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# BEFORE THE HEARING BOARD OF THE SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

In The Matter Of

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT,

Petitioner,

VS.

CHIQUITA CANYON, LLC a Delaware Corporation, [Facility ID No. 119219]

Respondent.

Case No. 6177-4

SUPPLEMENTAL DECLARATION OF NEAL BOLTON, P.E.

Health and Safety Code § 41700, and District Rules 402, 431.1, 3002, 203, 1150

Hearing Date: December 9 and 11, 2025

Hearing Time: 9:30 A.M.
Place: Hearing Board

South Coast Air Quality Management District, 21865 Copley Drive Diamond Bar, CA 91765

I, Neal Bolton, declare as follows:

- 1. I am of sufficient age and am competent to testify in this proceeding. I make this declaration based upon personal knowledge and am competent to testify to the facts set forth herein.
- 2. This supplemental declaration is made for the status and modification hearing being held on December 9 and 11, 2025, regarding the Stipulated Order for Abatement in Case No. 6177-4 with the South Coast AQMD, most recently modified on June 24, 2025 ("Modified Stipulated Order"). This declaration supplements my declaration submitted to the South Coast AQMD Hearing Board on October 22, 2025, as Exhibit HHHHH. That declaration outlines my background and credentials and experience working with the Chiquita Canyon Landfill (the "Landfill"). That declaration also provides updates regarding Chiquita Canyon, LLC's ("Chiquita") compliance with the conditions of the Modified Stipulated Order. Everything stated in my October 22, 2025 declaration remains true and applicable for this upcoming status and modification hearing.
- 3. This supplemental declaration provides additional information regarding a voluntary evaluation on the settlement rate at the Landfill, prepared by my company, Blue Ridge Services Montana ("BRS"). A true and correct copy of our September 15, 2025 report of our findings is attached

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hereto as **Exhibit A**. The goal of the evaluation was twofold. First, we wanted to identify potential areas of accelerated settlement that could be potentially attributed to the ongoing elevated temperature landfill event ("ETLF event" or "reaction"). Additionally, we wanted to attempt to quantify the rate of change of settlement to determine whether the reaction was accelerating and if so, in what direction(s).

#### **Settlement Overview**

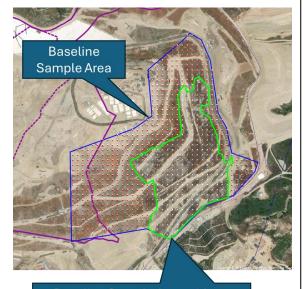
4. As waste decomposes, the surface of a landfill gradually sinks as a result of compression, biodegradation, and consolidation of waste – this process is known as settlement. All landfills experience some degree of settlement, and that settlement generally occurs at a predictable rate. However, that rate can vary based on factors such as the overall depth of the landfill and character of the waste (e.g., organic vs. inert material). During ETLF events as a result of higher temperatures and increased liberation of landfill liquids or leachate, the rate of settlement can be exacerbated.

#### **Summary of Methodology**

- 5. To evaluate settlement across the Landfill, we analyzed the surface elevation data from May 2021 through May 2025, with detailed analysis between May 18, 2023 through May 21, 2025. We obtained the surface elevation data from Propeller drone flyovers of the Landfill.<sup>1</sup> The analysis focused not just on the overall settlement but more importantly on the rate of settlement.
- 6. Based on this data, we determined that the settlement rate of change is now slowing, which suggests that the reaction is decelerating. As outlined in the report, we first determined Chiquita's

<sup>&</sup>lt;sup>1</sup> Propeller is a third-party service provider that provides onsite drone mapping equipment and software. Chiquita uses Propeller to prepare routine mapping of the Landfill's surface.

baseline settlement rate (i.e., the rate of settlement in a portion of the Landfill not impacted by the reaction), by calculating the settlement rate in the southeast portion of the Landfill. The baseline sample area is depicted in **Figure 1**. We selected this location because it was furthest away from Chiquita's data-driven reaction area boundary line ("RA-data area") and also because the area had not received waste since 2021. Our calculations determined that settlement within that area was typical of what we would expect to see at a landfill not experiencing an ETLF event. This area had an annualized rate of



Baseline Sample Area with no significant change for all four years

Figure 1

change between 0% and 2.1% of the waste depth per year. We determined that the Landfill's typical annualized settlement change was 2.1% of the waste depth, and any settlement greater than that we could attribute directly or indirectly to the reaction.

7. After determining the baseline settlement rate at the Landfill, we then compared that baseline against the settlement rates within the RA-data area, the Reaction Area as defined in Condition

9(a) of the Modified Stipulated Order ("RA-AQMD area"), and other areas closer to the RA-AQMD area. To evaluate the settlement rate in these areas, we used all 82 topographic maps through Propeller that had been generated through the two-year data window. We ultimately mapped 453 sample points on each of the maps for a total of 37,146 elevation change data points. The location of these points is shown in the green area in **Figure 2**.

8. After mapping the data points, we reviewed the rate of change, which is the percentage of elevation



Figure 2

relative to depth in relation to a time interval. To find the rate of change, we averaged the change in elevation at each point and divided it by the number of days in the Propeller mapping period.<sup>2</sup>

9. We also evaluated the data utilizing two additional models: a cumulative running average and a three-month rolling average. The cumulative average is the running average of all data sets measured from the starting date to each monthly increment. The three-month rolling average, on the other hand, depicts the average of the daily percent change in elevation relative to the depth of waste. Both the cumulative and three-month rolling averages demonstrated that while there are areas outside the RA-data area experiencing increased settlement, the majority are below the rates observed in the RA-data area. When higher rates of settlement were observed outside the data-driven reaction area, they

<sup>&</sup>lt;sup>2</sup> The number of days between Propeller drone flyovers was inconsistent as Chiquita increased the flyovers from monthly, to bi-monthly, and then again to weekly.

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are not consistent enough to indicate that the reaction has spread to the east – or beyond the current RAdata area.

#### **Summary of Results**

10. After conducting these analyses, we determined that, as reflected in Figure 3, the data-driven reaction area is experiencing the greatest rate of change of settlement (at or above 6% are shown in yellow, orange, and red). We also determined that most of the area outside of the data-driven reaction area is experiencing a rate of change of less than 2% per year (less than or equal to 2% are shown in purple and the darker blues), which is consistent with the Landfill's baseline.

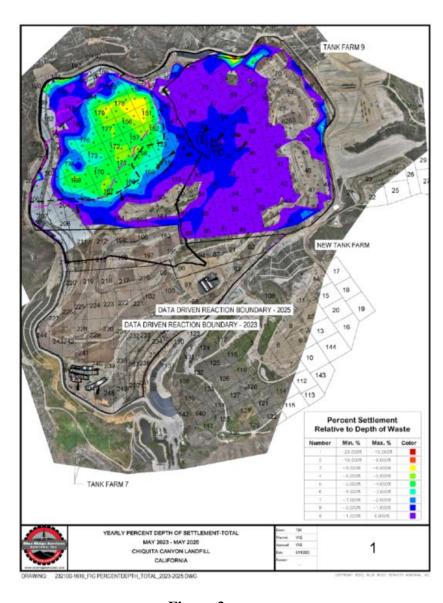


Figure 3

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11. We also looked at how the settlement rates have changed over time. The months with the highest rate of change within the data-driven reaction area were March 2024 and December 2024 when annualized settlement approached 8%. Figure 4 shows the settlement rate within both the RA-data area and RA-AQMD area. As shown in Figure 4, the settlement rate trendline for

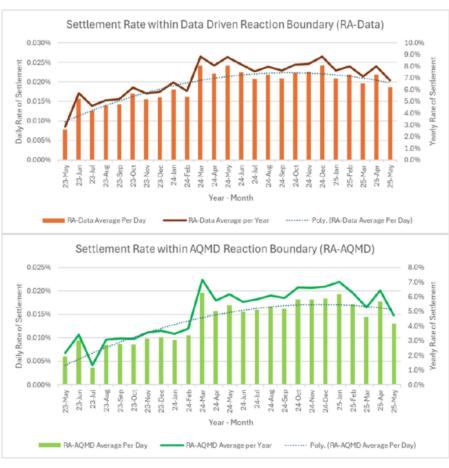
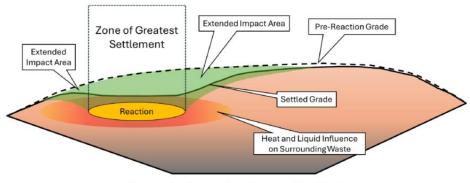


Figure 4

both areas peaks around September 2024 and has been decreasing since. The diminishing rate of settlement indicates that the reaction is slowing rather than expanding. BRS believes this decrease in annualized settlement implies the mitigation measures implemented by Chiquita are effective in mitigating the reaction.

12. The settlement rates also show that the rate of change in the RA-AQMD area has always been substantially slower than that in the RA-data area. This indicates a distinction between the true area at the Landfill being impacted by the reaction and the adjacent areas. We also determined that settlement in the areas adjacent to RA-data area is likely caused by the effect of the reaction. Waste mass in close proximity to the area experiencing significant settlement because of the subsurface reaction area (shown in **Figure 5** as the zone of greatest settlement) will naturally experience some related effects (shown in **Figure 5** as the extended impact area). Adjacent settlement is also attributed to the lateral transfer of landfill gas, heat, and liberated leachate that radiates outward from RA-data area.



**Conceptual Impact on Surrounding Waste** 

#### Figure 5

13. We have recommended to Chiquita that we should update this settlement evaluation on an annual basis. Evaluating this data on an annual basis will allow Chiquita to continue to assess the status of the reaction from a settlement rate perspective, which will ultimately allow Chiquita and its consultants to better assess the effectiveness of the mitigation efforts being implemented at the Landfill. We recommend an annual review, as opposed to quarterly or semi-annually, to ensure that there is enough data available to provide meaningful insight regarding overall settlement and rate of change.

1	I declare under penalty of perjury under the laws of the State of California that the foregoing is true an		
2	correct to my personal knowledge.		
3	Executed on this 4th day of December 2025, in Victor, Montana.		
4	Neal Balla		
5	Neal Bolton		
6	President Blue Ridge Services, Inc.		
7	Blue Riage Services, me.		
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 $Chiquita\ Canyon, LLC\ [Facility\ ID\ No.\ 119219] - Supplemental\ Declaration\ of\ Neal\ Bolton,\ P.E.$ 

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# Evaluation of Reaction Caused Surface Settlement:

May 18, 2023, through May 21, 2025

# Prepared For:



September 15, 2025



Blue Ridge Services Montana, Inc. P.O. Box 1945 Hamilton, MT 59840 Telephone: (406) 370-8544

www.blueridgeservices.com

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# **ACRONYMS**

Acronym	Meaning
AQMD	South Coast Air Quality Management District
BRS	Blue Ridge Services Montana, Inc.
CCL	Chiquita Canyon Landfill
ETLF	Elevated Temperature Landfill
GCCS	Gas Collection and Control System
LFG	Landfill Gas
MSW	Municipal Solid Waste
RA-AQMD	Reaction Area as defined by AQMD
RA-Data	Reaction Area as defined by Reaction Committee using Data
SEM	Surface Emission Monitoring for Landfill Gas

# **BACKGROUND**

The Chiquita Canyon Landfill (CCL or Landfill) is a municipal solid waste (MSW) landfill located in northern Los Angeles County. A portion of the Landfill is experiencing a subsurface reaction also known as an Elevated Temperature Landfill (ETLF) event. While all landfills experience surface settlement due to normal decomposition of waste, ETLF events cause accelerated decomposition often resulting in increases to a landfill's settlement rate, heat generation, and liquid levels.

Chiquita continues to diligently monitor the status of the reaction, particularly in terms of its location and whether it is expanding laterally. Simultaneously, CCL continues its efforts to mitigate the effects of the ETLF event, by extracting landfill gas (LFG) and leachate from within and around the RA-Data at unprecedented rates.

While there are many criteria used to delineate the physical boundary of the reaction, this Surface Settlement Study addresses one of them – settlement.

This Surface Settlement Study was conducted by Blue Ridge Services Montana, Inc. (BRS), under the direction of Neal Bolton, P.E. Mr. Bolton is president of Blue Ridge Services Montana, Inc. (BRS) and is a national expert in landfill operations. He serves on the Reaction Committee as the subject matter expert in landfill design and operational best management practices pursuant to Condition No. 12(a)(i) of the Stipulated Order for Abatement with the South Coast Air Quality Management District (AQMD) in Case No. 6177-4 (SOFA). He has provided various consulting support to Chiquita since 2020, including being part of the consulting team that resolved the working face odor issue in 2022. Additionally, he has broad operational experience within the heavy construction and solid waste industry that spans more than 47 years, during which time he has provided operational support for more than 500 landfills throughout North America and abroad.

