OVAM Mortsel: Bi-weekly report

Soil remediation by Electric Resistance Heating

March 1 – March 15, 2024

Former Electra Site, Statielei 111 Mortsel

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1 Introduction

This letter report contains a brief description of the Electrical Resistance Heating (ERH) remediation system operations performed at the former Electra Site at Statielei 105 – 113 in Mortsel. The time period addressed in this report is from March 1 to March 15, 2024. **Figure 1** contains a site map displaying the locations of the thermal treatment area, electrodes, temperature monitoring points (TMPs) and other pertinent Site features.

2 System Operation Activities

The weeks of the reporting period involve week 10 and 11 of 2024. During this period the site was visited 8 times in light of the soil sampling activities.

In the reporting period the following works were performed:

- Sampling of electrodes with Dräger tubes, PID and VaporSafe
    - Results have been communicated separately
- Removed pallets and cardboard boxes for Veerle
- VCMI drillings, assisted where required
- General checks and equipment maintenance
    - General data collection and inspections
        - Amp surveys
        - Step & Touch
        - PID measurements
        - Relative humidity measurements
        - Temperature measurements
    - Drained the condensate in the VGAC vessels, influent hose blowers
    - Drained cooling water from SC
    - Repaired impeller of P05 (the condensate pump in the KO vessel in SL113)
    - Replaced V-belt of B01 in SC due to strange noise

3 ERH Application Summary

The ERH system operational parameters from the current reporting period are presented in **Table 1** below.

Table 1. ERH System Parameters

ERH System Parameters	Estimated	Up to March 15th	Percentage of total
Operation Time (days)	137[1]	115[3]	84%
Cumulative Energy Applied (MWh)	3.800[2]	2.453	65%

Total energy for ERH and auxiliary Equipment was ca. 2.453 MWh. Energy applied for ERH up to March 15th was ca. 2.373 MWh.

4 Temperature Monitoring

During the reporting period of March 1 to 15, 2024 the site average subsurface temperature slightly decreased from 96,9 °C to 95,2 °C a decrease of 1,7 °C this period. This represents an average temperature decrease of approximately 0,12 °C/day. This decrease is attributed to the shutdown of ERH due to drilling activities. Despite this, temperatures are still relatively stable.

[1] Extra days for higher concentrations in soil not included.

[2] Extra energy for higher concentrations in soil not included.

[3] This is with regard to the days that ERH was not active. Including those days would give an operation time of 140 days.

The highest individual temperature measurement within the treatment volume is 103,6 ˚C at TMP C10 at 7,5 meters below ground surface (bgs). Subsurface temperatures at different depths per TMP location and over time are presented in **Figure 2**. The site average peaked at 96,9 °C on the 3rd of March.

In total 4 shallow RTD's are installed near utilities (Statielei 109 front and Statielei 113 back) to measure the temperature close to the utilities. The average temperature at the utility RTDs is 46 °C, the maximum temperature is 55 °C in RTD T4 (SL 113 back).

5 Vapor Recovery

During the reporting period the vacuum applied to the vapor recovery piping system (as measured at the condenser inlet) was maintained between 20 - 130 mbar. The difference is caused by impeller issues with the P05 pump and tests with a lower vapor recovery flow. All pipe and field piezometer pressure measurements show negative values, indicating the system is working sufficiently to maintain negative pressure. The vapor flow rate, as measured after the vapor recovery blower, averaged circa 950 m^3/hour. Minimum vapor flow was 780 m^3/hr, max. vapor flow was 1.200 m^3/hr.

Vapor monitoring

During every site visit HMVT performs PID vapor measurements of the ambient air and the extracted soil vapor. The most recent PID measurement for chlorinated volatile organic compounds (CVOC), collected on March 11, was 6.1 ppm. The PID measurements of the extracted soil vapor are still stable on a level of 5 - 10 ppm. During the reporting period, the highest recorded PID measurement in the soil vapor was 12,3 ppm at March 1.

6 Vapor treatment

The extracted soil vapors are treated with granular activated carbon (GAC). The emission limit, as defined in the tender document, for PCE and TCE is 100 mg/m^3 if total mass is higher than 2.000 g/hr. The client wants to limit the emissions to zero.

The spare Mach4X vessel, containing 10 m^3 of GAC, is currently connected and functioning as the second VGAC. HMVT performs PID vapor measurements of the vapor treatment on a regular base. During the reporting period, the PID reading of the effluent of the first GAC filter was 0,1 ppm. The PID reading of the effluent of the second GAC filter was 0,0 ppm. TEC will periodically take vapor samples from the influent and effluent of each vessel.

The activated carbon has a relatively low adsorption rate. The low adsorption rate is probably related to the contaminant (CIS), the low and fluctuating influent concentrations and the low emission limits (zero emission). During this reporting period the activated carbon filters were drained frequently. The amount of condensate was low.

7 Condensate and water treatment

During the reporting period 261 m^3 of water was recovered via condensed water by the vapor recovery system. A total of 2.014 m^3 of condensate has been produced since the start-up of the ERH system.

The condensate produced from the steam condensers is collected and treated in 2 liquid granular activated carbon vessels, before being discharged to the sewer. The discharge limit for PCE and TCE is 10 µg/l. TEC will periodically take samples from the water treatment system. From the samples of the 16th of January, no contaminants were detected in the effluent. No new analysis results have been obtained by HMVT since then.

