	10	11 / YR3-3	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	11	11	12 / YR3-4	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	12	12	13 / YR3-5	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	13	13	14 / YR3-6	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	14	14	15 / YR3-7	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71	1.71
	15	15	16 / YR2-1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	16	16	17 / YR2-2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	17	17	18 / YR2-3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	18	18	19 / YR2-4	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	19	19	20 / YR2-5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	20	20	21 / YR2-6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	21	21	22 / YR2-7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	22	22	23 / YR1-1	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	23	23	24 / YR1-2	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	24	24	25 / YR1-3	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	25	25	26 / YR1-4	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	26	26	27 / YR1-5	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	27	27	28 / YR1-6	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
	28												
	29												
	30												
	Thickness Check												
		From Line	To Line / SUM	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
		1	28 / Thickness =	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
			Thickness Check	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

UNIT WEIGHT	Layer No.	Material										
	1	*Null Layer*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*	*0.0*
	2	*YR4-1*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	3	*YR4-2*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	4	*YR4-3*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	5	*YR4-4*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	6	*YR4-5*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	7	*YR4-6*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	8	*YR3-1*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	9	*YR3-2*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	10	*YR3-3*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	11	*YR3-4*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	12	*YR3-5*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	13	*YR3-6*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	14	*YR3-7*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	15	*YR2-1*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	16	*YR2-2*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	17	*YR2-3*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	18	*YR2-4*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	19	*YR2-5*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	20	*YR2-6*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	21	*YR2-7*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	22	*YR1-1*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	23	*YR1-2*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	24	*YR1-3*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	25	*YR1-4*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	26	*YR1-5*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	27	*YR1-6*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	28											
	29		*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	30	*Soil below GW*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*
	Layer No.	***1*** **Null Layer**										
		Initial Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
		Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
		Midpoint Elevation, (m / ft)	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01
		Initial Effective Stress, σ'_i (kPa /psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
		Final Effective Stress, σ'_f (kPa/psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method												
Modulus, E (kPa/psf)=		Strain										
		Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)												
Consolidation Properties												
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)												
OCR Manual Input Value												
OCR Computation Input												
Preconsolidation pressure, σ'_p (kPa / psf)												
Modified Primary Compression Index, $C_{c\varepsilon}$												
Modified Recompression Index, $C_{r\varepsilon}$												
Modified Secondary Compression Index, C_α												
ratio of t2 / t1												
Settlements												
Primary Settlement, (m / ft)												
Secondary Settlement (m / ft)												
Total Settlement (m / ft)												
		Elastic or Plastic (E/P)										
		Settlement of Layer 1 (m / ft)										

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No. 2 YR4-1											
Initial Stress Reference Layer (top of layer)	2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01
Initial Effective Stress, σ'_i (kPa /psf)	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03
Final Effective Stress, σ'_f (kPa/psf)	0.02	0.02	0.02	0.02	0.02	0.03	0.03	0.03	0.03	0.03
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
OCR Manual Input Value	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291
Modified Recompression Index, $C_{r\varepsilon}$	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%
ratio of t2 / t1	2	2	2	2	2	2	2	2	2	2
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 2 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No. 3 YR4-2										
Initial Stress Reference Layer (top of layer)	2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01
Initial Effective Stress, σ'_i (kPa /psf)	0.05	0.06	0.06	0.07	0.07	0.08	0.09	0.09	0.10	0.10
Final Effective Stress, σ'_f (kPa/psf)	0.05	0.06	0.06	0.07	0.07	0.08	0.09	0.09	0.10	0.10
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
OCR Manual Input Value	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291
Modified Recompression Index, $C_{r\varepsilon}$	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%
ratio of t2 / t1	2	2	2	2	2	2	2	2	2	2
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 3 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No. 4 YR4-3										
Initial Stress Reference Layer (top of layer)	2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01
Initial Effective Stress, σ'_i (kPa /psf)	0.09	0.10	0.10	0.12	0.12	0.13	0.15	0.15	0.16	0.16
Final Effective Stress, σ'_f (kPa/psf)	0.09	0.10	0.10	0.12	0.12	0.13	0.15	0.15	0.16	0.16
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
OCR Manual Input Value	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291
Modified Recompression Index, $C_{r\varepsilon}$	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%
ratio of t2 / t1	2	2	2	2	2	2	2	2	2	2
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 4 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No. 5 YR4-4											
Initial Stress Reference Layer (top of layer)	2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01
Initial Effective Stress, σ'_i (kPa /psf)	0.12	0.14	0.14	0.16	0.16	0.18	0.20	0.20	0.22	0.22
Final Effective Stress, σ'_f (kPa/psf)	0.12	0.14	0.14	0.16	0.16	0.18	0.20	0.20	0.22	0.22
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
OCR Manual Input Value	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291
Modified Recompression Index, $C_{r\varepsilon}$	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%
ratio of t2 / t1	2	2	2	2	2	2	2	2	2	2
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 5 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No. 6 YR4-5										
Initial Stress Reference Layer (top of layer)	2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01
Initial Effective Stress, σ'_i (kPa /psf)	0.16	0.18	0.19	0.21	0.21	0.24	0.26	0.26	0.29	0.29
Final Effective Stress, σ'_f (kPa/psf)	0.16	0.18	0.19	0.21	0.21	0.24	0.26	0.26	0.29	0.29
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
OCR Manual Input Value	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291
Modified Recompression Index, $C_{r\varepsilon}$	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%
ratio of t2 / t1	2	2	2	2	2	2	2	2	2	2
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 6 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No. 7 YR4-6										
Initial Stress Reference Layer (top of layer)	2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01	460.01
Initial Effective Stress, σ'_i (kPa /psf)	0.19	0.23	0.23	0.26	0.26	0.29	0.32	0.32	0.35	0.35
Final Effective Stress, σ'_f (kPa/psf)	0.19	0.23	0.23	0.26	0.26	0.29	0.32	0.32	0.35	0.35
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MW	MW	MW	MW	MW	MW	MW	MW	MW	MW
OCR Manual Input Value	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291	0.291
Modified Recompression Index, $C_{r\varepsilon}$	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%	0.08%
ratio of t2 / t1	2	2	2	2	2	2	2	2	2	2
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)										
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 7 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No. *8* **YR3-1**											
Initial Stress Reference Layer (top of layer)	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	459.15	459.15	459.15	459.15	459.15	459.15	459.15	459.15	459.15	459.15
Initial Effective Stress, σ'_i (kPa /psf)	73.73	73.73	73.73	73.73	73.73	73.73	73.73	73.73	73.73	73.73
Final Effective Stress, σ'_f (kPa/psf)	73.94	73.98	73.98	74.01	74.01	74.05	74.08	74.08	74.11	74.11
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	74	74	74	74	74	74	74	74	74	74
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Settlements										
Primary Settlement, (m / ft)	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Secondary Settlement (m / ft)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Total Settlement (m / ft)	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 8 (m / ft)	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007
Layer No. *9* **YR3-2**										
Initial Stress Reference Layer (top of layer)	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	457.44	457.44	457.44	457.43	457.43	457.43	457.43	457.43	457.43	457.43
Initial Effective Stress, σ'_i (kPa /psf)	221.20	221.20	221.20	221.20	221.20	221.19	221.19	221.19	221.19	221.19
Final Effective Stress, σ'_f (kPa/psf)	221.41	221.45	221.45	221.48	221.48	221.51	221.54	221.54	221.57	221.57
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	221	221	221	221	221	221	221	221	221	221
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Total Settlement (m / ft)	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.007	0.007
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 9 (m / ft)	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.007	0.007
Layer No. *10* **YR3-3**										
Initial Stress Reference Layer (top of layer)	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	455.72	455.72	455.72	455.72	455.72	455.72	455.72	455.72	455.72	455.72
Initial Effective Stress, σ'_i (kPa /psf)	368.67	368.67	368.67	368.66	368.66	368.66	368.65	368.65	368.65	368.65
Final Effective Stress, σ'_f (kPa/psf)	368.88	368.91	368.91	368.94	368.94	368.97	369.00	369.00	369.03	369.03
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	369	369	369	369	369	369	369	369	369	369
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Total Settlement (m / ft)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 10 (m / ft)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006

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Layer No. *11* **YR3-4**											
Initial Stress Reference Layer (top of layer)	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	454.01	454.01	454.01	454.01	454.01	454.00	454.00	454.00	454.00	454.00
Initial Effective Stress, σ'_i (kPa /psf)	516.14	516.13	516.13	516.13	516.13	516.12	516.11	516.11	516.10	516.10
Final Effective Stress, σ'_f (kPa/psf)	516.35	516.38	516.38	516.41	516.41	516.43	516.46	516.46	516.49	516.49
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	516	516	516	516	516	516	516	516	516	516
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Total Settlement (m / ft)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 11 (m / ft)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Layer No. *12* **YR3-5**										
Initial Stress Reference Layer (top of layer)	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	452.29	452.29	452.29	452.29	452.29	452.29	452.29	452.29	452.29	452.29
Initial Effective Stress, σ'_i (kPa /psf)	663.61	663.60	663.60	663.59	663.59	663.58	663.57	663.57	663.56	663.56
Final Effective Stress, σ'_f (kPa/psf)	663.82	663.85	663.85	663.87	663.87	663.90	663.92	663.92	663.94	663.94
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	664	664	664	664	664	664	664	664	664	664
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Total Settlement (m / ft)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 12 (m / ft)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Layer No. *13* **YR3-6**										
Initial Stress Reference Layer (top of layer)	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	450.58	450.58	450.58	450.58	450.58	450.58	450.58	450.58	450.58	450.58
Initial Effective Stress, σ'_i (kPa /psf)	811	811	811	811	811	811	811	811	811	811
Final Effective Stress, σ'_f (kPa/psf)	811	811	811	811	811	811	811	811	811	811
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	811	811	811	811	811	811	811	811	811	811
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Total Settlement (m / ft)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 13 (m / ft)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006

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Layer No. *14* **YR3-7**											
Initial Stress Reference Layer (top of layer)	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	448.86	448.86	448.86	448.86	448.86	448.86	448.86	448.86	448.86	448.86
Initial Effective Stress, σ'_i (kPa /psf)	959	959	959	959	959	959	958	958	958	958
Final Effective Stress, σ'_f (kPa/psf)	959	959	959	959	959	959	959	959	959	959
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	959	959	959	959	959	959	958	958	958	958
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Total Settlement (m / ft)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 14 (m / ft)	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
Layer No. *15* **YR2-1**										
Initial Stress Reference Layer (top of layer)	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00
Initial Effective Stress, σ'_i (kPa /psf)	0	0	0	0	0	0	0	0	0	0
Final Effective Stress, σ'_f (kPa/psf)	1,032	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 15 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No. *16* **YR2-2**										
Initial Stress Reference Layer (top of layer)	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00
Initial Effective Stress, σ'_i (kPa /psf)	0	0	0	0	0	0	0	0	0	0
Final Effective Stress, σ'_f (kPa/psf)	1,032	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 16 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No. *17* **YR2-3**											
Initial Stress Reference Layer (top of layer)	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00
Initial Effective Stress, σ'_i (kPa /psf)	0	0	0	0	0	0	0	0	0	0
Final Effective Stress, σ'_f (kPa/psf)	1,032	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 17 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No. *18* **YR2-4**										
Initial Stress Reference Layer (top of layer)	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00
Initial Effective Stress, σ'_i (kPa /psf)	0	0	0	0	0	0	0	0	0	0
Final Effective Stress, σ'_f (kPa/psf)	1,032	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 18 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No. *19* **YR2-5**										
Initial Stress Reference Layer (top of layer)	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00
Initial Effective Stress, σ'_i (kPa /psf)	0	0	0	0	0	0	0	0	0	0
Final Effective Stress, σ'_f (kPa/psf)	1,032	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 19 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No. *20* **YR2-6**											
Initial Stress Reference Layer (top of layer)	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00
Initial Effective Stress, σ'_i (kPa /psf)	0	0	0	0	0	0	0	0	0	0
Final Effective Stress, σ'_f (kPa/psf)	1,032	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 20 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No. *21* **YR2-7**										
Initial Stress Reference Layer (top of layer)	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*	*15*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00	448.00
Initial Effective Stress, σ'_i (kPa /psf)	0	0	0	0	0	0	0	0	0	0
Final Effective Stress, σ'_f (kPa/psf)	1,032	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033	1,033
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	0	0	0	0	0	0	0	0	0	0
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 21 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No. *22* **YR1-1**										
Initial Stress Reference Layer (top of layer)	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	446.50	446.50	446.50	446.50	446.50	446.50	446.50	446.50	446.50	446.50
Initial Effective Stress, σ'_i (kPa /psf)	129	129	129	129	129	129	129	129	129	129
Final Effective Stress, σ'_f (kPa/psf)	1,161	1,161	1,161	1,161	1,161	1,162	1,162	1,162	1,162	1,162
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	129	129	129	129	129	129	129	129	129	129
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.834	0.834	0.834	0.834	0.834	0.834	0.834	0.834	0.834	0.834
Secondary Settlement (m / ft)	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Total Settlement (m / ft)	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 22 (m / ft)	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No. *23* **YR1-2**											
Initial Stress Reference Layer (top of layer)	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	443.51	443.51	443.51	443.51	443.51	443.51	443.51	443.51	443.50	443.50
Initial Effective Stress, σ'_i (kPa /psf)	387	387	387	387	387	387	387	387	387	387
Final Effective Stress, σ'_f (kPa/psf)	1,419	1,419	1,419	1,419	1,419	1,419	1,419	1,419	1,419	1,419
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	387	387	387	387	387	387	387	387	387	387
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.493	0.493	0.493	0.493	0.493	0.493	0.493	0.493	0.493	0.493
Secondary Settlement (m / ft)	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Total Settlement (m / ft)	0.510	0.510	0.510	0.510	0.510	0.510	0.510	0.510	0.510	0.510
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 23 (m / ft)	0.510	0.510	0.510	0.510	0.510	0.510	0.510	0.510	0.510	0.510
Layer No. *24* **YR1-3**										
Initial Stress Reference Layer (top of layer)	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	440.51	440.51	440.51	440.51	440.51	440.51	440.51	440.51	440.51	440.51
Initial Effective Stress, σ'_i (kPa /psf)	645	645	645	645	645	645	645	645	645	645
Final Effective Stress, σ'_f (kPa/psf)	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677	1,677
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	645	645	645	645	645	645	645	645	645	645
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363	0.363
Secondary Settlement (m / ft)	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Total Settlement (m / ft)	0.379	0.379	0.379	0.379	0.379	0.379	0.379	0.379	0.379	0.379
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 24 (m / ft)	0.379	0.379	0.379	0.379	0.379	0.379	0.379	0.379	0.379	0.379
Layer No. *25* **YR1-4**										
Initial Stress Reference Layer (top of layer)	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	437.51	437.51	437.51	437.51	437.51	437.51	437.51	437.51	437.51	437.51
Initial Effective Stress, σ'_i (kPa /psf)	902.71	902.70	902.70	902.69	902.69	902.68	902.67	902.67	902.66	902.66
Final Effective Stress, σ'_f (kPa/psf)	1,935.21	1,935.21	1,935.21	1,935.22	1,935.22	1,935.23	1,935.24	1,935.24	1,935.25	1,935.25
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	903	903	903	903	903	903	903	903	903	903
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.289	0.289	0.289	0.289	0.289	0.289	0.289	0.289	0.289	0.289
Secondary Settlement (m / ft)	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Total Settlement (m / ft)	0.306	0.306	0.306	0.306	0.306	0.306	0.306	0.306	0.306	0.306
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 25 (m / ft)	0.306	0.306	0.306	0.306	0.306	0.306	0.306	0.306	0.306	0.306

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No. *26* **YR1-5**											
Initial Stress Reference Layer (top of layer)	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	434.51	434.51	434.51	434.51	434.51	434.51	434.51	434.51	434.51	434.51
Initial Effective Stress, σ'_i (kPa /psf)	1,160.63	1,160.61	1,160.61	1,160.60	1,160.60	1,160.59	1,160.57	1,160.57	1,160.56	1,160.56
Final Effective Stress, σ'_f (kPa/psf)	2,193.12	2,193.13	2,193.13	2,193.13	2,193.13	2,193.14	2,193.14	2,193.14	2,193.15	2,193.15
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161	1,161
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.241	0.241	0.241	0.241	0.241	0.241	0.241	0.241	0.241	0.241
Secondary Settlement (m / ft)	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Total Settlement (m / ft)	0.258	0.258	0.258	0.258	0.258	0.258	0.258	0.258	0.258	0.258
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 26 (m / ft)	0.258	0.258	0.258	0.258	0.258	0.258	0.258	0.258	0.258	0.258
Layer No. *27* **YR1-6**										
Initial Stress Reference Layer (top of layer)	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*	*22*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	431.51	431.51	431.51	431.51	431.51	431.51	431.51	431.51	431.51	431.51
Initial Effective Stress, σ'_i (kPa /psf)	1,418.55	1,418.53	1,418.53	1,418.51	1,418.51	1,418.49	1,418.48	1,418.48	1,418.46	1,418.46
Final Effective Stress, σ'_f (kPa/psf)	2,451.04	2,451.04	2,451.04	2,451.04	2,451.04	2,451.05	2,451.05	2,451.05	2,451.05	2,451.05
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*	*MW*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	1,419	1,419	1,419	1,419	1,419	1,418	1,418	1,418	1,418	1,418
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*	*0.291*
Modified Recompression Index, $C_{r\varepsilon}$	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*	*0.005*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*	*0.60%*
ratio of t2 / t1	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Settlements										
Primary Settlement, (m / ft)	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208	0.208
Secondary Settlement (m / ft)	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016	0.016
Total Settlement (m / ft)	0.224	0.224	0.224	0.224	0.224	0.224	0.224	0.224	0.224	0.224
Elastic or Plastic (E/P)	P	P	P	P	P	P	P	P	P	P
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 27 (m / ft)	0.224	0.224	0.224	0.224	0.224	0.224	0.224	0.224	0.224	0.224

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	Layer No.	Material										
LAYER SETTLEMENT	1	*Null Layer*										
	2	*YR4-1*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	3	*YR4-2*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	4	*YR4-3*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	5	*YR4-4*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	6	*YR4-5*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	7	*YR4-6*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	8	*YR3-1*	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007	0.007
	9	*YR3-2*	0.006	0.006	0.006	0.006	0.006	0.007	0.007	0.007	0.007	0.007
	10	*YR3-3*	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
	11	*YR3-4*	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
	12	*YR3-5*	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
	13	*YR3-6*	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
	14	*YR3-7*	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006	0.006
	15	*YR2-1*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	16	*YR2-2*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	17	*YR2-3*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	18	*YR2-4*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	19	*YR2-5*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	20	*YR2-6*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	21	*YR2-7*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	22	*YR1-1*	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850	0.850
	23	*YR1-2*	0.510	0.510	0.510	0.510	0.510	0.510	0.510	0.510	0.510	0.510
	24	*YR1-3*	0.379	0.379	0.379	0.379	0.379	0.379	0.379	0.379	0.379	0.379
	25	*YR1-4*	0.306	0.306	0.306	0.306	0.306	0.306	0.306	0.306	0.306	0.306
	26	*YR1-5*	0.258	0.258	0.258	0.258	0.258	0.258	0.258	0.258	0.258	0.258
	27	*YR1-6*	0.224	0.224	0.224	0.224	0.224	0.224	0.224	0.224	0.224	0.224
	28	*Additional Foundation Settlement*	9.676	9.679	9.585	8.494	8.556	8.613	8.515	8.515	9.551	9.632
	29											
	30											
		TOTAL SETTLEMENT	**12.25**	**12.25**	**12.16**	**11.07**	**11.13**	**11.18**	**11.09**	**11.09**	**12.12**	**12.20**
POST-SETTLEMENT ELEVATION (M/FT)	Line	1	Top of Year 4 Dredge	447.76	447.76	447.85	448.94	448.88	448.83	448.92	448.92	447.89	447.81
	Line	2	Top of Year 4 Dredge	447.76	447.76	447.85	448.94	448.88	448.83	448.92	448.92	447.89	447.81
	Line	3		447.76	447.76	447.85	448.94	448.88	448.83	448.92	448.92	447.89	447.81
	Line	4		447.76	447.76	447.85	448.94	448.88	448.82	448.92	448.92	447.89	447.80
	Line	5		447.76	447.76	447.85	448.94	448.88	448.82	448.92	448.92	447.89	447.80
	Line	6		447.76	447.76	447.85	448.94	448.88	448.82	448.92	448.92	447.88	447.80
	Line	7		447.76	447.76	447.85	448.94	448.88	448.82	448.92	448.92	447.88	447.80
	Line	8	Top of Year 3 Dredge	447.76	447.76	447.85	448.94	448.88	448.82	448.92	448.92	447.88	447.80
	Line	9		446.05	446.05	446.14	447.23	447.17	447.11	447.21	447.21	446.18	446.09
	Line	10		444.34	444.34	444.43	445.53	445.46	445.41	445.50	445.50	444.47	444.39
	Line	11		442.64	442.63	442.73	443.82	443.76	443.70	443.80	443.80	442.76	442.68
	Line	12		440.93	440.92	441.02	442.11	442.05	441.99	442.09	442.09	441.05	440.97
	Line	13		439.22	439.22	439.31	440.40	440.34	440.28	440.38	440.38	439.34	439.26
	Line	14		437.51	437.51	437.60	438.69	438.63	438.57	438.67	438.67	437.63	437.55
	Line	15	Top of Year 2 Dredge	435.80	435.80	435.89	436.98	436.92	436.86	436.96	436.96	435.93	435.84
	Line	16		435.80	435.80	435.89	436.98	436.92	436.86	436.96	436.96	435.93	435.84
	Line	17		435.80	435.80	435.89	436.98	436.92	436.86	436.96	436.96	435.93	435.84
	Line	18		435.80	435.80	435.89	436.98	436.92	436.86	436.96	436.96	435.93	435.84
	Line	19		435.80	435.80	435.89	436.98	436.92	436.86	436.96	436.96	435.93	435.84
	Line	20		435.80	435.80	435.89	436.98	436.92	436.86	436.96	436.96	435.93	435.84
	Line	21		435.80	435.80	435.89	436.98	436.92	436.86	436.96	436.96	435.93	435.84
	Line	22	Top of Year 1 Dredge	435.80	435.80	435.89	436.98	436.92	436.86	436.96	436.96	435.93	435.84
	Line	23		433.65	433.65	433.74	434.83	434.77	434.72	434.81	434.81	433.78	433.70
	Line	24		431.16	431.16	431.25	432.35	432.28	432.23	432.32	432.32	431.29	431.21
	Line	25		428.54	428.54	428.63	429.73	429.66	429.61	429.70	429.70	428.67	428.59
	Line	26		425.85	425.85	425.94	427.03	426.97	426.91	427.01	427.01	425.97	425.89
	Line	27		423.11	423.11	423.20	424.29	424.23	424.17	424.27	424.27	423.23	423.15
	Line	28	Top of Gravel(Top of Incompressib	420.33	420.33	420.42	421.52	421.45	421.40	421.50	421.50	420.46	420.38
	Line	29											
	Line	30											
	Line	31											

Written by:	Yiwen Cao	Date:	12/17/2009	Reviewed by:	R. Kulasingam/Jay Beech	Date:	12/17/2009
Client:	Honeywell	Project:	Onondaga Lake SCA Final Design	Project/ Proposal No.:	GJ4299	Task No.:	04

Attachment 8

CASE 7: Settlement Analysis for Top of LPSL 30 Years after Closure (i.e., End of Year 35) (Cross Section A, Points 26 to 35)

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Settlement Prediction Model

Programmer: **Yiwen Cao, GeoSyntec Consultants**

Version Control V 1.002 11.14.2007

Project: **Onondaga Lake SCA Final**

Notes:

Unit: **ft / psf**

Average Compaction Effort = **1440.00** kPa or psf

Consider Compaction Effort = **N** yes or no

Point #					**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**
Distance (meter or ft)					*349.52*	*371.48*	*371.77*	*391.48*	*391.77*	*412.70*	*431.77*	*432.06*	*451.77*	*452.06*
ELEVATION (M/FT)	Line	1	Top of Final Cover		*451.00*	*451.06*	*451.06*	*451.10*	*451.10*	*451.06*	*451.03*	*451.03*	*451.01*	*451.01*
	Line	2	Top of Dredge		*447.76*	*447.76*	*447.85*	*448.94*	*448.88*	*448.83*	*448.92*	*448.92*	*447.89*	*447.81*
	Line	3	Top of Gravel		*420.33*	*420.33*	*420.42*	*421.52*	*421.45*	*421.40*	*421.50*	*421.50*	*420.46*	*420.38*
	Line	4	Top of Clay		*414.01*	*413.82*	*413.91*	*407.13*	*406.94*	*406.89*	*406.99*	*407.11*	*413.95*	*413.87*
	Line	5	Top of Dike		*411.77*	*412.14*	*412.11*	*405.36*	*405.29*	*405.33*	*405.42*	*405.42*	*412.27*	*412.30*
	Line	6	Top of Subgrade		*411.77*	*412.14*	*412.11*	*405.36*	*405.29*	*405.33*	*405.42*	*405.42*	*412.27*	*412.30*
	Line	7			*409.61*	*409.96*	*409.93*	*403.57*	*403.51*	*403.55*	*403.63*	*403.63*	*410.08*	*410.11*
	Line	8			*407.44*	*407.77*	*407.74*	*401.79*	*401.73*	*401.76*	*401.84*	*401.84*	*407.89*	*407.91*
	Line	9			*405.28*	*405.59*	*405.56*	*400.00*	*399.94*	*399.98*	*400.05*	*400.05*	*405.69*	*405.72*
	Line	10			*403.12*	*403.40*	*403.38*	*398.22*	*398.16*	*398.19*	*398.26*	*398.26*	*403.50*	*403.52*
	Line	11			*400.96*	*401.22*	*401.20*	*396.43*	*396.38*	*396.41*	*396.47*	*396.47*	*401.31*	*401.33*
	Line	12			*398.79*	*399.03*	*399.01*	*394.64*	*394.60*	*394.63*	*394.68*	*394.68*	*399.12*	*399.14*
	Line	13			*396.63*	*396.85*	*396.83*	*392.86*	*392.82*	*392.84*	*392.89*	*392.89*	*396.92*	*396.94*
	Line	14			*394.47*	*394.66*	*394.65*	*391.07*	*391.04*	*391.06*	*391.10*	*391.10*	*394.73*	*394.75*
	Line	15			*392.30*	*392.48*	*392.46*	*389.29*	*389.25*	*389.27*	*389.32*	*389.32*	*392.54*	*392.55*
	Line	16			*390.14*	*390.29*	*390.28*	*387.50*	*387.47*	*387.49*	*387.53*	*387.53*	*390.35*	*390.36*
	Line	17			*387.98*	*388.11*	*388.10*	*385.72*	*385.69*	*385.70*	*385.74*	*385.74*	*388.15*	*388.16*
	Line	18			*385.81*	*385.92*	*385.91*	*383.93*	*383.91*	*383.92*	*383.95*	*383.95*	*385.96*	*385.97*
	Line	19			*383.65*	*383.74*	*383.73*	*382.14*	*382.13*	*382.14*	*382.16*	*382.16*	*383.77*	*383.78*
	Line	20			*381.49*	*381.55*	*381.55*	*380.36*	*380.35*	*380.35*	*380.37*	*380.37*	*381.58*	*381.58*
	Line	21			*379.33*	*379.37*	*379.37*	*378.57*	*378.56*	*378.57*	*378.58*	*378.58*	*379.38*	*379.39*
	Line	22			*377.16*	*377.18*	*377.18*	*376.79*	*376.78*	*376.78*	*376.79*	*376.79*	*377.19*	*377.19*
	Line	23	Bottom of Zone2 Above GW		*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*
	Line	24			*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*
	Line	25	Bottom of Zone 3 Above GW		*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*
	Line	26			*370.00*	*370.00*	*370.00*	*370.00*	*370.00*	*370.00*	*370.00*	*370.00*	*370.00*	*370.00*
	Line	27	Bottom of Zone 2 Below GW		*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*
	Line	28	Top of Incompressible Layer		*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*
	Line	29	GND	for sigma_p	*421.51*	*421.84*	*421.84*	*421.86*	*421.86*	*421.91*	*421.96*	*421.96*	*422.00*	*422.00*
	Line	30	GW		*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*	*375.00*
	Line	31	ROCK		*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*	*365.00*
LAYER THICKNESS (M/FT)	Layer No.	From	To	Material										
	1	*1*	*2*	*Cover*	*3.24*	*3.30*	*3.21*	*2.16*	*2.22*	*2.23*	*2.11*	*2.11*	*3.12*	*3.20*
	2	*2*	*3*	*Dredge*	*27.43*	*27.43*	*27.43*	*27.42*	*27.43*	*27.43*	*27.42*	*27.42*	*27.43*	*27.43*
	3	*3*	*4*	*Gravel*	*6.32*	*6.51*	*6.51*	*14.39*	*14.51*	*14.51*	*14.51*	*14.39*	*6.51*	*6.51*
	4	*4*	*5*	*Clay*	*2.24*	*1.68*	*1.80*	*1.77*	*1.65*	*1.56*	*1.57*	*1.69*	*1.68*	*1.57*
	5	*5*	*6*	*Dike*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	6	*6*	*7*	*Zone2-Above-GW-1*	*2.16*	*2.18*	*2.18*	*1.79*	*1.78*	*1.78*	*1.79*	*1.79*	*2.19*	*2.19*
	7	*7*	*8*	*Zone2-Above-GW-2*	*2.16*	*2.18*	*2.18*	*1.79*	*1.78*	*1.78*	*1.79*	*1.79*	*2.19*	*2.19*
	8	*8*	*9*	*Zone2-Above-GW-3*	*2.16*	*2.18*	*2.18*	*1.79*	*1.78*	*1.78*	*1.79*	*1.79*	*2.19*	*2.19*
	9	*9*	*10*	*Zone2-Above-GW-4*	*2.16*	*2.18*	*2.18*	*1.79*	*1.78*	*1.78*	*1.79*	*1.79*	*2.19*	*2.19*
	10	*10*	*11*	*Zone2-Above-GW-5*	*2.16*	*2.18*	*2.18*	*1.79*	*1.78*	*1.78*	*1.79*	*1.79*	*2.19*	*2.19*
	11	*11*	*12*	*Zone2-Above-GW-6*	*2.16*	*2.18*	*2.18*	*1.79*	*1.78*	*1.78*	*1.79*	*1.79*	*2.19*	*2.19*
	12	*12*	*13*	*Zone2-Above-GW-7*	*2.16*	*2.18*	*2.18*	*1.79*	*1.78*	*1.78*	*1.79*	*1.79*	*2.19*	*2.19*
	13	*13*	*14*	*Zone2-Above-GW-8*	*2.16*	*2.18*	*2.18*	*1.79*	*1.78*	*1.78*	*1.79*	*1.79*	*2.19*	*2.19*
	14	*14*	*15*	*Zone2-Above-GW-9*	*2.16*	*2.18*	*2.18*	*1.79*	*1.78*	*1.78*	*1.79*	*1.79*	*2.19*	*2.19*
	15	*15*	*16*	*Zone2-Above-GW-10*	*2.16*	*2.18*	*2.18*	*1.79*	*1.78*	*1.78*	*1.79*	*1.79*	*2.19*	*2.19*
	16	*16*	*17*	*Zone2-Above-GW-11*	*2.16*	*2.18*	*2.18*	*1.79*	*1.78*	*1.78*	*1.79*	*1.79*	*2.19*	*2.19*
	17	*17*	*18*	*Zone2-Above-GW-12*	*2.16*	*2.18*	*2.18*	*1.79*	*1.78*	*1.78*	*1.79*	*1.79*	*2.19*	*2.19*
	18	*18*	*19*	*Zone2-Above-GW-13*	*2.16*	*2.18*	*2.18*	*1.79*	*1.78*	*1.78*	*1.79*	*1.79*	*2.19*	*2.19*
	19	*19*	*20*	*Zone2-Above-GW-14*	*2.16*	*2.18*	*2.18*	*1.79*	*1.78*	*1.78*	*1.79*	*1.79*	*2.19*	*2.19*
	20	*20*	*21*	*Zone2-Above-GW-15*	*2.16*	*2.18*	*2.18*	*1.79*	*1.78*	*1.78*	*1.79*	*1.79*	*2.19*	*2.19*
	21	*21*	*22*	*Zone2-Above-GW-16*	*2.16*	*2.18*	*2.18*	*1.79*	*1.78*	*1.78*	*1.79*	*1.79*	*2.19*	*2.19*
	22	*22*	*23*	*Zone2-Above-GW-17*	*2.16*	*2.18*	*2.18*	*1.79*	*1.78*	*1.78*	*1.79*	*1.79*	*2.19*	*2.19*
	23	*23*	*24*	*Zone3-Above-GW-1*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	24	*24*	*25*	*Zone3-Above-GW-2*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	25	*25*	*26*	*Zone2-Below-GW-18*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*
	26	*26*	*27*	*Zone2-Below-GW-19*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*	*5.00*
	27	*27*	*28*	*Zone3-Below-GW-3*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	28													
	29	*29*	*30*	Soil Above GW	*46.51*	*46.84*	*46.84*	*46.86*	*46.86*	*46.91*	*46.96*	*46.96*	*47.00*	*47.00*
	30	*30*	*31*	Soil Below GW	*10.00*	*10.00*	*10.00*	*10.00*	*10.00*	*10.00*	*10.00*	*10.00*	*10.00*	*10.00*
	Thickness Check													
		From Line	To Line	SUM	*86.00*	*86.06*	*86.06*	*86.10*	*86.10*	*86.06*	*86.03*	*86.03*	*86.01*	*86.01*
		1	*28*	Thickness =	*86.00*	*86.06*	*86.06*	*86.10*	*86.10*	*86.06*	*86.03*	*86.03*	*86.01*	*86.01*
				Thickness Check	***OK***	***OK***	***OK***	***OK***	***OK***	***OK***	***OK***	***OK***	***OK***	***OK***

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

	Layer No.	Material										
UNIT WEIGHT	1	*Cover*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*
	2	*Dredge*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*	*86.0*
	3	*Gravel*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*
	4	*Clay*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*
	5	*Dike*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*	*120.0*
	6	*Zone2-Above-GW-1*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	7	*Zone2-Above-GW-2*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	8	*Zone2-Above-GW-3*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	9	*Zone2-Above-GW-4*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	10	*Zone2-Above-GW-5*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	11	*Zone2-Above-GW-6*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	12	*Zone2-Above-GW-7*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	13	*Zone2-Above-GW-8*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	14	*Zone2-Above-GW-9*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	15	*Zone2-Above-GW-10*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	16	*Zone2-Above-GW-11*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	17	*Zone2-Above-GW-12*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	18	*Zone2-Above-GW-13*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	19	*Zone2-Above-GW-14*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	20	*Zone2-Above-GW-15*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	21	*Zone2-Above-GW-16*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	22	*Zone2-Above-GW-17*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	23	*Zone3-Above-GW-1*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	24	*Zone3-Above-GW-2*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	25	*Zone2-Below-GW-18*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*
	26	*Zone2-Below-GW-19*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*
	27	*Zone3-Below-GW-3*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*
	28											
	29	*Soil Above GW*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*	*82.0*
	30	*Soil below GW*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*	*19.6*
	Layer No.	***1*** **Cover**										
		Initial Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
		Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
		Midpoint Elevation, (m / ft)	449.38	449.41	449.46	450.02	449.99	449.95	449.98	449.98	449.45	449.41
		Initial Effective Stress, σ'_i (kPa /psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
		Final Effective Stress, σ'_f (kPa/psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method												
Modulus, E (kPa/psf)=		Strain										
		Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)												
Consolidation Properties												
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)												
OCR Manual Input Value												
OCR Computation Input												
Preconsolidation pressure, σ'_p (kPa / psf)												
Modified Primary Compression Index, $C_{c\varepsilon}$												
Modified Recompression Index, $C_{r\varepsilon}$												
Modified Secondary Compression Index, C_α												
ratio of t2 / t1												
Settlements												
Primary Settlement, (m / ft)												
Secondary Settlement (m / ft)												
Total Settlement (m / ft)												
		Elastic or Plastic (E/P)										
		Settlement of Layer 1 (m / ft)										

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Layer No. *2* **Dredge**											
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Midpoint Elevation, (m / ft)	434.05	434.05	434.14	435.23	435.17	435.12	435.21	435.21	434.18	434.10
Initial Effective Stress, σ'_i (kPa /psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Final Effective Stress, σ'_f (kPa/psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)										
OCR Manual Input Value										
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)										
Modified Primary Compression Index, $C_{c\varepsilon}$										
Modified Recompression Index, $C_{r\varepsilon}$										
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$										
ratio of t2 / t1										
Settlements										
Primary Settlement, (m / ft)										
Secondary Settlement (m / ft)										
Total Settlement (m / ft)										
Elastic or Plastic (E/P)										
Settlement of Layer 2 (m / ft)										
Layer No. *3* **Gravel**										
Initial Stress Reference Layer (top of layer)	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
Final Stress Reference Layer (top of layer)	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*	*3*
Midpoint Elevation, (m / ft)	417.17	417.08	417.17	414.33	414.20	414.15	414.25	414.31	417.21	417.13
Initial Effective Stress, σ'_i (kPa /psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Final Effective Stress, σ'_f (kPa/psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)										
OCR Manual Input Value										
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)										
Modified Primary Compression Index, $C_{c\varepsilon}$										
Modified Recompression Index, $C_{r\varepsilon}$										
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$										
ratio of t2 / t1										
Settlements										
Primary Settlement, (m / ft)										
Secondary Settlement (m / ft)										
Total Settlement (m / ft)										
Elastic or Plastic (E/P)										
Settlement of Layer 3 (m / ft)										
Layer No. *4* **Clay**										
Initial Stress Reference Layer (top of layer)	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Final Stress Reference Layer (top of layer)	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*
Midpoint Elevation, (m / ft)	412.89	412.98	413.01	406.25	406.12	406.11	406.21	406.27	413.11	413.09
Initial Effective Stress, σ'_i (kPa /psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Final Effective Stress, σ'_f (kPa/psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)										
OCR Manual Input Value										
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)										
Modified Primary Compression Index, $C_{c\varepsilon}$										
Modified Recompression Index, $C_{r\varepsilon}$										
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$										
ratio of t2 / t1										
Settlements										
Primary Settlement, (m / ft)										
Secondary Settlement (m / ft)										
Total Settlement (m / ft)										
Elastic or Plastic (E/P)										
Settlement of Layer 4 (m / ft)										

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Layer No. 5 **Dike**											
Initial Stress Reference Layer (top of layer)	5	5	5	5	5	5	5	5	5	5
Final Stress Reference Layer (top of layer)	5	5	5	5	5	5	5	5	5	5
Midpoint Elevation, (m / ft)	411.77	412.14	412.11	405.36	405.29	405.33	405.42	405.42	412.27	412.30
Initial Effective Stress, σ'_i (kPa /psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Final Effective Stress, σ'_f (kPa/psf)	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight	Weight
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)										
OCR Manual Input Value										
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)										
Modified Primary Compression Index, $C_{c\varepsilon}$										
Modified Recompression Index, $C_{r\varepsilon}$										
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$										
ratio of t2 / t1										
Settlements										
Primary Settlement, (m / ft)										
Secondary Settlement (m / ft)										
Total Settlement (m / ft)										
Elastic or Plastic (E/P)										
Settlement of Layer 5 (m / ft)										
Layer No. 6 **Zone2-Above-GW-1**										
Initial Stress Reference Layer (top of layer)	2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	410.69	411.05	411.02	404.47	404.40	404.44	404.53	404.53	411.17	411.20
Initial Effective Stress, σ'_i (kPa /psf)	3,475	3,431	3,446	4,371	4,371	4,361	4,361	4,361	3,432	3,419
Final Effective Stress, σ'_f (kPa/psf)	3,848	3,778	3,792	4,686	4,687	4,663	4,678	4,678	3,783	3,770
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
OCR Manual Input Value	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	1,775	1,769	1,774	2,853	2,864	2,866	2,859	2,859	1,775	1,771
Modified Primary Compression Index, $C_{c\varepsilon}$	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460
Modified Recompression Index, $C_{r\varepsilon}$	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%
ratio of t2 / t1	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75
Settlements										
Primary Settlement, (m / ft)	0.044	0.042	0.042	0.025	0.025	0.024	0.025	0.025	0.043	0.043
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.015	0.015	0.015	0.015	0.015	0.019	0.019
Total Settlement (m / ft)	0.063	0.061	0.061	0.040	0.040	0.039	0.040	0.040	0.062	0.062
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 6 (m / ft)	0.063	0.061	0.061	0.040	0.040	0.039	0.040	0.040	0.062	0.062
Layer No. 7 **Zone2-Above-GW-2**										
Initial Stress Reference Layer (top of layer)	2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	408.53	408.86	408.84	402.68	402.62	402.65	402.74	402.74	408.98	409.01
Initial Effective Stress, σ'_i (kPa /psf)	3,652	3,610	3,625	4,517	4,517	4,507	4,508	4,508	3,611	3,598
Final Effective Stress, σ'_f (kPa/psf)	4,024	3,957	3,971	4,834	4,834	4,809	4,825	4,825	3,963	3,950
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	MS	MS	MS	MS	MS	MS	MS	MS	MS	MS
OCR Manual Input Value	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,130	2,128	2,132	3,146	3,156	3,158	3,152	3,152	2,135	2,131
Modified Primary Compression Index, $C_{c\varepsilon}$	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460	0.460
Modified Recompression Index, $C_{r\varepsilon}$	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014	0.014
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%	0.91%
ratio of t2 / t1	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75
Settlements										
Primary Settlement, (m / ft)	0.042	0.040	0.040	0.024	0.024	0.023	0.024	0.024	0.041	0.041
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.015	0.015	0.015	0.015	0.015	0.019	0.019
Total Settlement (m / ft)	0.060	0.059	0.058	0.040	0.039	0.038	0.040	0.040	0.060	0.060
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 7 (m / ft)	0.060	0.059	0.058	0.040	0.039	0.038	0.040	0.040	0.060	0.060

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Layer No. *8* **Zone2-Above-GW-3**											
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	406.36	406.68	406.65	400.90	400.84	400.87	400.95	400.95	406.79	406.81
Initial Effective Stress, σ'_i (kPa /psf)	3,830	3,790	3,804	4,663	4,663	4,653	4,655	4,655	3,791	3,778
Final Effective Stress, σ'_f (kPa/psf)	4,200	4,138	4,149	4,980	4,980	4,958	4,973	4,973	4,143	4,130
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*2.0*	*2.0*	*2.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	*2.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,485	2,486	2,490	1,719	1,724	1,725	1,723	1,723	2,495	2,490
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.040	0.038	0.038	0.023	0.023	0.023	0.024	0.024	0.039	0.039
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.015	0.015	0.015	0.015	0.015	0.019	0.019
Total Settlement (m / ft)	0.058	0.057	0.057	0.039	0.039	0.038	0.039	0.039	0.058	0.058
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 8 (m / ft)	0.058	0.057	0.057	0.039	0.039	0.038	0.039	0.039	0.058	0.058
Layer No. *9* **Zone2-Above-GW-4**										
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	404.20	404.49	404.47	399.11	399.05	399.09	399.16	399.16	404.60	404.62
Initial Effective Stress, σ'_i (kPa /psf)	4,007	3,969	3,983	4,810	4,810	4,799	4,801	4,801	3,971	3,958
Final Effective Stress, σ'_f (kPa/psf)	4,376	4,317	4,328	5,128	5,128	5,107	5,122	5,122	4,323	4,311
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*2.0*	*2.0*	*2.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	*2.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,839	2,844	2,848	1,866	1,870	1,872	1,870	1,870	2,854	2,850
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.038	0.037	0.036	0.023	0.023	0.022	0.023	0.023	0.037	0.037
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.015	0.015	0.015	0.015	0.015	0.019	0.019
Total Settlement (m / ft)	0.057	0.055	0.055	0.038	0.038	0.037	0.038	0.038	0.056	0.056
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 9 (m / ft)	0.057	0.055	0.055	0.038	0.038	0.037	0.038	0.038	0.056	0.056
Layer No. *10* **Zone2-Above-GW-5**										
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	402.04	402.31	402.29	397.32	397.27	397.30	397.37	397.37	402.40	402.43
Initial Effective Stress, σ'_i (kPa /psf)	4,184	4,148	4,162	4,956	4,956	4,946	4,948	4,948	4,151	4,138
Final Effective Stress, σ'_f (kPa/psf)	4,553	4,496	4,507	5,276	5,276	5,255	5,271	5,271	4,504	4,491
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*2.0*	*2.0*	*2.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*2.0*	*2.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,194	3,202	3,206	2,012	2,017	2,018	2,016	2,016	3,214	3,210
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.036	0.035	0.035	0.022	0.022	0.022	0.023	0.023	0.036	0.036
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.015	0.015	0.015	0.015	0.015	0.019	0.019
Total Settlement (m / ft)	0.055	0.054	0.053	0.038	0.038	0.037	0.038	0.038	0.055	0.055
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 10 (m / ft)	0.055	0.054	0.053	0.038	0.038	0.037	0.038	0.038	0.055	0.055

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No. *11* **Zone2-Above-GW-6**											
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	399.87	400.12	400.10	395.54	395.49	395.52	395.58	395.58	400.21	400.23
Initial Effective Stress, σ'_i (kPa /psf)	4,362	4,327	4,341	5,103	5,102	5,092	5,095	5,095	4,331	4,318
Final Effective Stress, σ'_f (kPa/psf)	4,729	4,674	4,685	5,424	5,423	5,404	5,419	5,419	4,684	4,672
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	1,774	1,780	1,782	2,159	2,163	2,164	2,163	2,163	1,787	1,785
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.035	0.034	0.033	0.022	0.022	0.021	0.022	0.022	0.034	0.034
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.015	0.015	0.015	0.015	0.015	0.019	0.019
Total Settlement (m / ft)	0.054	0.052	0.052	0.037	0.037	0.036	0.037	0.037	0.053	0.053
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 11 (m / ft)	0.054	0.052	0.052	0.037	0.037	0.036	0.037	0.037	0.053	0.053
Layer No. *12* **Zone2-Above-GW-7**										
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	397.71	397.94	397.92	393.75	393.71	393.73	393.79	393.79	398.02	398.04
Initial Effective Stress, σ'_i (kPa /psf)	4,539	4,506	4,520	5,249	5,248	5,238	5,241	5,241	4,510	4,498
Final Effective Stress, σ'_f (kPa/psf)	4,906	4,853	4,864	5,572	5,571	5,552	5,568	5,568	4,864	4,856
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	1,952	1,960	1,961	2,305	2,309	2,311	2,310	2,310	1,966	1,965
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.034	0.032	0.032	0.021	0.021	0.021	0.022	0.022	0.033	0.034
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.015	0.015	0.015	0.015	0.015	0.019	0.019
Total Settlement (m / ft)	0.052	0.051	0.051	0.037	0.037	0.036	0.037	0.037	0.052	0.052
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 12 (m / ft)	0.052	0.051	0.051	0.037	0.037	0.036	0.037	0.037	0.052	0.052
Layer No. *13* **Zone2-Above-GW-8**										
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	395.55	395.75	395.74	391.97	391.93	391.95	392.00	392.00	395.83	395.84
Initial Effective Stress, σ'_i (kPa /psf)	4,716	4,685	4,699	5,396	5,394	5,385	5,388	5,388	4,690	4,678
Final Effective Stress, σ'_f (kPa/psf)	5,082	5,032	5,043	5,720	5,718	5,701	5,716	5,716	5,045	5,036
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,129	2,139	2,140	2,452	2,455	2,457	2,456	2,457	2,146	2,145
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.032	0.031	0.031	0.021	0.021	0.020	0.021	0.021	0.032	0.032
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.015	0.015	0.015	0.015	0.015	0.019	0.019
Total Settlement (m / ft)	0.051	0.050	0.050	0.036	0.036	0.036	0.036	0.036	0.051	0.051
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 13 (m / ft)	0.051	0.050	0.050	0.036	0.036	0.036	0.036	0.036	0.051	0.051

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No. *14* **Zone2-Above-GW-9**											
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	393.39	393.57	393.56	390.18	390.15	390.17	390.21	390.21	393.64	393.65
Initial Effective Stress, σ'_i (kPa /psf)	4,894	4,865	4,878	5,542	5,540	5,531	5,535	5,535	4,870	4,858
Final Effective Stress, σ'_f (kPa/psf)	5,258	5,209	5,222	5,868	5,866	5,849	5,865	5,865	5,226	5,214
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,307	2,318	2,319	2,598	2,601	2,603	2,603	2,603	2,326	2,325
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.031	0.030	0.030	0.020	0.020	0.020	0.021	0.021	0.031	0.031
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.015	0.015	0.015	0.015	0.015	0.019	0.019
Total Settlement (m / ft)	0.050	0.049	0.048	0.036	0.036	0.035	0.036	0.036	0.050	0.050
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 14 (m / ft)	0.050	0.049	0.048	0.036	0.036	0.035	0.036	0.036	0.050	0.050
Layer No. *15* **Zone2-Above-GW-10**										
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	391.22	391.39	391.37	388.39	388.36	388.38	388.42	388.42	391.44	391.46
Initial Effective Stress, σ'_i (kPa /psf)	5,071	5,044	5,057	5,689	5,686	5,677	5,682	5,682	5,050	5,038
Final Effective Stress, σ'_f (kPa/psf)	5,435	5,389	5,402	6,016	6,013	5,998	6,013	6,013	5,406	5,394
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,484	2,497	2,498	2,744	2,747	2,750	2,750	2,750	2,506	2,505
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.030	0.029	0.029	0.020	0.020	0.020	0.020	0.020	0.030	0.030
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.015	0.015	0.015	0.015	0.015	0.019	0.019
Total Settlement (m / ft)	0.049	0.048	0.047	0.035	0.035	0.035	0.036	0.036	0.049	0.049
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 15 (m / ft)	0.049	0.048	0.047	0.035	0.035	0.035	0.036	0.036	0.049	0.049
Layer No. *16* **Zone2-Above-GW-11**										
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	389.06	389.20	389.19	386.61	386.58	386.60	386.63	386.63	389.25	389.26
Initial Effective Stress, σ'_i (kPa /psf)	5,248	5,223	5,236	5,835	5,832	5,824	5,828	5,828	5,229	5,218
Final Effective Stress, σ'_f (kPa/psf)	5,612	5,568	5,581	6,164	6,161	6,146	6,162	6,162	5,587	5,575
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,661	2,676	2,677	2,891	2,893	2,896	2,897	2,897	2,685	2,685
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.029	0.028	0.028	0.020	0.020	0.019	0.020	0.020	0.029	0.029
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.015	0.015	0.015	0.015	0.015	0.019	0.019
Total Settlement (m / ft)	0.048	0.047	0.047	0.035	0.035	0.034	0.035	0.035	0.048	0.048
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 16 (m / ft)	0.048	0.047	0.047	0.035	0.035	0.034	0.035	0.035	0.048	0.048

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No. *17* **Zone2-Above-GW-12**											
Initial Stress Reference Layer (top of layer)	2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	386.90	387.02	387.01	384.82	384.80	384.81	384.84	384.84	387.06	387.07
Initial Effective Stress, σ'_i (kPa /psf)	5,426	5,402	5,415	5,981	5,978	5,970	5,975	5,975	5,409	5,398
Final Effective Stress, σ'_f (kPa/psf)	5,789	5,749	5,760	6,311	6,308	6,294	6,310	6,310	5,767	5,756
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	2,839	2,855	2,856	3,037	3,039	3,042	3,043	3,043	2,865	2,864
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.028	0.027	0.027	0.019	0.019	0.019	0.019	0.019	0.028	0.028
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.015	0.015	0.015	0.015	0.015	0.019	0.019
Total Settlement (m / ft)	0.047	0.046	0.046	0.034	0.034	0.034	0.035	0.035	0.047	0.047
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 17 (m / ft)	0.047	0.046	0.046	0.034	0.034	0.034	0.035	0.035	0.047	0.047
Layer No. *18* **Zone2-Above-GW-13**										
Initial Stress Reference Layer (top of layer)	2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	384.73	384.83	384.82	383.04	383.02	383.03	383.05	383.05	384.87	384.87
Initial Effective Stress, σ'_i (kPa /psf)	5,603	5,581	5,594	6,128	6,124	6,116	6,122	6,122	5,589	5,578
Final Effective Stress, σ'_f (kPa/psf)	5,967	5,929	5,939	6,459	6,456	6,440	6,458	6,458	5,948	5,936
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,016	3,034	3,035	3,184	3,185	3,188	3,190	3,190	3,045	3,044
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.027	0.026	0.026	0.019	0.019	0.018	0.019	0.019	0.027	0.027
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.015	0.015	0.015	0.015	0.015	0.019	0.019
Total Settlement (m / ft)	0.046	0.045	0.045	0.034	0.034	0.034	0.034	0.034	0.046	0.046
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 18 (m / ft)	0.046	0.045	0.045	0.034	0.034	0.034	0.034	0.034	0.046	0.046
Layer No. *19* **Zone2-Above-GW-14**										
Initial Stress Reference Layer (top of layer)	2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	382.57	382.65	382.64	381.25	381.24	381.24	381.26	381.26	382.67	382.68
Initial Effective Stress, σ'_i (kPa /psf)	5,781	5,760	5,773	6,274	6,271	6,262	6,269	6,269	5,769	5,757
Final Effective Stress, σ'_f (kPa/psf)	6,144	6,108	6,119	6,606	6,602	6,588	6,605	6,605	6,128	6,117
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,193	3,214	3,214	3,330	3,331	3,335	3,337	3,337	3,225	3,224
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.026	0.026	0.025	0.018	0.018	0.018	0.019	0.019	0.026	0.027
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.015	0.015	0.015	0.015	0.015	0.019	0.019
Total Settlement (m / ft)	0.045	0.044	0.044	0.034	0.034	0.033	0.034	0.034	0.045	0.045
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 19 (m / ft)	0.045	0.044	0.044	0.034	0.034	0.033	0.034	0.034	0.045	0.045

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No.	*20*	**Zone2-Above-GW-15**									
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	380.41	380.46	380.46	379.46	379.45	379.46	379.47	379.47	380.48	380.49
Initial Effective Stress, σ'_i (kPa /psf)	5,958	5,939	5,952	6,421	6,417	6,409	6,415	6,415	5,948	5,937
Final Effective Stress, σ'_f (kPa/psf)	6,321	6,288	6,298	6,753	6,749	6,737	6,753	6,753	6,309	6,300
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,371	3,393	3,393	3,477	3,478	3,481	3,484	3,484	3,405	3,404
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.026	0.025	0.025	0.018	0.018	0.018	0.018	0.018	0.026	0.026
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.015	0.015	0.015	0.015	0.015	0.019	0.019
Total Settlement (m / ft)	0.044	0.044	0.043	0.033	0.033	0.033	0.034	0.034	0.045	0.045
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 20 (m / ft)	0.044	0.044	0.043	0.033	0.033	0.033	0.034	0.034	0.045	0.045
Layer No.	*21*	**Zone2-Above-GW-16**									
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	378.24	378.28	378.27	377.68	377.67	377.68	377.68	377.68	378.29	378.29
Initial Effective Stress, σ'_i (kPa /psf)	6,135	6,119	6,131	6,567	6,563	6,555	6,562	6,562	6,128	6,117
Final Effective Stress, σ'_f (kPa/psf)	6,498	6,467	6,478	6,901	6,897	6,885	6,902	6,902	6,489	6,481
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,548	3,572	3,572	3,623	3,624	3,627	3,630	3,630	3,584	3,584
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.025	0.024	0.024	0.018	0.018	0.017	0.018	0.018	0.025	0.025
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.015	0.015	0.015	0.015	0.015	0.019	0.019
Total Settlement (m / ft)	0.043	0.043	0.043	0.033	0.033	0.033	0.033	0.033	0.044	0.044
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 21 (m / ft)	0.043	0.043	0.043	0.033	0.033	0.033	0.033	0.033	0.044	0.044
Layer No.	*22*	**Zone2-Above-GW-17**									
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	376.08	376.09	376.09	375.89	375.89	375.89	375.89	375.89	376.10	376.10
Initial Effective Stress, σ'_i (kPa /psf)	6,313	6,298	6,310	6,714	6,709	6,701	6,709	6,709	6,308	6,297
Final Effective Stress, σ'_f (kPa/psf)	6,676	6,647	6,658	7,049	7,044	7,033	7,050	7,050	6,671	6,660
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,725	3,751	3,751	3,770	3,770	3,774	3,777	3,777	3,764	3,764
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.024	0.024	0.023	0.017	0.017	0.017	0.018	0.018	0.024	0.025
Secondary Settlement (m / ft)	0.019	0.019	0.019	0.015	0.015	0.015	0.015	0.015	0.019	0.019
Total Settlement (m / ft)	0.043	0.042	0.042	0.033	0.033	0.032	0.033	0.033	0.043	0.043
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 22 (m / ft)	0.043	0.042	0.042	0.033	0.033	0.032	0.033	0.033	0.043	0.043