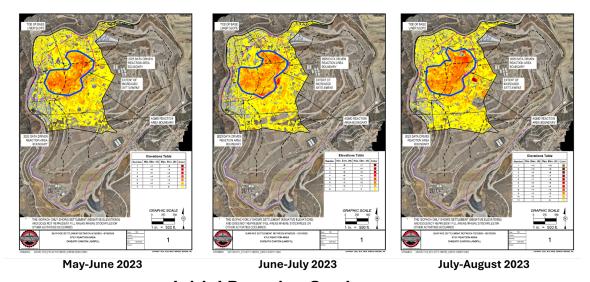
In this report, BRS analyzed surface settlement at CCL over a 2-year period between May 18, 2023, and May 21, 2025. The start date of May 18, 2023, was chosen because that date was the earliest date with Propeller<sup>1</sup> drone mapping data where no MSW fill activity occurred within the RA-Data of the Landfill. All subsequent fill activity was limited to reaction mitigation efforts involving the placement of cover material, re-grading, material stockpiling, and localized construction.

# **EXECUTIVE SUMMARY**

There were two primary goals of this study. The first was to identify areas of accelerated settlement that can be directly attributed to the ETLF event. The second was to quantify the rate of change of settlement to ascertain if the reaction is accelerating or decelerating vertically and/or laterally - and if so in what direction(s).

The results of this settlement study indicate that the reaction is slowing. Initially, in early 2023, the rate of change in terms of settlement was increasing – it was accelerating. This acceleration was a clear and obvious indicator that the subsurface reaction was occurring. At its peak, settlement within the RA-Data was occurring at an annualized rate of nearly 8% per year. Please note that we have expressed this at an annual rate, even though the period of peak acceleration lasted only a few months.

The location of the rapidly accelerating settlement was first observed within the eastern third of the current RA-Data as defined by the Reaction Committee. This acceleration is shown by the areas outlined by the blue line in the following three isopach's (See Figure 1). This shows the accelerated



**Initial Reaction Settlement** 

Figure 1

<sup>&</sup>lt;sup>1</sup> Propeller is a third-party service provider of onsite drone mapping equipment and software. CCL utilizes Propeller to provide high quality topographic mapping of the Landfill's surface on an as-needed basis.

#### Surface Settlement Analysis: May 18, 2023, through May 21, 2025

settlement that occurred during the first three months from the start of our 2-year analysis. This appears to show the general starting area of the reaction.

As seen in Figure 1, the reaction was progressively expanding mostly to the west and northwest. This was supported by field evidence of high liquid levels, elevated temperatures, and general highly decomposed waste characteristics observed in drilling spoils and material excavated during the West Toe Project and the North Slope Termination Project.

While the rate of change of settlement across the northwest portion of CCL increased above baseline,

the highest rate of change occurred within the red-shaded RA-Data boundary. Accelerated settlement rates were also observed in the adjacent area within the tan-shaded AQMD defined reaction area (RA-AQMD), but the rates were not as high as within RA-Data (See Figure 2). For reference, these two areas, along with the non-reaction area green-shaded area.

Our settlement analysis indicates that areas adjacent to the RA-Data boundary also showed increased settlement due to collateral impacts of the reaction.

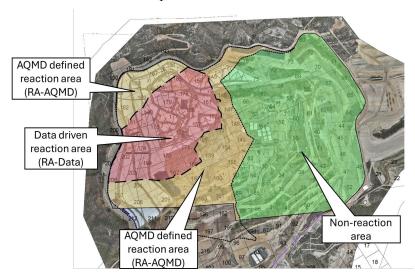


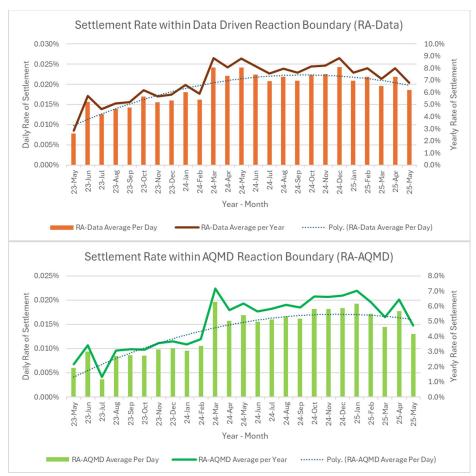
Figure 2

These collateral impacts include the lateral migration of heat, LFG, and leachate that is being generated by the reaction. However, the rate of settlement in those adjacent areas is much less than was observed within the RA-Data. Accordingly, it is important to note that while above normal settlement is still occurring within and adjacent to the RA-Data boundary, the rate of change over time is slowing – it is decelerating.

These charts (See Figure 3) show the average annualized rate of change of settlement within the RA-Data and RA-AQMD respectively (See the right-hand vertical axis on each chart). The months with the highest rate of change within RA-Data were March 2024 and December 2024 when annualized settlement approached 8%.

As simply a point of reference, both charts show the daily rate of settlement and the annualized – or yearly – rate of settlement.

It is important to note the trendline for changing rate of settlement. In both the trendline cases, peak in reached its September 2024 and has since been declining. This diminishing rate of settlement indicates that the reaction is slowing, rather than expanding. This also implies that CCL's efforts related to liquid and gas removal effective mitigating the reaction.



As evidenced by the combined data (See

Figure 3

Figure 4), the RA-Data area has always exhibited a faster rate of settlement, which is expected in the portion of Landfill that is experiencing the ETLF event. The surrounding area, the RA-AQMD area,

by nature of being in proximity to the RA-Data area, also experienced increased settlement prior to September 2024.

However, as noted by the data, the rate of change of settlement in the RA-AQMD area has always been substantially slower than that in the RA-Data

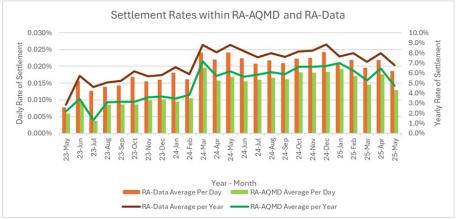
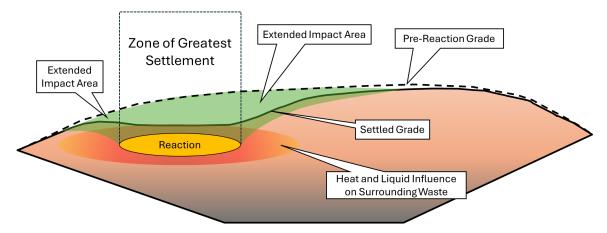


Figure 4

area, demonstrating the difference between the true area of CCL being impacted by the reaction and the areas adjacent thereto.

Settlement in the areas adjacent to the RA-Data area is likely caused by the effect of the reaction where the waste mass in proximity to it is influenced by the collapse of the subsurface reaction area and shown here as the zone of greatest settlement. Adjacent settlement is also attributed to the lateral transfer of LFG, heat, and liberated leachate that radiates outward from the RA-Data (See Figure 5).

In summary, while settlement is evident outside the RA-Data boundary, it has been observed at the same rate as within the RA-Data area. More importantly, the rate of settlement across the northwest portion of the Landfill is slowing – it is decelerating.



**Conceptual Impact on Surrounding Waste** 

Figure 5

# **GOALS**

There were two primary goals of this study. The first was to identify areas of accelerated settlement that can be directly attributed to the ETLF event. The second was to quantify the rate of change of settlement to ascertain if the reaction is accelerating or decelerating vertically and/or laterally - and if so in what direction(s).

Most landfills measure settlement in terms of depth settled per time (e.g., 3 feet per year), or as a percentage of depth per time (e.g., 1.5% per year). However, to accurately quantify how the reaction is changing, we evaluated the rate of change in terms of percentage rate of settlement over time. The percentage of settlement is more accurate when evaluating change on a portion of the Landfill that ranges from 0 feet to over 300 feet in depth. Further, evaluating percentage settlement in terms of "rate of change" allowed us to identify settlement trends over time, even when the multiple topographic maps covered varying time intervals.

It should be noted that settlement alone does not necessarily define the RA-Data area. In fact, there are many more criteria that the Reaction Committee continually evaluates in determining RA-Data.

These additional criteria are defined in the Reaction Committee's boundary determination submitted on September 9, 2025. These criteria include, without limitation, wellhead temperatures, down-well leachate liquid temperatures, liquid levels, LFG composition, and LFG surface emission monitoring (SEM) results.

# **METHODOLOGY**

#### Settlement

Settlement occurs at all landfills to varying degrees and is the result of several interrelated factors, which we examine, in turn, below.

#### Initial Compaction Density

Landfills that achieve a high rate of compaction density during initial waste placement will generally see less incremental settlement after placement, though they may achieve a greater ultimate settlement. Operational practices at the CCL historically in-placed waste at a density that exceeded normal industry standard practice. Consequently, by achieving a higher rate of compaction density during initial waste placement, we would expect to see more gradual settlement per year, with an ultimate density above that achieved by the typical landfill.

#### Waste Type

Most of the settlement that occurs at landfills results from organic material breaking down through biological decomposition and physical deformation. Thus, it follows that landfills that receive a higher percentage of organic material will settle more and settle faster. However, even inert materials within a landfill will break down physically and as it does, smaller pieces of waste will tend to move downward to fill in the voids that may exist in between coarse, bulky material.

# Physical Loading

The waste mass in every landfill is supported by the physical structure of the waste itself. Even paper and cardboard can provide small, almost microscopic trusses, while larger items like poles and lumber can create a complex system of beams, columns, and trusses the help support the waste mass.

Over time, those supporting structures in the landfill's waste mass are impacted by the loading (weight) of subsequent overlying layers of material (waste and soil). That loading, along with the processes of creep, deformation, and compression, will eventually cause the supporting structure of the waste mass to gradually lose strength and fail, thereby allowing the landfill to settle. Other factors like increasing moisture content and decomposition will exacerbate the loss of physical strength. For example, cellulose fibers that are present in wood, brush, cardboard and other materials will decompose and soften over time.

#### Biological Decomposition

All organics within the Landfill are at some state of decomposing. In the process, solid organic material is converted into gas. This process of biological decomposition is normal. However, in the case of the ETLF portion of the Landfill, biological decomposition is quite accelerated, resulting in rapid liberation of LFG, liquid leachate, and associated settlement.

#### Chemical Processes

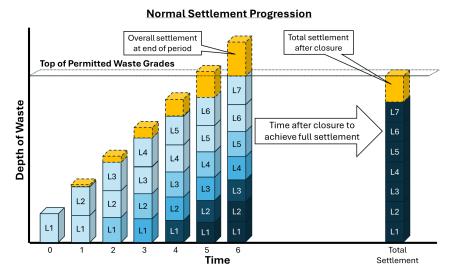
Within all landfills, there are also chemical processes that will weaken the internal supporting structures leading to a loss of support and eventual settlement. Ferrous metal will rust (i.e., oxidize) over time and whatever support was initially provided by those items will be lost.

The amount of settlement, and time period over which it occurs is generally predictable at most landfills, but not at landfills that are experiencing ETLF conditions.

Also, the ultimate settlement at any landfill, including CCL, and the time required to settle is very dependent on the overall depth of waste. The greater the overall depth of waste, the greater the loading on lower layers, and thus the greater the degree of settlement. This can be exacerbated during ETLF conditions due to the higher temperatures and the increased liberation of liquid leachate.

Consequently, even though waste may have been placed at a constant density during the operational phases of the Landfill, the lower portions of the waste column will become denser as additional layers (i.e., loading) are placed. This is shown conceptually in Figure 6 where we can see the first layer (at time 0) is placed at a certain density, and it consumes a specific depth of landfill airspace. However, as subsequent layers are stacked on top, and even though each new layer is placed at the same density and consumes a similar depth of airspace, the underlying layers become progressively more compressed (e.g., denser). Consequently, the lower layers, which have the greatest loading, receive the greatest loading and therefore achieve the highest density.

Settlement is typically quantified by either overall settlement depth measured in an elevation change or as a percentage of settlement. The percentage of settlement is calculated by dividing the measured depth settlement by the depth of the underlying waste prior to settlement occurring. Both can be presented for a specific interval of time such as annually, or the total Figure 6

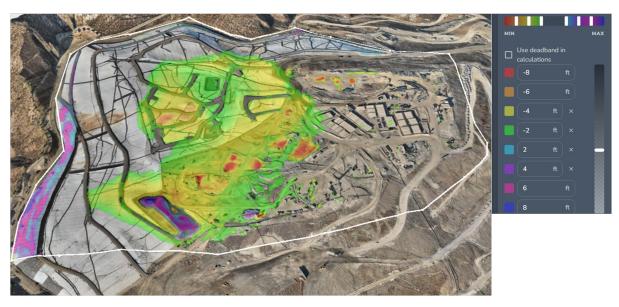


as annually, or the total Figure 6 timeframe of the site such as lifetime ultimate settlement.