8 Mass removal (by PID)

The mass removal calculation is based on the PID measurements in the influent of GAC1. We use a 10,6 eV bulb, so the correction factor for PCE is 0,57. During the reporting period, the total mass removed from the subsurface

was approximately 8 kg (based on PCE), 1 kg less than the previous reporting period. The total mass recovered from the subsurface since the start of the project is circa 372 kg **(Figure 3.)**. The last measurement of this week was done on March 11, therefore the mass removal estimate is slightly lagging..

9 Health & Safety

During the reporting period, there were no mentionable affairs regarding health and safety.

Step & Touch

The highest measured voltage (step and touch) during the reporting period was negligible at <100 mV.

Ambient air monitoring

During the reporting period, no presence of CVOC in daily ambient air monitoring was measured (PID). TEC will provide the measurement data from the VaporSafe.

10 Settlement measurements

The settlement measurements are being monitored on a weekly basis by buro Teugels. The results of the measurements can be found in table 2, displayed in meters. Settlement is expressed in mm. The measuring points can be found in the map below.

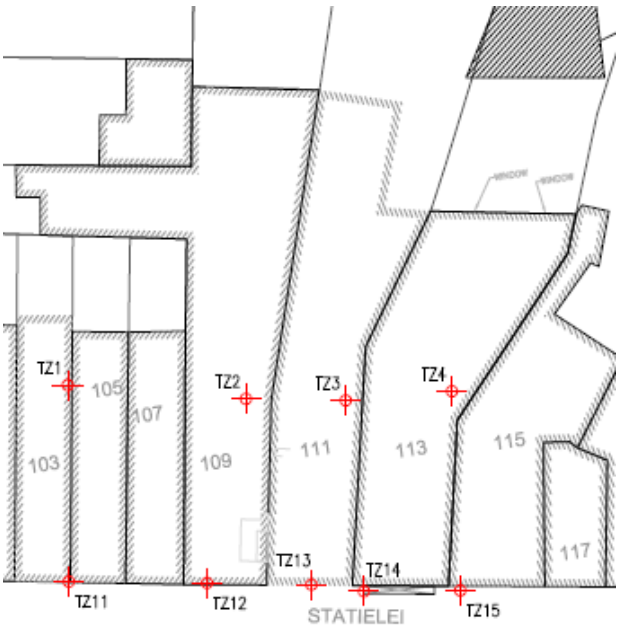


Table 2. Results settlement measurements

ZETTINGSMETING

Nr. pt	19/04/23	Δ	TOT Δ	16/01/24	Δ	TOT Δ	30/01/24	Δ	TOT Δ	06/02/24	Δ	TOT Δ	20/02/24	Δ	TOT Δ	27/02/24	Δ	TOT Δ	05/03/24	Δ	TOT Δ
TZ1	5,705			5,703	0	-2	5,703	0	-2	5,703	0	-2	5,703	0	-2	5,703	0	-2	5,703	0	-2
TZ2	8,780			8,778	0	-2	8,777	-1	-3	8,776	-1	-4	8,776	0	-4	8,777	1	-3	8,776	-1	-4
TZ3	12,178			12,176	0	-2	12,176	0	-2	12,175	-1	-3	12,175	0	-3	12,176	1	-2	12,176	0	-2
TZ4	9,256			9,256	0	0	9,255	-1	-1	9,255	0	-1	9,254	-1	-2	9,255	1	-1	9,255	0	-1
TZ11	5,211			5,209	0	-2	5,209	0	-2	5,209	0	-2	5,209	0	-2	5,210	1	-1	5,210	0	-1
TZ12	8,150			8,147	0	-3	8,146	-1	-4	8,145	-1	-5	8,145	0	-5	8,146	1	-4	8,146	0	-4
TZ13	11,095			11,095	0	0	11,095	0	0	11,095	0	0	11,095	0	0	11,096	1	1	11,096	0	1
TZ14	8,922			8,923	1	1	8,923	0	1	8,923	0	1	8,923	0	1	8,924	1	2	8,924	0	2
TZ15	3,971			3,971	1	0	3,970	-1	-1	3,970	0	-1	3,970	0	-1	3,971	1	0	3,970	-1	-1

OPMERKINGEN
Ref.meting: 19/04/23
Δ : verschil t.o.v. vorige meting
TOT Δ : verschil t.o.v. ref.meting

Limited settlements (2 – 4 mm) have been measured in buildings Statielei 103, 109 and 111. Settlement in front of and the back of Statielei 109 still appear to retreat. According to stability engineer Herman Peiffer, settlements over 6 mm can pose a potential problem. We notified him of these ongoing settlements, he will be present on the 26th of March, during the site visit by the people from the insurance companies.

11 Further remarks

During the reporting period, soil samples were taken by TEC. Soil sampling results came after the reporting period, but are reported here nonetheless. Analyserapport 1387839 and 1388516 ORTEC1700613 both show once more that the soil samples came back clean (below the remediation target) and that HMVT has fulfilled the remediation goal.