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **04**

Layer No. *23* **Zone3-Above-GW-1**											
Initial Stress Reference Layer (top of layer)	2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00
Initial Effective Stress, σ'_i (kPa /psf)	6,401	6,387	6,399	6,787	6,782	6,774	6,782	6,782	6,398	6,387
Final Effective Stress, σ'_f (kPa/psf)	6,765	6,737	6,747	7,123	7,118	7,108	7,125	7,125	6,760	6,750
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,814	3,841	3,841	3,843	3,843	3,847	3,850	3,850	3,854	3,854
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*
Modified Recompression Index, $C_{r\varepsilon}$	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 23 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No. *24* **Zone3-Above-GW-2**										
Initial Stress Reference Layer (top of layer)	2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00	375.00
Initial Effective Stress, σ'_i (kPa /psf)	6,401	6,387	6,399	6,787	6,782	6,774	6,782	6,782	6,398	6,387
Final Effective Stress, σ'_f (kPa/psf)	6,765	6,737	6,747	7,123	7,118	7,108	7,125	7,125	6,760	6,750
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,814	3,841	3,841	3,843	3,843	3,847	3,850	3,850	3,854	3,854
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*
Modified Recompression Index, $C_{r\varepsilon}$	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	p	p	p	p	p	p	p	p	p	p
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 24 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Layer No. *25* **Zone2-Below-GW-18**										
Initial Stress Reference Layer (top of layer)	2	2	2	2	2	2	2	2	2	2
Final Stress Reference Layer (top of layer)	1	1	1	1	1	1	1	1	1	1
Midpoint Elevation, (m / ft)	372.50	372.50	372.50	372.50	372.50	372.50	372.50	372.50	372.50	372.50
Initial Effective Stress, σ'_i (kPa /psf)	6,450	6,436	6,448	6,836	6,831	6,823	6,831	6,831	6,447	6,436
Final Effective Stress, σ'_f (kPa/psf)	6,814	6,786	6,797	7,174	7,169	7,158	7,175	7,175	6,810	6,802
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,863	3,890	3,890	3,892	3,892	3,896	3,899	3,899	3,903	3,903
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.055	0.053	0.053	0.048	0.048	0.048	0.049	0.049	0.055	0.055
Secondary Settlement (m / ft)	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043
Total Settlement (m / ft)	0.098	0.096	0.095	0.091	0.091	0.091	0.092	0.092	0.098	0.098
Elastic or Plastic (E/P)										
	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 25 (m / ft)	0.098	0.096	0.095	0.091	0.091	0.091	0.092	0.092	0.098	0.098

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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Layer No. *26* **Zone2-Below-GW-19**											
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	367.50	367.50	367.50	367.50	367.50	367.50	367.50	367.50	367.50	367.50
Initial Effective Stress, σ'_i (kPa /psf)	6,548	6,534	6,546	6,934	6,929	6,921	6,929	6,929	6,545	6,534
Final Effective Stress, σ'_f (kPa/psf)	6,913	6,886	6,897	7,274	7,269	7,259	7,276	7,276	6,911	6,900
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	3,961	3,988	3,988	3,990	3,990	3,994	3,997	3,997	4,001	4,001
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*	*0.460*
Modified Recompression Index, $C_{r\varepsilon}$	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*	*0.014*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*	*0.91%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.054	0.052	0.052	0.048	0.048	0.048	0.049	0.049	0.054	0.054
Secondary Settlement (m / ft)	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043	0.043
Total Settlement (m / ft)	0.097	0.095	0.095	0.091	0.091	0.090	0.092	0.092	0.097	0.097
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 26 (m / ft)	0.097	0.095	0.095	0.091	0.091	0.090	0.092	0.092	0.097	0.097
Layer No. *27* **Zone3-Below-GW-3**										
Initial Stress Reference Layer (top of layer)	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*	*2*
Final Stress Reference Layer (top of layer)	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*	*1*
Midpoint Elevation, (m / ft)	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00
Initial Effective Stress, σ'_i (kPa /psf)	6,597	6,583	6,595	6,983	6,978	6,970	6,978	6,978	6,594	6,583
Final Effective Stress, σ'_f (kPa/psf)	6,962	6,936	6,947	7,326	7,321	7,311	7,328	7,328	6,961	6,950
Elastic Method										
Modulus, E (kPa/psf)= Strain										
Settlement (m / ft)										
1-D Consolidation Theory (Plastic Method)										
Consolidation Properties										
OCR Manual or Auto Input (MW/MS: Manual waste/soil, A:Automatic)	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*	*MS*
OCR Manual Input Value	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*	*1.0*
OCR Computation Input										
Preconsolidation pressure, σ'_p (kPa / psf)	4,010	4,037	4,037	4,039	4,039	4,043	4,046	4,046	4,050	4,050
Modified Primary Compression Index, $C_{c\varepsilon}$	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*	*0.380*
Modified Recompression Index, $C_{r\varepsilon}$	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*	*0.021*
Modified Secondary Compression Index, $C_{\alpha\varepsilon}$	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*	*0.70%*
ratio of t2 / t1	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*	*8.75*
Settlements										
Primary Settlement, (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Secondary Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Total Settlement (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elastic or Plastic (E/P)	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D	1-D
Settlement of Layer 27 (m / ft)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Written by: **Yiwen Cao** Date: **12/17/2009** Reviewed by: **R. Kulasingam/Jay Beech** Date: **12/17/2009**

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	Layer No.	Material										
LAYER SETTLEMENT	1	*Cover*										
	2	*Dredge*										
	3	*Gravel*										
	4	*Clay*										
	5	*Dike*										
	6	*Zone2-Above-GW-1*	0.063	0.061	0.061	0.040	0.040	0.039	0.040	0.040	0.062	0.062
	7	*Zone2-Above-GW-2*	0.060	0.059	0.058	0.040	0.039	0.038	0.040	0.040	0.060	0.060
	8	*Zone2-Above-GW-3*	0.058	0.057	0.057	0.039	0.039	0.038	0.039	0.039	0.058	0.058
	9	*Zone2-Above-GW-4*	0.057	0.055	0.055	0.038	0.038	0.037	0.038	0.038	0.056	0.056
	10	*Zone2-Above-GW-5*	0.055	0.054	0.053	0.038	0.038	0.037	0.038	0.038	0.055	0.055
	11	*Zone2-Above-GW-6*	0.054	0.052	0.052	0.037	0.037	0.036	0.037	0.037	0.053	0.053
	12	*Zone2-Above-GW-7*	0.052	0.051	0.051	0.037	0.037	0.036	0.037	0.037	0.052	0.052
	13	*Zone2-Above-GW-8*	0.051	0.050	0.050	0.036	0.036	0.036	0.036	0.036	0.051	0.051
	14	*Zone2-Above-GW-9*	0.050	0.049	0.048	0.036	0.036	0.035	0.036	0.036	0.050	0.050
	15	*Zone2-Above-GW-10*	0.049	0.048	0.047	0.035	0.035	0.035	0.036	0.036	0.049	0.049
	16	*Zone2-Above-GW-11*	0.048	0.047	0.047	0.035	0.035	0.034	0.035	0.035	0.048	0.048
	17	*Zone2-Above-GW-12*	0.047	0.046	0.046	0.034	0.034	0.034	0.035	0.035	0.047	0.047
	18	*Zone2-Above-GW-13*	0.046	0.045	0.045	0.034	0.034	0.034	0.034	0.034	0.046	0.046
	19	*Zone2-Above-GW-14*	0.045	0.044	0.044	0.034	0.034	0.033	0.034	0.034	0.045	0.045
	20	*Zone2-Above-GW-15*	0.044	0.044	0.043	0.033	0.033	0.033	0.034	0.034	0.045	0.045
	21	*Zone2-Above-GW-16*	0.043	0.043	0.043	0.033	0.033	0.033	0.033	0.033	0.044	0.044
	22	*Zone2-Above-GW-17*	0.043	0.042	0.042	0.033	0.033	0.032	0.033	0.033	0.043	0.043
	23	*Zone3-Above-GW-1*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	24	*Zone3-Above-GW-2*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	25	*Zone2-Below-GW-18*	0.098	0.096	0.095	0.091	0.091	0.091	0.092	0.092	0.098	0.098
	26	*Zone2-Below-GW-19*	0.097	0.095	0.095	0.091	0.091	0.090	0.092	0.092	0.097	0.097
	27	*Zone3-Below-GW-3*	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	28											
	29	*Soil Above GW*										
	30	*Soil Below GW*										
		TOTAL SETTLEMENT	**1.06**	**1.04**	**1.03**	**0.79**	**0.79**	**0.78**	**0.80**	**0.80**	**1.06**	**1.06**
POST-SETTLEMENT ELEVATION (M/FT)	Line	1	Top of Final Cover	449.94	450.02	450.03	450.31	450.31	450.28	450.23	450.23	449.95	449.95
	Line	2	Top of Dredge	446.70	446.72	446.82	448.15	448.09	448.05	448.12	448.12	446.83	446.75
	Line	3	Top of Gravel	419.27	419.29	419.39	420.73	420.66	420.62	420.70	420.70	419.40	419.32
	Line	4	Top of Clay	412.95	412.78	412.88	406.34	406.15	406.11	406.19	406.31	412.89	412.81
	Line	5	Top of Dike	410.71	411.10	411.08	404.57	404.50	404.55	404.62	404.62	411.21	411.24
	Line	6	Top of Subgrade	410.71	411.10	411.08	404.57	404.50	404.55	404.62	404.62	411.21	411.24
	Line	7		408.61	408.98	408.96	402.82	402.76	402.80	402.87	402.87	409.08	409.11
	Line	8		406.51	406.85	406.83	401.07	401.01	401.06	401.12	401.12	406.95	406.97
	Line	9		404.41	404.73	404.70	399.33	399.27	399.31	399.37	399.37	404.82	404.84
	Line	10		402.30	402.60	402.58	397.58	397.53	397.56	397.62	397.62	402.68	402.70
	Line	11		400.19	400.47	400.45	395.83	395.78	395.82	395.87	395.87	400.54	400.56
	Line	12		398.08	398.33	398.32	394.08	394.04	394.07	394.12	394.12	398.40	398.42
	Line	13		395.97	396.20	396.18	392.33	392.29	392.32	392.36	392.36	396.26	396.28
	Line	14		393.86	394.06	394.05	390.58	390.55	390.57	390.61	390.61	394.12	394.13
	Line	15		391.75	391.93	391.92	388.83	388.80	388.82	388.86	388.86	391.98	391.99
	Line	16		389.63	389.79	389.78	387.08	387.05	387.07	387.10	387.10	389.83	389.84
	Line	17		387.52	387.65	387.64	385.33	385.31	385.32	385.35	385.35	387.69	387.70
	Line	18		385.40	385.51	385.51	383.58	383.56	383.57	383.59	383.59	385.54	385.55
	Line	19		383.28	383.37	383.37	381.83	381.81	381.82	381.84	381.84	383.40	383.40
	Line	20		381.16	381.23	381.23	380.08	380.06	380.07	380.08	380.08	381.25	381.25
	Line	21		379.05	379.09	379.09	378.32	378.32	378.32	378.33	378.33	379.10	379.11
	Line	22		376.93	376.95	376.95	376.57	376.57	376.57	376.57	376.57	376.95	376.96
	Line	23	Bottom of Zone2 Above GW	374.81	374.81	374.81	374.82	374.82	374.82	374.82	374.82	374.81	374.80
	Line	24		374.81	374.81	374.81	374.82	374.82	374.82	374.82	374.82	374.81	374.80
	Line	25	Bottom of Zone 3 Above GW	374.81	374.81	374.81	374.82	374.82	374.82	374.82	374.82	374.81	374.80
	Line	26		369.90	369.90	369.90	369.91	369.91	369.91	369.91	369.91	369.90	369.90
	Line	27	Bottom of Zone 2 Below GW	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00
	Line	28	Top of Incompressible Layer	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00	365.00
	Line	29	GND										
	Line	30	GW										
	Line	31	ROCK										

APPENDIX I

EVALUATION OF HYDRAULIC PERFORMANCE FOR SCA DESIGN

GEOSYNTEC CONSULTANTS

COMPUTATION COVER SHEET

Client: Honeywell **Project:** Onondaga Lake SCA Design **Project/Proposal #:** GJ4299 **Task #:** 18

TITLE OF COMPUTATIONS **EVALUTION OF HYDRAULIC PERFORMANCE FOR SCA DESIGN**

COMPUTATIONS BY:

Signature [signature] 1/12/2010 DATE

Printed Name and Title: Joseph Sura, Staff Engineer

ASSUMPTIONS AND PROCEDURES CHECKED BY:
(Peer Reviewer)

Signature [signature] 1/12/2010 DATE

Printed Name and Title: R. Kulasingam, Project Engineer

COMPUTATIONS CHECKED BY:

Signature [signature] 1/12/2010 DATE

Printed Name and Title: Fan Zhu, Staff Engineer

COMPUTATIONS BACKCHECKED BY:
(Originator)

Signature [signature] 1/12/2010 DATE

Printed Name and Title: Joseph Sura, Staff Engineer

APPROVED BY:
(PM or Designate)

Signature [signature] 12 JAN 2010 DATE

Printed Name and Title: Jay Beech, Principal

STATE OF NEW YORK JOHN E. BEECH LICENSED PROFESSIONAL ENGINEER

APPROVAL NOTES:

REVISIONS (Number and initial all revisions)

NO.	SHEET	DATE	BY	CHECKED BY	APPROVAL

EVALUATION OF HYDRAULIC PERFORMANCE FOR SCA DESIGN

INTRODUCTION

This package was prepared in support of the design of the Sediment Consolidation Area (SCA) for the Onondaga Lake Bottom Site, which will be constructed on Wastebed 13 (WB-13). This package presents an analysis of hydraulic performance of the SCA, which will contain geotextile tubes (geo-tubes) filled with dredge material from Onondaga Lake. The analysis presented in this package has three main objectives:

1. Evaluate the infiltration rate through the final cover system. The infiltration rate through the cover system is needed to calculate the amount of liquid to be pumped through the base liner liquid management system (LMS) after closure of the SCA.
2. Evaluate the liquid head above the liner system. It should be noted that the maximum liquid head acting on the base liner system will be limited to 12 inches per New York State Department of Environmental Conservation (NYSDEC) regulations.
3. Determine the liquid head on the cover system of the SCA top and side slopes. The liquid head on the cover system of the SCA side slopes is required to analyze the veneer stability of the final cover system. More details regarding the veneer stability analysis are provided in the calculation package titled "Final Cover Veneer Stability Analyses for SCA Design" (Appendix L of the SCA Final Design).

In addition, calculations were performed to estimate the amount of consolidation water that could potentially be squeezed out of the foundation Solvay waste (SOLW) due to the SCA loading. The estimated amount of consolidation water was compared with the estimated reduction in infiltration of precipitation into WB-13 due to the installation of the SCA liner system. Calculations were also performed to compare the efficiencies of the proposed liner and NYSDEC Part 360 liner systems with regards to protection of groundwater quality.

METHODOLOGY

The calculations in this package were performed using the "Hydraulic Evaluation of Landfill Performance" (HELP) software, Version 3.07 developed by the U.S. Environmental Protection Agency. The HELP model is a quasi two-dimensional hydrologic model of water movement across, into, through, and out of landfills. The model accepts weather, soil, and design data and accounts for the effects of surface storage, snowmelt, runoff, infiltration,

evapotranspiration, vegetative growth, lateral drainage, and leakage through liners [Schroeder, 1994]. The amount of consolidation water was estimated using methods that are consistent with the calculation package titled "Settlement Analyses for SCA" (Appendix H of the SCA Final Design).

INPUT PARAMETERS

The HELP software accepts parameters for layer type, hydraulic conductivity *K* for each layer, drainage path length, slope, moisture storage values, and climate. The SCA was modeled as shown in Figure 1, which provides a typical cross section. Specific properties of the eight different layers of materials are included in Table 1 and are discussed further below. It is noted that the HELP default parameters were used to select the total porosity, field capacity, and wilting point of each layer, however, the hydraulic conductivity was modified to better represent expected or potentially critical conditions.

SCA Geometry and Cover

The current design of the side slopes of the SCA is based on a 20-ft offset between geo-tubes. Each geo-tube layer is expected to be approximately 6-ft thick. This results in side slopes of 20 horizontal:6 vertical (i.e., 30% slopes) and a slope angle β=16.7 degrees. The drainage path length along the side slopes is 100 ft. The overall final cover slope on the top of the SCA is approximately 0.5% towards the low points near the sump areas. The longest possible drainage path is shown in Figure 2, which is approximately 1500 ft in length.

The current design of the SCA final cover consists of the following layers, from top to bottom, as shown in Figures 3A and 3B for the top and side slopes, respectively:

- Vegetative soil layer;
- Protective soil layer;
- Geocomposite drainage layer (SCA side slopes only);
- Geomembrane (GM) liner; and
- Leveling layer.

The proposed vegetative soil layer has a thickness of 6 in and was modeled as a sandy silt (ML) with a hydraulic conductivity of 1.0×10^{-4} cm/s. The protective soil layer has a thickness of 24 in and is assumed to be a sandy clay (SC) material with a hydraulic conductivity of 1.0×10^{-5} cm/s.

The geocomposite drainage layer will only be included in the side slopes of the SCA to reduce the liquid head on the cover and improve the final cover veneer stability. For purposes of this analysis, a 200 mil geocomposite with a minimum measured hydraulic conductivity of 10 cm/s is recommended. After the use of reduction factors to account for creep (1.2), delayed intrusion (1.1), degradation (1.2), particulate clogging (1.2), chemical clogging (1.2), biological clogging (1.3) and a general safety factor of 2.5, the design hydraulic conductivity is considered to be 1.33 cm/s.

The cover GM was modeled using the HELP model parameters for a low density polyethylene (LDPE) liner, which is available in the HELP database. It is noted that changing the type of GM to other materials, such as ethylene-propylene diene monomer (EPDM) or high density polyethylene (HDPE), which are also available in the HELP database, did not affect the calculated values. It was assumed to contain one hole per acre and have good contact with the soil layer below, both of which can typically be achieved during construction. The holes in the GM were assumed to be 0.16 in^2, following the recommendations of Giroud and Bonaparte [1989].

A leveling layer was assumed to smooth post-settlement contours and maintain positive drainage. The decision on the material to be used in the leveling layer will be determined based on available material sources during operations. Therefore, a sensitivity analysis has been performed to model the impact of using either a SC material of the same type as the protective soil layer (i.e., hydraulic conductivity of 10^{-5} cm/s) or a granular material with hydraulic conductivity of 1.0 cm/s that is likely to be available if particle separation is performed on the dredged material. It is noted that the thickness of the leveling layer may vary, based on surface water requirements and the amount of separated material available for disposal. Based on sensitivity analyses, a thickness of 6 inches was selected for modeling.

Geo-tubes and Dredge Material

The geo-tubes above the gravel drainage layer were modeled as three separate layers, from bottom to top: (i) a layer for the dredge material; (ii) a small intermediate layer; and (iii) a geotextile layer for the top layer of geo-tubes. The 30-ft thick dredge material was modeled with properties similar to a low plasticity silt (ML). A hydraulic conductivity of $K_{DREDGE} = 1.0\text{x}10^{-5}$ cm/s was used to represent the dredged material. Laboratory test results on the material to be dredged, which consists mostly of Solvay waste (SOLW) from the In-Lake Waste Deposit (ILWD) of Onondaga Lake, indicate that the hydraulic conductivity of the dredge material (K_{DREDGE}) may vary from approximately $K_{DREDGE}=10^{-5}$ cm/s to $K_{DREDGE}=10^{-6}$ cm/s. As discussed in subsequent sections, sensitivity analyses were performed to evaluate the effect of K_{DREDGE} on the infiltration rate and the head on the liner.

The intermediate layer above the dredge material was modeled as a vertical percolation layer of 60-mil thickness of dredge material. This layer is necessary due to modeling restrictions within the HELP program, which does not allow the placement of a barrier soil layer underlying another barrier soil layer.

The geotextile layer represents the interface between the geo-tubes and dredge material. As the liquid flows through the cover system to reach the top geo-tube/dredge material interface, it will experience preferential flow patterns. As shown in Figure 4, the liquid can pass through the geotextile material itself or through the open area filled with dredge material. Therefore, this layer was modeled using a combined equivalent hydraulic conductivity K_{EQ}, calculated using Equation 1 below, as discussed by Das [2005].

$$K_{EQ} = K_{DREDGE} \text{ x } A_{DREDGE} + K_{GT} \text{ x } A_{GT} \qquad \text{(Eq.1)}$$

where:

K_{EQ} = Equivalent hydraulic conductivity

K_{DREDGE} = Hydraulic conductivity of dredge material

A_{DREDGE} = Cross-sectional area of dredge material, measured as percent open area of the geotextile

K_{GT} = Hydraulic conductivity of woven geotextile

A_{GT} = Cross-sectional area covered by woven geotextile material and calculated as 100% - A_{DREDGE}

The percent open area was assumed to be 4% based on the standard typical minimum value for a woven geotextile [TC Mirafi, 2000]. A sensitivity analysis on the equivalent hydraulic conductivity resulting from different values of K_{GT} was performed and is shown in Figure 5. As described on Figure 5, a value of $K_{EQ} = 4.0\text{x}10^{-7}$ cm/s was selected based on this analysis.

Liner System

The SCA liner system consists of the following layers from top to bottom:

- Gravel drainage layer;
- Nonwoven geotextile cushion;
- Geomembrane (GM) liner; and
- Low permeability soil layer.

The proposed gravel drainage layer has an average thickness of 2 ft and a minimum thickness of 1 ft. It was modeled conservatively as a 1-ft thick layer. This drainage layer will be sloped towards the sumps to allow gravity drainage. Based on the predicted grading of the underlying low permeability soil layer 30 years after closure, the gravel drainage layer was modeled with a slope of 1% and a drainage path length of 1500 ft, as shown in Figure 6. A sensitivity analysis using a slope of 0.5% for the gravel drainage layer was also performed. The assumed hydraulic conductivity of the gravel is 10 cm/s based on available material sources. Sensitivity analyses were performed to evaluate the effect of K_{GRAVEL} ranging from 5 cm/s to 15 cm/s, based on a range in values for other potentially available gravel types.

A nonwoven (NW) geotextile (GT) cushion will be placed between the gravel drainage layer and GM for protection. This NW GT layer was not included in the HELP model.

The GM was modeled using the HELP model parameters for a low density polyethylene (LDPE) liner, which is available in the HELP database. It is noted that changing the type of GM to other materials, such as ethylene-propylene diene monomer (EPDM) or high density polyethylene (HDPE), which are also available in the HELP database, did not affect the calculated values. The GM was assumed to contain one hole per acre and have good contact with the soil layer below, both of which can typically be achieved during construction. The holes in the GM were assumed to be 0.16 in^2, following the recommendations of Giroud and Bonaparte [1989].

The low permeability soil layer has a proposed minimum thickness of 1 ft. The top 6 inches of this layer is required to have a hydraulic conductivity of $K=10^{-6}$ cm/s or lower, per agreement with NYSDEC. The bottom part of this layer was modeled with a hydraulic conductivity of $K=10^{-5}$ cm/s.

Climate Data

The data for precipitation, temperature, humidity, and solar radiation were modeled using the HELP software synthetic data generation function for Syracuse, New York for a 100-year modeling period. This generation uses recorded mean monthly data for Syracuse, shown in Table 2, to stochastically generate daily data with approximately the same statistical characteristics as the historic data. The precipitation data was manually adjusted to account for the design storm event of a 25-year, 24-hour rainfall. The rainfall corresponding to the design storm event was selected to be 4.4 inches based on recommendations from the Natural Resources Conservation Service [1986], as shown in Figure 7. The evaporative zone depth, which is the maximum depth from which water may be removed by evapotranspiration, was assumed to be 30

inches, corresponding to the total thickness of the topsoil and the protective soil layer in the final cover system. For this analysis, it is assumed that a good stand of grass will be established on the final cover system; therefore, the leaf area index (i.e., the dimensionless ratio of leaf area of active vegetation to the nominal surface area) of 3.5 was selected. If willows are planted above the GM, less infiltration will result; therefore, that case is not analyzed herein. Values of the climate parameters are shown in Table 3.

CASES ANALYZED

Table 4 provides a summary of the cases evaluated, which includes a Base Case (top and side slopes) and a sensitivity analysis on the parameters K_{DREDGE}, K_{GRAVEL}, and $K_{LEVELING}$. Case 1, as compared to the Base Case (top), was used to evaluate the effect of uncertainty in the hydraulic conductivity of the dredge material. Cases 2A and 2B, as compared to the Base Case (top), were used to evaluate the effect of the gravel drainage layer hydraulic conductivity on liquid production and the liquid head on the geomembrane liner. Case 3, as compared to the Base Case (top), was used to evaluate the effect of a clayey soil (i.e., SC soil, $K_{LEVELING}=1.0\times10^{-5}$ cm/s) in the leveling layer as compared to granular soil (i.e., $K_{LEVELING}=1.0$ cm/s) in the leveling layer.

For analysis of the SCA side slopes, the Base Case parameters were used with a geocomposite added to the final cover, as discussed previously. This case is referred to as Base (side slopes) in Table 4.

Finally, HELP modeling was also performed to demonstrate the efficiency of the SCA with the proposed composite liner system as compared to the efficiency of the SCA with a prescribed Part 360 liner. The Part 360 prescribed liner system used for comparison is summarized in Table 5.

RESULTS OF ANALYSIS

The results of the HELP Model analyses are summarized in Table 6. HELP Output files for the Base Case on the SCA top (run I_1A) and SCA side slopes (run III_1A) are included in Attachment 1.

The effect of uncertainty in the hydraulic conductivity of the dredge material was studied by comparing the results of Case 1 with the Base Case (top). Increasing the hydraulic conductivity of the dredge material did not significantly affect calculated peak daily or average annual values

of liquid head on the cover and liner system or liquid production. Therefore, it is recommended that a value of K_{DREDGE}= 10^{-5} cm/s be used for design purposes.

When compared to the Base Case on the top (K_{GRAVEL}=10 cm/s), changing the gravel hydraulic conductivity (i.e., Cases 2A and 2B) did not significantly affect calculated peak daily or average annual values of liquid head on the cover and liner system or liquid production. Therefore, it is recommended that a value of K_{GRAVEL}=10 cm/s be used for design purposes.

Changing the material used in the leveling layer (i.e., Base Case [top] compared to Case 3) did not affect the calculated peak daily or average annual values of liquid head on the cover and liner system or liquid production. Therefore, based on the results of the HELP analysis, use of either the SC soil or a granular material (or any other soil with K values in between 1.0×10^{-5} cm/s and 1 cm/s) is considered to be acceptable from a hydraulic performance standpoint.

The results of the consolidation water and infiltration reduction calculations are presented in Table 7. These calculations were performed on an annual average basis during the SCA operational period using reasonable assumptions regarding liner construction and geo-tube filling phasing. Key assumptions are presented as footnotes in Table 7. During the four years of operation, total amounts of consolidation water due to filling of the SCA and infiltration reduction due to installation of the liner were calculated to be 189 and 162 million gallons, respectively. Considering the complicated nature of nonlinear field processes such as consolidation and infiltration and the use of idealized simple models to perform the estimates, the total amount of consolidation water and reduction in infiltration are considered to be comparable over a four year operational period. The current capacity of the existing liquid collection system and its ability to handle a potential increase in flow will be further evaluated as part of the closure of WB-9 through WB-15.

The equivalency calculations summarized in Table 8 indicate that the SCA with both the proposed liner and the NYSDEC Part 360 liner have liner efficiencies of greater than 99.99%. Therefore, it can be demonstrated that the proposed system will effectively protect groundwater quality.

SUMMARY AND CONCLUSIONS

This package presents the analyses of the hydraulic performance of the proposed SCA using the HELP model. The evaluation presented in this package has three main objectives: (i) evaluate the infiltration rate through the proposed final cover system; (ii) evaluate the liquid head above the liner system; and (iii) evaluate the liquid head above the GM in the cover system on the top and side slopes of the SCA. Analysis of the SCA top and side slopes indicates that the

calculated liquid head on the liner satisfies the NYSDEC requirement of 1 ft or less on the liner system. The calculated annual average liquid rate was approximately 0.4 gallons per minute. The maximum and average calculated liquid heads in the cover system on the SCA side slopes during the peak day were 0.030 inches (0.003 ft) and 0.020 inches (0.002 ft), respectively.

In addition, the calculations performed to estimate the amount of consolidation water indicate that the amount of water squeezed out over the four year operational period is the same order of magnitude as the reduction in infiltration that will occur due to liner system installation. The capacity of the existing liquid collection system is currently being evaluated as part of the WB-9 through WB-15 closure.

The equivalency calculations indicate that the efficiency of the proposed SCA with its composite liner system is comparable to the efficiency of the SCA with a Part 360 liner. Therefore, it can be demonstrated that the proposed SCA liner will effectively protect groundwater quality at the site.