Both methods require a before and after topographic map of the Landfill.

CCL continues to create and submit a monthly isopach map to several regulatory agencies which show an isopach image of settlement across a specific portion of the Landfill. Those isopach maps use various colors to illustrate the degree of settlement in specific areas. This is measured in feet and provides a visual representation of where and how much the surface topography has settled as is shown in Figure 7.

# Chiquita Canyon Landfill - Isopach



January 3, 2025 Survey Image. October 2, 2024 vs January 3, 2025 Figure 7

# **Baseline Settlement**

Every landfill settles over time, but as previously noted, the rate of settlement varies from one landfill to another. To identify and quantify surface settlement caused directly and/or indirectly by the ETLF reaction, we had to establish a baseline settlement rate that applied specifically to CCL and which was outside the RA-Data.

#### Surface Settlement Analysis: May 18, 2023, through May 21, 2025

It is important to note that unlike overall settlement measured elevation change, the rate of change is influenced by the depth of waste in relation to a period Because it is of time. measured by the elevation change divided by the depth of waste prior to settlement occurring, the rate of change in shallow waste can be more than in deeper waste as Figure 8 shows. This is evident in the isopach maps in later sections of this report.

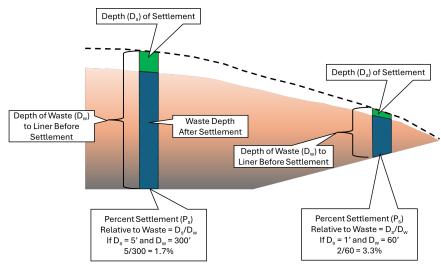


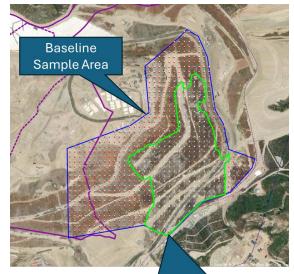
Figure 8

The portion of CCL we selected for our settlement baseline was in the southeast portion of the Landfill (See Figure 9). This area was chosen because it was furthest from the RA-Data and had not

recently received any new waste (from 2021-2025).

The initial baseline analysis area (the blue boundary) had a grid of sample points every 50 feet, providing 850 points on a 50-foot grid pattern. From this area we extracted annual elevation points over a 4-year period.

However, under closer inspection and after pulling those points into CAD and Excel, we discovered that there were areas where some localized activity occurred within the four-year period. Consequently, we reduced the area from 850 points to 324 points where there was less significant change to the topography year-to-year. This area, with its 324 points (within the green boundary) was used as our non-reaction baseline for defining typical settlement.



Baseline Sample Area with no significant change for all four years

Surface elevations for each of those 4 years were Figure 9 recorded for each of those 324 points resulting in a total of 1,296 elevation data points.

Using the elevation data points, we measured the elevation change between each year's topographic mapping. Because some minor grading (i.e., cutting and filling) activities did occur within the final dataset, there were some outliers in terms of year-to-year settlement. To address those elevation anomalies, we eliminated the upper and lower 2% of the points. A total of 50 points were eliminated, leaving a remainder of 1,246 points for our baseline settlement calculation.

All elevations were then evaluated in a scatter plot showing the annual change in elevation relative to the depth of waste at the start of the year (See Figure 10). This data showed a clear pattern of settlement that was in line with industry standards. Please note that in our calculations, we began by calculating daily percentage settlement to account for topographic maps that ranged from weekly to monthly. Then, we standardized all settlement results by converting them to an annualized percentage settlement based on total waste depth.

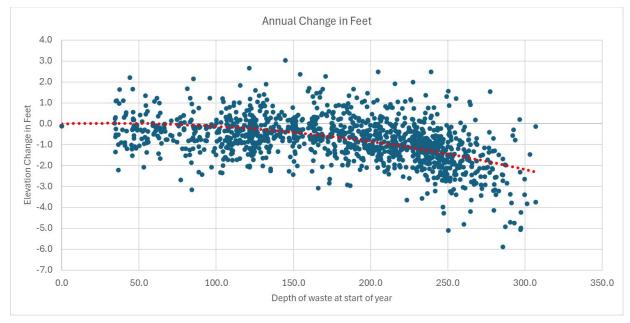


Figure 10

Please note that along with the settlement data which is shown as a negative value (in feet), there are certain areas that show positive values, which indicate localized fill activity or potentially some error in topographical mapping. During our review of the topographic maps over that four-year period, we determined that many of those areas that showed up as fill were in fact related to road maintenance, slope repair, and placement and removal of stockpiled material.

Finally, to help quantify the time component regarding settlement, we showed the average annual settlement percentage for the entire baseline area. The annualized rate of change (i.e., percentage settlement) appeared to be in line with industry standards at 0%-2.1% per year, as shown in Figure 11.

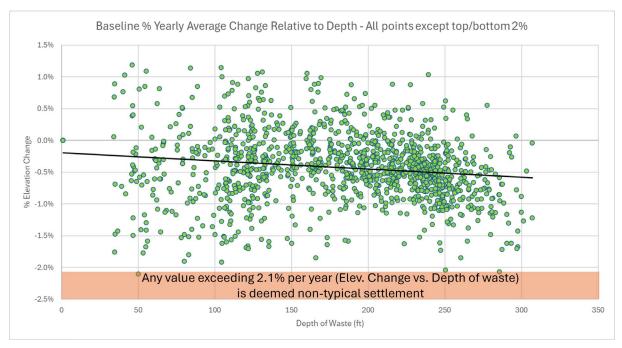


Figure 11

These baseline rates of change, which we deemed to be typical of CCL allowed us to conversely determine settlement rates that were outside the norm for CCL. We then used this data to identify annualized elevation changes in and around the RA-Data. In that regard, we determined that CCL's typical annualized settlement change was 2.1% of the waste depth, and that any settlement greater than 2.1% could be attributed directly or indirectly to the reaction. Again, please note that by convention, the landfill industry measures settlement on an annual basis. So, even though we had before and after topographic maps from intervals as frequent as weekly; by converting all data to an annualized settlement rate, we maintained the industry's standard units of measurement.

# **Detailed Site Settlement Analysis**

With CCL's baseline settlement rate established, BRS generated new data sample points across the entire site. We selected data points based on the existing inspection grid, dividing each into quadrants, placing sample points at the center of each of those quadrants as is shown in Figure 12 with green background.

In this manner, a total of 718 points were generated across the entire Landfill footprint as shown here in Figure 13.

For the 2-year evaluation period, there were 82 individual topographic maps generated through Propeller. This equates to 81 *before and* 

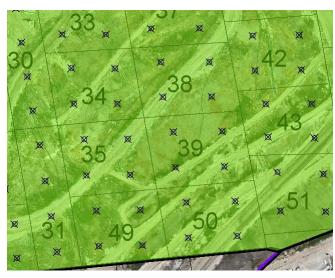


Figure 12

after sample periods where elevation change occurred and 81 periods were evaluated. By taking an elevation for each of the 718 sample points from each of the surfaces, a total of 58,138 elevation change data points were obtained.



Figure 13

The isopach shown here (See Figure 14) shows the positive and negative (fill or cut) elevation changes for all 58,138 data points for the two-year analysis period. Based on this before and after comparison, the RA-Data and its influence (e.g., depth of settlement) on adjacent areas can be clearly seen.

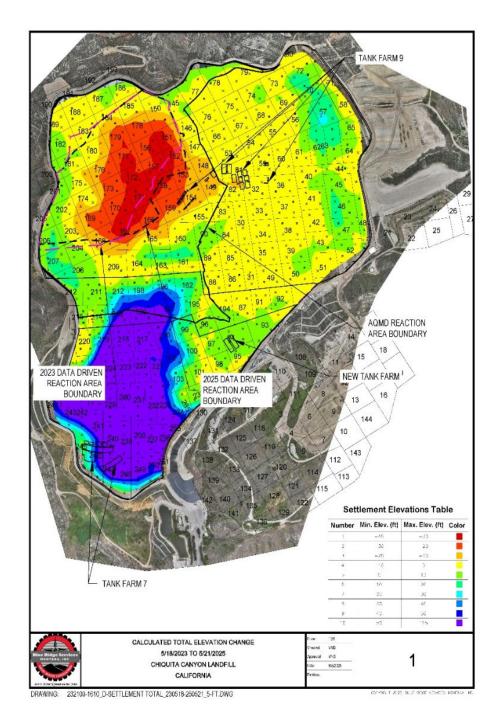


Figure 14

# **Total Settlement: North Half**

However, because waste filling was still occurring in the southern portion of the Landfill during the analysis period (May 18, 2023, through May 21, 2025) we reduced our data set from 718 points, down to only 453 points in the north half of the Landfill. These were used with the sample area shown in Figure 15 as the green area. This resulted in a total of 37,146 points remaining for analysis.

Using data points from the north half, the first analysis was for total settlement between the start and end of the evaluation period, that being May 18, 2023, through May 21, 2025. This was done with more detailed gradation in the settlement depth color bands to identify the area of the reaction that showed the most subsidence. The purpose was to identify the potential horizontal limit of the reaction itself. Additionally, it shows the adjacent areas that were directly or indirectly impacted by the excessive settlement in the area experiencing the ETLF event.

# Rate of Change

The rate of change is simply taking the percentage of elevation change relative to depth in relation to a time interval. Typically, settlement evaluations of a site are done on a yearly basis with CCL submitting monthly submissions showing the settlement for the month, expressed in feet.

In the analysis for this report, it was necessary to convert the data into a change in elevation per day because the Propeller drone mapping flights varied in frequency. Initially the mapping flights were performed monthly and then increased to twice a month. Now, these mapping flights occur weekly.

To adjust for this inconsistency in between mapping periods, calculated the number of days in that period and then divided by the total elevation change for each point. At each point with the known elevation change per day for that period, it was then divided by the depth of waste at Figure 15



the start of the period in question. This elevation resulted in a percentage change in elevation per day relative to the depth of waste.

As previously noted, we converted the rate of change from daily to an annualized percent rate of change to comply with the industry's standard practice of expressing landfill settlement per year. Figure 16 shows the average annual percentage settlement per year over the two-year period of the evaluation. The two-year total average clearly shows the limits of the reaction with the yearly average

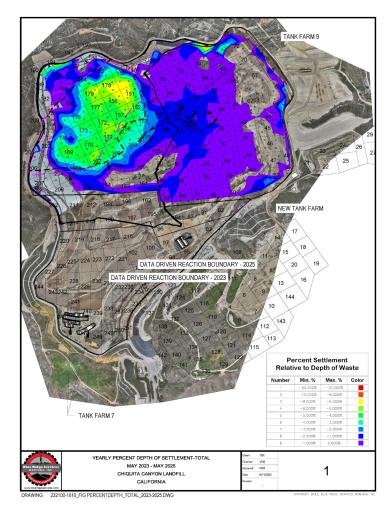
providing more detail on the impact of the reaction to the east. Most of the area outside of the RA-Data is experiencing a rate of change of less than 2% per year (purple and dark blue zones), which is within the baseline.

Any additional increase is likely the indirect result of the reaction through horizontal migration of heat and liquids as well as liquid removal as part of the mitigation efforts.

To help visualize any potential that the reaction was spreading, we also evaluated the rates of change on a reduced frequency.

By evaluating the percentage settlement monthly, the dynamic nature of CCL became more evident. This is particularly evident along the northeastern and eastern perimeter of the landfill (See Figure 16).

Based on review of aerial photo imagery at the time topography Figure 16 was generated and on review of



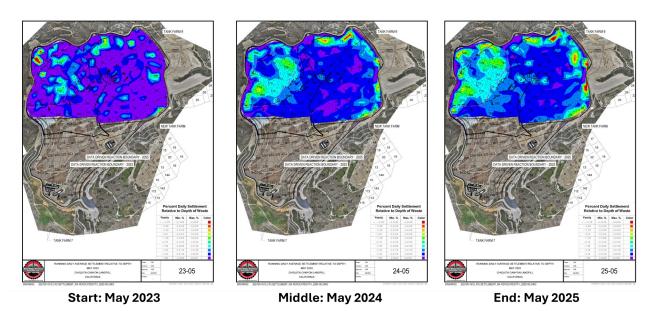
the surfaces of selected topography the variations in the percentage settlements were due to localized grading, the adding and removing of stockpiles, placing or removing tanks, repairing settled areas, and other activities.