12 Planned Activities

Planned activities for the following two weeks (12 and 13) involve:

- Regular monitoring and maintenance activities
- Detachment of electrodes in several zones
- Start cooling in SL 105, 107 and 113
- Soil vapor monitoring with VaporSafe

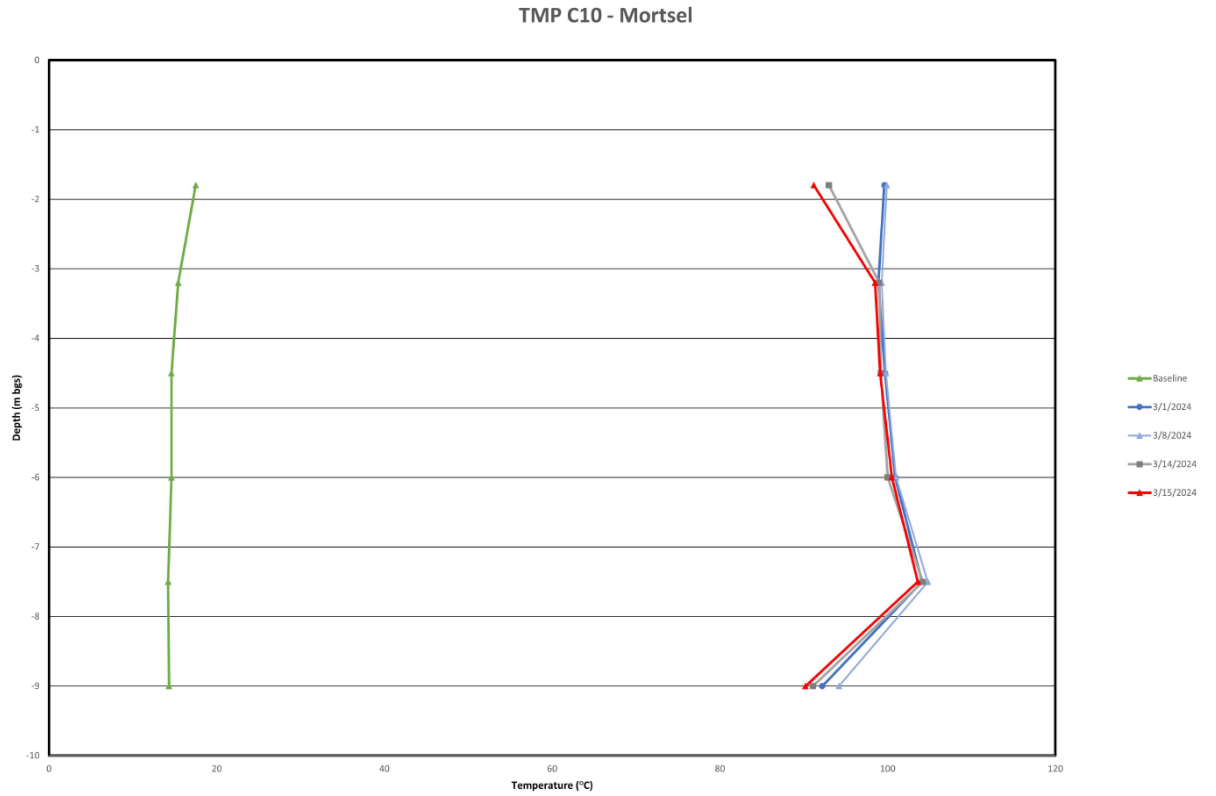
Figures

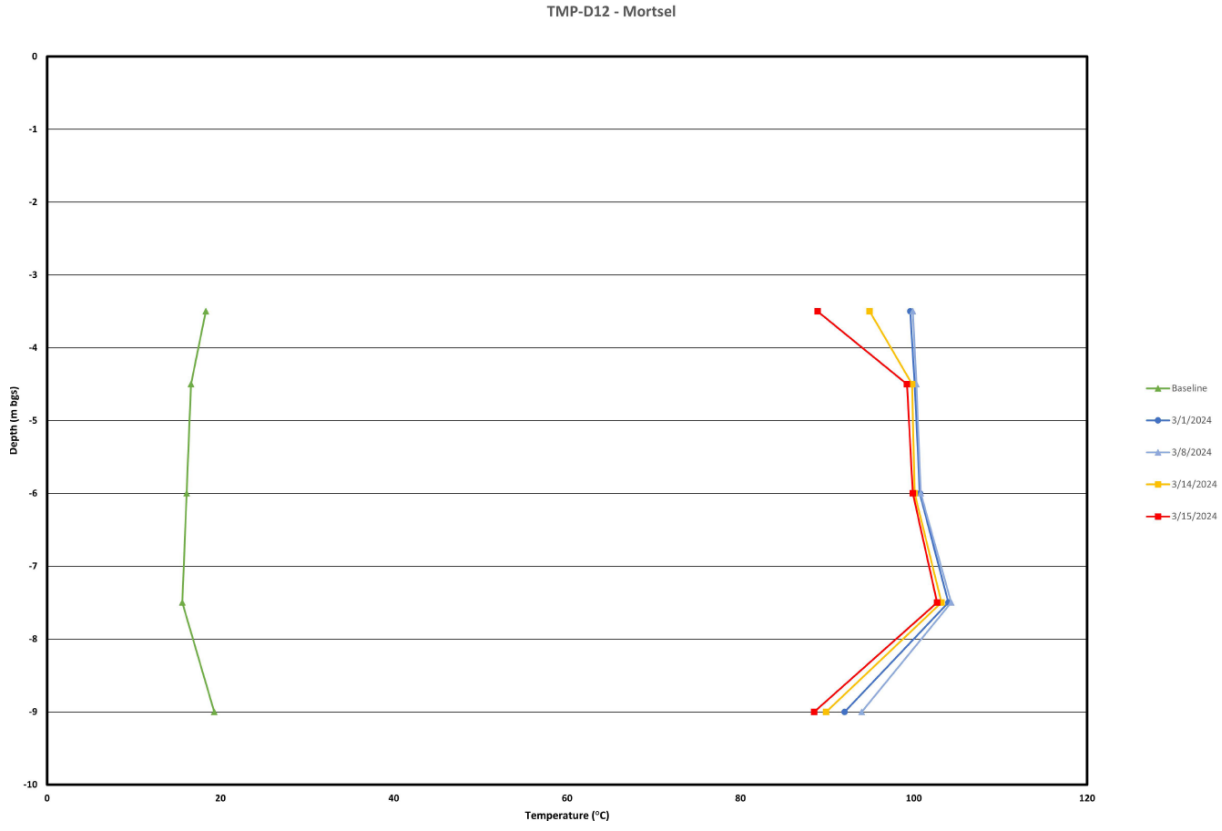
1. Site plan
2. Average Temperature vs. Time (by TMP)
3. Cumulative Mass Removed vs. Time