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Tables

Table 1: Material Properties of Layers within SCA System

Layer	Description[1]	Layer Type[2]	HELP Default[3]	HELP USCS Name	Thickness (in)	K (cm/s)
1	Topsoil	1	8	ML	6	1.0E-04
2	Protective Layer	2	13	SC	24	1.0E-05
3	Geomembrane	4	36	LDPE	0.06	4.0E-13[4]
4	Leveling Layer	1	21 / 13	Gravel / SC	6[5]	1.0 / 1.0E-05
5	Geo-tube with Dredge Filter Cake	3	20	Drainage Net	0.06	4.0E-07[6]
6	Dredge material[7]	1	22	ML	0.06	1.0E-05[8]
7	Dredge material	3	22	ML	360	1.0E-05[8]
8	Gravel Drainage	2	21	Gravel	12	10[9]
9	Geomembrane	4	36	LDPE	0.06	4.0E-13[4]
10	Low Permeability Soil (Top 6")	3	24	SC	6	1.0E-06
11	Low Permeability Soil (Bottom 6")	1	13	SC	6	1.0E-05

Notes:

1. This is a general description of each layer.
2. The following layer types are available in the HELP model: 1=Vertical Percolation, 2=Lateral Drainage, 3=Barrier Soil Liner, 4=Geomembrane Liner (GM).
3. This is the HELP default soil texture number. It is noted that the hydraulic conductivity of each layer may be changed from the HELP default to better represent expected or potentially critical conditions. All input parameters can be found in the HELP output files provided in Attachment 1.
4. This layer is modeled as LDPE GM, using typical values from the HELP database. Selection of a different GM type will not affect the results significantly.
5. The leveling layer thickness may vary based on surface water requirements and the amount of separated material available for disposal. Based on sensitivity analyses discussed in the package, a thickness of 6 inches was selected for modeling.
6. This was calculated using the percent Open Area, as discussed in the package.
7. This layer is identical to the 360 inch (30 ft) layer of dredge material, but is modeled as a vertical percolation layer. This is necessary due to modeling restrictions within the HELP program.
8. The value shown here is the base parameter, used in cases labeled "A". This value was changed to $K=1.0x10^{-6}$ cm/s in cases labeled "B" to evaluate sensitivity.
9. The assumed hydraulic conductivity of the gravel is 10 cm/s, based on potentially available material.
10. It is noted that layers 8 through 11 compose the proposed liner system.

11. It is noted that for the side slope case (S_III_1A), a 200 mil geocomposite drainage layer was added between layers 2 and 3. This layer was modeled as the HELP default soil texture 20 (i.e., drainage net) and a design hydraulic conductivity of 1.33 cm/s, which corresponds to a measured laboratory hydraulic conductivity of 10 cm/s.

Table 2: Normal Mean Precipitation and Temperature Data for Syracuse, NY

Month	Precipitation (in)	Temperature (°F)
January	2.61	22.80
February	2.65	24.00
March	3.11	33.30
April	3.34	46.10
May	3.16	57.00
June	3.63	66.30
July	3.76	70.90
August	3.77	69.30
September	3.29	62.10
October	3.14	51.30
November	3.45	40.60
December	3.20	28.30

Note:

These are the default normal mean monthly values of precipitation and temperature for Syracuse, NY, available in the HELP software.

Table 3: Climate Parameters for Syracuse, NY and Other Parameters for the SCA Final Cover (HELP Default Values Unless Stated Otherwise)

Parameter	Value	Units
Fraction of Area allowing Runoff	100%	percent of total area
Evaporative Zone Depth	30	Inches
Latitude	43.07	Degrees
Maximum Leaf Area Index	3.5[3]	--
Start of Growing Season (date)	124[4]	--
End of Growing Season (date)	284[4]	--
Planar Area[1]	1	Acre
Average Annual Wind Speed	9.7	miles/hr
Average 1st Quarter Relative Humidity	72%	--
Average 2nd Quarter Relative Humidity	68%	--
Average 3rd Quarter Relative Humidity	75%	--
Average 4th Quarter Relative Humidity	76%	--
Peak Daily Rainfall, 25-year, 24-hour storm event[2]	4.40	Inches

Notes:

1. The area was modeled as one acre to produce values on a per-acre basis. This was multiplied by the total number of acres to calculate total flow rates over the entire area of the SCA. The total area of the SCA was assumed to be approximately 70 acres.
2. Value from National Resources Conservation Service data shown in Figure 7.
3. This value corresponds to a good stand of grass on top of the final cover.
4. These dates correspond to May 4 through October 11.

Table 4: Cases Evaluated

Case	Run ID[1]	Variable	Description of Variable	K_{DREDGE} (cm/s)	K_{GRAVEL} (cm/s)	$K_{LEVELING}$ (cm/s)
Base Top[2]	**I_1A**	N/A	Base case using parameters from Table 1	1.0E-05	10	1
1	**I_1B**	K_{DREDGE}	Hydraulic conductivity of dredge material	1.0E-06	10	1
2A	**I_2A**	K_{GRAVEL}	Hydraulic conductivity of gravel drainage layer	1.0E-05	5	1
2B	**I_2B**	K_{GRAVEL}	Hydraulic conductivity of gravel drainage layer	1.0E-05	15	1
3	**II_1A**	$K_{LEVELING}$	Material to be used for leveling layer (SC or granular)	1.0E-05	10	1.0E-05
Base Side Slopes[3]	**S_III_1A**	N/A	Base case using parameters from Table 1	1.0E-05	10	1

Note:

1. The Run ID corresponds to the case listed in Table 6.
2. This is the base case for comparison. The parameters used are the base parameters shown in Table 1, and the leveling layer is considered to be granular material.
3. This is the base case for the side slopes. The parameters used are the base parameters shown in Table 1, with the modifications described in Note 11 of Table 1.

Table 5: Part 360 Prescribed Liner System

Layer	Description[1]	Layer Type[2]	HELP Default[3]	HELP USCS Name	Thickness (in)	K (cm/s)
8[4]	Granular Drainage	2	1	SP	24	0.01[5]
9	Geomembrane	4	36	LDPE	0.06	4.0E-13[6]
10	Compacted Clay	3	29	CH	6	1.0E-07[5]
11	Structural Fill	1	10	SC	12	1.0E-04[7]
12	Granular Drainage	2	1	SP	12	0.01[5]
13	Geomembrane	4	36	LDPE	0.06	4.0E-13[6]
14	Compacted Clay	3	29	CH	24	1.0E-07[5]

Notes:

1. This is a general description of each layer.
2. The following layer types are available in the HELP model: 1=Vertical Percolation, 2=Lateral Drainage, 3=Barrier Soil Liner, 4=Geomembrane Liner (GM).
3. This is the HELP default soil texture number. It is noted that the hydraulic conductivity of each layer may be changed from the HELP default to better represent expected or potentially critical conditions.
4. Layers 1 through 7 represent the final cover system and geo-tubes. Therefore, they are modeled identically as in the base case. Details of these layers are shown on Table 1. Layers 8 through 14 compose the Part 360 prescribed liner system, as compared to Layers 8 through 11 in Table 1 that represent the proposed liner system.
5. Required values per NYSDEC Part 360 regulations.
6. This layer is modeled as LDPE GM, using typical values from the HELP database. It is noted that the regulations do not specify a GM material. Selection of a different GM type will not affect the results significantly.
7. This hydraulic conductivity value is assumed based on the type of material.

Table 6: Results of HELP Modeling for the SCA

Case	Run ID	Curve Number	K_{DREDGE} (cm/s)	K_{GRAVEL} (cm/s)	$K_{LEVELING}$ (cm/s)	Peak Daily Values					Average Annual Values				
						H_{AVG} (in) cover	H_{MAX} (in) liner	H_{AVG} (in) liner	Liquid (ft^3/ad)	Liquid (gal/min)	H_{AVG} (in) liner	Liquid (ft^3/ac-yr)	Liquid (gal/ac-day)	Liquid (gal/ac)	Liquid (gal/min)
Base Top	**I_1A**	68.2	1.0E-05	10	1	30.0	0.0	0.0	2.6	0.9	0.0	366.0	7.5	525.0	0.4
1	**I_1B**	68.2	1.0E-06	10	1	30.0	0.0	0.0	2.6	0.9	0.0	366.0	7.5	525.0	0.4
2A	**I_2A**	68.2	1.0E-05	5	1	30.0	0.0	0.0	2.6	0.9	0.0	366.0	7.5	525.0	0.4
2B	**I_2B**	68.2	1.0E-05	15	1	30.0	0.0	0.0	2.6	0.9	0.0	366.0	7.5	525.0	0.4
3	**II_1A**	68.2	1.0E-05	10	1.0E-05	30.0	0.0	0.0	2.6	0.9	0.0	366.0	7.5	525.0	0.4
Base Side Slopes	**S_III_1A**	76.1	1.0E-05	10	1	0.02	0.0	0.0	13.1	4.8	0.0	403.5	8.3	578.8	0.4

Notes:

1. The curve number is calculated by HELP based on model inputs.
1. Selected maximum precipitation for a single day is 4.4 inches, based on the National Resources Conservation Service [1986] recommendations for a 25 year, 24 hour storm event.
2. SCA is assumed to have a total acreage of 70 acres.
3. This table uses a drainage path length of 1500 ft and slope of approximately 0.5% for the final cover top area and a drainage path length of 1500 ft and slope of 1% for the gravel drainage layer.
4. The HELP Output file for the base case, I_1A, is included in Attachment 1.
5. Case S_III_1A represents the SCA side slopes and is modeled with a final cover drainage path length of 100 ft and slope of 30%. It is noted that the gravel drainage layer is modeled with a drainage path length of 1500 ft and slope of 1%. The HELP Output file for this case is included in Attachment 1.

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Table 7: Results of Consolidation Water and Reduction in Infiltration Rate Calculations

Year	SCA Footprint at End of Each Phase (ac)[1]	New SCA Footprint in Each Year (ac)	Total Lined SCA Area at End of Each Phase (ac)[2]	Additional Lined Area (ac)[3]	Infiltration Cut-off (million gallons)		Consolidation Squeezed Water (million gallons)				
					Assuming 40" Infiltration Each Year[4]	Assuming 0.5 x 40" Infiltration Each Year[5]	Estimated Average Geo-tube Height (ft)[6]	Estimated Average Total Thickness of Gravel Drainage Layer and Liner (ft)[7]	Estimated Total Equivalent Soil Thickness (ft)[8]	Estimated Average Settlement (ft)[9]	Estimated Consolidation Squeezed Water in Each Year (million gallons)[10]
0	--	--	15	10	14	7	--	--	--	--	--
1	30	30	40	10	54	27	18	5	18.1	5.4	53
2	50	20	61	10	77	39	22	5	20.7	6.2	48
3	72	22	72	10	89	45	23	5	21.3	6.4	49
4	72	0	72	10	89	45	30	5	26.8	8.0	38
Total Estimated Infiltration Cut-off in 4+ years (million gallons)					323	**162**	Total Estimated Consolidation Squeezed Water in 4 years (million gallons)				**189**

Notes:

1. The SCA footprint is measured from the outside toe of the perimeter berm.
2. Assuming half of the new SCA footprint will be lined in advance during the previous year.
3. Additional lined area for basins, and water treatment and pre-processing facilities.
4. The infiltration cut-off volume equals 40 inches of annual average rainfall multiplied by the total lined area at the end of each year. In year 0, only half a year for the infiltration cut-off was assumed.
5. Assuming 50% for evapotranspiration based on the analysis presented in the HELP calculations.
6. To estimate the average geo-tube height for calculating loads for settlements, a 25% decrease of the available footprint was considered to account for the SCA perimeter berm, the 10-ft gap between geo-tubes and the berm, and the 20-ft offset distance for geo-tube stacking. This assumption is considered reasonable based on the calculation of an average geo-tube height of 30 ft for year 4.
7. These thicknesses are based on the calculations presented in the package titled "Volume Calculations for SCA Design".
8. Assuming a unit weight of 120 pcf for liner and gravel and 86 pcf for dredge material. The total thickness was converted to an equivalent thickness of soil with a unit weight of 120 pcf.
9. Using a rule of thumb: 10 ft soil causes approximately 3 ft of settlement in SOLW (based on test plot results). The total calculated average settlement of 8 feet in the 4th year is consistent with the results of detailed settlement calculations presented in the calculation package titled "Settlement Analyses for SCA" in the Final SCA Design.
10. The Solvay waste above the groundwater table was conservatively assumed to be fully saturated in the calculation. Primary consolidation time was assumed to be less than one year, thus resulting in all calculated consolidation water for a given year being squeezed out within that year.

Table 8: Results of Liner Equivalency Calculations

Run ID	Liner Type	Peak Daily Values			Average Annual Values		
		Precipitation (in/ac-day)	Leakage (in/ac-day)	Efficiency (%)	Precipitation (in/ac)	Leakage (in/ac)	Efficiency (%)
I_1A	Proposed	4.40	0.000314	99.9929%	39.20	0.00340	99.9913%
360_Soil	Part 360 - Double-liner with soils	4.40	0.000000	100.0000%	39.20	0.00001	100.0000%

Notes:

1. The analyses presented in the table use a drainage path length of 1500 ft and slope of 0.5% for the final cover and a drainage path length of 1500 ft and slope of 1% for the drainage layer in the liner.
2. The proposed liner system (Base Case [top], run I_1A) is described in Table 1. The prescribed NYSDEC Part 360 liner is described in Table 5.
3. The efficiency of the liner is calculated using the formula:

$$Efficiency = 100\% - \frac{Leakage}{Precipitation}.$$

Figures

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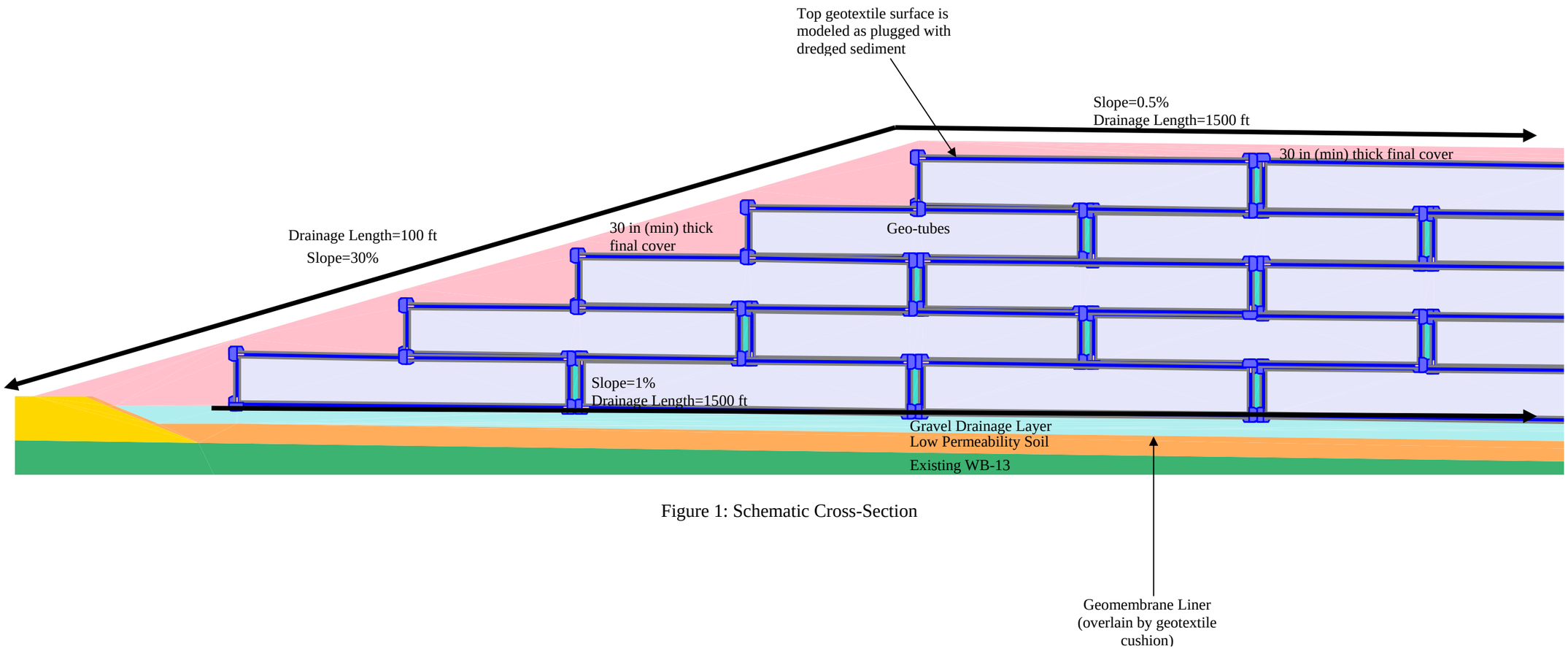


Figure 1: Schematic Cross-Section

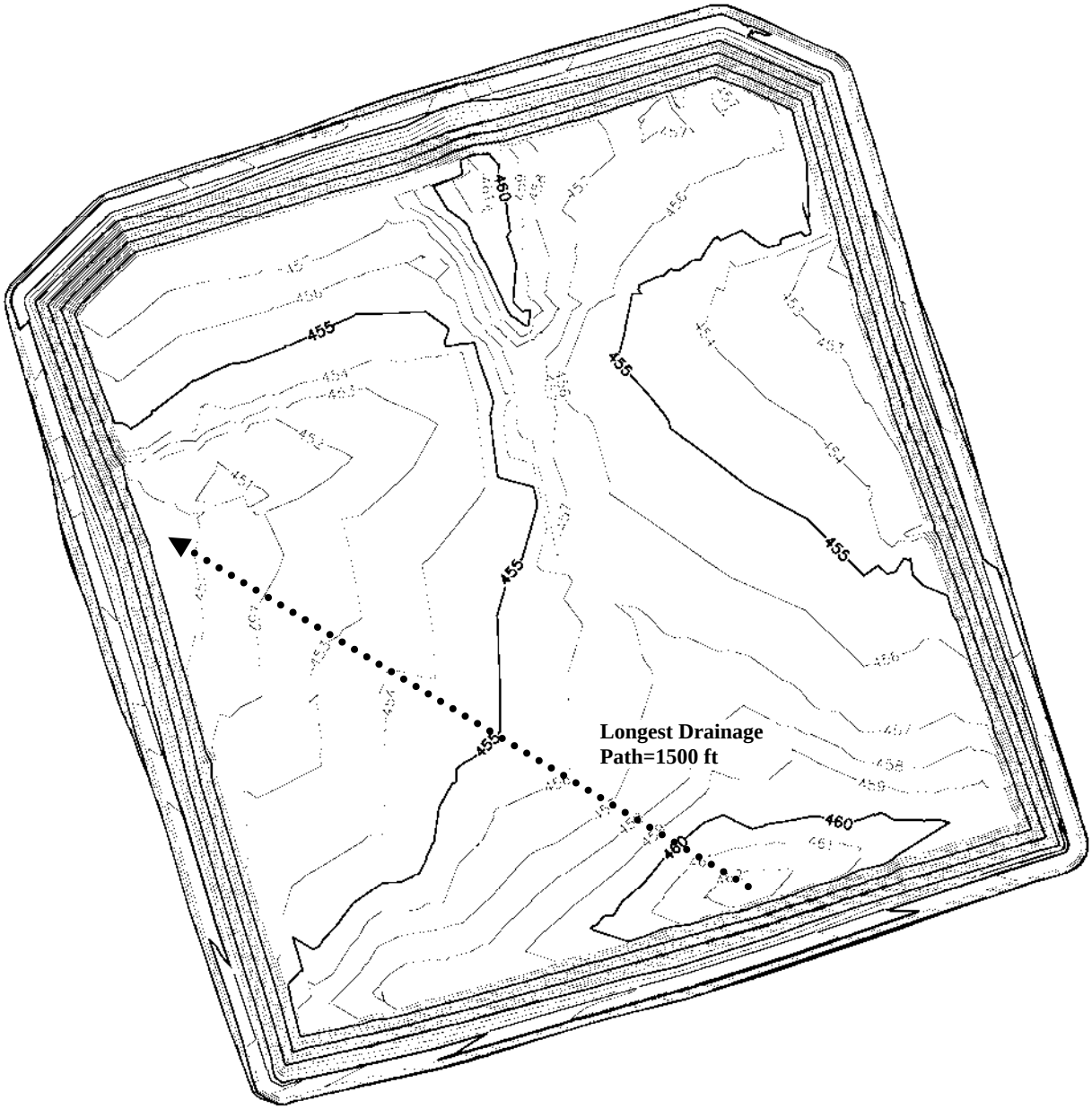


Figure 2: Design Top of Final Cover

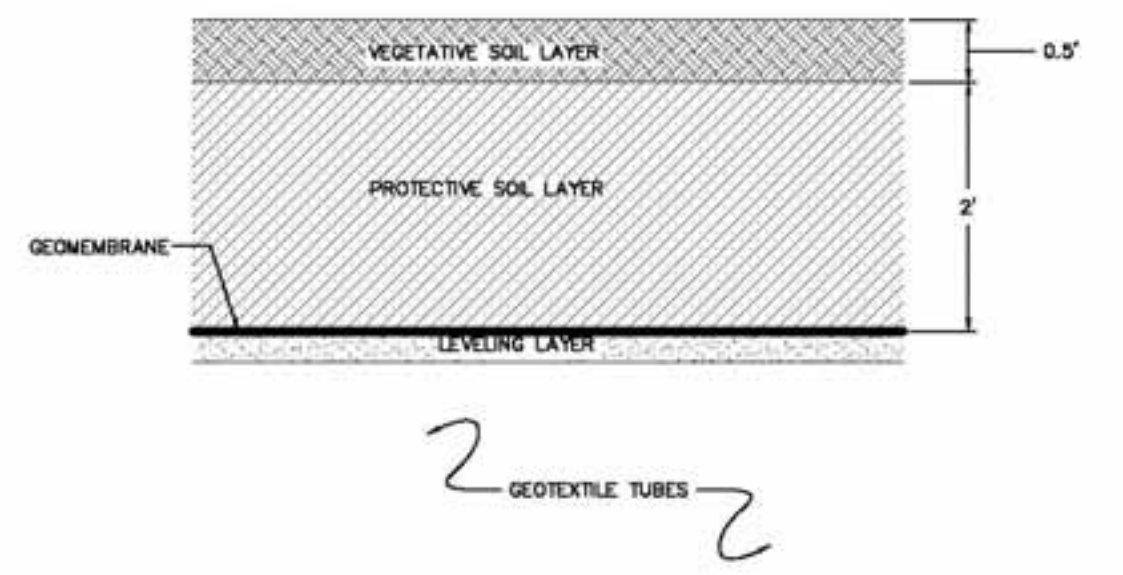


Figure 3A: Section View of Final Cover (SCA top)

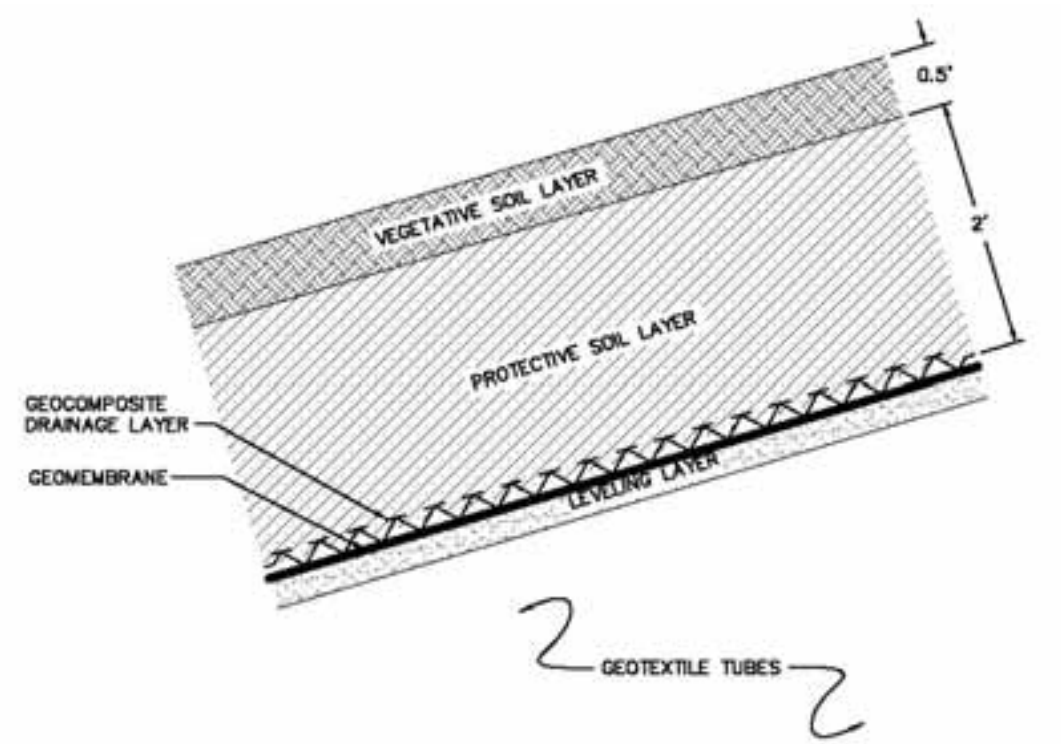
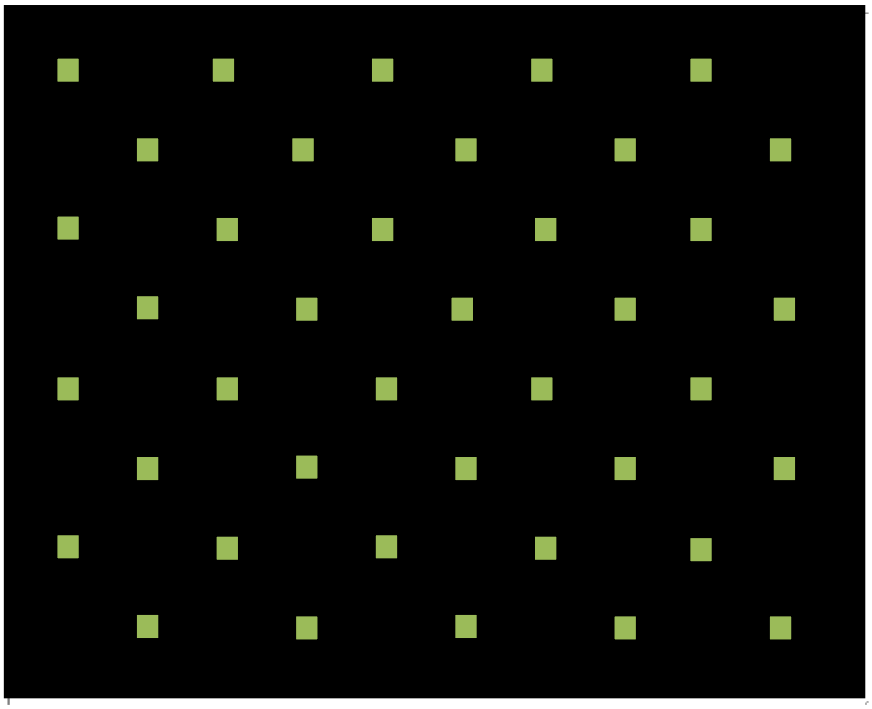


Figure 3B: Section View of Final Cover (SCA side slopes)



K_{DREDGE}

K_{GT}

Figure 4: Conceptual View of Geo-tube/Dredge Material Layer Equivalent Hydraulic Conductivity

Notes:

1. This figure illustrates the modeling of the geo-tube/dredge material layer equivalent hydraulic conductivity.
2. The open area of the geo-tubes (assumed to be 4% of total area) is covered with dredge filter cake material, as shown. Therefore, the hydraulic conductivity of the geo-tubes/dredge material interface layer was modeled as a liner with equivalent hydraulic conductivity.