The effect of minor modifications to the surface elevation are much more evident along the perimeter where waste is shallow. Remember that the percentage change in settlement is based on the elevation change divided by the underlying depth of waste. Where the waste depth is shallow, the denominator becomes very small, so even minor changes in the numerator result in exaggerated percentage settlement.

Another likely contributor to these fluctuations is the massive quantities of liquids that have been, and continue to be, removed from the site through wells and the LCS. This loss of volume is likely causing some subsurface consolidation. To address these fluctuations, a Cumulative Average and a 3-Month Rolling Average were used to buffer out the extremes in the data.

#### Cumulative Average

The Cumulative Average is the running average of all data sets measured from the starting date to each monthly increment. As an example, the following Figure 17 shows the cumulative daily average, averaged from the start of the two-year period, for May 2023, May 2024, and May 2025. The full set of monthly comparisons can be found in Appendix A.

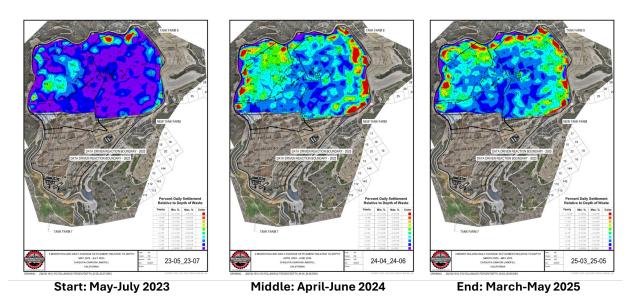


**Cumulative Running Average** 

Figure 17

### 3-Month Rolling Average

Our last analysis was to create a 3-month rolling average of the daily percent change in elevation relative to the depth of waste. However, rather than average the rate of change from the earliest topographic map, in this analysis we simply averaged the settlement that was happening over a 3-month period, with those 3 months rolling every month. As an example, the following Figure 18 shows the rolling average for the periods of May through July 2023, April through June 2024, and March through May 2025. The full series can be found in Appendix B.



# 3-Month Rolling Average

Figure 18

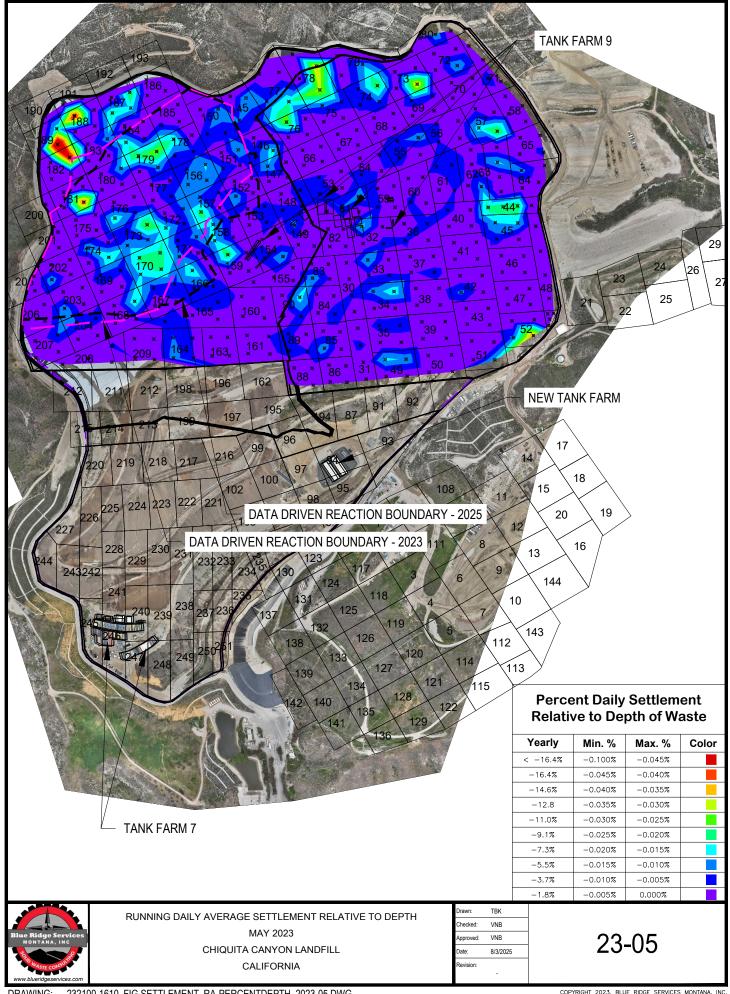
Based on the cumulative and 3-month rolling averages, though there are areas of increased settlement outside of the RA-Data boundary, the majority are below the rates seen within the RA-Data. When high rates of settlement are observed, they are not consistent enough to indicate that the reaction has spread to the east – or beyond the current RA-Data boundary.

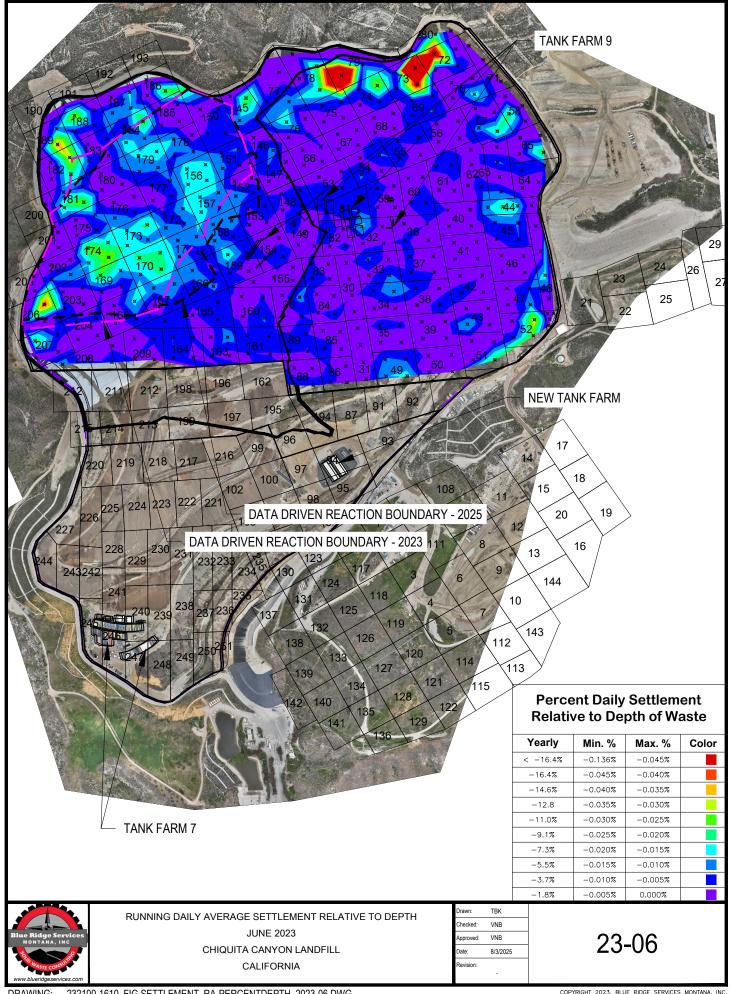
# **CONCLUSION**

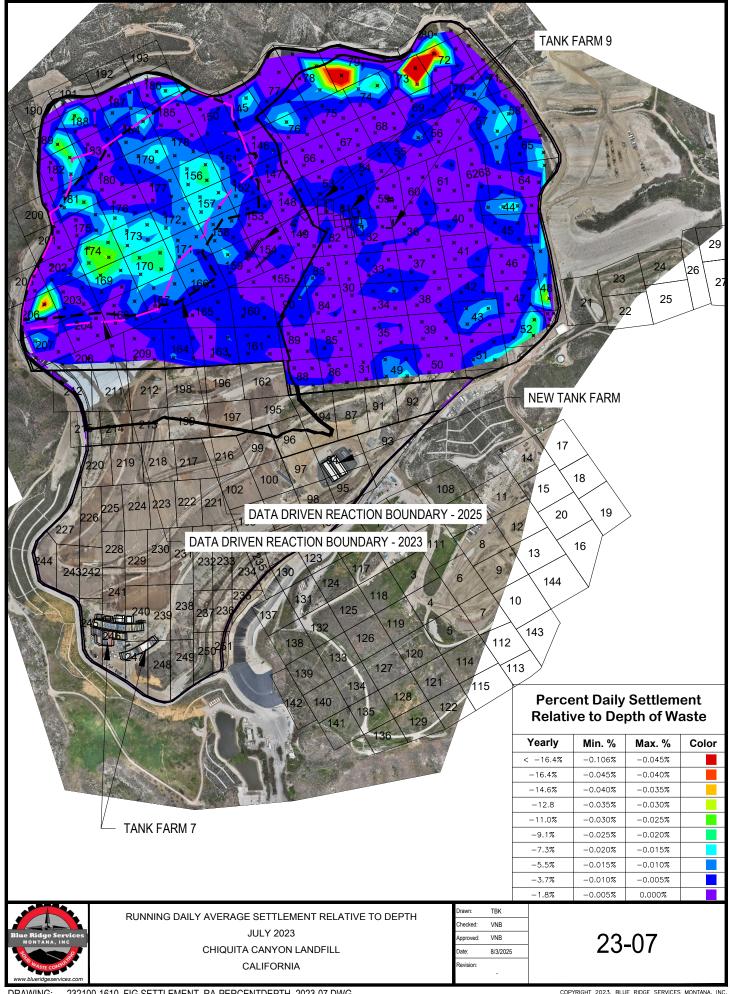
Our analysis shows that the rate of change of settlement within the RA-Data is slowing. Similarly, the rate of change of settlement in areas outside – but adjacent to – the RA-Data is also slowing.

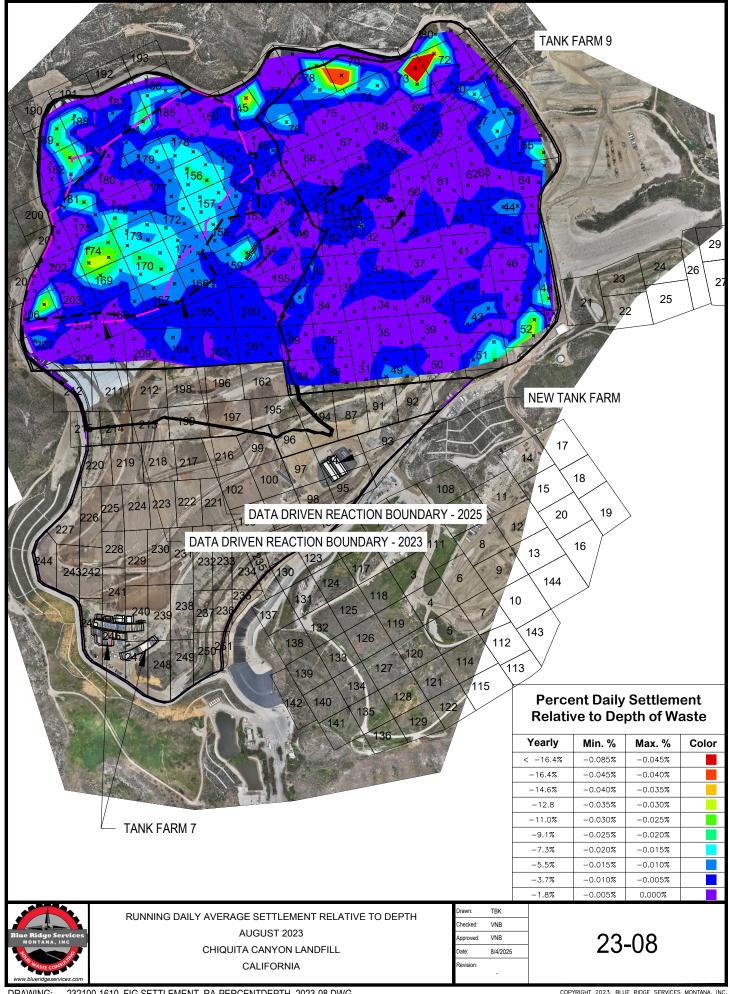
We believe those changes inside and outside the RA-Data are interrelated and are more likely the result of the indirect effects of the main subsurface reaction inside the RA-Data. The variability in rate of change of settlement in areas outside the RA-Data are the result of horizontal migration of liquids and heat causing the normal decomposition rate to increase, but not at a rate that could be associated with an ETLF event.