Figure 1: Site plan

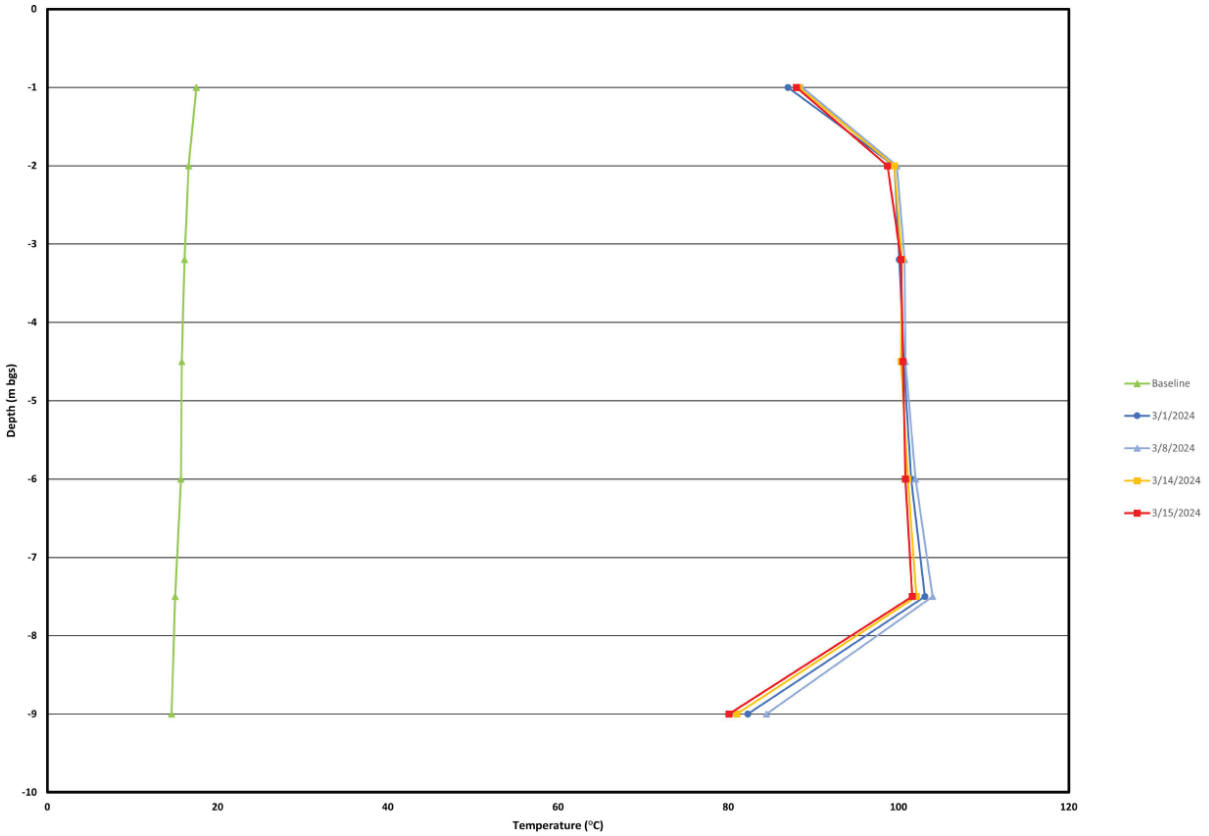
The as built site plan is attached separately

Figure 2. Average Temperature vs. Time (By TMP)