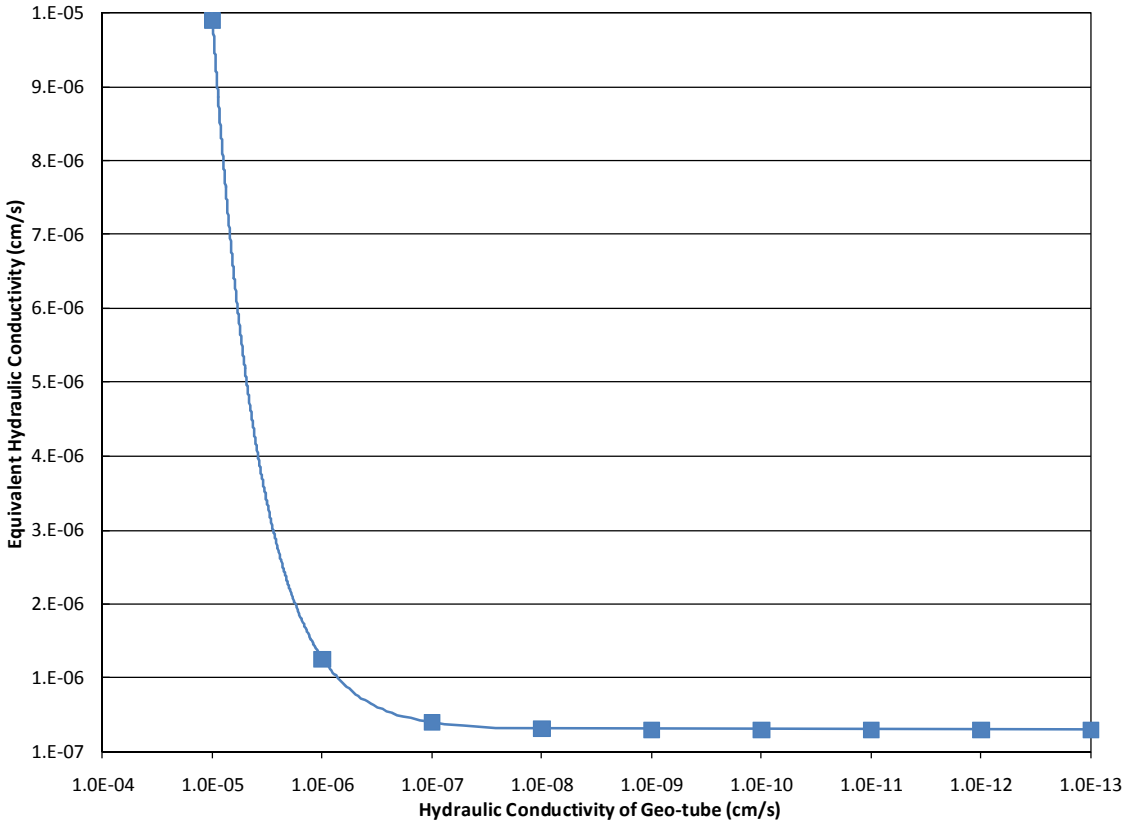


Figure 5: Sensitivity of Dredge Material/Geo-tube Equivalent Hydraulic Conductivity to the Hydraulic Conductivity of the Geo-tube Material

Notes:

1. This figure shows the equivalent hydraulic conductivity of Layer 5, the top of geo-tubes with open areas plugged with dredge material.
2. The actual fabric of a woven geotextile was assumed to have a hydraulic conductivity of 10^{-8} cm/s or less.
3. The calculations were performed using a hydraulic conductivity of 1.0×10^{-5} cm/s for the dredge material.
4. Based on the assumed $K_{GT} = 10^{-8}$ cm/s, a K_{EQ} value of 4×10^{-7} cm/s has been assumed for the analyses.

Written by:	**Joseph Sura**	Date:	**11/23/2009**	Reviewed by:	**Fan Zhu / R. Kulasingam**	Date:	**12/2/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA Final Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**18**

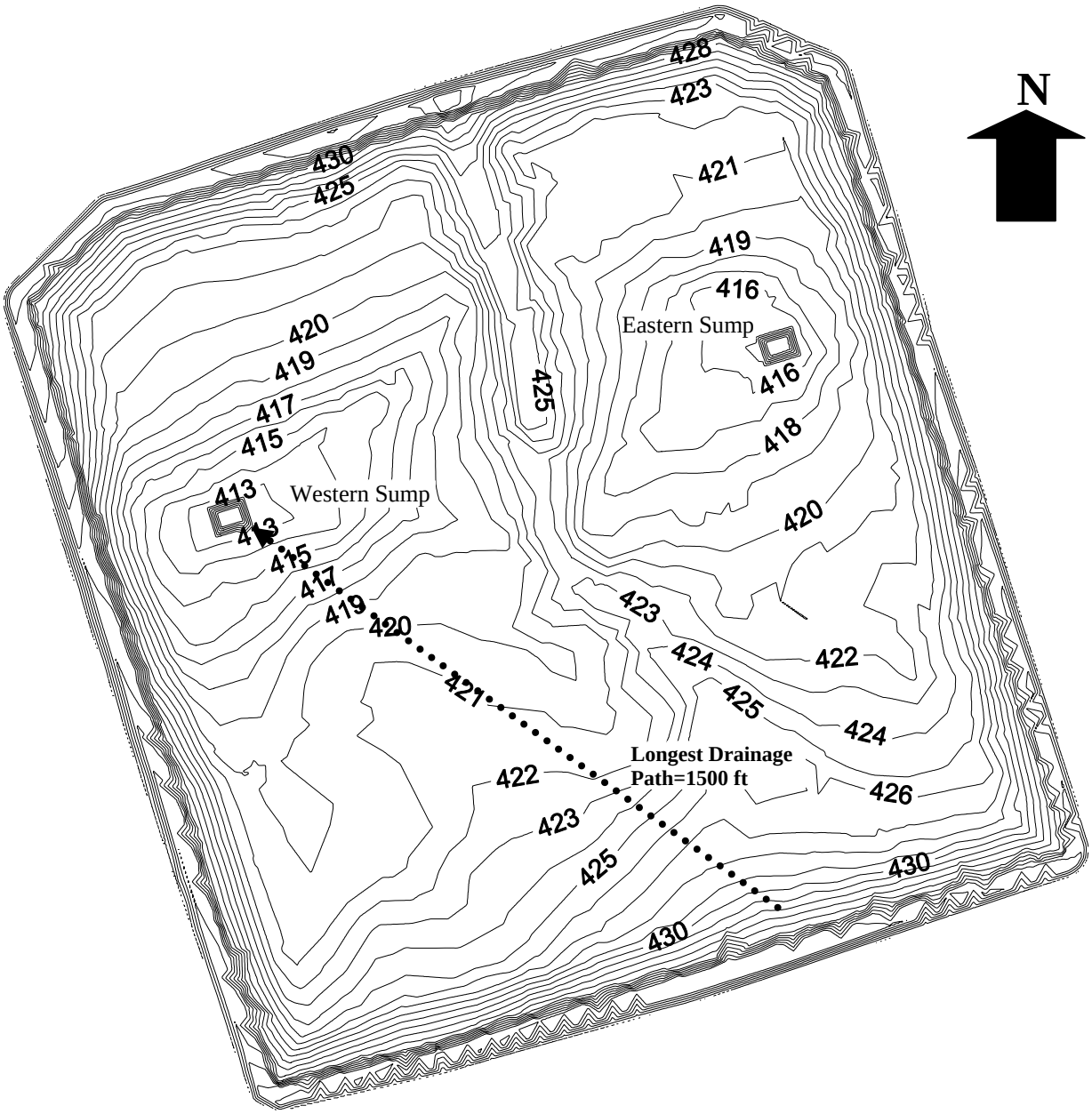


Figure 6: Top of Low Permeability Soil Liner Grades - 30 Years after Closure

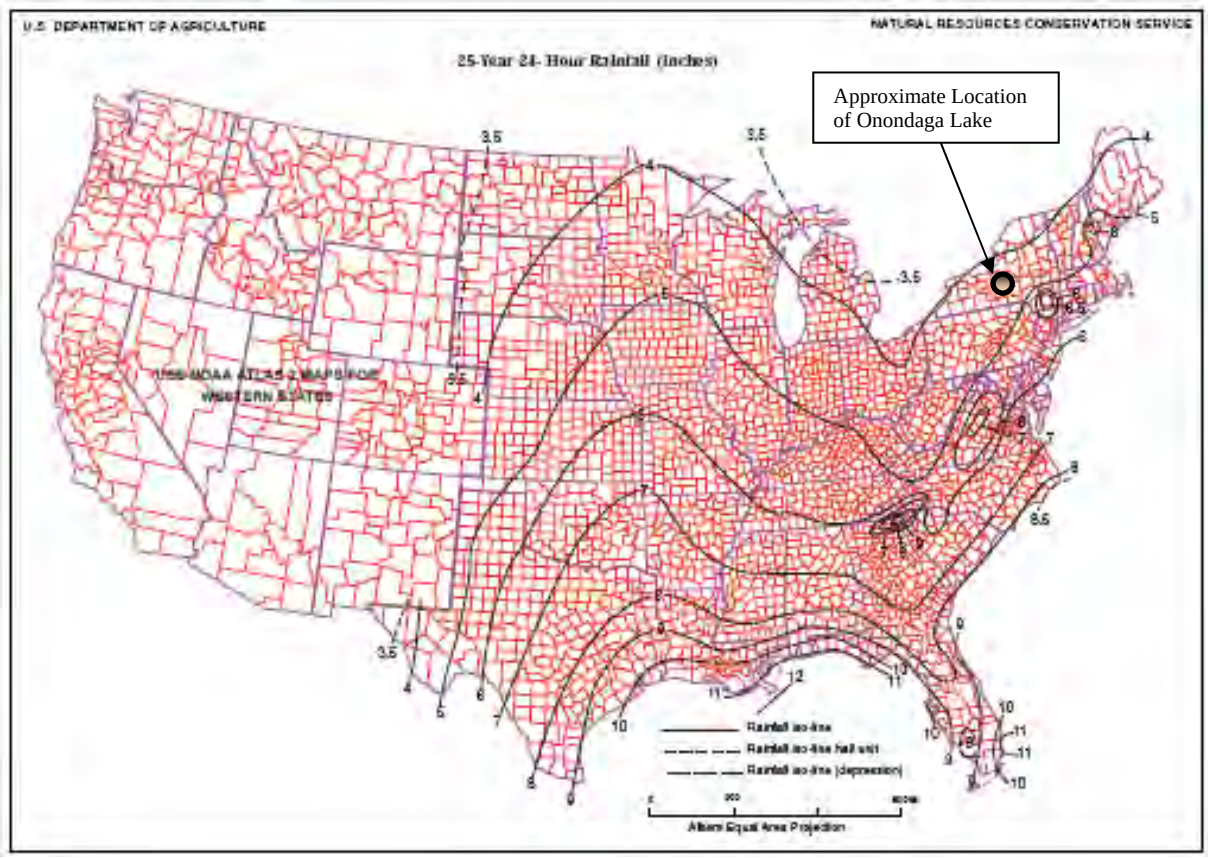


Figure 7: NRCS Map for Calculation of 25-year, 24-hour Storm Event [NRCS, 1986]

Note:

The value selected for the model is 4.40 inches, based on the approximate location of Onondaga Lake.

Written by:	**Joseph Sura**	Date:	**11/23/2009**	Reviewed by:	**Fan Zhu / R. Kulasingam**	Date:	**12/2/2009**
Client:	**Honeywell**	Project:	**Onondaga Lake SCA Final Design**	Project/ Proposal No.:	**GJ4299**	Task No.:	**18**

Attachment 1: HELP Output Files

```
******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:    C:\PROGRA~1\HELP\OLPRECIP.D4
TEMPERATURE DATA FILE:      C:\PROGRA~1\HELP\OLTEMP.D7
SOLAR RADIATION DATA FILE:  C:\PROGRA~1\HELP\OLSOLAR.D13
EVAPOTRANSPIRATION DATA:    C:\PROGRA~1\HELP\OL_LAI35.D11
SOIL AND DESIGN DATA FILE:  C:\PROGRA~1\HELP\I__1A.D10
OUTPUT DATA FILE:           C:\PROGRA~1\HELP\I__1A.OUT


TIME:  13:38     DATE:  12/ 9/2009


******************************************************************************

     TITLE:  Onondaga Lake SCA - Final Design

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER 108
           THICKNESS                  =      6.00   INCHES
           POROSITY                   =      0.4630 VOL/VOL
           FIELD CAPACITY             =      0.2320 VOL/VOL
           WILTING POINT              =      0.1160 VOL/VOL
           INITIAL SOIL WATER CONTENT =      0.4586 VOL/VOL
           EFFECTIVE SAT. HYD. COND.  =  0.999999975000E-04 CM/SEC


                                  LAYER  2
                                  --------

                       TYPE 2 - LATERAL DRAINAGE LAYER
```

```
              MATERIAL TEXTURE NUMBER 113
THICKNESS                   =     24.00   INCHES
POROSITY                    =      0.4300 VOL/VOL
FIELD CAPACITY              =      0.3210 VOL/VOL
WILTING POINT               =      0.2210 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.4310 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999975000E-05 CM/SEC
SLOPE                       =      0.51   PERCENT
DRAINAGE LENGTH             =   1500.0    FEET


                        LAYER  3
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  36
THICKNESS                   =      0.06   INCHES
POROSITY                    =      0.0000 VOL/VOL
FIELD CAPACITY              =      0.0000 VOL/VOL
WILTING POINT               =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY         =      0.00   HOLES/ACRE
FML INSTALLATION DEFECTS    =      1.00   HOLES/ACRE
FML PLACEMENT QUALITY       =  3 - GOOD


                        LAYER  4
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER 221
THICKNESS                   =      6.00   INCHES
POROSITY                    =      0.3970 VOL/VOL
FIELD CAPACITY              =      0.0320 VOL/VOL
WILTING POINT               =      0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0320 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   1.00000000000     CM/SEC


                        LAYER  5
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER 120
THICKNESS                   =      0.06   INCHES
POROSITY                    =      0.8500 VOL/VOL
FIELD CAPACITY              =      0.0100 VOL/VOL
WILTING POINT               =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.8500 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.400000005000E-06 CM/SEC


                        LAYER  6
```

```
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER 122
THICKNESS                   =      0.06   INCHES
POROSITY                    =      0.4190 VOL/VOL
FIELD CAPACITY              =      0.3070 VOL/VOL
WILTING POINT               =      0.1800 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3070 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999975000E-05 CM/SEC


                        LAYER  7
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER 122
THICKNESS                   =    360.00   INCHES
POROSITY                    =      0.4190 VOL/VOL
FIELD CAPACITY              =      0.3070 VOL/VOL
WILTING POINT               =      0.1800 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.4190 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999975000E-05 CM/SEC


                        LAYER  8
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER 121
THICKNESS                   =     12.00   INCHES
POROSITY                    =      0.3970 VOL/VOL
FIELD CAPACITY              =      0.0320 VOL/VOL
WILTING POINT               =      0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0320 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   10.0000000000     CM/SEC
SLOPE                       =      1.00   PERCENT
DRAINAGE LENGTH             =   1500.0    FEET


                        LAYER  9
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  36
THICKNESS                   =      0.06   INCHES
POROSITY                    =      0.0000 VOL/VOL
FIELD CAPACITY              =      0.0000 VOL/VOL
WILTING POINT               =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY         =      0.00   HOLES/ACRE
FML INSTALLATION DEFECTS    =      1.00   HOLES/ACRE
FML PLACEMENT QUALITY       =  3 - GOOD
```

```
                          LAYER 10
                          --------

                 TYPE 3 - BARRIER SOIL LINER
                 MATERIAL TEXTURE NUMBER 124
THICKNESS                   =      6.00   INCHES
POROSITY                    =      0.3650 VOL/VOL
FIELD CAPACITY              =      0.3050 VOL/VOL
WILTING POINT               =      0.2020 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3650 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999997000E-06 CM/SEC


                          LAYER 11
                          --------

             TYPE 1 - VERTICAL PERCOLATION LAYER
                 MATERIAL TEXTURE NUMBER 113
THICKNESS                   =      6.00   INCHES
POROSITY                    =      0.4300 VOL/VOL
FIELD CAPACITY              =      0.3210 VOL/VOL
WILTING POINT               =      0.2210 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3049 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999975000E-05 CM/SEC


            GENERAL DESIGN AND EVAPORATIVE ZONE DATA
            ----------------------------------------

 NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
          SOIL DATA BASE USING SOIL TEXTURE # 8 WITH A
          GOOD STAND OF GRASS, A SURFACE SLOPE OF  1.%
          AND A SLOPE LENGTH OF 1500. FEET.

SCS RUNOFF CURVE NUMBER             =     68.20
FRACTION OF AREA ALLOWING RUNOFF    =    100.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE  =      1.000  ACRES
EVAPORATIVE ZONE DEPTH              =     30.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE   =     13.096  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE  =     13.098  INCHES
LOWER LIMIT OF EVAPORATIVE STORAGE  =      6.000  INCHES
INITIAL SNOW WATER                  =      0.000  INCHES
INITIAL WATER IN LAYER MATERIALS    =    168.601  INCHES
TOTAL INITIAL WATER                 =    168.601  INCHES
TOTAL SUBSURFACE INFLOW             =      0.00   INCHES/YEAR


             EVAPOTRANSPIRATION AND WEATHER DATA
             -----------------------------------

 NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
          SYRACUSE              NEW YORK
```

```
STATION LATITUDE                        =  43.07 DEGREES
MAXIMUM LEAF AREA INDEX                 =   3.50
START OF GROWING SEASON (JULIAN DATE)   =    124
END OF GROWING SEASON (JULIAN DATE)     =    284
EVAPORATIVE ZONE DEPTH                  =  30.0  INCHES
AVERAGE ANNUAL WIND SPEED               =   9.70 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY   =  72.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY   =  68.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY   =  75.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY   =  76.00 %


    NOTE:  PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
             COEFFICIENTS FOR    SYRACUSE            NEW YORK

             NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

  JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
  -------     -------     -------     -------     -------     -------
    2.61        2.65        3.11        3.34        3.16        3.63
    3.76        3.77        3.29        3.14        3.45        3.20


    NOTE:  TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
             COEFFICIENTS FOR    SYRACUSE            NEW YORK

         NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

  JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
  -------     -------     -------     -------     -------     -------
   22.80       24.00       33.30       46.10       57.00       66.30
   70.90       69.30       62.10       51.30       40.60       28.30


    NOTE:  SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
             COEFFICIENTS FOR    SYRACUSE            NEW YORK
               AND STATION LATITUDE  =  43.07 DEGREES


*******************************************************************************

         AVERAGE MONTHLY VALUES IN INCHES FOR YEARS    1 THROUGH  100
-------------------------------------------------------------------------------

                        JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                        -------  -------  -------  -------  -------  -------
  PRECIPITATION
  -------------
    TOTALS                 2.59     2.72     3.16     3.27     3.09     3.71
                           3.87     3.95     3.27     2.95     3.40     3.22

    STD. DEVIATIONS        0.70     0.96     1.19     1.19     1.31     1.57
                           1.67     1.76     1.60     1.16     1.19     0.76

  RUNOFF
```

```
------
  TOTALS                 0.840    1.708    5.121    2.038    0.493    0.312
                         0.056    0.019    0.027    0.158    0.770    1.251

  STD. DEVIATIONS        0.941    1.678    2.481    1.397    0.690    0.666
                         0.419    0.152    0.165    0.473    1.120    1.084

EVAPOTRANSPIRATION
------------------
  TOTALS                 0.491    0.407    0.480    1.806    2.889    5.480
                         6.166    4.126    2.211    1.045    0.710    0.497

  STD. DEVIATIONS        0.080    0.077    0.169    0.691    0.799    0.644
                         0.755    1.297    0.674    0.154    0.135    0.109

LATERAL DRAINAGE COLLECTED FROM LAYER  2
----------------------------------------
  TOTALS                 0.0000   0.0000   0.0000   0.0002   0.0003   0.0002
                         0.0001   0.0000   0.0000   0.0001   0.0002   0.0002

  STD. DEVIATIONS        0.0000   0.0000   0.0000   0.0001   0.0000   0.0000
                         0.0000   0.0000   0.0001   0.0001   0.0002   0.0002

PERCOLATION/LEAKAGE THROUGH LAYER  3
-------------------------------------
  TOTALS                 0.0052   0.0043   0.0052   0.0129   0.0194   0.0150
                         0.0069   0.0024   0.0021   0.0046   0.0100   0.0128

  STD. DEVIATIONS        0.0019   0.0011   0.0018   0.0046   0.0006   0.0014
                         0.0034   0.0037   0.0044   0.0071   0.0084   0.0065

PERCOLATION/LEAKAGE THROUGH LAYER  5
-------------------------------------
  TOTALS                 0.0052   0.0043   0.0052   0.0129   0.0194   0.0150
                         0.0069   0.0024   0.0021   0.0046   0.0100   0.0128

  STD. DEVIATIONS        0.0019   0.0011   0.0018   0.0046   0.0006   0.0014
                         0.0034   0.0037   0.0044   0.0071   0.0084   0.0065

PERCOLATION/LEAKAGE THROUGH LAYER  7
-------------------------------------
  TOTALS                 0.0052   0.0043   0.0052   0.0129   0.0194   0.0150
                         0.0069   0.0024   0.0021   0.0046   0.0100   0.0128

  STD. DEVIATIONS        0.0019   0.0011   0.0018   0.0046   0.0006   0.0014
                         0.0034   0.0037   0.0044   0.0071   0.0084   0.0065

LATERAL DRAINAGE COLLECTED FROM LAYER  8
----------------------------------------
  TOTALS                 0.0052   0.0043   0.0051   0.0125   0.0194   0.0153
                         0.0071   0.0024   0.0020   0.0045   0.0097   0.0131

  STD. DEVIATIONS        0.0020   0.0011   0.0017   0.0047   0.0006   0.0014
                         0.0034   0.0037   0.0044   0.0070   0.0084   0.0066

PERCOLATION/LEAKAGE THROUGH LAYER 10
------------------------------------
  TOTALS                 0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                         0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

  STD. DEVIATIONS        0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                         0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
```

```
  PERCOLATION/LEAKAGE THROUGH LAYER 11
  ------------------------------------
    TOTALS                  0.0004   0.0004   0.0004   0.0004   0.0004   0.0003
                            0.0003   0.0001   0.0001   0.0001   0.0002   0.0003

    STD. DEVIATIONS         0.0011   0.0009   0.0009   0.0008   0.0008   0.0007
                            0.0006   0.0003   0.0003   0.0003   0.0006   0.0006


-------------------------------------------------------------------------------
               AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


  DAILY AVERAGE HEAD ON TOP OF LAYER  3
  -------------------------------------
    AVERAGES                5.1671   4.5585   5.1793  17.5567  26.9031  21.4400
                            8.4427   2.6768   2.6671   6.0991  13.9574  16.9021

    STD. DEVIATIONS         2.5364   1.2677   2.2985   7.1492   0.7459   2.1231
                            5.0019   4.8488   6.1433   9.8299  12.0795   9.2454

  DAILY AVERAGE HEAD ON TOP OF LAYER  5
  -------------------------------------
    AVERAGES                0.0001   0.0001   0.0001   0.0001   0.0002   0.0002
                            0.0001   0.0000   0.0000   0.0001   0.0001   0.0001

    STD. DEVIATIONS         0.0000   0.0000   0.0000   0.0001   0.0000   0.0000
                            0.0000   0.0000   0.0001   0.0001   0.0001   0.0001

  DAILY AVERAGE HEAD ON TOP OF LAYER  7
  -------------------------------------
    AVERAGES                0.0002   0.0002   0.0002   0.0005   0.0007   0.0006
                            0.0002   0.0001   0.0001   0.0002   0.0004   0.0005

    STD. DEVIATIONS         0.0001   0.0000   0.0001   0.0002   0.0000   0.0001
                            0.0001   0.0001   0.0002   0.0003   0.0003   0.0002

  DAILY AVERAGE HEAD ON TOP OF LAYER  9
  -------------------------------------
    AVERAGES                0.0004   0.0004   0.0004   0.0011   0.0017   0.0013
                            0.0006   0.0002   0.0002   0.0004   0.0009   0.0011

    STD. DEVIATIONS         0.0002   0.0001   0.0001   0.0004   0.0000   0.0001
                            0.0003   0.0003   0.0004   0.0006   0.0007   0.0006
*******************************************************************************


*******************************************************************************

     AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH  100
-------------------------------------------------------------------------------
                                      INCHES            CU. FEET       PERCENT
                                 -------------------   -------------   ---------
 PRECIPITATION                    39.20    (   4.823)     142279.7     100.00

 RUNOFF                           12.794   (  3.3907)      46441.28     32.641

 EVAPOTRANSPIRATION               26.309   (  2.2364)      95501.46     67.122
```

```
LATERAL DRAINAGE COLLECTED      0.00145 (  0.00054)         5.246    0.00369
  FROM LAYER  2

PERCOLATION/LEAKAGE THROUGH     0.10082 (  0.02666)       365.966     0.25722
  LAYER  3

AVERAGE HEAD ON TOP            10.962 (    3.116)
  OF LAYER  3

PERCOLATION/LEAKAGE THROUGH     0.10082 (  0.02666)       365.966     0.25722
  LAYER  5

AVERAGE HEAD ON TOP             0.000 (    0.000)
  OF LAYER  5

PERCOLATION/LEAKAGE THROUGH     0.10082 (  0.02666)       365.966     0.25722
  LAYER  7

AVERAGE HEAD ON TOP             0.000 (    0.000)
  OF LAYER  7

LATERAL DRAINAGE COLLECTED      0.10081 (  0.02665)       365.952    0.25721
  FROM LAYER  8

PERCOLATION/LEAKAGE THROUGH     0.00001 (  0.00000)         0.020     0.00001
  LAYER 10

AVERAGE HEAD ON TOP             0.001 (    0.000)
  OF LAYER  9

PERCOLATION/LEAKAGE THROUGH     0.00340 (  0.00747)        12.332     0.00867
  LAYER 11

CHANGE IN WATER STORAGE        -0.013   (  1.5171)        -46.59     -0.033
******************************************************************************

*****************************************************************************

               PEAK DAILY VALUES FOR YEARS    1 THROUGH  100
   ------------------------------------------------------------------------
                                              (INCHES)      (CU. FT.)
                                             ----------   -------------
      PRECIPITATION                            4.40         15972.000

      RUNOFF                                   4.342        15759.7656

      DRAINAGE COLLECTED FROM LAYER  2         0.00002          0.06081

      PERCOLATION/LEAKAGE THROUGH LAYER  3     0.000703         2.55133

      AVERAGE HEAD ON TOP OF LAYER  3         30.000

      MAXIMUM HEAD ON TOP OF LAYER  3         37.397

      LOCATION OF MAXIMUM HEAD IN LAYER  2
            (DISTANCE FROM DRAIN)            596.4 FEET

      PERCOLATION/LEAKAGE THROUGH LAYER  5     0.000703         2.55133

      AVERAGE HEAD ON TOP OF LAYER  5          0.000
```

```
PERCOLATION/LEAKAGE THROUGH LAYER  7       0.000703         2.55133

AVERAGE HEAD ON TOP OF LAYER  7            0.001

DRAINAGE COLLECTED FROM LAYER  8           0.00070          2.55124

PERCOLATION/LEAKAGE THROUGH LAYER 10       0.000000         0.00009

AVERAGE HEAD ON TOP OF LAYER  9            0.002

MAXIMUM HEAD ON TOP OF LAYER  9            0.004

LOCATION OF MAXIMUM HEAD IN LAYER  8
      (DISTANCE FROM DRAIN)                0.0 FEET

PERCOLATION/LEAKAGE THROUGH LAYER 11       0.000314         1.14110

SNOW WATER                                 9.62         34911.7891


MAXIMUM VEG. SOIL WATER (VOL/VOL)                  0.4366

MINIMUM VEG. SOIL WATER (VOL/VOL)                  0.2000

 ***  Maximum heads are computed using McEnroe's equations.  ***

      Reference:  Maximum Saturated Depth over Landfill Liner
                  by Bruce M. McEnroe, University of Kansas
                  ASCE Journal of Environmental Engineering
                  Vol. 119, No. 2, March 1993, pp. 262-270.

******************************************************************************
```

Written by: **Joseph Sura** Date: **11/23/2009** Reviewed by: **Fan Zhu / R. Kulasingam** Date: **12/2/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **18**

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******************************************************************************

                    FINAL WATER STORAGE AT END OF YEAR  100
    ---------------------------------------------------------------------
                     LAYER        (INCHES)       (VOL/VOL)
                     -----        --------       ---------
                       1            2.7516         0.4586

                       2            9.3544         0.3898

                       3            0.0000         0.0000

                       4            0.1920         0.0320

                       5            0.0510         0.8500

                       6            0.0184         0.3070

                       7          150.8400         0.4190

                       8            0.3840         0.0320

                       9            0.0000         0.0000

                      10            2.1900         0.3650

                      11            1.4902         0.2484

                   SNOW WATER       0.046

******************************************************************************
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```

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******************************************************************************
**                                                                          **
**                                                                          **
**              HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE               **
**                HELP MODEL VERSION 3.07  (1 NOVEMBER 1997)                **
**                  DEVELOPED BY ENVIRONMENTAL LABORATORY                   **
**                    USAE WATERWAYS EXPERIMENT STATION                     **
**             FOR USEPA RISK REDUCTION ENGINEERING LABORATORY              **
**                                                                          **
**                                                                          **
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******************************************************************************



PRECIPITATION DATA FILE:    C:\PROGRA~1\HELP\OLPRECIP.D4
TEMPERATURE DATA FILE:      C:\PROGRA~1\HELP\OLTEMP.D7
SOLAR RADIATION DATA FILE:  C:\PROGRA~1\HELP\OLSOLAR.D13
EVAPOTRANSPIRATION DATA:    C:\PROGRA~1\HELP\OL_LAI35.D11
SOIL AND DESIGN DATA FILE:  C:\PROGRA~1\HELP\S_III1A.D10
OUTPUT DATA FILE:           C:\PROGRA~1\HELP\S_III1A.OUT