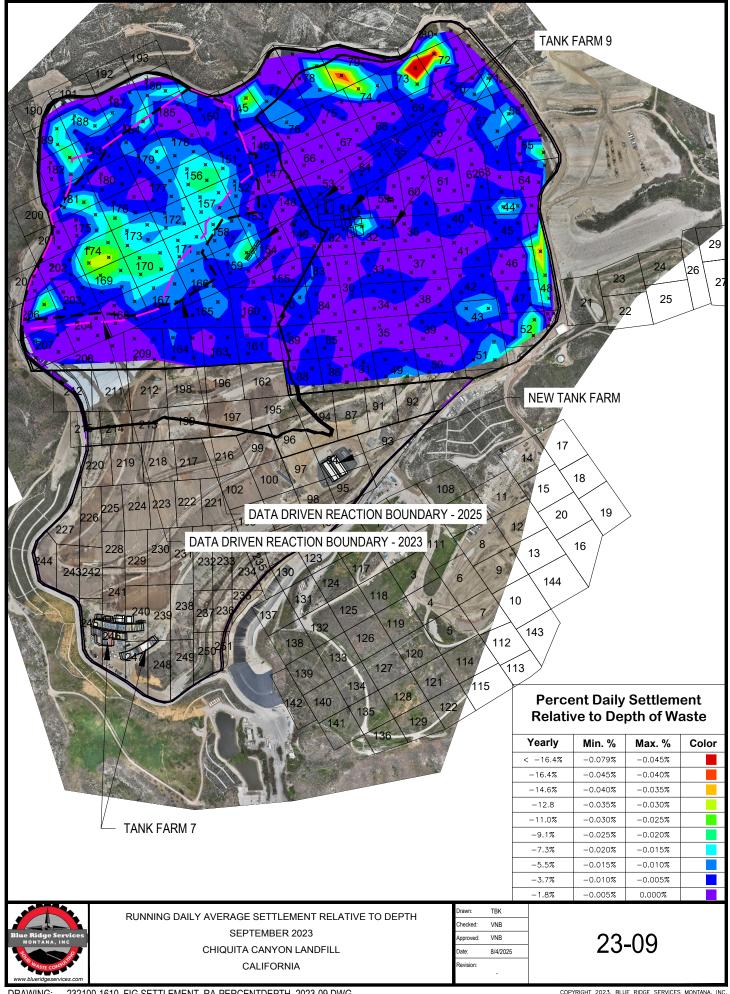
# Appendices A

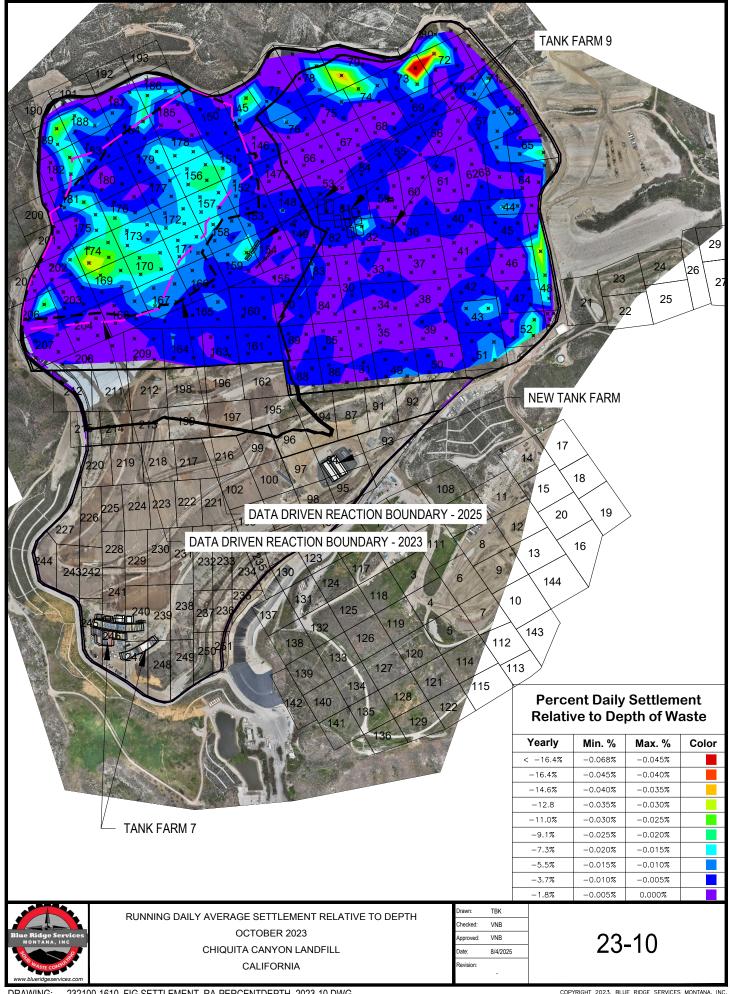


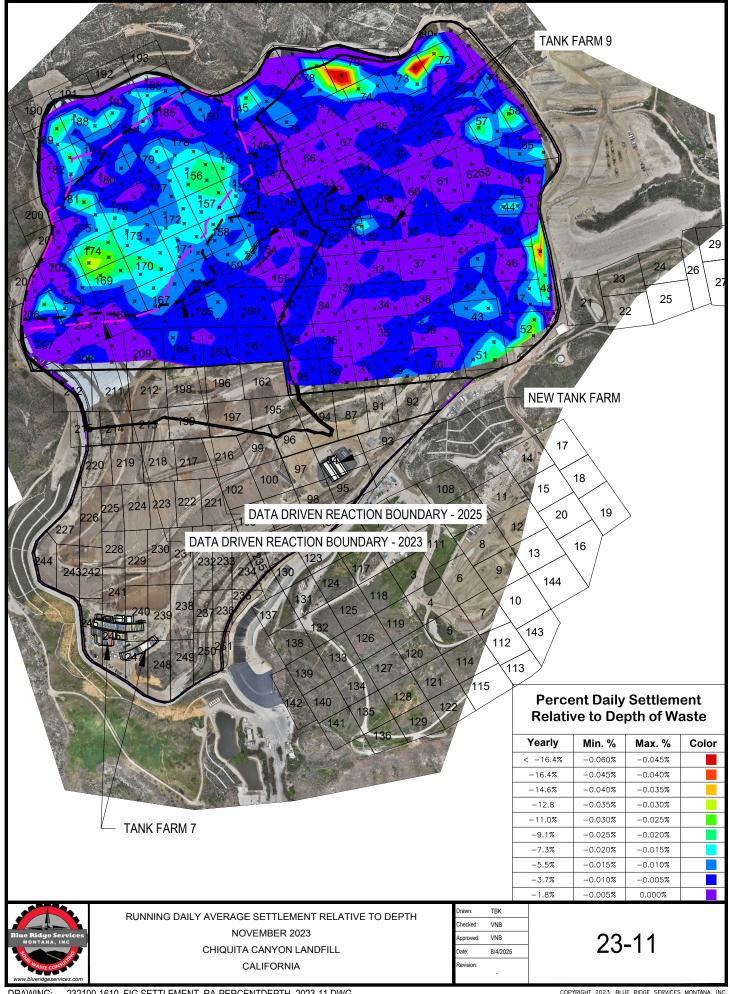


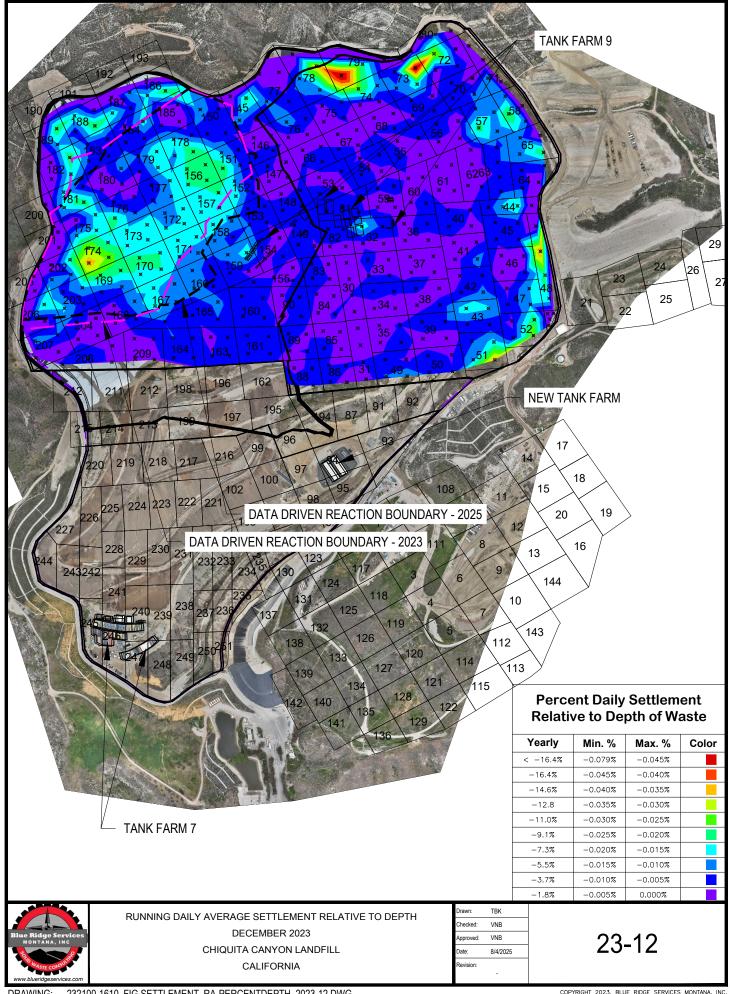


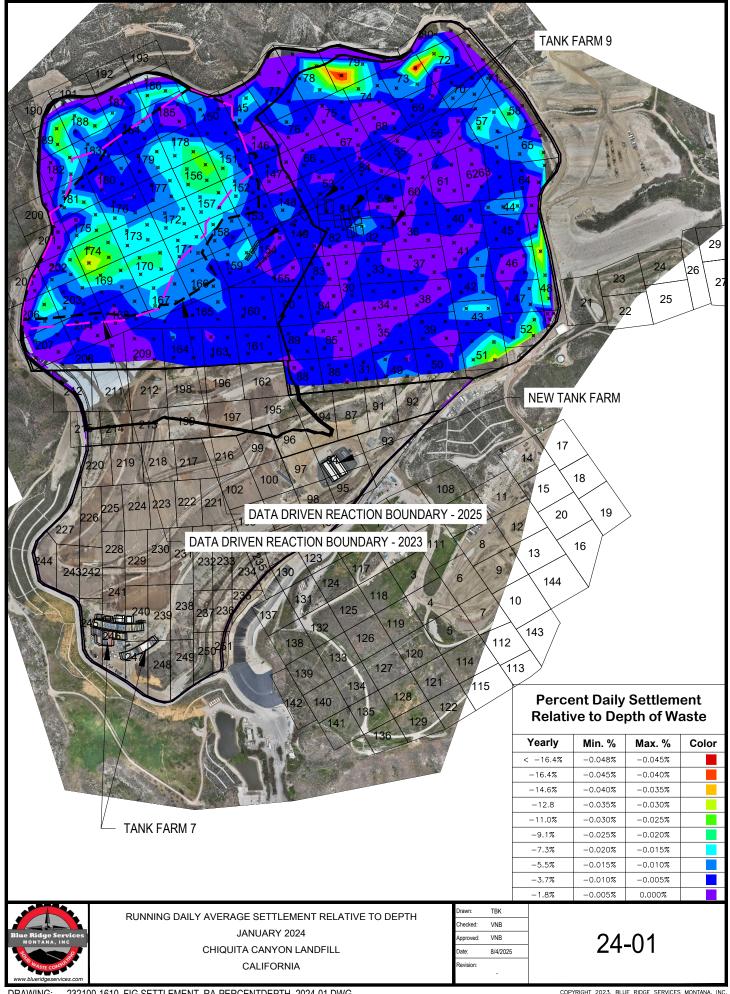