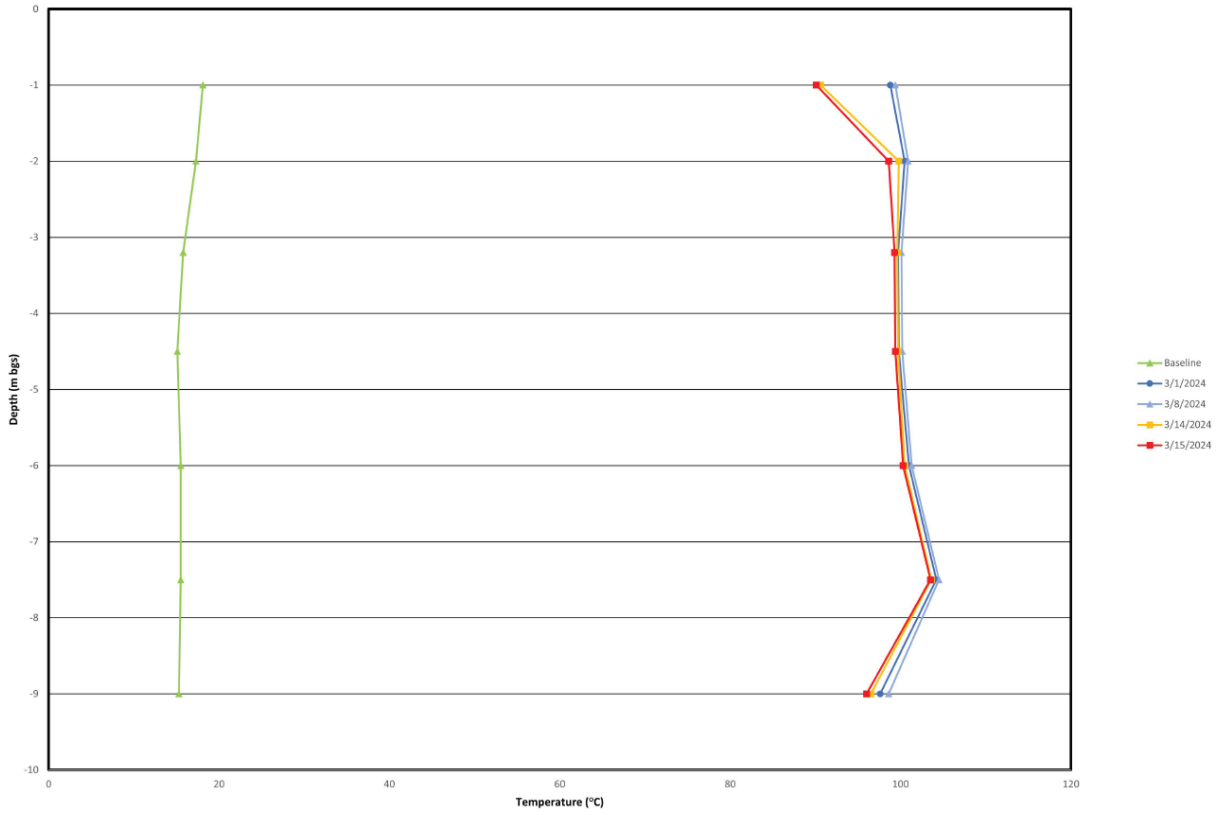




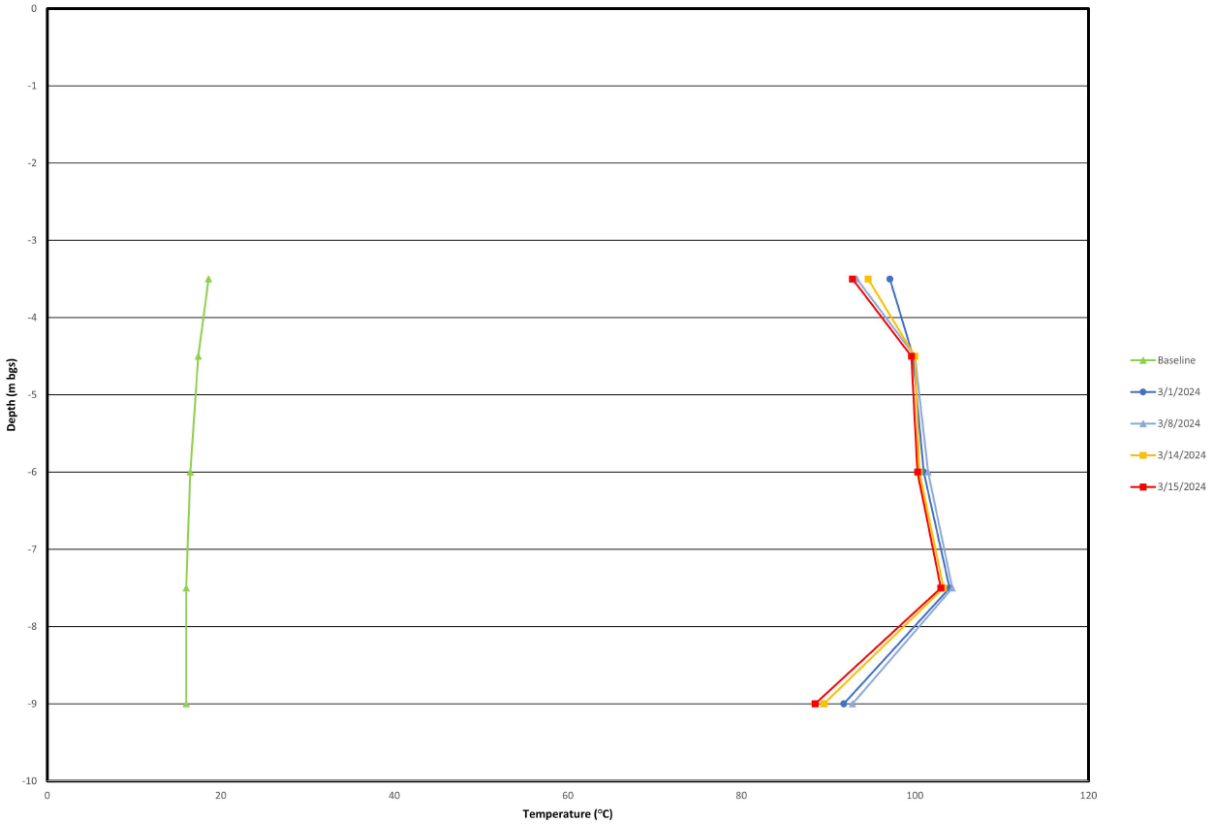
TMP-E05 - Mortsel



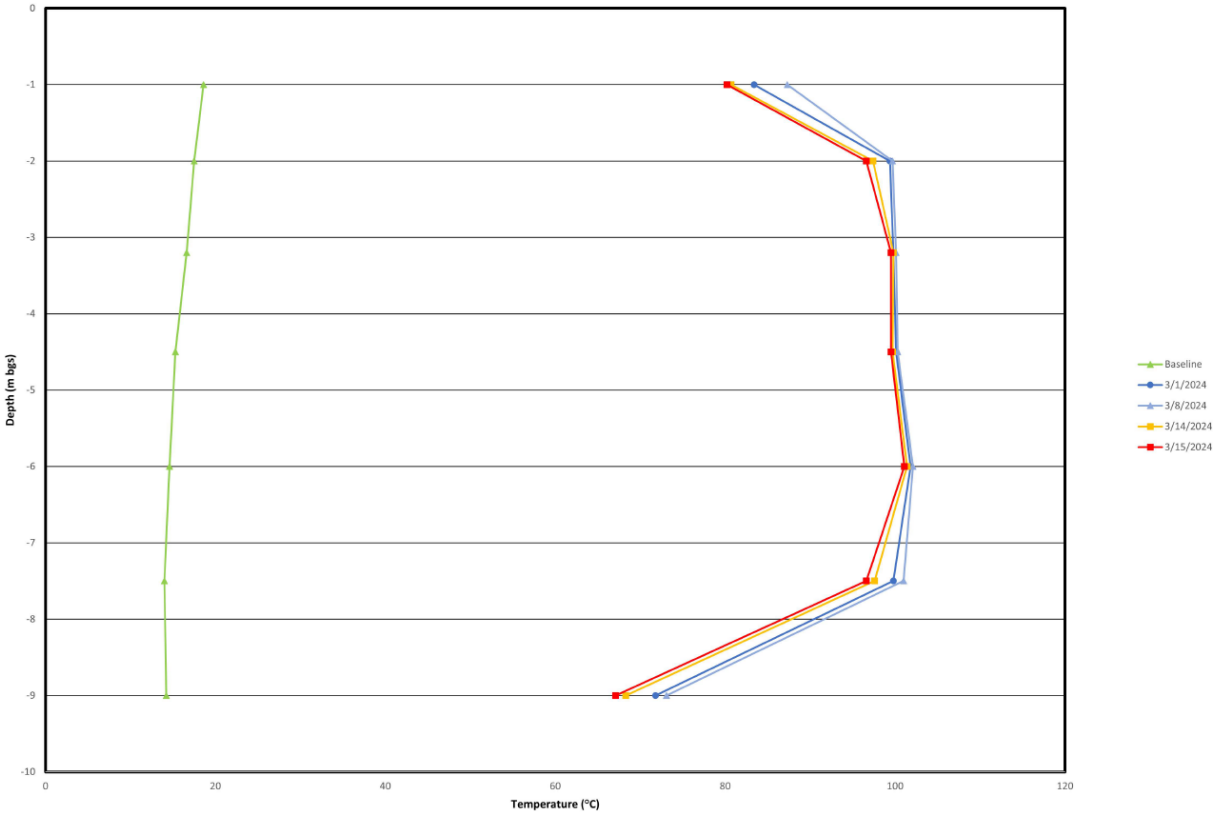