TIME:  13:47     DATE:  12/ 9/2009



******************************************************************************

     TITLE:  Onondaga Lake SCA - Final Design

******************************************************************************


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
              COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                  LAYER  1
                                  --------

                     TYPE 1 - VERTICAL PERCOLATION LAYER
                         MATERIAL TEXTURE NUMBER 108
           THICKNESS                  =      6.00   INCHES
           POROSITY                   =      0.4630 VOL/VOL
           FIELD CAPACITY             =      0.2320 VOL/VOL
           WILTING POINT              =      0.1160 VOL/VOL
           INITIAL SOIL WATER CONTENT =      0.4567 VOL/VOL
           EFFECTIVE SAT. HYD. COND.  =  0.999999975000E-04 CM/SEC


                                  LAYER  2
                                  --------

                       TYPE 2 - LATERAL DRAINAGE LAYER
```

```
              MATERIAL TEXTURE NUMBER 113
THICKNESS                   =     24.00   INCHES
POROSITY                    =      0.4300 VOL/VOL
FIELD CAPACITY              =      0.3210 VOL/VOL
WILTING POINT               =      0.2210 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.4057 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999975000E-05 CM/SEC


                        LAYER  3
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER 220
THICKNESS                   =      0.20   INCHES
POROSITY                    =      0.8500 VOL/VOL
FIELD CAPACITY              =      0.0100 VOL/VOL
WILTING POINT               =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0100 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   1.33000004000     CM/SEC
SLOPE                       =     30.00   PERCENT
DRAINAGE LENGTH             =    100.0    FEET


                        LAYER  4
                        --------

            TYPE 4 - FLEXIBLE MEMBRANE LINER
              MATERIAL TEXTURE NUMBER  36
THICKNESS                   =      0.06   INCHES
POROSITY                    =      0.0000 VOL/VOL
FIELD CAPACITY              =      0.0000 VOL/VOL
WILTING POINT               =      0.0000 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0000 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.399999993000E-12 CM/SEC
FML PINHOLE DENSITY         =      0.00   HOLES/ACRE
FML INSTALLATION DEFECTS    =      1.00   HOLES/ACRE
FML PLACEMENT QUALITY       =  3 - GOOD


                        LAYER  5
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER 221
THICKNESS                   =      6.00   INCHES
POROSITY                    =      0.3970 VOL/VOL
FIELD CAPACITY              =      0.0320 VOL/VOL
WILTING POINT               =      0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0320 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   1.00000000000     CM/SEC


                        LAYER  6
```

```
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER 120
THICKNESS                   =      0.06   INCHES
POROSITY                    =      0.8500 VOL/VOL
FIELD CAPACITY              =      0.0100 VOL/VOL
WILTING POINT               =      0.0050 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.8500 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.400000005000E-06 CM/SEC


                        LAYER  7
                        --------

          TYPE 1 - VERTICAL PERCOLATION LAYER
              MATERIAL TEXTURE NUMBER 122
THICKNESS                   =      0.06   INCHES
POROSITY                    =      0.4190 VOL/VOL
FIELD CAPACITY              =      0.3070 VOL/VOL
WILTING POINT               =      0.1800 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.3070 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999975000E-05 CM/SEC


                        LAYER  8
                        --------

              TYPE 3 - BARRIER SOIL LINER
              MATERIAL TEXTURE NUMBER 122
THICKNESS                   =    360.00   INCHES
POROSITY                    =      0.4190 VOL/VOL
FIELD CAPACITY              =      0.3070 VOL/VOL
WILTING POINT               =      0.1800 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.4190 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =  0.999999975000E-05 CM/SEC


                        LAYER  9
                        --------

            TYPE 2 - LATERAL DRAINAGE LAYER
              MATERIAL TEXTURE NUMBER 121
THICKNESS                   =     12.00   INCHES
POROSITY                    =      0.3970 VOL/VOL
FIELD CAPACITY              =      0.0320 VOL/VOL
WILTING POINT               =      0.0130 VOL/VOL
INITIAL SOIL WATER CONTENT  =      0.0320 VOL/VOL
EFFECTIVE SAT. HYD. COND.   =   10.0000000000     CM/SEC
SLOPE                       =      1.00   PERCENT
DRAINAGE LENGTH             =   1500.0    FEET


                        LAYER 10
```

```
                              --------

                 TYPE 4 - FLEXIBLE MEMBRANE LINER
                   MATERIAL TEXTURE NUMBER  36
   THICKNESS                    =      0.06   INCHES
   POROSITY                     =      0.0000 VOL/VOL
   FIELD CAPACITY               =      0.0000 VOL/VOL
   WILTING POINT                =      0.0000 VOL/VOL
   INITIAL SOIL WATER CONTENT   =      0.0000 VOL/VOL
   EFFECTIVE SAT. HYD. COND.    =  0.399999993000E-12 CM/SEC
   FML PINHOLE DENSITY          =      0.00   HOLES/ACRE
   FML INSTALLATION DEFECTS     =      1.00   HOLES/ACRE
   FML PLACEMENT QUALITY        =  3 - GOOD



                              LAYER 11
                              --------

                   TYPE 3 - BARRIER SOIL LINER
                   MATERIAL TEXTURE NUMBER 124
   THICKNESS                    =      6.00   INCHES
   POROSITY                     =      0.3650 VOL/VOL
   FIELD CAPACITY               =      0.3050 VOL/VOL
   WILTING POINT                =      0.2020 VOL/VOL
   INITIAL SOIL WATER CONTENT   =      0.3650 VOL/VOL
   EFFECTIVE SAT. HYD. COND.    =  0.999999997000E-06 CM/SEC



                              LAYER 12
                              --------

               TYPE 1 - VERTICAL PERCOLATION LAYER
                   MATERIAL TEXTURE NUMBER 113
   THICKNESS                    =      6.00   INCHES
   POROSITY                     =      0.4300 VOL/VOL
   FIELD CAPACITY               =      0.3210 VOL/VOL
   WILTING POINT                =      0.2210 VOL/VOL
   INITIAL SOIL WATER CONTENT   =      0.3038 VOL/VOL
   EFFECTIVE SAT. HYD. COND.    =  0.999999975000E-05 CM/SEC



              GENERAL DESIGN AND EVAPORATIVE ZONE DATA
              ----------------------------------------

 NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
          SOIL DATA BASE USING SOIL TEXTURE # 8 WITH A
          GOOD STAND OF GRASS, A SURFACE SLOPE OF 30.%
          AND A SLOPE LENGTH OF  100. FEET.

SCS RUNOFF CURVE NUMBER             =     76.10
FRACTION OF AREA ALLOWING RUNOFF    =    100.0    PERCENT
AREA PROJECTED ON HORIZONTAL PLANE  =      1.000  ACRES
EVAPORATIVE ZONE DEPTH              =     30.0    INCHES
INITIAL WATER IN EVAPORATIVE ZONE   =     12.477  INCHES
UPPER LIMIT OF EVAPORATIVE STORAGE  =     13.098  INCHES
```

```
LOWER LIMIT OF EVAPORATIVE STORAGE  =      6.000  INCHES
INITIAL SNOW WATER                  =      0.000  INCHES
INITIAL WATER IN LAYER MATERIALS    =    167.977  INCHES
TOTAL INITIAL WATER                 =    167.977  INCHES
TOTAL SUBSURFACE INFLOW             =      0.00   INCHES/YEAR
```

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
SYRACUSE NEW YORK

```
STATION LATITUDE                        =  43.07 DEGREES
MAXIMUM LEAF AREA INDEX                 =   3.50
START OF GROWING SEASON (JULIAN DATE)   =    124
END OF GROWING SEASON (JULIAN DATE)     =    284
EVAPORATIVE ZONE DEPTH                  =  30.0  INCHES
AVERAGE ANNUAL WIND SPEED               =   9.70 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY   =  72.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY   =  68.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY   =  75.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY   =  76.00 %
```

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SYRACUSE NEW YORK

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
2.61	2.65	3.11	3.34	3.16	3.63
3.76	3.77	3.29	3.14	3.45	3.20

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SYRACUSE NEW YORK

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
22.80	24.00	33.30	46.10	57.00	66.30
70.90	69.30	62.10	51.30	40.60	28.30

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR SYRACUSE NEW YORK
AND STATION LATITUDE = 43.07 DEGREES

****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 100

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	2.59	2.72	3.16	3.27	3.09	3.71
	3.87	3.95	3.27	2.95	3.40	3.22
STD. DEVIATIONS	0.70	0.96	1.19	1.19	1.31	1.57
	1.67	1.76	1.60	1.16	1.19	0.76
RUNOFF						
TOTALS	0.497	1.349	4.738	1.504	0.063	0.094
	0.038	0.037	0.071	0.048	0.080	0.259
STD. DEVIATIONS	0.697	1.446	2.349	1.452	0.208	0.310
	0.224	0.147	0.214	0.155	0.213	0.487
EVAPOTRANSPIRATION						
TOTALS	0.491	0.407	0.479	1.824	2.916	5.443
	4.723	3.571	2.156	1.070	0.725	0.498
STD. DEVIATIONS	0.080	0.077	0.168	0.702	0.812	0.668
	1.357	1.206	0.670	0.183	0.141	0.111
LATERAL DRAINAGE COLLECTED FROM LAYER 3						
TOTALS	0.0459	0.0000	0.1598	1.8128	0.8908	0.3306
	0.0782	0.0232	0.0449	0.3348	1.0917	1.1946
STD. DEVIATIONS	0.1518	0.0000	0.4555	0.7230	0.6554	0.3481
	0.1773	0.1174	0.1629	0.6606	1.0613	0.9642
PERCOLATION/LEAKAGE THROUGH LAYER 4						
TOTALS	0.0008	0.0000	0.0017	0.0247	0.0222	0.0121
	0.0025	0.0006	0.0013	0.0063	0.0183	0.0205
STD. DEVIATIONS	0.0029	0.0000	0.0051	0.0103	0.0076	0.0059
	0.0041	0.0028	0.0043	0.0115	0.0156	0.0136
PERCOLATION/LEAKAGE THROUGH LAYER 6						
TOTALS	0.0008	0.0000	0.0017	0.0247	0.0222	0.0121
	0.0025	0.0006	0.0013	0.0063	0.0183	0.0205
STD. DEVIATIONS	0.0029	0.0000	0.0051	0.0103	0.0076	0.0059
	0.0041	0.0028	0.0043	0.0115	0.0156	0.0136
PERCOLATION/LEAKAGE THROUGH LAYER 8						
TOTALS	0.0008	0.0000	0.0017	0.0247	0.0222	0.0121
	0.0025	0.0006	0.0013	0.0063	0.0183	0.0205
STD. DEVIATIONS	0.0029	0.0000	0.0051	0.0103	0.0076	0.0059
	0.0041	0.0028	0.0043	0.0115	0.0156	0.0136

```
LATERAL DRAINAGE COLLECTED FROM LAYER  9
-----------------------------------------
  TOTALS                 0.0010   0.0000   0.0015   0.0238   0.0228   0.0123
                         0.0027   0.0006   0.0013   0.0061   0.0177   0.0213

  STD. DEVIATIONS        0.0033   0.0000   0.0046   0.0108   0.0078   0.0059
                         0.0042   0.0028   0.0043   0.0112   0.0155   0.0137

PERCOLATION/LEAKAGE THROUGH LAYER 11
------------------------------------
  TOTALS                 0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                         0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

  STD. DEVIATIONS        0.0000   0.0000   0.0000   0.0000   0.0000   0.0000
                         0.0000   0.0000   0.0000   0.0000   0.0000   0.0000

PERCOLATION/LEAKAGE THROUGH LAYER 12
------------------------------------
  TOTALS                 0.0000   0.0000   0.0000   0.0003   0.0005   0.0005
                         0.0004   0.0003   0.0003   0.0002   0.0003   0.0004

  STD. DEVIATIONS        0.0001   0.0000   0.0000   0.0006   0.0010   0.0009
                         0.0006   0.0007   0.0007   0.0005   0.0006   0.0006


-------------------------------------------------------------------------------
               AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


DAILY AVERAGE HEAD ON TOP OF LAYER  4
-------------------------------------
  AVERAGES               0.0001   0.0000   0.0003   0.0036   0.0018   0.0007
                         0.0002   0.0000   0.0001   0.0006   0.0022   0.0023

  STD. DEVIATIONS        0.0003   0.0000   0.0009   0.0015   0.0013   0.0007
                         0.0003   0.0002   0.0003   0.0013   0.0021   0.0019

DAILY AVERAGE HEAD ON TOP OF LAYER  6
-------------------------------------
  AVERAGES               0.0000   0.0000   0.0000   0.0003   0.0002   0.0001
                         0.0000   0.0000   0.0000   0.0001   0.0002   0.0002

  STD. DEVIATIONS        0.0000   0.0000   0.0001   0.0001   0.0001   0.0001
                         0.0000   0.0000   0.0000   0.0001   0.0002   0.0002

DAILY AVERAGE HEAD ON TOP OF LAYER  8
-------------------------------------
  AVERAGES               0.0000   0.0000   0.0001   0.0009   0.0008   0.0004
                         0.0001   0.0000   0.0000   0.0002   0.0007   0.0007

  STD. DEVIATIONS        0.0001   0.0000   0.0002   0.0004   0.0003   0.0002
                         0.0001   0.0001   0.0002   0.0004   0.0006   0.0005

DAILY AVERAGE HEAD ON TOP OF LAYER 10
-------------------------------------
  AVERAGES               0.0001   0.0000   0.0001   0.0021   0.0019   0.0011
                         0.0002   0.0001   0.0001   0.0005   0.0016   0.0018

  STD. DEVIATIONS        0.0003   0.0000   0.0004   0.0010   0.0007   0.0005
                         0.0004   0.0002   0.0004   0.0010   0.0014   0.0012
```

```
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     AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH  100
------------------------------------------------------------------------------
                                      INCHES            CU. FEET       PERCENT
                                  -------------------   -------------   ---------
 PRECIPITATION                     39.20    (   4.823)     142279.7     100.00

 RUNOFF                             8.779   (  2.3674)      31868.48     22.398

 EVAPOTRANSPIRATION                24.302   (  2.5984)      88217.59     62.003

 LATERAL DRAINAGE COLLECTED         6.00731 (  2.22963)     21806.545   15.32654
   FROM LAYER  3

 PERCOLATION/LEAKAGE THROUGH        0.11115 (  0.03784)       403.480     0.28358
   LAYER  4

 AVERAGE HEAD ON TOP                0.001 (    0.000)
   OF LAYER  4

 PERCOLATION/LEAKAGE THROUGH        0.11115 (  0.03784)       403.480     0.28358
   LAYER  6

 AVERAGE HEAD ON TOP                0.000 (    0.000)
   OF LAYER  6

 PERCOLATION/LEAKAGE THROUGH        0.11115 (  0.03784)       403.480     0.28358
   LAYER  8

 AVERAGE HEAD ON TOP                0.000 (    0.000)
   OF LAYER  8

 LATERAL DRAINAGE COLLECTED         0.11115 (  0.03780)       403.465    0.28357
   FROM LAYER  9

 PERCOLATION/LEAKAGE THROUGH        0.00000 (  0.00000)         0.015     0.00001
   LAYER 11

 AVERAGE HEAD ON TOP                0.001 (    0.000)
   OF LAYER 10

 PERCOLATION/LEAKAGE THROUGH        0.00307 (  0.00595)        11.137     0.00783
   LAYER 12

 CHANGE IN WATER STORAGE           -0.008   (  1.3026)        -27.54     -0.019
******************************************************************************

*****************************************************************************

                PEAK DAILY VALUES FOR YEARS    1 THROUGH  100
   ----------------------------------------------------------------------
                                              (INCHES)      (CU. FT.)
                                             ----------   -------------
      PRECIPITATION                            4.40         15972.000

      RUNOFF                                   4.194        15225.1016
```

```
DRAINAGE COLLECTED FROM LAYER  3          0.34412       1249.16895

PERCOLATION/LEAKAGE THROUGH LAYER  4      0.004427        16.06958

AVERAGE HEAD ON TOP OF LAYER  4           0.020

MAXIMUM HEAD ON TOP OF LAYER  4           0.030

LOCATION OF MAXIMUM HEAD IN LAYER  3
      (DISTANCE FROM DRAIN)               0.0 FEET

PERCOLATION/LEAKAGE THROUGH LAYER  6      0.004427        16.06958

AVERAGE HEAD ON TOP OF LAYER  6           0.002

PERCOLATION/LEAKAGE THROUGH LAYER  8      0.004427        16.06958

AVERAGE HEAD ON TOP OF LAYER  8           0.005

DRAINAGE COLLECTED FROM LAYER  9          0.00361         13.08806

PERCOLATION/LEAKAGE THROUGH LAYER 11      0.000000         0.00022

AVERAGE HEAD ON TOP OF LAYER 10           0.010

MAXIMUM HEAD ON TOP OF LAYER 10           0.019

LOCATION OF MAXIMUM HEAD IN LAYER  9
      (DISTANCE FROM DRAIN)               0.0 FEET

PERCOLATION/LEAKAGE THROUGH LAYER 12      0.000289         1.04834

SNOW WATER                                9.62         34911.7891


MAXIMUM VEG. SOIL WATER (VOL/VOL)                 0.4355

MINIMUM VEG. SOIL WATER (VOL/VOL)                 0.2000


 ***  Maximum heads are computed using McEnroe's equations.  ***

      Reference:  Maximum Saturated Depth over Landfill Liner
                  by Bruce M. McEnroe, University of Kansas
                  ASCE Journal of Environmental Engineering
                  Vol. 119, No. 2, March 1993, pp. 262-270.


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                  FINAL WATER STORAGE AT END OF YEAR  100
    ----------------------------------------------------------------------
                   LAYER        (INCHES)       (VOL/VOL)
                   -----        --------       ---------
                     1            2.7516         0.4586