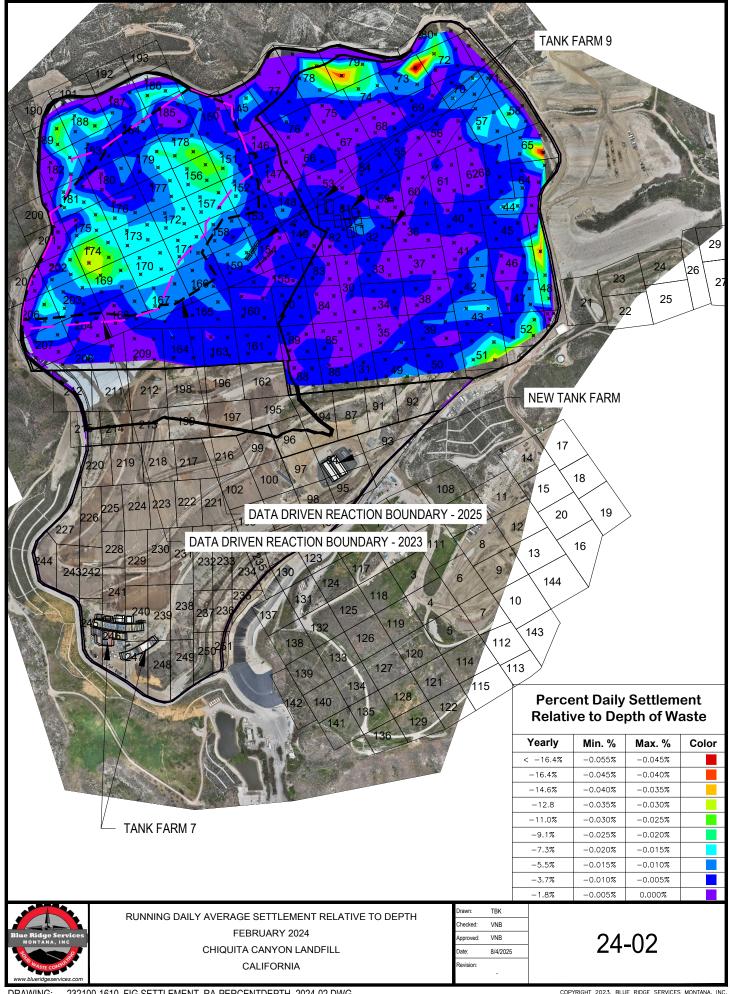


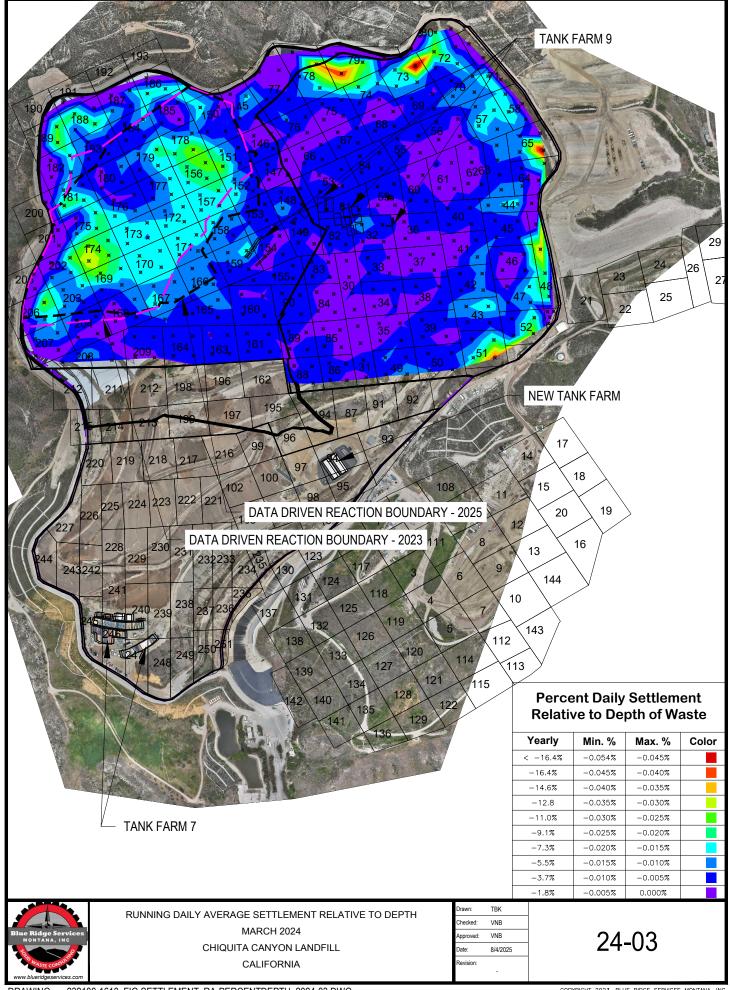


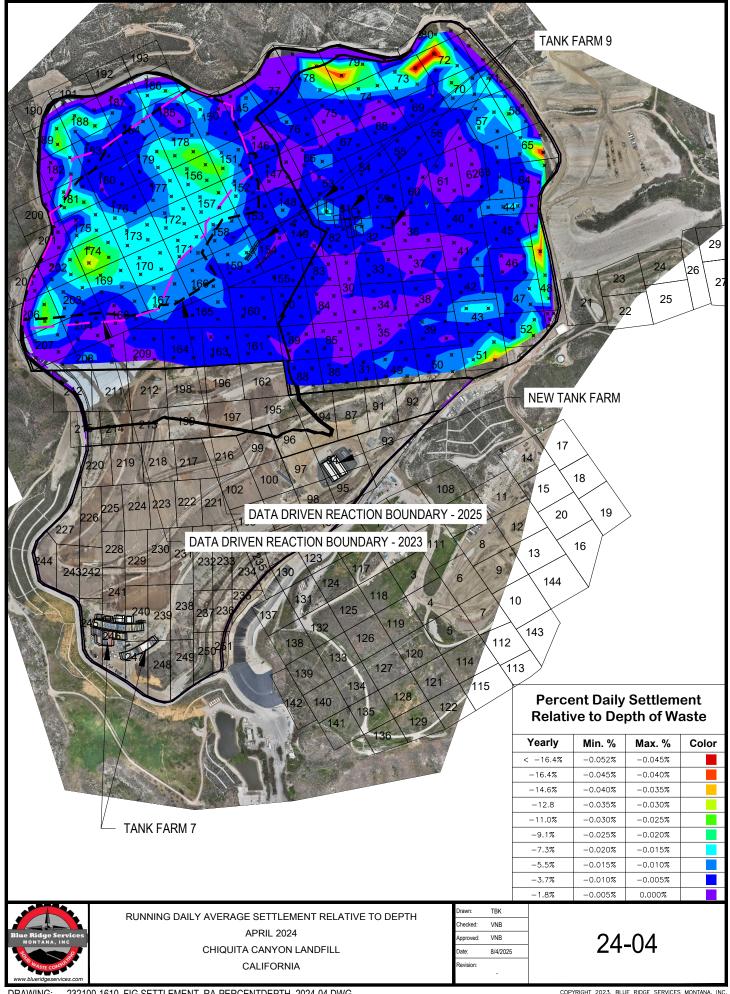


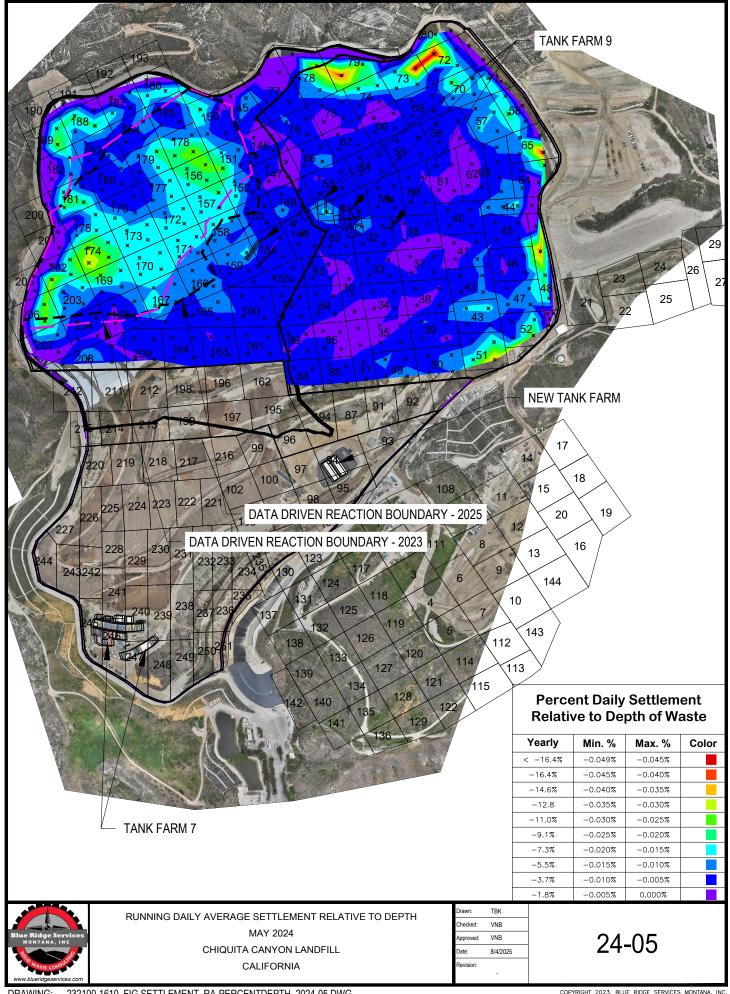


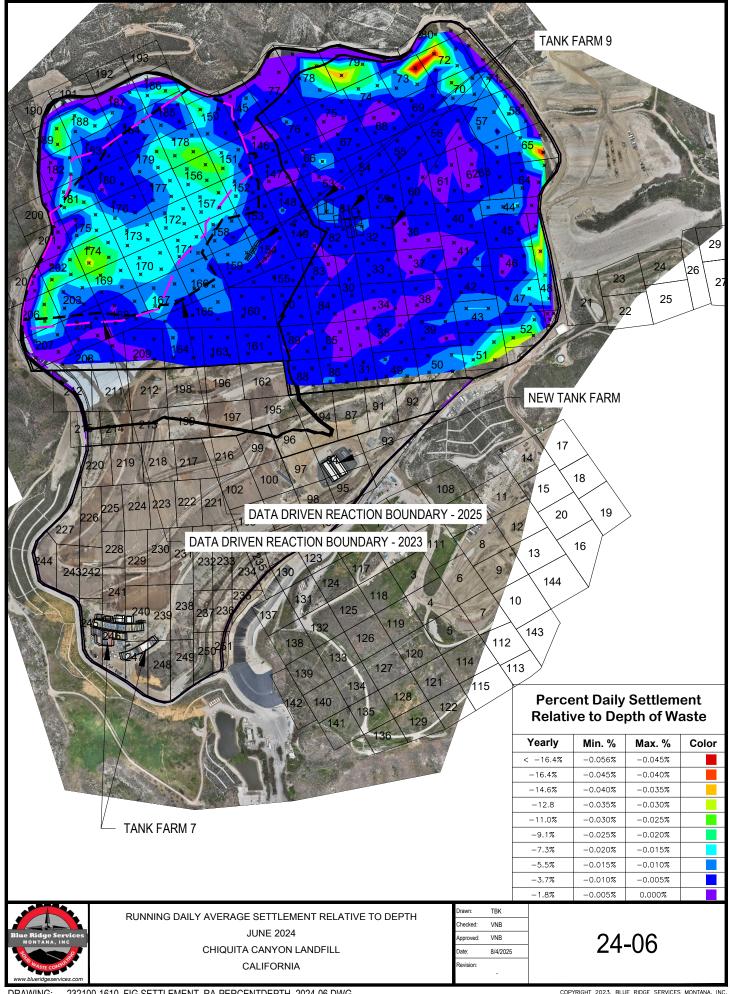


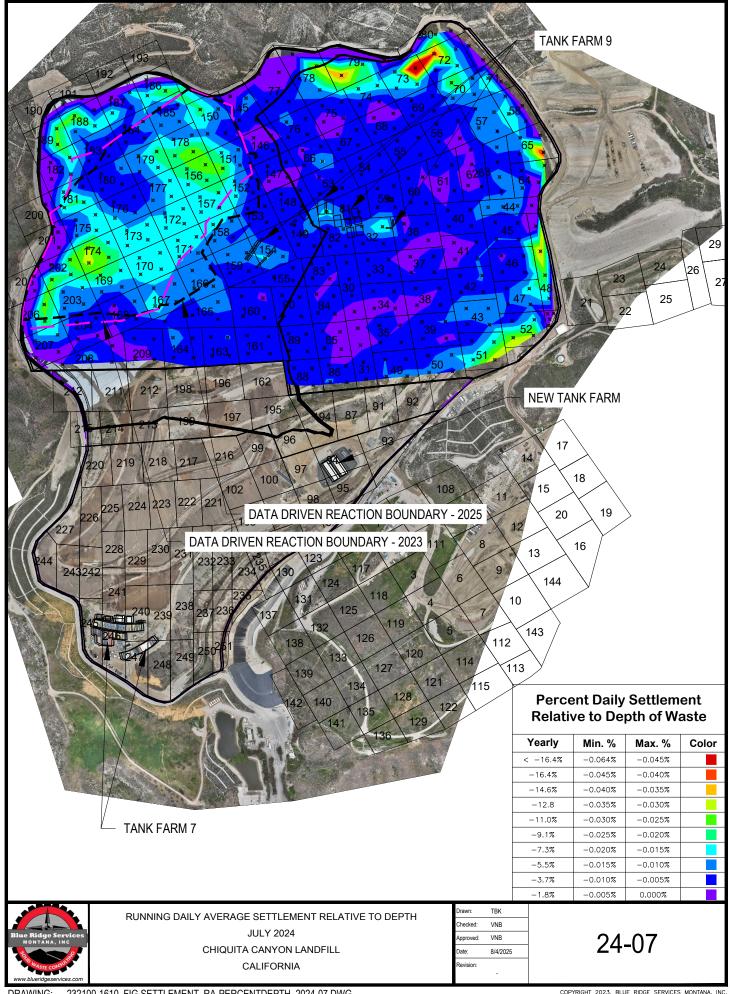