TMP F08 - Mortsel



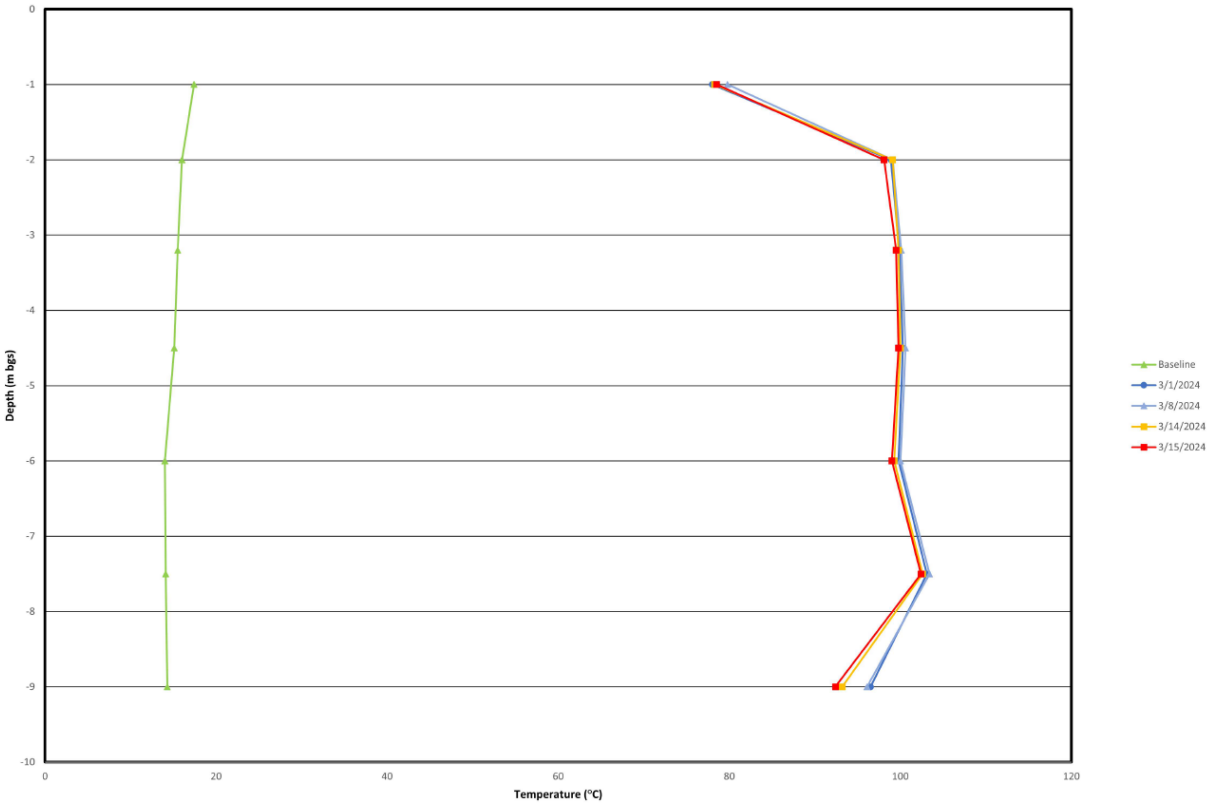
TMP H10 - Mortsel



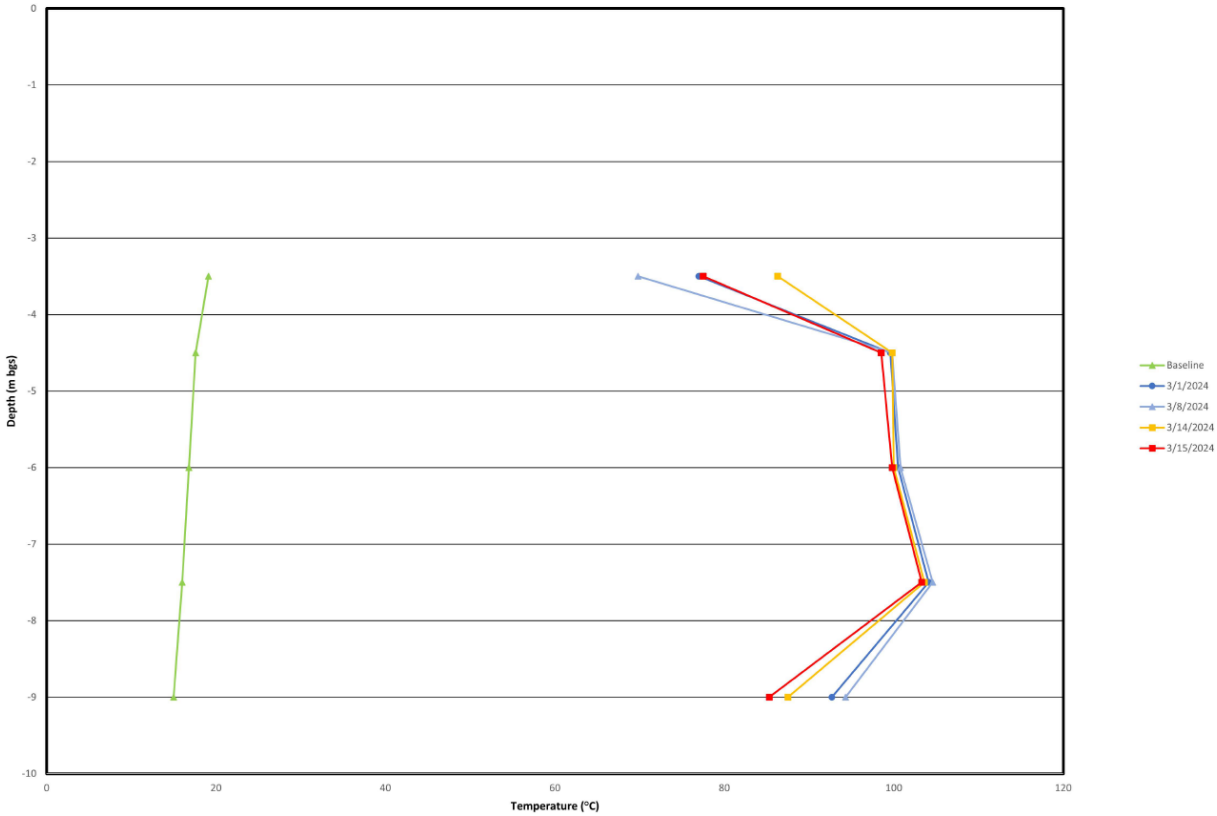