                     2            9.2275         0.3845

                     3            0.0020         0.0100
```

```
                    4          0.0000        0.0000
                    5          0.1920        0.0320
                    6          0.0510        0.8500
                    7          0.0184        0.3070
                    8        150.8400        0.4190
                    9          0.3840        0.0320
                   10          0.0000        0.0000
                   11          2.1900        0.3650
                   12          1.5163        0.2527
              SNOW WATER       0.046
*******************************************************************************
*******************************************************************************
```

APPENDIX J

SUMP AND RISER CALCULATIONS FOR SCA DESIGN

GEOSYNTEC CONSULTANTS

COMPUTATION COVER SHEET

Client: Honeywell **Project:** Onondaga Lake SCA Design **Project/Proposal #:** GJ4299 **Task #:** 18

TITLE OF COMPUTATIONS **SUMP AND RISER CALCULATIONS FOR SCA DESIGN**

COMPUTATIONS BY:

Signature [signature] 1/12/2010 DATE

Printed Name and Title: Joseph Sura, Staff Engineer

ASSUMPTIONS AND PROCEDURES CHECKED BY: (Peer Reviewer)

Signature R. Kulasingam 1/12/2010 DATE

Printed Name and Title: R. Kulasingam, Project Engineer

COMPUTATIONS CHECKED BY:

Signature Fan Zhu 1/12/2010 DATE

Printed Name and Title: Fan Zhu, Staff Engineer

COMPUTATIONS BACKCHECKED BY: (Originator)

Signature [signature] 1/12/2010 DATE

Printed Name and Title: Joseph Sura, Staff Engineer

APPROVED BY: (PM or Designate)

Signature [signature] 12 JAN 2010 DATE

Printed Name and Title: Jay Beech, Principal

STATE OF NEW YORK JOHN J. BEECH 066337 LICENSED PROFESSIONAL ENGINEER

APPROVAL NOTES:

REVISIONS (Number and initial all revisions)

NO.	SHEET	DATE	BY	CHECKED BY	APPROVAL

Written by:	Joseph Sura	Date:	12/1/2009	Reviewed by:	Fan Zhu/R. Kulasingam	Date:	12/4/2009
Client:	Honeywell	Project:	Onondaga Lake SCA Final Design	Project/ Proposal No.:	GJ4299	Task No.:	18

SUMP AND RISER CALCULATIONS FOR SCA DESIGN

INTRODUCTION

This package was prepared in support of the design of the Sediment Consolidation Area (SCA) for the Onondaga Lake Bottom Site, which will be constructed on Wastebed 13 (WB-13) to contain dredged material from the Lake. This package presents analysis of the proposed liquid management system (LMS) sump and riser of the SCA, which will utilize geotextile tubes (geo-tubes) for dewatering. The purpose of the analyses presented in this package is to:

1. Evaluate the hydraulic requirements for riser pipe perforations to handle the design inflow during post-closure conditions.
2. Evaluate the requirements for structural stability of the riser pipe, including: (i) ring compressive strain; (ii) ring bending strain; (iii) ring buckling; (iv) longitudinal (axial) strain and buckling; and (v) flotation.
3. Calculate the liquid storage volume and typical pump off and on times for the sumps during post-closure conditions.

The pumps, risers, and sumps analyzed herein are designed for the post-closure conditions. Interim liquid removal measures (e.g., temporary pumps) will be used during the operational period, as needed. These measures are not addressed in this package and will be addressed in the Sediment Management Intermediate and/or Final Design.

METHODOLOGY

The sump and riser calculations in this package include three steps: (i) sizing the riser pipe perforations to achieve the target inflow rates; (ii) calculating the dimensions and structural stability of the riser pipe; and (iii) calculating the volume of the sump.

Pipe Perforation Sizing:

The riser pipe perforations were sized to accommodate the target design inflow, following the general procedure of Bernoulli's Equation [Qian et al., 2002]. Initially, the area of each perforation A_b (ft^2) was calculated with an assumed diameter d (ft) as follows:

$$A_b = \frac{\pi}{4} * d^2 \quad (1)$$

Bernoulli's Equation was then used to calculate the inflow capacity of a single perforation of diameter *d* as follows:

$$Q_b = C * A_b * v_{ent} \quad (2)$$

where:

Q_b = Inflow per orifice (ft^3/s)

C = Discharge coefficient, assumed to be 0.62 [Qian et al., 2002]

v_{ent} = Entry velocity (ft/s), assumed to be 0.1 ft/s [Qian et al., 2002]

The calculated maximum inflow capacity for a selected perforated pipe length *L* was then computed using Equation 3.

$$Q_{in} = Q_b * N_{row} * R * L \quad (3)$$

where:

Q_{in} = Calculated maximum inflow capacity for the perforated length (ft^3/s)

N_{row} = Number of perforations per row = $\frac{360°}{\theta}$

θ = Angle between perforations within a row (°)

R = Number of rows per foot = $\frac{12}{\delta}$

δ = Offset between rows of perforations (in)

L = Perforated pipe length (ft)

The perforated pipe length *L* only takes into account the length between the automatic "off" elevation of the pump and the top of the sump excavation (i.e., the "on" elevation of the pump). It is noted that the perforations may extend to the bottom of the riser, however water may pond below the automatic "off" elevation of the pump. Therefore, the perforations below the

automatic "off" elevation have been conservatively ignored for purposes of this calculation. The number of perforations per row and offset between rows for the proposed riser pipe was varied to analyze various possible pipe perforation options.

Pipe Structural Stability:

Calculations were performed to verify that the proposed high density polyethylene (HDPE) manhole riser pipes are able to withstand the loads applied on them with adequate factors of safety. Failure mechanisms that were checked include: (i) ring compressive strain; (ii) ring bending strain; (iii) ring buckling; (iv) longitudinal (axial) strain and buckling; and (iv) flotation. It is noted that the pipe structural stability is dependent on the standard dimension ratio (SDR) which is only available in specific values.

The radial pressure applied on the manhole riser may be approximated using the active earth pressure, computed by Equation 4 [Chevron Phillips, 2004]. It is noted that the coefficient of 1.21 in the equation is intended to account for the variability of active earth pressure around the riser. It is further noted that this equation has been modified to take into account strength reduction due to the perforations, which are assumed to extend the entire length of the riser [Qian et al., 2002]:

$$P_R = \frac{1.21 * K_A * \gamma * H}{1 - \frac{n * d}{12}} \qquad (4)$$

where:

P_R	=	Radial pressure (psf);
γ	=	Soil unit weight (pcf);
H	=	Height of fill (ft);
K_A	=	Active earth pressure coefficient = $\tan^2(45 - \phi/2)$;
Φ	=	Soil friction angle (deg);
n	=	Number of perforations per lineal foot of pipe; and
d	=	Diameter of a single perforation (in).

The downdrag load applied to the manhole due to soil settlement is calculated assuming that the radially-directed pressure varies linearly with depth. Equation 5 can be used to calculate the average shear stress T_A applied to a manhole riser [Chevron Phillips, 2004]. The average shear stress may then be used in Equation 6 to calculate the downdrag load [Chevron Phillips, 2004].

$$T_A = \mu * \frac{(P_{R1} + P_{R2})}{2} \quad (5)$$

where:

T_A = Average shear stress (psf);
P_{R1} = Radial pressure at top of riser (psf);
P_{R2} = Radial pressure at base of riser (psf); and
μ = Friction coefficient between riser and soil.

$$P_D = T_A * \pi \frac{(D_O)}{12} * H \quad (6)$$

where:

P_D = Downdrag load (lb);
D_O = Outside diameter of riser (in);
T_A = Average shear stress (psf); and
H = Height of manhole fill (ft).

It is noted that μ of 0.4 is recommended for the coefficient of friction between HDPE manholes and granular or granular-cohesive backfills [Chevron Phillips, 2004]. It is further noted that the effect of water will reduce the downdrag load due to the buoyancy effect. However, the water level will fluctuate due to seasonal variations and the effect of pumping operations. Therefore, water has been conservatively ignored in calculation of the radial pressure, average shear stress, and downdrag load.

Ring Compressive Strain: Radially-directed earth loads cause ring compressive strain and bending strains in the riser. It is noted that ring compressive strain should be limited to 3.5% at 73°F [Chevron Phillips, 2004]. Equations 7 and 8 may be used to determine ring compressive thrust and ring compressive strain, respectively [Chevron Phillips, 2004].

$$N_T = \frac{P_R}{144} * (R_M) \quad (7)$$

where:

N_T = Ring compressive thrust (lb/in);
P_R = Radial pressure (psf);
R_M = Mean riser radius (in) = $\frac{ID + t}{2}$;

ID = Inside manhole diameter (in); and
t = Minimum wall thickness (in).

$$\varepsilon_T = \frac{N_T}{E * t} \tag{8}$$

where:

ε_T = Ring compressive strain (in/in);
N_T = Ring compressive thrust (lb/in);
E = Modulus of elasticity (psi); and
t = Minimum wall thickness (in).

Ring Bending: Ring deflection often occurs during installation, causing a bending moment within the riser. It is noted that ring bending strain can be added to ring compressive strain to calculate the combined strain, which should be limited to 5% at 73°F [Chevron Phillips, 2004]. Equations 9 and 10 may be used to determine ring bending moment and ring bending strain, respectively, assuming 2% deflection during installation [Chevron Phillips, 2004].

$$M_E = 0.25 * C_O * D_M * N_T \tag{9}$$

where:

M_E = Ring bending moment (lb-in/in);
C_O = Correction for 2% deflection = 0.02;
D_M = Mean riser diameter (in); and
N_T = Ring compressive thrust (lb/in).

$$\varepsilon_B = \frac{6 * M_E}{E * t^2} \tag{10}$$

where:

ε_B = Ring bending strain (in/in);
M_E = Ring bending moment (lb-in/in);
E = Modulus of elasticity (psi); and
t = Minimum wall thickness (in).

Ring Buckling: If ring compressive thrust exceeds a critical buckling value, the manhole riser may buckle. Ring buckling is calculated differently depending on whether the riser is above or

below the water level. It is noted that the water level for this project will vary seasonally and based on operational conditions, therefore both calculations were performed and the more critical result was used in analysis. For a manhole riser completely above the water level, the critical ring compressive thrust may be calculated using Equation 11 [Chevron Phillips, 2004].

$$N_{CR} = 0.3 * R_H * t * E^{1/3} * E_S^{2/3} \qquad (11)$$

where:

N_{CR} = Critical ring compressive thrust, no water (lb/in);
R_H = Geometry factor = 1.0 if relative stiffness (RS) is less than 0.005;
t = Minimum riser wall thickness (in);
E = Modulus of elasticity of soil (psi);
E_S = Young's Modulus of soil (psi);
RS = Relative stiffness = $\frac{0.22 * E * t^3}{E_S * R_M^3}$; and
R_M = Mean radius of riser (in).

If the manhole riser or a portion of the riser is below the water level, the critical compressive thrust may be calculated with Equation 12 [Chevron Phillips, 2004].

$$N_{CRW} = 0.82 * \sqrt{\frac{R * B' * E' * E * t^3}{D_M}} \qquad (12)$$

where:

N_{CRW} = Critical ring compressive thrust with water (lb/in);
D_M = Mean diameter (in);
R = Buoyancy reduction = $1 - 0.33 * \frac{H'}{H}$;
H' = Height of water from invert (ft);
H = Height of manhole fill (ft);
E = Modulus of elasticity of soil (psi);
E' = Modulus of soil reaction (psi);
t = Minimum riser wall thickness (in); and
B' = $\frac{1}{1 + 4 * e^{(-0.065 * H)}}$.

It is noted that the ring compressive thrust N_T should not exceed 50% of the critical ring compressive thrust N_{CR} or N_{CRW} [Chevron Phillips, 2004]. It is further noted that while the manhole top and bottom may increase the stiffness and lower the amount of buckling observed, this is conservatively ignored for purposes of this calculation.

Longitudinal (Axial) Strain and Buckling: Longitudinal compressive strain may be caused by downdrag loads, dead loads (i.e., manhole weight), and any live loads (i.e., equipment and personnel on top of the manhole). Longitudinal compressive strains can be calculated using Equation 13 [Chevron Phillips, 2004].

$$\varepsilon_A = \frac{P_D + P_L + P_W}{E * \pi * D_M * t} \tag{13}$$

where:

ε_A = Longitudinal compressive strain (in/in);
P_D = Downdrag force (lb);
P_L = Live load (lb);
P_W = Dead load (lb);
E = Modulus of elasticity of soil (psi);
D_M = Mean riser diameter (in); and
t = Minimum riser wall thickness (in).

Local wall buckling can occur if the longitudinal strain exceeds the critical longitudinal strain, calculated by Equation 14 [Chevron Phillips, 2004].

$$\varepsilon_{CR} = \frac{2 * t}{D_M * \sqrt{3 * (1 - \mu^2)}} \tag{14}$$

where:

ε_{CR} = Critical longitudinal compressive strain (in/in);
D_M = Mean riser diameter (in);
μ = Poisson's ratio for HDPE; and
t = Minimum riser wall thickness (in).

It is noted that the use of granular soil or granular-cohesive soil surrounding the manhole will provide an additional safety factor not considered in this calculation; therefore the use of an

additional safety factor is not required [Chevron Phillips, 2004]. Therefore, ε_A must be less than ε_{CR}. Additionally, ε_A must be less than 3.5%. It is noted that if the calculated strain ε_A fails to meet either condition, a thicker riser (i.e., smaller SDR) should be selected.

Flotation: When a manhole riser is surrounded by water, the buoyancy force may cause flotation if the downward forces (i.e., manhole weight, friction, etc.) are not sufficient to resist the buoyancy force due to the water. It is noted that flotation will only occur if water is between the riser bottom and the liner. Based on current designs, the riser will be placed directly on top of the liner, so flotation is not expected to be an issue. However, to be conservative, the effect of flotation has been calculated. The net downward (resisting) force can be calculated using Equation 15 [Chevron Phillips, 2004]. It is noted that a factor of safety of 1.5 is selected for both the weight of the anti-flotation slab and the soil weight.

$$F_{DOWN} = W_{MH} + W_{CC} + \frac{W_{AF}}{FS_{AF}} + \frac{W_{AFS}}{FS_{AFS}} \qquad (15)$$

where:

F_{DOWN} = Total downward force (lb);
W_{MH} = Manhole weight (lb);
W_{CC} = Weight of manhole cover (lb);
W_{AF} = Weight of anti-flotation slab (lb);
FS_{AF} = Factor of safety for anti-flotation slab weight;
W_{AFS} = Weight of soil above anti-flotation slab (lb); and
FS_{AFS} = Factor of safety for soil weight above anti-flotation slab.

Manhole weight and the weight of manhole cover can be obtained from the manufacturer of the riser and/or calculated from design drawings. It is noted that because the manhole cover will be installed after construction of the manhole, its weight has been conservatively neglected (i.e., assumed to be zero) for purposes of the analyses herein. It is additionally noted that for purposes of flotation calculations, the manhole weight has been conservatively neglected (i.e., assumed to be zero). The weight of the anti-flotation slab can be computed using Equation 16 [Chevron Phillips, 2004].

$$W_{AF} = (L_{AF} * w_{AF} * \frac{t_{AF}}{12} * (\gamma_C - \gamma_W)) \qquad (16)$$

where:

W_{AF} = Weight of anti-flotation slab (lb);
L_{AF} = Length of anti-flotation slab (ft);
w_{AF} = Width of anti-flotation slab (ft);
t_{AF} = Thickness of anti-flotation slab (in);
γ_C = Unit weight of concrete (pcf); and
γ_W = Unit weight of water (pcf).

Equation 17 is used to calculate the weight of the soil above the anti-flotation slab [Chevron Phillips, 2004]. It is noted that for the soil weight calculation, there will not be soil directly above the riser; therefore, the plan area of the riser has been subtracted from the total area.

$$W_{AFS} = (L_{AF} * w_{AF} - A_{OVER}) * (\gamma * (H_{AF} - H_W) + H_W * (\gamma - \gamma_W)) \qquad (17)$$

where:

W_{AFS} = Weight of soil above slab (lb);
L_{AF} = Length of slab (ft);
w_{AF} = Width of slab (ft);
A_{OVER} = Plan area of riser directly on top of slab (ft^2);
γ = Soil unit weight (pcf);
γ_W = Unit weight of water (pcf);
H_{AF} = Height of soil above slab (ft); and
H_W = Height of water above slab (ft).

The upward forces lifting the manhole off the ground include the buoyant force acting on the manhole, as shown in Equation 18 [Chevron Phillips, 2004].

$$F_{UP} = \pi * \frac{D_O^2}{576} * \gamma_W * H_W \qquad (18)$$

where:

F_{UP} = Uplift force (lb);
D_O = Outside diameter of riser (in);
γ_W = Unit weight of water; and
H_W = Height of water (ft).

The overall factor of safety against flotation can be calculated using Equation 19 [Chevron Phillips, 2004]. It is noted that for purposes of this calculation, FS values have been applied to the downward (i.e., resisting) forces individually, therefore, an overall safety factor of 1.0 is be considered acceptable [Chevron Phillips, 2004].

$$FS = \frac{F_{DOWN}}{F_{UP}} \tag{19}$$

where:

FS = Factor of safety against flotation;
F_{DOWN} = Total downward force (lb); and
F_{UP} = Total upward force (lb).

It is noted that the ability of the manhole cover to carry personnel loads and equipment without excessive deformations (i.e., flexural strength) is an important safety consideration. It is recommended that certification be obtained from the manhole riser manufacturer for a minimum allowable live load of about 750 lbs for the manhole cover. Clear signs should be posted at the cover to indicate allowable live loads.

Sump Volume and Pump Sizing:

The storage volume of the sump is calculated as the volume between the pump off level and the top of the low permeability soil liner outside the sump area. This volume is a combination of open area inside the riser pipes and pore volume of areas outside the risers that are filled with gravel.

Pump on time is calculated by dividing the storage volume by the selected pumping rate minus the design inflow rate. Pump off time is calculated by dividing the storage volume by the inflow rate to the sump.

INPUT PROPERTIES

The calculated liquid inflow rate for the entire SCA was 0.4 gal/min, as presented in Appendix I, “Evaluation of Hydraulic Performance for SCA Design”. It is noted that this inflow rate has been computed for post-closure conditions (i.e., after placement of the final cover system). However, it is noted that placement of the geomembrane in the final cover system may not occur immediately after construction. Therefore, a target inflow rate of 15 gal/min has been

selected to represent conditions following the fourth year of construction. This inflow rate was computed in Appendix I of the SCA Initial Design Submittal [Parsons and Geosyntec, 2009] for conditions following the fourth year of construction including the placement of a 3-inch thick leveling layer.

As presented in Figure 1, the liner grading plan indicates that the total water infiltration will be split between the western sump area and the eastern sump area. Based on the relative areas, it appears that approximately 67% of the infiltration will drain to the western sump and approximately 33% to the eastern sump area. Therefore, the assumed target liquid inflow rate for the individual sump areas is 10 gal/min. The perforation sizing and pipe structural analyses performed in this package assume that both the western and eastern sump areas will be designed identically to be able to handle the target inflow of 10 gal/min. The volume and pump on and off time calculations use a target liquid inflow rate of 10 gal/min for the western sump area and 5 gal/min for the eastern sump area. It is noted that for the post-closure condition, the total inflow rate of 0.4 gal/min is expected to follow the same 67%/33% split. Therefore, the volume and pump off and on time calculations use a target liquid inflow rate of 0.27 gal/min for the western sump area and 0.13 gal/min for the eastern sump area.

It is further assumed that each sump area will consist of two separate riser pipes, a main and a backup, with a pump in the main riser and a 10 ft offset between each riser pipe. As presented in Figure 2, the pump was assumed to require a 1 ft working pad above the liner, have an automatic off elevation 3 ft above the bottom of the pump, and have an automatic on elevation *L* ft above the automatic off elevation. The walls of the excavated sump area were assumed to be sloped at a 2.5 horizontal:1 vertical (H:V) slope. Each riser pipe was assumed to be approximately 5 ft in diameter. In addition, a 10 ft offset between the edge of the riser pipe and the start of the sump side slopes was provided. The area of the pumps is small relative to the total sump area and has been neglected with respect to the sump volume calculation.

It is assumed that the riser pipes will be SDR 26, with an inside diameter of 57.85 inches and a nominal outside diameter of 63 inches, as shown in Table 1. The riser pipes are assumed to be HDPE with a long-term modulus of elasticity at 73°F of 28,200 psi, as shown in Table 2 [Chevron Phillips, 2004]. A reduction factor of 0.76 has been conservatively applied to account for stress concentrations [August et al., 1997]. The Poisson's ratio of HDPE is assumed to be 0.45 for long-term and 0.35 for short-term [Chevron Phillips, 2004]. It is assumed that there will not be any riser stubouts. The manhole weight is assumed to be approximately 8000 lb for purposes of downdrag calculations, based on the estimated weight per lineal foot shown in Table 1 and a 40 ft riser. It is noted that for purposes of anti-flotation calculations, the manhole weight is neglected, as discussed previously. A square anti-flotation slab with length and width of 7.25

ft and a thickness of 6.0 inches will be constructed from concrete (γ_C=150 pcf). It is assumed that the riser will be bolted to the anti-flotation slab.

The design live load for purposes of downdrag calculations is considered to be 1000 lb. It is noted that the weight of two people (assumed to be 250 lb per person), the pump (assumed 100 lb), and other cap equipment such as bolts and flanges (assumed 100 lb) is less than 1000 lb, therefore this assumption is considered reasonable. However, it is noted that the allowable live load on the cap may be less than 1000 lb due to flexural stability of the cap itself. Therefore, the allowable live load should be selected based on manufacturer recommendations.

It is assumed that the riser pipes are surrounded by a layer of gravel throughout their entire height. The maximum riser height is considered to be 40 ft. It is noted that after the dredged material in the geo-tube undergoes settlement, the total thickness of geo-tubes is expected to be less than 30 ft, therefore the use of a 40 ft riser is considered to be conservative. The water is considered to rise to a maximum of 18.5 ft above the base. This corresponds to an elevation of 434 ft, the same height as the lowest berm elevation near the sumps. It is noted that this condition is not expected to occur, however this represents the worst-case scenario of the SCA flooding with water during operations and is therefore expected to be conservative.

Based on discussions with Parsons, two types of gravel, #2 and #3A, are available from nearby quarry sites for use in the SCA drainage layer, including the sump areas. The sieve analysis test results for these two types of gravel are presented in Table 3, and the associated grain size distribution curves are in Figure 3. Gravel type #3A has a larger D_{85} value (D_{85}=1.4 in) than type #2 (D_{85}=0.9 in), therefore it has been assumed that #3A will be selected for the drainage layer to provide more drainage capacity. The unit weight and drained friction angle of the gravel are considered to be 120 pcf and 38 degrees, respectively, following recommendations from Appendix G, “Slope Stability Analyses for SCA Design”. A typical value of 0.4 is chosen for the porosity of the gravel. The elastic modulus for coarse grained soils is assumed to be 250 tsf, as shown in Table 4 [USACE, 1990].

CALCULATIONS

A sample calculation spreadsheet for the pipe perforation sizing is included in Attachment 1, following the methodology described above. The calculation worksheets for the pipe structural stability and sump volume are also provided in Attachment 1.

RESULTS OF ANALYSIS

The results of the pipe perforation sizing are summarized in Table 5. Multiple combinations of perforation angle and row offset resulted in acceptable calculated FS values. Choosing a pipe perforation length of 4 ft (i.e., a total excavation depth of 8 ft), pipe perforation angle of 45 degrees and row offset of 3 inches results in a calculated inflow capacity of 19.4 gal/min. A conceptual diagram of the proposed design is presented in Figure 4.

Based on the pipe perforation dimensions chosen, the structural stability appears to be acceptable, as summarized in Table 6. Specifically, the calculated ring compressive strain, combined ring strain, and ring buckling satisfy the target criteria of less than 3.5%, less than 5.0%, and less than 50%, respectively. In addition, the calculated longitudinal strain is less than the critical longitudinal strain (i.e., 5.2%) and less than the set limit of 3.5%. The calculated FS value against flotation with the anti-flotation slab satisfies the chosen target FS.

The results of the sump volume calculations are summarized in Table 7. Based on the results presented previously, a sump depth of 8 ft was selected, with the two sumps separated by 10 ft. This configuration resulted in a total storage volume of 47,000 gallons for each of the sump areas and a filling time of approximately 78 hours for the western sump area and 156 hours for the eastern sump area under the design condition (i.e., inflow of 10 gal/min to the western sump and 5 gal/min to the eastern sump). For a selected pumping rate of 30 gal/min, the western sump will have a pump on time of approximately 39 hours under the design condition (i.e., inflow of 10 gal/min). For a selected pumping rate of 20 gal/min, the eastern sump will have a pump on time of approximately 52 hours under the design condition (i.e., 5 gal/min).