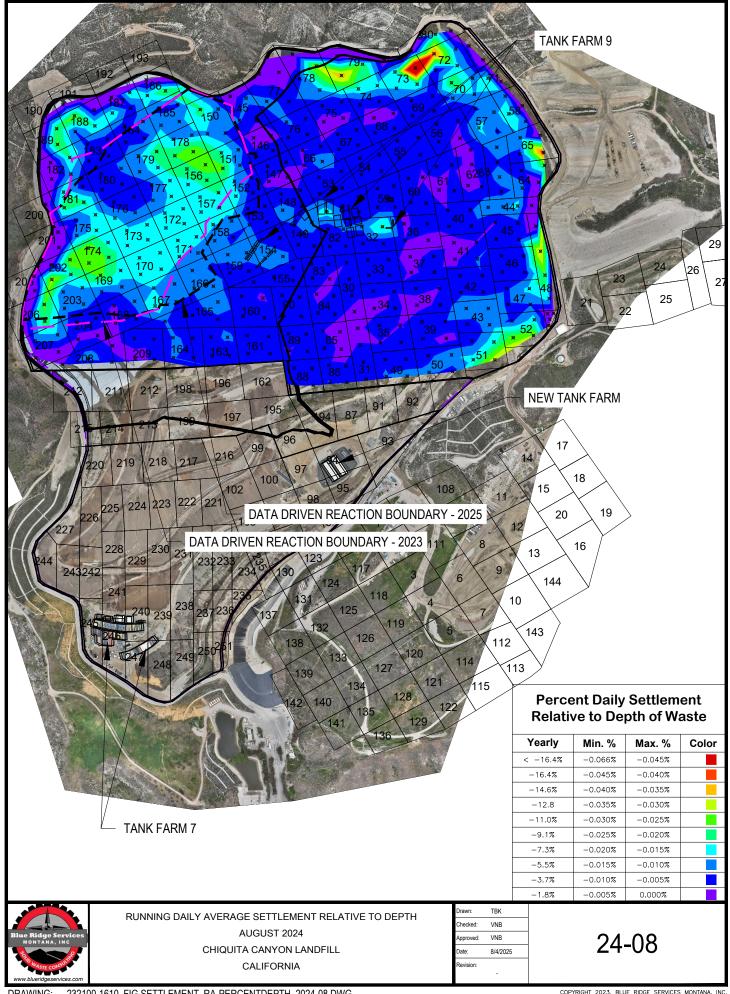


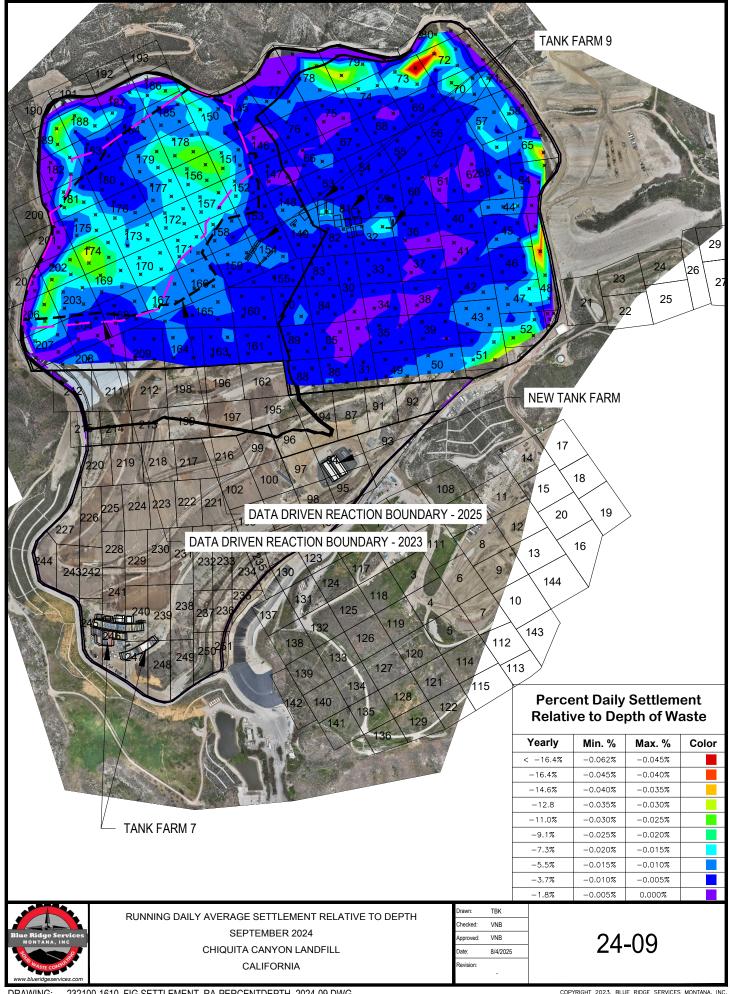


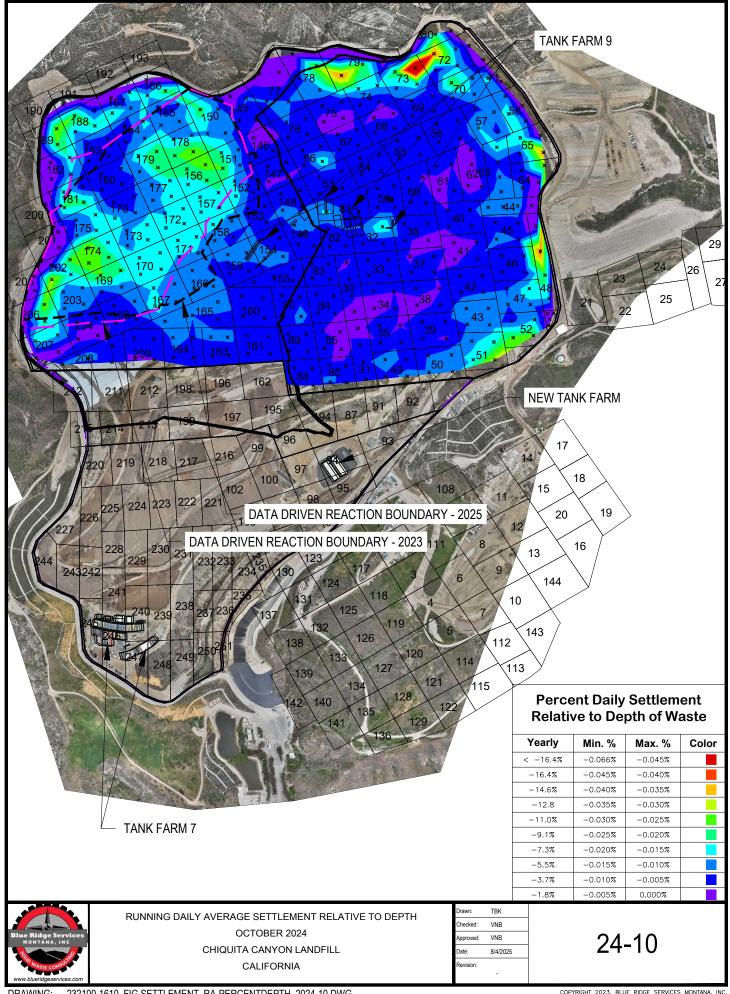


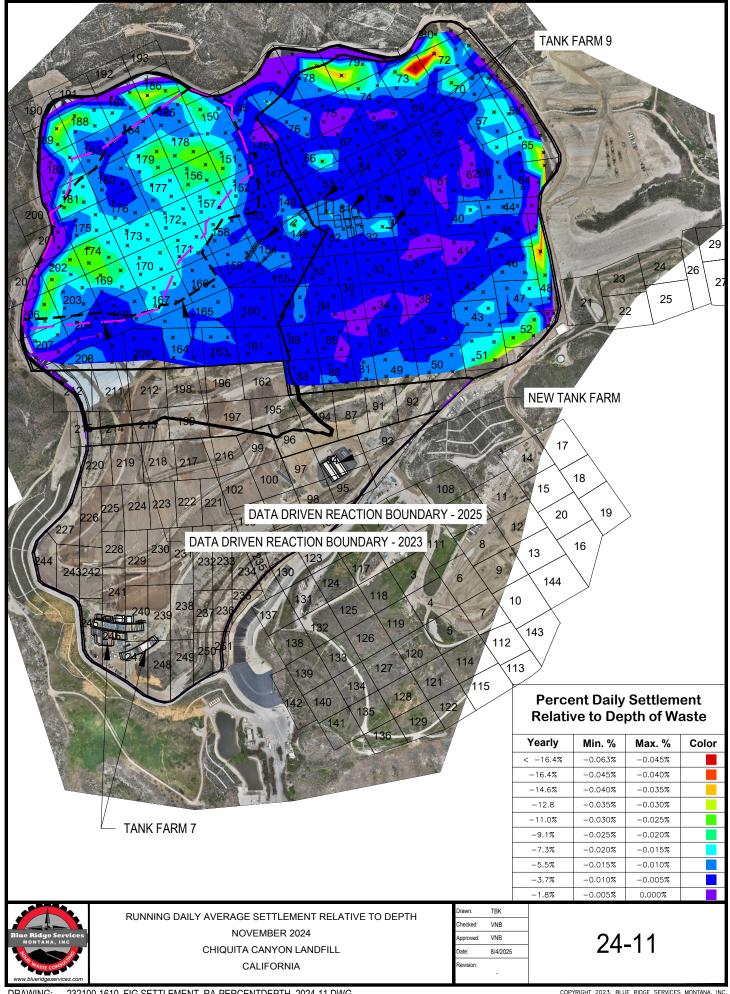


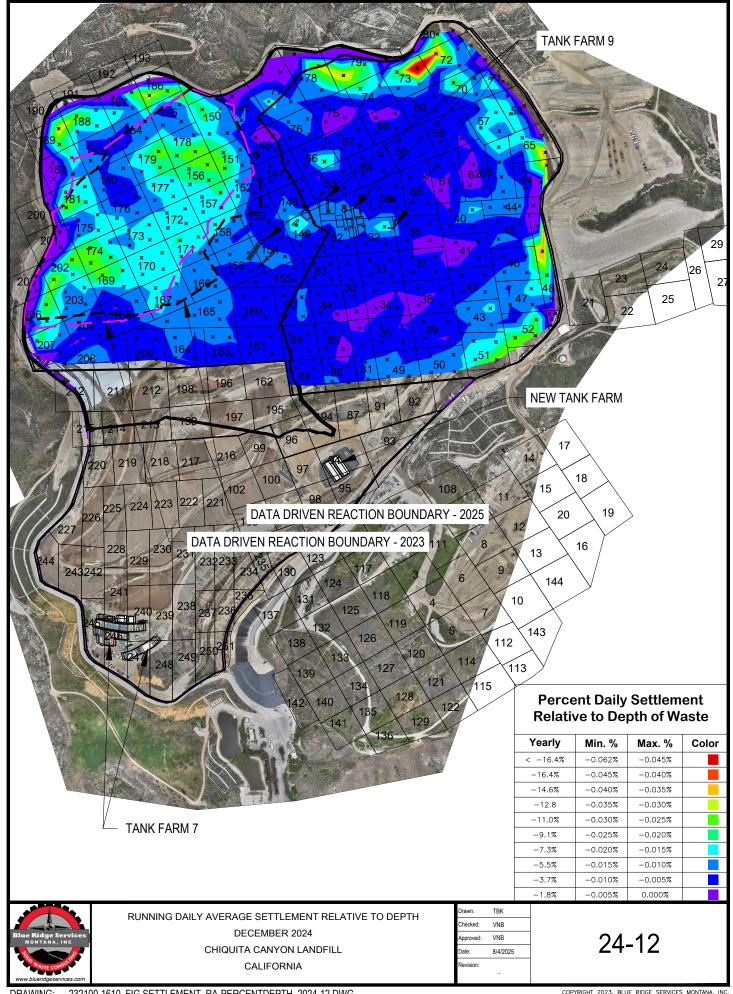