TMP J03 - Mortsel



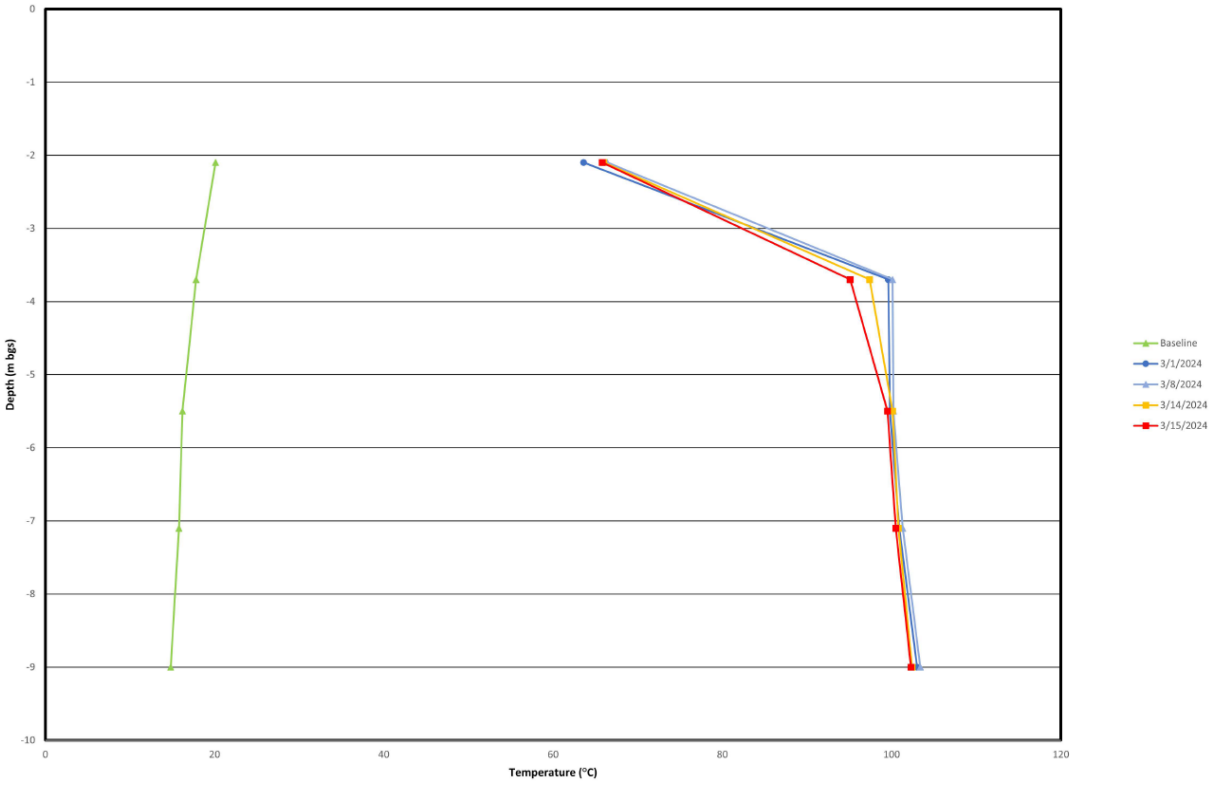
TMP K06 - Mortsel



TMP K10 - Mortsel



TMP N04 - Mortsel