For the post-closure conditions (i.e., inflow of 0.27 gal/min to the western sump and 0.13 gal/min to the eastern sump), the configuration resulted in a fill time of approximately 2900 hours for the western sump and 6000 hours for the eastern sump. For a selected pumping rate of 30 gal/min, the western sump will have a pump on time of approximately 26 hours under post-closure conditions (i.e., inflow of 0.27 gal/min). For a selected pumping rate of 20 gal/min, the eastern sump will have a pump on time of approximately 39 hours under the design condition (i.e., 0.13 gal/min).

SUMMARY AND CONCLUSIONS

This package presents calculations to support the design of the sump areas of the proposed SCA within WB-13. Three types of calculations were performed: (i) evaluation of the hydraulic requirements for pipe perforations to handle the required inflow during post-closure conditions; (ii) evaluation of the requirements for structural stability of the riser pipe, including ring

compressive strain, ring bending strain, ring buckling, longitudinal (axial) strain and buckling, and flotation; and (iii) calculation of liquid storage volume and filling time for the sump area during post-closure conditions.

Based on the calculations, it is recommended that a SDR 26 riser pipe with an inside diameter of 57.85 inches and a nominal outside diameter of 63 inches, with a perforation angle of 45 degrees, perforation row offset of 3 inches, and a total SOLW excavation depth of 8 ft be selected. This resulted in a calculated inflow capacity of 19.4 gal/min, exceeding the target design inflow of 10 gal/min for design conditions and 0.27 gal/min for post-closure conditions. It is noted that the calculated strains did not exceed the target strains. In addition, the calculated FS of the riser pipe satisfied the target FS with regards to flotation with the inclusion of a 7.25 ft x 7.25 ft x 6.0 inches square concrete anti-flotation slab beneath the riser.

For the western sump area, the calculated sump storage volume of 47,000 gallons resulted in a pump off time of 78 hours and pump on time of 39 hours using the design inflow rate of 10 gal/min and a pumping rate of 30 gal/min. Additionally, the calculated sump storage volume of 47,000 gallons resulted in a pump off time of 2900 hours (approximately 120 days) and pump on time of 26 hours using the design post-closure inflow rate of 0.27 gal/min and a pumping rate of 30 gal/min.

The eastern sump area with a calculated sump storage volume of 47,000 gallons, a design inflow rate of 5 gal/min, and a pumping rate of 20 gal/min, resulted in a calculated pump off time of 156 hours and pump on time of 52 hours. Additionally, the calculated sump storage volume of 47,000 gallons resulted in a pump off time of 6000 hours (approximately 250 days) and pump on time of 39 hours using the design post-closure inflow rate of 0.13 gal/min and a pumping rate of 20 gal/min.

Different pump capacities and on/off times may be used as appropriate based on actual field conditions, as long as performance requirements are met. It is further noted that a smaller SDR ratio is expected to reduce the strains and increase the calculated FS values and therefore pipes with a smaller SDR ratio than SDR of 26 used in this calculation may be used as appropriate.

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Tables

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Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **18**

Table 1: Typical Pipe Properties [IscoIndustries, 2009]

PE 3608/3408 IPS HDPE PIPE SIZES

Pressure Rating		DR 17 (100psi)			DR 19 (89psi)			DR 21 (80psi)			DR 26 (65psi)			DR 32.5 (50psi)		
Nominal Size	Actual O.D	Min. wall	Average I.D.	Weight lb/ft	Min. wall	Average I.D.	Weight lb/ft	Min. wall	Average I.D.	Weight lb/ft	Min. wall	Average I.D.	Weight lb/ft	Min. wall	Average I.D.	Weight lb/ft
3/4"	1.050"	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1"	1.315"	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1 1/4"	1.660"	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
1 1/2"	1.900"	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---
2"	2.375"	0.140"	2.079"	0.429	---	---	---	---	---	---	---	---	---	---	---	---
3"	3.500"	0.206"	3.064"	0.932	---	---	---	---	---	---	---	---	---	---	---	---
4"	4.500"	0.265"	3.939"	1.540	0.237"	3.996"	1.387	0.214"	4.046"	1.262	0.173"	4.133"	1.030	0.138"	4.206"	0.831
5"	5.375"	0.316"	4.705"	2.197	0.283"	4.775"	1.980	0.256"	4.832"	1.801	0.207"	4.937"	1.470	0.165"	5.024"	1.186
5"	5.563"	0.327"	4.869"	2.353	0.293"	4.942"	2.120	0.265"	5.001"	1.929	0.214"	5.109"	1.574	0.171"	5.200"	1.270
6"	6.625"	0.390"	5.799"	3.338	0.349"	5.886"	3.007	0.315"	5.956"	2.736	0.255"	6.085"	2.233	0.204"	6.193"	1.801
7"	7.125"	0.419"	6.236"	3.860	0.375"	6.330"	3.478	0.339"	6.406"	3.165	0.274"	6.544"	2.582	0.219"	6.660"	2.083
8"	8.625"	0.507"	7.549"	5.657	0.454"	7.663"	5.097	0.411"	7.754"	4.637	0.332"	7.922"	3.784	0.265"	8.062"	3.053
10"	10.750"	0.632"	9.409"	8.788	0.566"	9.551"	7.918	0.512"	9.665"	7.204	0.413"	9.873"	5.878	0.331"	10.049"	4.742
12"	12.750"	0.750"	11.160"	12.362	0.671"	11.327"	11.138	0.607"	11.463"	10.134	0.490"	11.710"	8.269	0.392"	11.918"	6.671
14"	14.000"	0.824"	12.254"	14.905	0.737"	12.438"	13.429	0.667"	12.587"	12.218	0.538"	12.858"	9.970	0.431"	13.087"	8.044
16"	16.00"	0.941"	14.005"	19.467	0.842"	14.215"	17.540	0.762"	14.385"	15.959	0.615"	14.695"	13.022	0.492"	14.956"	10.506
18"	18.00"	1.059"	15.755"	24.638	0.947"	15.992"	22.199	0.857"	16.183"	20.198	0.692"	16.532"	16.480	0.554"	16.826"	13.296
20"	20.00"	1.176"	17.506"	30.418	1.053"	17.768"	27.406	0.952"	17.981"	24.936	0.769"	18.369"	20.346	0.615"	18.695"	16.415
22"	22.00"	1.294"	19.256"	36.805	1.158"	19.545"	33.162	1.048"	19.779"	30.172	0.846"	20.206"	24.619	0.677"	20.565"	19.863
24"	24.00"	1.412"	21.007"	43.801	1.263"	21.322"	39.465	1.143"	21.577"	35.907	0.923"	22.043"	29.299	0.738"	22.434"	23.638
26"	26.00"	1.529"	22.758"	51.406	1.368"	23.099"	46.316	1.238"	23.375"	42.141	1.000"	23.880"	34.385	0.800"	24.304"	27.742
28"	28.00"	1.647"	24.508"	59.618	1.474"	24.876"	53.716	1.333"	25.173"	48.874	1.077"	25.717"	39.879	0.862"	26.174"	32.174
30"	30.00"	1.765"	26.259"	68.439	1.579"	26.653"	61.664	1.429"	26.971"	56.105	1.154"	27.554"	45.779	0.923"	28.043"	36.934
32"	32.00"	1.882"	28.009"	77.869	1.684"	28.429"	70.160	1.524"	28.770"	63.835	1.231"	29.391"	52.086	0.985"	29.913"	42.023
34"	34.00"	2.000"	29.760"	87.907	1.789"	30.206"	79.204	1.619"	30.568"	72.064	1.308"	31.228"	58.814	1.046"	31.782"	47.440
36"	36.00"	2.118"	31.511"	98.553	1.895"	31.983"	88.796	1.714"	32.366"	80.791	1.385"	33.065"	65.922	1.108"	33.652"	53.186
42"	42.00"	2.471"	36.762"	134.141	2.211"	37.314"	120.861	2.000"	37.760"	109.966	1.615"	38.575"	89.727	1.292"	39.260"	72.392
48"	48.00"	2.824"	42.014"	175.205	2.526"	42.644"	157.857	2.286"	43.154"	143.629	1.846"	44.086"	117.194	1.477"	44.869"	94.552
54"	54.00"	3.176"	47.266"	222.547	2.842"	47.975"	199.791	2.571"	48.549"	182.298	2.077"	49.597"	148.324	1.662"	50.478"	119.668
63"	62.99"	---	---	---	---	---	---	3.000"	56.631"	247.800	2.423"	57.854"	202.010	1.938"	58.881"	162.980

NOTE:

- Items highlighted in Blue indicates standard stocking items that are more readily available.
- Pressures are based on using water at 23°C (73°F).
- Average inside diameter calculated using nominal OD and minimum wall plus 6% for use in estimating fluid flows. Actual ID will vary.
- Service factors should be utilized to compensate for the effect of liquids other than water, and for other temperatures.
- Other piping sizes or DR's may be available upon request.
- Standard Lengths: 40' for 2"-24" / 50' for 26" and larger / Coils available for 3/4"-6"(8" by special order)

Selected Pipe

Page 2 of 2

Notes:

1. These are typical commercially available HDPE pipe sizes.
2. The pipe chosen has an outside diameter of 63 in, based on the nominal outside diameter of 5 ft as discussed in the package.

Table 2: Modulus of Elasticity Values for HDPE [Chevron Phillips, 2004]

Table 2-2 Modulus of Elasticity for HDPE, psi

LOAD DURATION	TEMPERATURE 0° F	73° F	120° F	140°F
Short-term	260,000	110,000	65,000	50,000
1 hour	148,000	69,600	36,900	28,400
10 hours	122,000	57,500	30,500	23,500
1000 hours	92,800	43,700	23,200	17,800
10 years	67,100	31,600	16,800	12,900
50 years	59,900	28,200	15,000	11,500

Notes:

1. The Modulus of Elasticity chosen is for 50 years (long-term) at 73°F.
2. A reduction factor of 0.76 has been applied to the chosen reduction factor [August et. al, 1997]

Table 3: Sieve Analysis Test Results for Potential Gravel Sources

Sieve Size	#3A's	#2
3"	100.0%	100.0%
2"	100.0%	100.0%
1 1/2"	95.1%	100.0%
1"	14.5%	91.5%
3/4"	5.8%	65.2%
1/2"	3.4%	13.3%
3/8"	2.4%	0.8%
1/4"	1.8%	0.4%
#4		
1/8"		
#8		
#10		
#16		
#20		
#30		
#40		
#50		
#80		
#100		
#200		

Note:

1. These results were provided to Geosyntec by Parsons.

Table 4: Typical Elastic Modulus Values for soils [USACE, 1990]

Typical Elastic Moduli

Soil	E_s, tsf
Clay	
Very soft clay	5 - 50
Soft clay	50 - 200
Medium clay	200 - 500
Stiff clay, silty clay	500 - 1000
Sandy clay	250 - 2000
Clay shale	1000 - 2000
Sand	
Loose sand	100 - 250
Dense sand	250 - 1000
Dense sand and gravel	1000 - 2000
Silty sand	250 - 2000

Notes:

1. It is assumed that the riser pipes will be surrounded by gravel, which may or may not be heavily compacted. Therefore, a value of 250 tsf has been assumed to represent the worst expected scenario.

Table 5: Pipe Perforation Summary

Assumed Hole Diameter *d* (in)	Perforated Pipe Length *L* (ft)	Perforation Angle θ (°)	Row Offset *δ* (in)	Computed Inflow Capacity (gal/min)
1.00	3	45	2	21.9
1.00	3	45	3	14.6
1.00	4	45	3	19.4
1.00	4	60	2	21.9
1.00	4	60	3	14.6

Note:

1. This table summarizes acceptable combinations of perforated pipe length L, perforation angle θ, and row offset δ.

Table 6: Mechanical Stability Summary

Calculation	Target	Calculated	OK?
Ring Compressive Strain (%)	< 3.5%	0.84%	Yes
Combined Ring Strain (%)	< 5.0%	1.46%	Yes
Ring Buckling (%)	< 50%	15.64%	Yes
Longitudinal Strain (%)	< 3.5% < 5.2%	2.87%	Yes
Flotation with slab (FS)	> 1.0	3.05	Yes

Note:

1. These values are calculated following the methodology of Chevron Phillips [2004], as described in the package.

Table 7A: Sump Volume Summary – Design 15 gal/min flow rate

	Q_{DESIGN} (gal/min)	Pump Off Time[2] (hr)	Pump Rate (gal/min)	Pump Time (hr)
Sump 1	10	77.9	30	38.9
Sump 2	5	155.7	20	51.9

Table 7B: Sump Volume Summary – Post-Closure

	Q_{DESIGN} (gal/min)	Pump Off Time[2] (hr)	Pump Rate (gal/min)	Pump Time (hr)
Sump 1	0.27	2883.9	30	26.2
Sump 2	0.13	5989.7	20	39.2

Notes:

1. These values are calculated assuming an excavation depth of 8 ft, pipe perforation angle of 45 degrees, and perforation row offset of 3 inches, as described in the package.
2. This is the time taken for the liquid level to go from the minimum to maximum level within the sump area.
3. Different pump capacities and on/off times may be used as appropriate based on actual field conditions, as long as performance requirements are met.

Figures

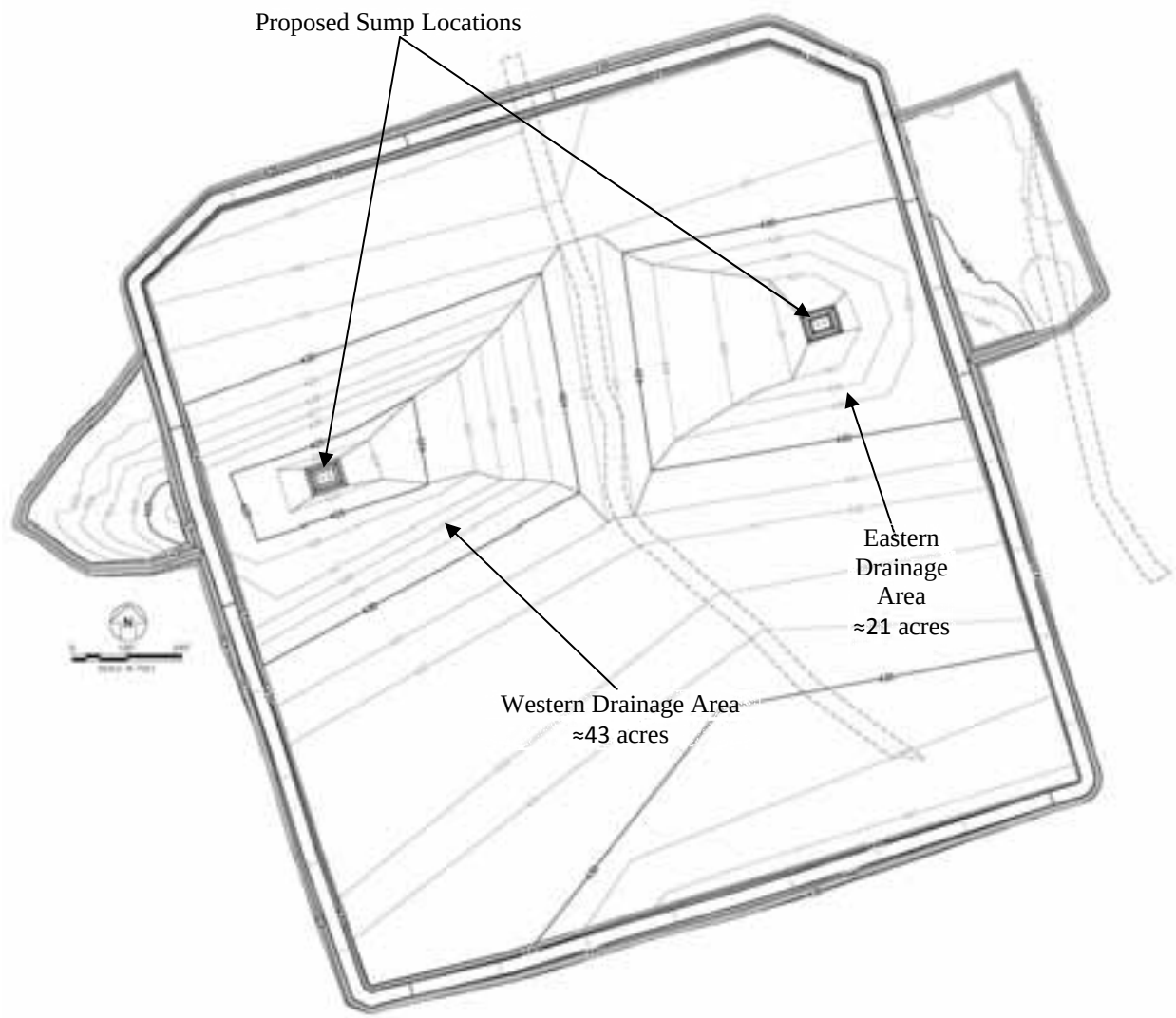

Figure 1: Grading Plan of Top of Low Permeability Soil Layer

Note:

1. Approximately 67% of the SCA area will drain to the western sump area, and approximately 33% of the SCA area will drain to the eastern sump area.
2. This figure does not include settlement.

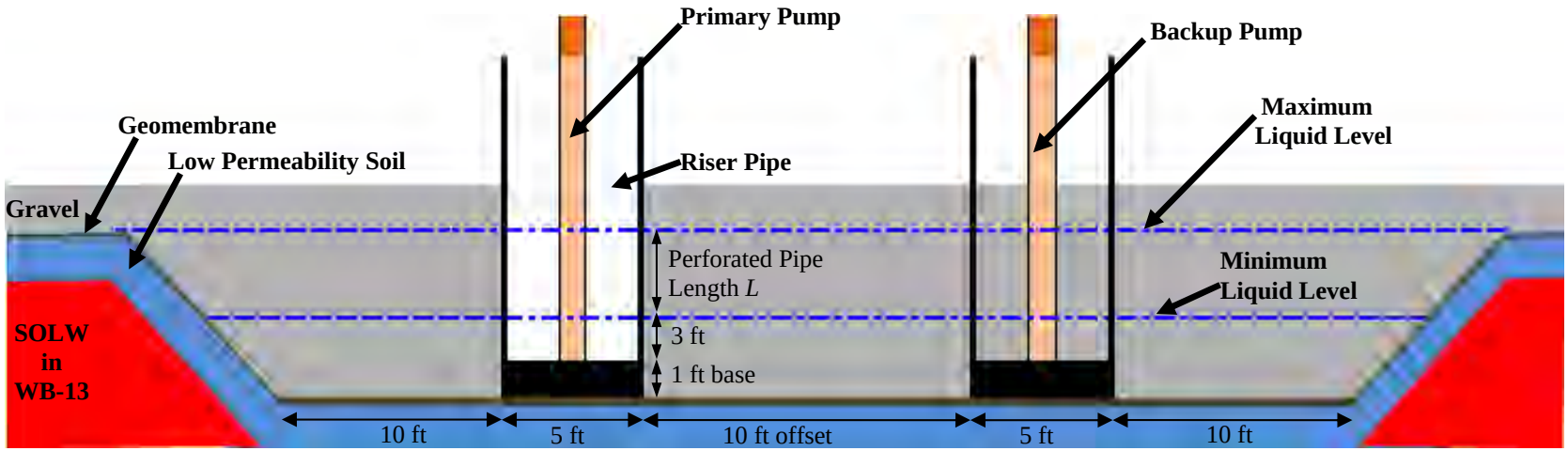

Figure 2: Conceptual View of Sump Area

Notes:

1. The backup riser is conservatively assumed to be filled with gravel, therefore no extra sump volume capacity is considered.
2. The total SOLW excavation depth is the sum of *L* (perforated pipe length), the 3 ft minimum liquid height and the 1 ft base. The 3 ft minimum liquid height is sufficient for several commercially available electrical pumps.
3. The side slopes are 2.5 horizontal:1 vertical.
4. The width of the sump bottom is considered to be 5 ft for the riser and 10 ft offset from the side slopes, for a total of 25 ft. The length of the sump bottom is 40 ft, as shown on this figure.
5. The low permeability soil liner has a minimum thickness of 1.5 ft near the sump area.

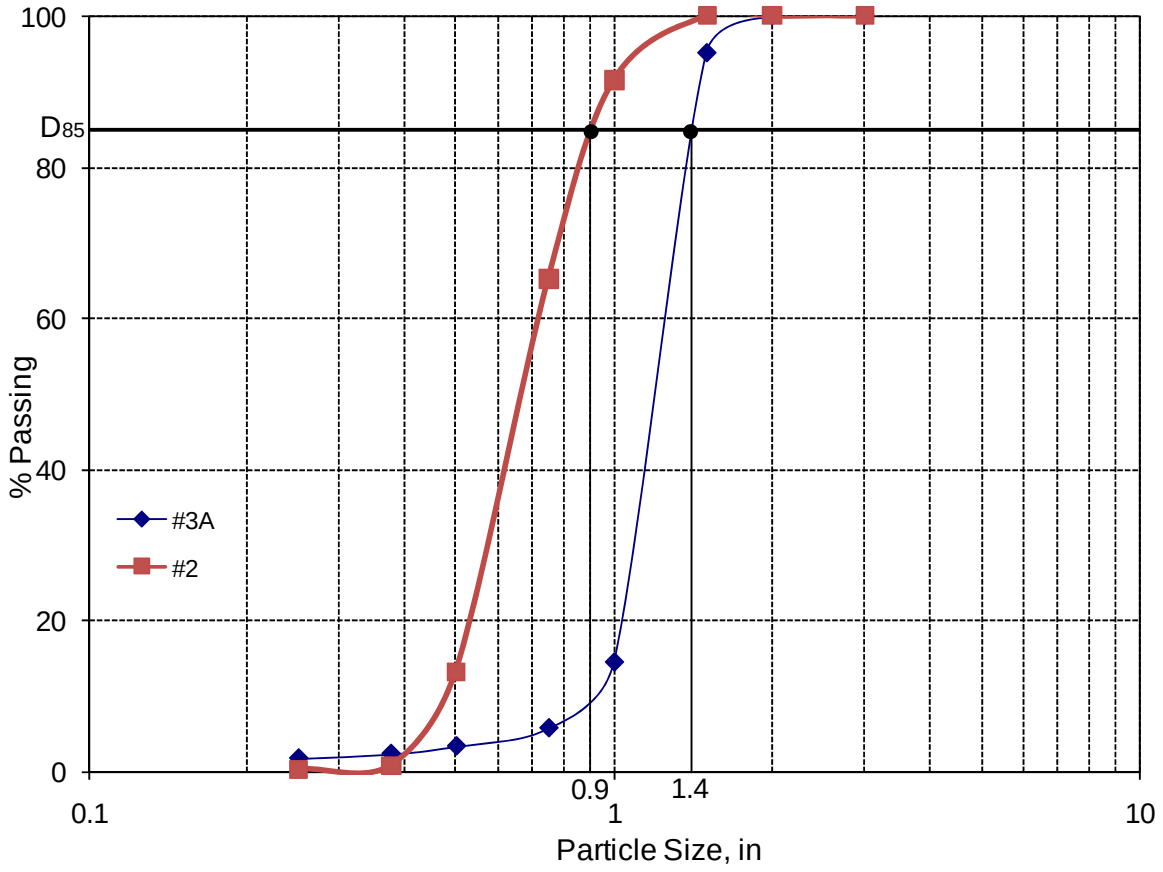

Figure 3: Grain Size Distribution Curves

Note:

1. These grain size distribution curves are based on sieve analysis results for potential gravel sources provided to Geosyntec by Parsons.

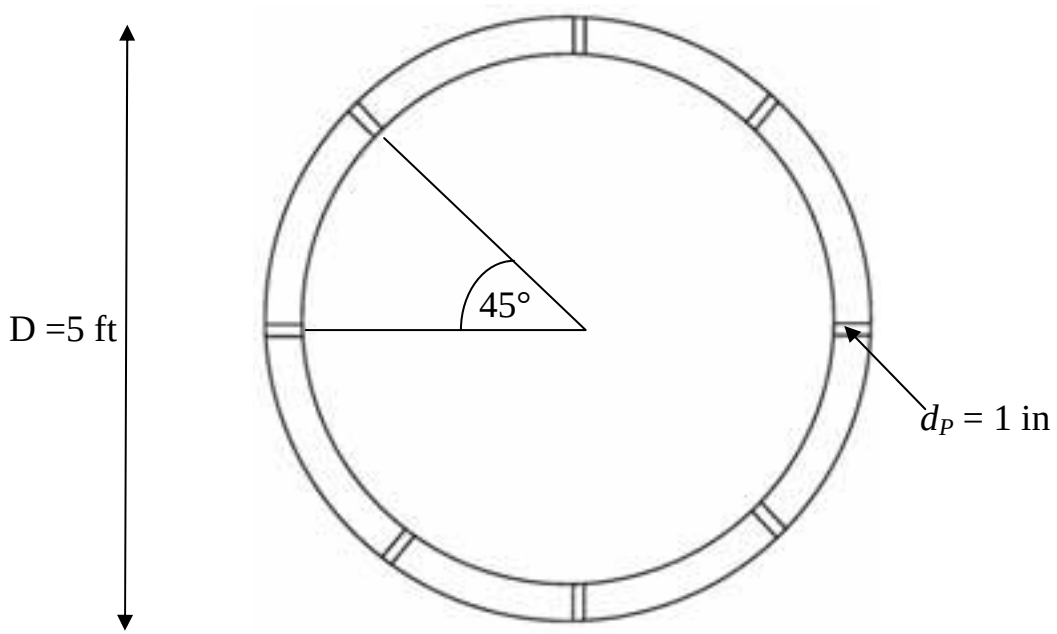

Figure 4a: Conceptual View of Proposed Perforated Pipe Section Design (Plan View)

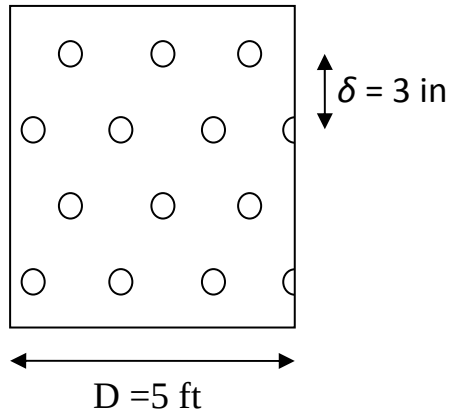

Figure 4b: Conceptual View of Proposed Perforated Riser Pipe Section Design (Side View)

Attachment 1: Calculation Spreadsheets

Written by: **Joseph Sura** Date: **12/1/2009** Reviewed by: **Fan Zhu/R. Kulasingam** Date: **12/4/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **18**

Bernoulli's Equation to calculate pipe perforations

Finding Area of Each Perforation	$A_b=\pi/4*d^2$			
Diameter of Perforation [d] =	1.00	in =	8.33E-02	ft
Area of Perforation [A_b] =	5.45E-03	ft^2		
Bernoulii Equation [1]	$Q_b=C*A_b*v_{ent}$			
Entry Velocity [v_{ent}] =	0.1	ft/s		
Discharge Coefficient [C] =	0.62			
Inflow per Orifice [Q_b] =	3.38E-04	ft^3/s =	2.03E-02	ft^3/min
Pipe Design				
Perforation offset angle [θ] =	45	degrees		
#Perforations in each row [N_{row}] =	8			
Offset between rows [δ] =	3.00	in		
Number of Rows [R] =	4			
Pipe Length [L] =	4	ft		
Maximum Flow	$Q_{in} = Q_b * N_{row} * R * L$			
Maximum Inflow Rate [Q_{in}] =	2.60	ft^3/min =	**19.43**	gal/min

Note:

1. Qian et al. [2002]

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PROPOSED MANHOLE RISER DESIGN
Onondaga Lake - SCA Design

Pipe Type:

Name:	Performance Pipe	
Nominal Inside Diameter	ID =	**57.854**
Minimum wall thickness (in)	t =	**2.423**
Reference Outside Diameter (in)	D_O =	**62.99**
Mean Diameter (in)	D_M =	**60.42**
Inside-Diameter Dimension Ratio	IDR =	**23.9**
Manhole Weight (lb)	W =	**8080.4**
Height of GW above base (ft)	H_w =	**18.5**
Modulus of elasticity (psi)	E =	**21,432**
Diameter of stubouts (in)	D_S =	**0.0**
Number of stubouts	N_S =	**0**
Number of perforations per ft	*n* =	**4**
Diameter of perforations (in)	*d* =	**1.0**

Quick Check: Are requirements met?
Yes

Obtained from manufacturer IscoPipe

50 year duration at 73°F [Chevron Phillips, 2004], applied reduction factor=0.76 August et al., 1997]

Stresses and Loads

Radially Directed Pressure

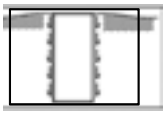
$P_R = (1.21 * K_A * y * H)/(1 - n*d/12)$ [Chevron Phillips, 2004] and [Qian et.al, 2002]

P_R = Radially directed pressure (psf)
K_A = Active earth pressure coefficient = $\tan^2(45-\varphi/2)$
φ = Soil angle of internal friction (°)
γ = Soil unit weight (pcf)
H = Height of fill above base (ft)
n = Number of perforations per ft = 4
d = Diameter of perforations (in) = 1

Layer No.	γ (pcf)	H (ft)	φ (°)	K_A	P_{R1} (psf)	P_{R2} (psf)	T_A (psf)
1 (Gravel above GWT)	**120**	**21.5**	**38.0**	0.238	**0.00**	1113.94	222.79
2 (Gravel below GWT)	**120**	**18.5**	**38.0**	0.238	1113.94	2072.44	637.28
3							
4							
5							
6							

Max. Radially Directed Earth Pressure P_R = **2072.44** psf
Dry soil weight (weighted average) = **120.00** psf

Downdrag Load



$T_A = \mu_F * (P_{R1} + P_{R2}) /2$ [Chevron Phillips, 2004]

T_A = Average shear stress (psf)
P_{R1} = Radial pressure at top of riser (psf)
P_{R2} = Radial pressure at base of riser (psf)
μ_F = Friction coefficient between riser and soil = **0.4**
μ_F = 0.4 for HDPE risers with granular or granular-cohesive soils [Chevron Phillips, 2004]

Sample Calculation for Layer 1:
T_{A1} = 0.4 * (0 + 1113.94) / 2
T_{A1} = 222.79 psf

Average shear stress of riser = $(T_{A1}*H_1 + T_{A2}*H_2 + \ldots)/H$
T_A = **414.49** psf

Compressive Stress caused by Downdrag Load [Chevron Phillips, 2004]

$P_D = T_A * \pi * (D_O/12) * H$

P_D = Downdrag load (lbs)
D_O = Outside riser diameter (in) = 62.99
T_A = Average shear stress (psf) = 414.49
H = Height of manhole fill (ft) = 40.0

P_D = 414.49 * π * (62.99/12) * 40
P_D = **273409.9** lb

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Ring Strains

Ring Compressive Thrust

$N_T = P_R * R_M / 144$ [Chevron Phillips, 2004]

N_T = Ring compressive thrust (lb/in)

P_R = Radial pressure (psf)

R_M = Mean radius of riser (in) = (ID + t) /2 = (57.854 + 2.423)/2 = 30.1385

N_T = 2072.44 * 30.1385 / 144

N_T = **433.75** lb/in

Ring Compressive Strain

$\varepsilon_T = N_T / (E * t)$ [Chevron Phillips, 2004]

ε_T = Ring compressive strain (in/in)

N_T = Ring compressive thrust (lb/in)

E = Modulus of elasticity (psi)

t = Minimum wall thickness (in)

ε_T = 433.75 / (21432 * 2.423) Should be less than 3.5% at 73°F [Chevron Phillips, 2004]

ε_T = **0.84%** **<3.5%, OK!**

Ring Bending

$M_E = 0.25 * C_O * D_M * N_T$ [Chevron Phillips, 2004]

M_E = Ring bending moment (in-lb/in)

C_O = 0.02 (correction for 2% deflection), [Chevron Phillips, 2004]

D_M = Mean riser diameter (in)

N_T = Ring compressive thrust (lb/in)

M_E = 0.25 * 0.02 * 60.422 * 433.75

M_E = **131.04** in-lb/in

Ring Bending Strain

$\varepsilon_B = 6 * M_E / (E * t^2)$ [Chevron Phillips, 2004]

ε_B = Ring bending strain (in/in)

M_E = Ring bending moment (in-lb/in)

E = Modulus of elasticity (psi)

t = Minimum wall thickness (in)

ε_B = 6 * 131.04 / (21432 * 2.423^2)

ε_B = **0.62%**

Combined Ring Strain

$\varepsilon_T + \varepsilon_B$ should be less than 5% [Chevron Phillips, 2004]

$\varepsilon_T + \varepsilon_B$ = **1.46%** **<5%, OK!**

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Ring Buckling

Ring Buckling (manhole above GWT)

$N_{CR} = 0.3 * R_H * t * E^{1/3} * E_S^{2/3}$ [Chevron Phillips, 2004]

N_{CR} = Critical ring compressive thrust (lb/in)
R_H = Geometry factor
t = Minimum wall thickness (in)
E = Modulus of elasticity (psi)
E_S = Elastic Modulus of soil (tsf) = **250** = 3472.22 (psi)

Calculate Relative Stiffness RS; if RS<0.005, R_H=1.0 [Chevron Phillips, 2004]
$RS = (0.22*E*t^3) / (E_S * R_M^3)$
RS = (0.22* 21432 * 2.423^3)/ (3472.22 * 30.1385^3)
RS = 0.0007 Geometry Factor=1.0

N_{CR} = 0.3 * 1.0 * 2.423 * 21432^1/3 * 3472.22 ^2/3
N_{CR} = 4629.85

Ring Buckling (manhole below GWT)

$N_{CRW} = 0.82 * ((R * B' * E_S * E * t^3)/D_M)^{0.5}$ [Chevron Phillips, 2004]

N_{CRW} = Critical ring compressive thrust for manhole below GWT (lb/in)
R = Buoyancy reduction = 1 - 0.33 * H_w /H = 0.847
$B' = 1/(1+4*e^{(-0.065H)})$ = 1 / (1+4*exp(-0.065*40))= 0.771
t = Minimum wall thickness (in)
E = Modulus of elasticity (psi)
E_S = Elastic Modulus of soil (psi) = 3472.22

N_{CRW} = 0.82 * (0.771*0.847*3472.22*21432*(2.423)^3) / (60.422)
N_{CRW} = 2773.64 lb/in

N_T should not be greater than 50% of the more critical of N_{CR} and N_{CRW} [Chevron Phillips, 2004]
N_T = 433.75 lb/in
N_{CR} = 4629.85 lb/in
N_{CRW} = 2773.64 lb/in more critical
N_T/N_{CR} = **15.64%** **Less than 50%, OK!**

Longitudinal Compressive Strain

$\varepsilon_A = (P_D + P_L + P_W) / (E * \pi * D_M * t)$ [Chevron Phillips, 2004]

ε_A = Longitudinal compressive strain (in/in)
P_D = Downdrag load (lbs)
P_L = Live load (lbs) = **1000**
P_W = Dead load, including riser weight (lbs)
E = Modulus of elasticity (psi)
D_M = Mean riser diameter (in)
t = Minimum wall thickness (in)
ε_A = (273409.9 + 1000 + 8080.4) / (21432 * Pi * 60.422 * 2.423)
ε_A = 2.87%

$\varepsilon_{CR} = (2 * t) / (D_M *(3*(1-\mu^2)^{0.5})$ [Chevron Phillips, 2004]

ε_{CR} = Critical longitudinal compressive strain (in/in)
D_M = Mean riser diameter (in)
μ = Poisson's ratio for HDPE = 0.45 for long-term [Chevron Phillips, 2004]
t = Minimum wall thickness (in)
ε_{CR} = (2 * 2.423) / (60.422* (3*(1 - 0.45^2))^0.5)
ε_{CR} = 5.19%

ε_A must be < ε_{CR} AND εA must be < 3.5% [Chevron Phillips, 2004]
ε_A = 2.87% **OK!**

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Flotation (anti-flotation slab)

$FS = F_{DOWN} / F_{UP}$ [Chevron Phillips, 2004]

FS = Factor of safety

F_{DOWN} = Downward forces (resisting flotation)

F_{UP}= Uplift forces (causing flotation)

$F_{DOWN} = W_{MH} + W_{CC} + (W_{AF})/FS_{AF} + (W_{AFS})/FS_{AFS}$ [Chevron Phillips, 2004]

W_{MH} = Manhole weight (lb)= **0.0**

W_{CC} = Concrete cap weight (lb) = **0**

W_{AF} = Anti-flotation slab weight (lb)

W_{AFS} = Soil weight above slab (lb)

Collar Dimensions and Safety Factors

Width of slab (ft)	w_{AF} =	**7.25**
Length of slab (ft)	L_{AF} =	**7.25**
Thickness of slab (in)	t_{AF} =	**6.0**
Plan area of riser directly on top of slab (ft^2)	A_{OVER} =	**21.6**
Unit weight of concrete (pcf)	γ_c =	**150**
Height of soil above slab(ft)	H_{AF} =	**39.5**
Height of soil above slab below GWT(ft)	H_{WAF} =	18.0
Safety Factor for slab weight	FS_{AF} =	**1.5**
Safety Factor for soil weight	FS_{AFS} =	**1.5**

Weight of Slab

$W_{AF} = L_{AF} * w_{AF} * (t_{AF} / 12) * (\gamma_c - \gamma_w)$ [Chevron Phillips, 2004]

W_{AF} = 7.25 * 7.25 * (6 /12) * (150 - 62.4)

W_{AF} = 2302.2 lb

Weight of Soil

$W_{AFS} = (L_{AF} * w_{AF} - A_{OVER}) *(\gamma*(H_{AF} - H_{WAF}) + H_{WAF} * (\gamma - \gamma_w))$ [Chevron Phillips, 2004]

W_{AFS} = Soil weight above slab (lb)

γ = Soil unit weight (pcf)

γ_w = Unit weight of water = 62.4 pcf

W_{AFS} = (7.25 * 7.25 - 21.6) * (120*(39.5 - 18) + 18*(120 - 62.4))

111985.2 lb

Total Downward Force

$F_{DOWN} = W_{MH} + W_{CC} + (W_{AF})/FS_{AF} + (W_{AFS})/FS_{AFS}$ [Chevron Phillips, 2004]

76191.6 lb

Total Upward Force

$F_{UP} = \pi * (D_O^2/576) * \gamma_w * H_w$ [Chevron Phillips, 2004]

F_{UP} = π * (62.99^2 / 576) * 62.4 * 18.5

F_{UP} = **24982** lb

Factor of Safety

Note that Safety Factors have already been applied individually to resisting factors, target FS=1.0

$FS = F_{DOWN} / F_{UP}$

FS = 76191.6 / 24982

FS = **3.05** **>1.0, OK!**

Written by: **Joseph Sura** Date: **12/1/2009** Reviewed by: **Fan Zhu/R. Kulasingam** Date: **12/4/2009**

Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **18**

Sump Volume Calculations: Design Flow Rate (15 gal/min)

Design Parameters[1]

	Sump 1	Sump 2
Gravel Porosity n =	0.4	0.4
Perforated Length L (ft) =	4	4
Target Inflow Rate Q_{IN} (gal/min) =	10	5
Pumping rate Q_{PUMP} (gal/min) =	30	20
Riser Nominal Diameter D_R (ft)=	5	5
Length at Maximum Liquid Level a (ft) =	80	80
Length at Minimum Liquid Level b (ft) =	60	60
Width at Maximum Liquid Level c (ft) =	65	65
Width at Minimum Liquid Level d (ft) =	45	45

Volume Calculations[2]

Vol. of Sump from W_{MIN} to W_{MAX} (gal) =	$V_{PYRAMID}$	
$V_{PYRAMID}$ (gal) =	$(L/6)*(ad+bc+2ac+2bd)/0.134$	
$V_{PYRAMID}$ (gal) =	115920.4	115920.4
Storage Vol. inside Riser V_{RISER} (gal) =	$(\pi/4*D_R^2*L)/.134$	
V_{RISER} (gal)=	586.1	586.1
Total Storage Vol. (gal) =	$(V_{PYRAMID}-V_{RISER})*n+V_{RISER}$	
Total Storage Vol. (gal) =	46719.8	46719.8

Pump On and Pump Off Time Calculations[3]

Pump off time (hr)=	$V_{STORAGE}/Q_{IN}$	
Pump off time (hr)=	77.9	155.7
Pump on time (hr)=	$V_{STORAGE}/(Q_{PUMP}-Q_{IN})$	
Pump on time (hr)=	38.9	51.9

Notes:

1. The lengths and widths at minimum and maximum liquid levels are calculated assuming a 2.5 H:1 V side slope and geometry as shown in Figure 2.
2. The sump volume is calculated based on a truncated rectangular pyramid. The riser pipe volume is calculated based on a cylindrical pipe. The volume occupied by the riser pipe wall thickness is small relative to the overall storage volume and is ignored.
3. Pump off time represents the amount of time necessary for the sump area to fill from the minimum water level to the maximum water level. The pump on time represents the amount of time that the pump runs to remove the liquid.
4. The backup riser is conservatively assumed to be filled with gravel in this calculation.

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Client: **Honeywell** Project: **Onondaga Lake SCA Final Design** Project/ Proposal No.: **GJ4299** Task No.: **18**

Sump Volume Calculations: Post-Closure Condition

Design Parameters[1]

	Sump 1	Sump 2
Gravel Porosity n =	0.4	0.4
Perforated Length L (ft) =	4	4
Target Inflow Rate Q_{IN} (gal/min) =	0.27	0.13
Pumping rate Q_{PUMP} (gal/min) =	30	20
Riser Nominal Diameter D_R (ft)=	5	5
Length at Maximum Liquid Level a (ft) =	80	80
Length at Minimum Liquid Level b (ft) =	60	60
Width at Maximum Liquid Level c (ft) =	65	65
Width at Minimum Liquid Level d (ft) =	45	45

Volume Calculations[2]

Vol. of Sump from W_{MIN} to W_{MAX} (gal) =	$V_{PYRAMID}$	
$V_{PYRAMID}$ (gal) =	$(L/6)*(ad+bc+2ac+2bd)/0.134$	
$V_{PYRAMID}$ (gal) =	115920.4	115920.4
Storage Vol. inside Riser V_{RISER} (gal) =	$(\pi/4*D_R^2*L)/.134$	
V_{RISER} (gal)=	586.1	586.1
Total Storage Vol. (gal) =	$(V_{PYRAMID}-V_{RISER})*n+V_{RISER}$	
Total Storage Vol. (gal) =	46719.8	46719.8

Pump On and Pump Off Time Calculations[3]

Pump off time (hr)=	$V_{STORAGE}/Q_{IN}$	
Pump off time (hr)=	2883.9	5989.7
Pump off time (days)=	120.2	249.6
Pump on time (hr)=	$V_{STORAGE}/(Q_{PUMP}-Q_{IN})$	
Pump on time (hr)=	26.2	39.2

Notes:

1. The lengths and widths at minimum and maximum liquid levels are calculated assuming a 2.5 H:1 V side slope and geometry as shown in Figure 2.
2. The sump volume is calculated based on a truncated rectangular pyramid. The riser pipe volume is calculated based on a cylindrical pipe. The volume occupied by the riser pipe wall thickness is small relative to the overall storage volume and is ignored.
3. Pump off time represents the amount of time necessary for the sump area to fill from the minimum water level to the maximum water level. The pump on time represents the amount of time that the pump runs to remove the liquid.
4. The backup riser is conservatively assumed to be filled with gravel in this calculation.