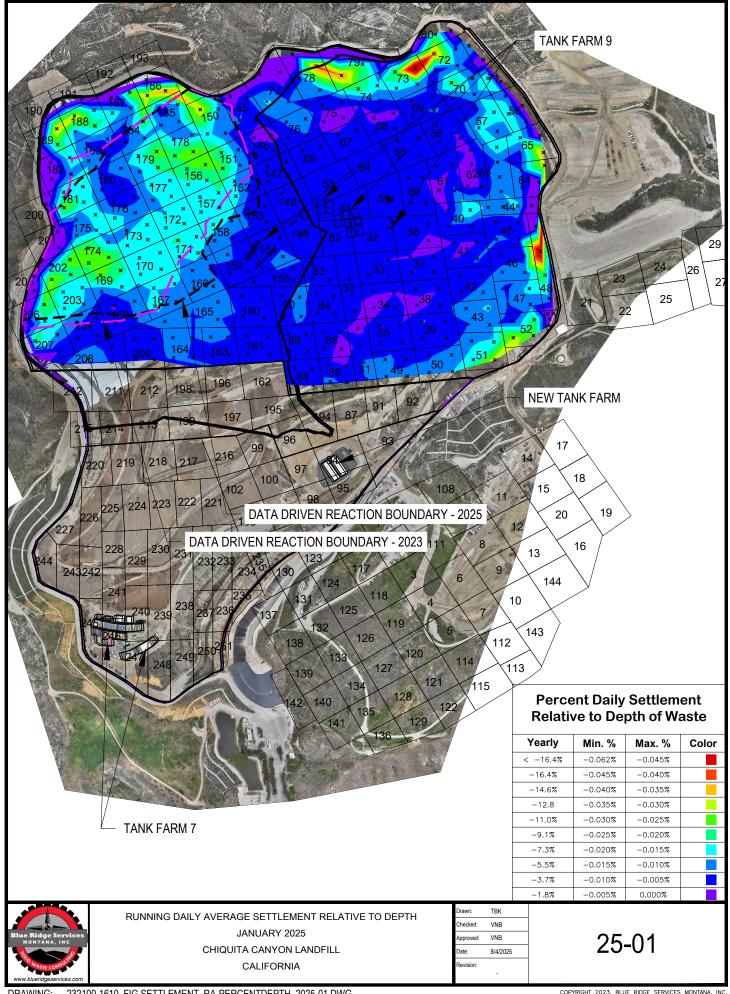


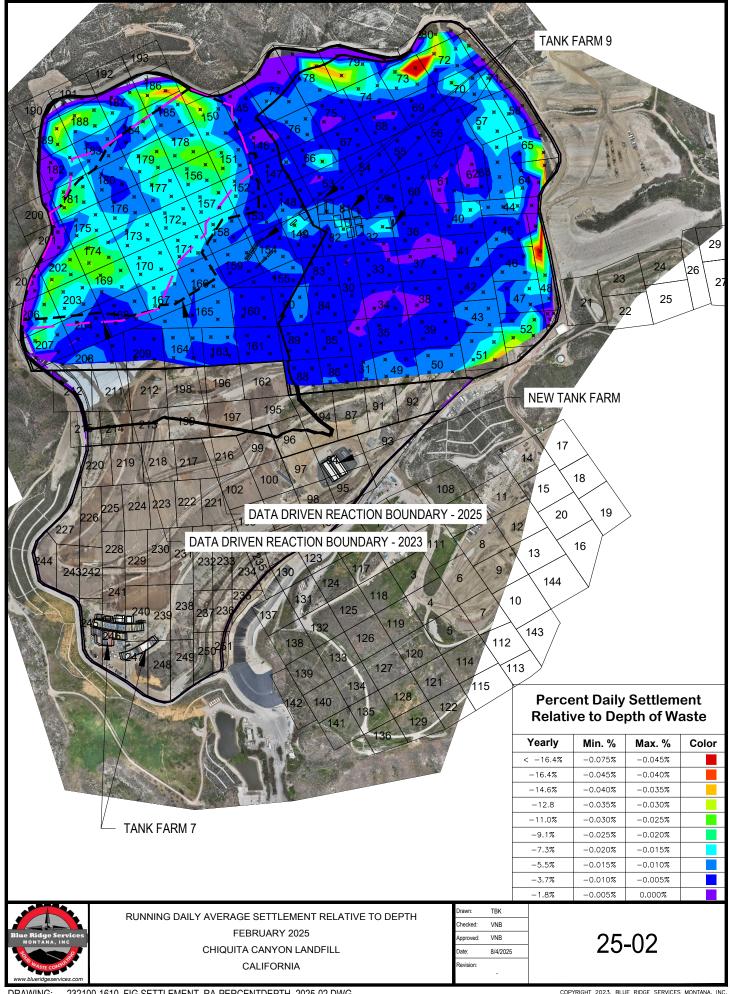


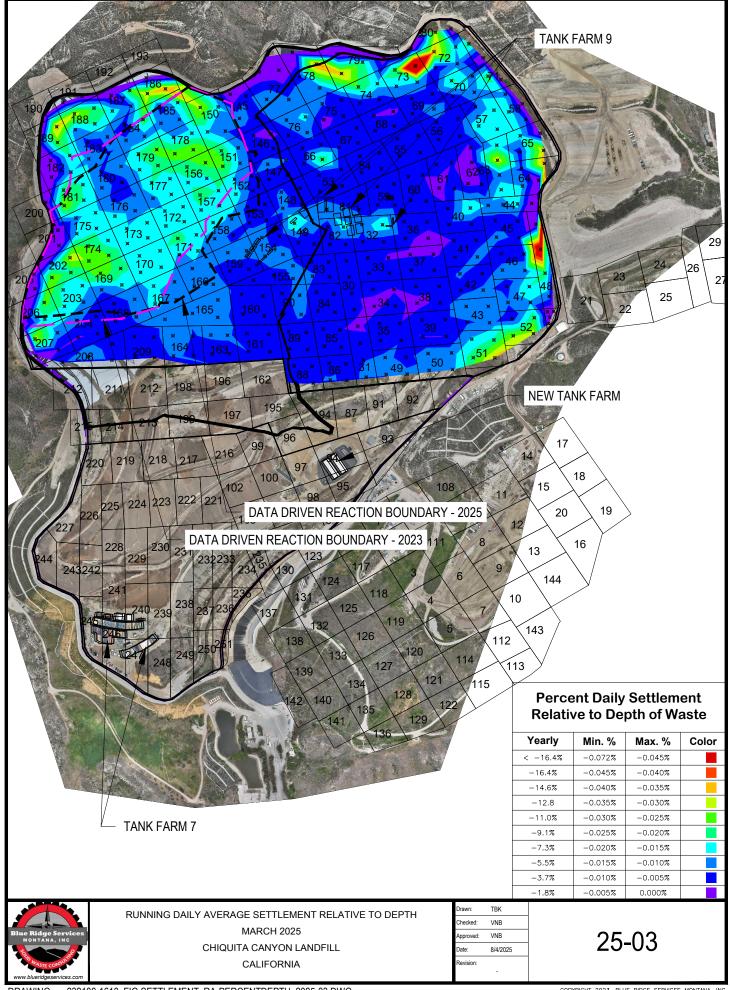


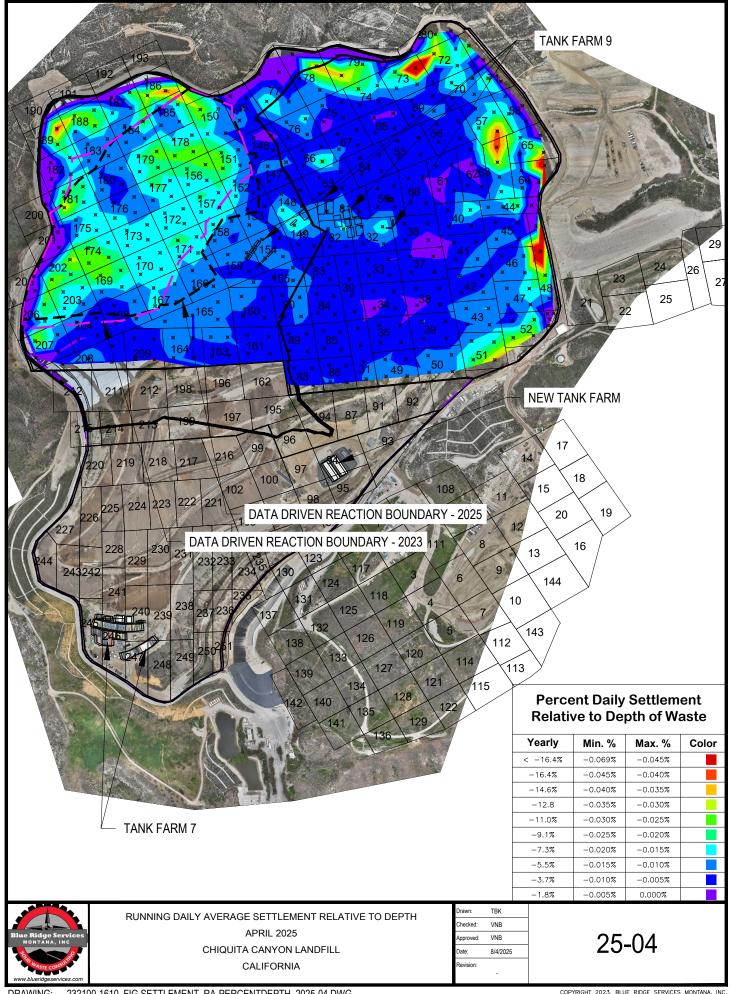


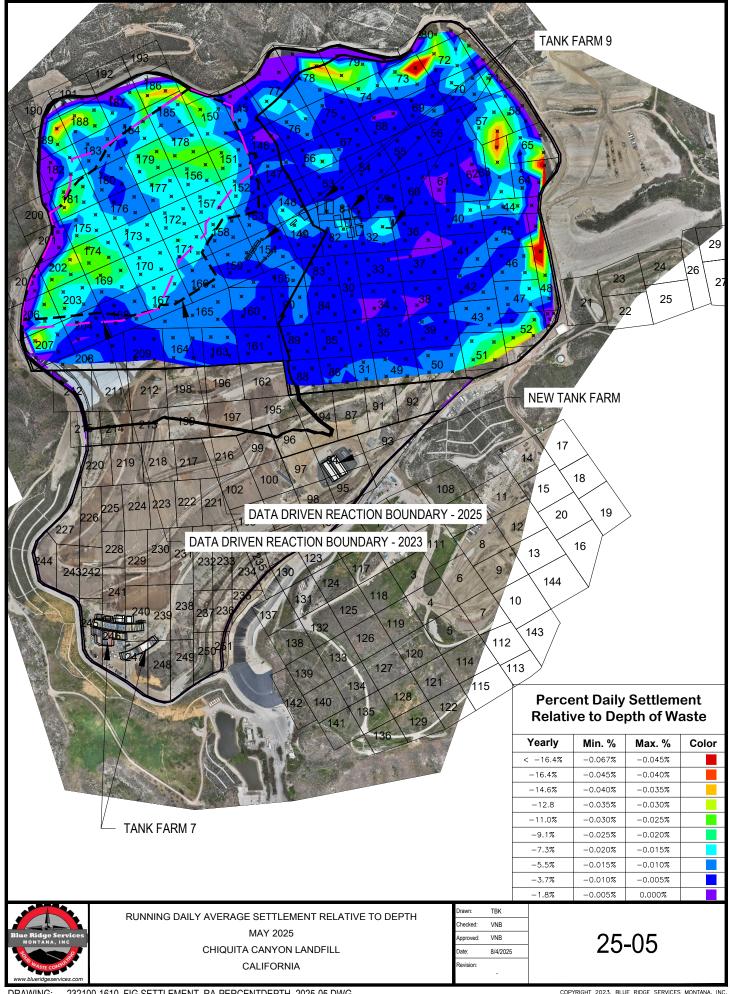












## Appendices B