Mortsel TMP Average Temperature over Time

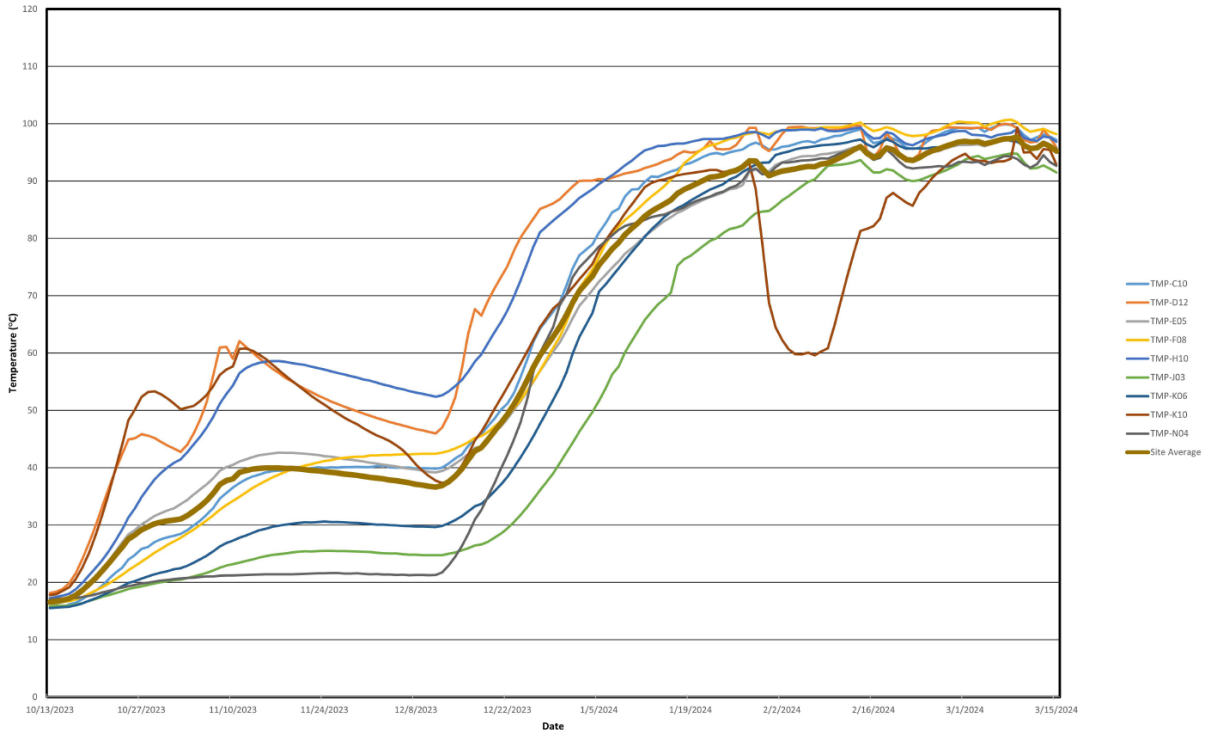


Figure 3. Cumulative Mass Removed vs. Time