OVAM Mortsel: Bi-weekly report

Soil remediation by Electric Resistance Heating

January 5 - 19, 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 January 5 to 19, 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 2 and 3 of 2024. During this period the site was visited 6 times.

In the reporting period the following works were performed:

- General data collection and inspections
- Installed fan to create more draught in SL111
- CARS software was updated
- Made a cooling coil to be able to sample bleed valves at electrodes
- Disconnected VGAC vessel 1
- Made preparations for cable- changes
- General checks and equipment maintenance.
    - Repaired a small leak in drip system
    - Fixed the pressure side of blower 2 to mitigate a minor leak
    - Drained the hoses of the blowers and led drainage over WGAC
        - Installed an extra valve in effluent tubing of blowers to remove eventual condensate.
    - Replaced pressure sensor T-N04 (water damage)
    - Optimized vapor extraction

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 January 19	Percentage of total
Operation Time (days)	137[1]	59[3]	43,1%
Cumulative Energy Applied (kW)	3.800.000[2]	1.233.457	32,5%

Total energy for ERH and auxiliary Equipment was ca. 1.233 MWh. Energy applied for ERH up to January 19 was ca. 1.195 MWh.

4 Temperature Monitoring

During the reporting period of January 5 to 19 the site average subsurface temperature increased from 75,4 degrees Celsius (°C) to 89,0 °C, an increase of 13,6 °C this period. This represents an average temperature increase of approximately 0,97 °C/day. The daily rise of the average site temperature is decreasing, which is logical as the upper limits are nearly reached. The temperature in several RTD's has reached the boiling temperature.

The highest individual temperature measurement within the treatment volume is 102,3 ˚C at TMP N04 at 9 meters below ground surface (bgs). Subsurface temperatures at different depths per TMP location and over time are presented in **Figure 2**.

[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 99 days.

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 23,3 °C, the maximum temperature is 30,8 °C in RTD T4.

5 Vapor Recovery

During the reporting period the vacuum applied to the vapor recovery piping system (as measured at the condenser inlet) was maintained around 100 mbar. All 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 1.030 m³/hour.

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 the 19th of January, was 21,1 ppm, a 4,5-fold decrease as opposed to the 95,5 ppm at January 5. During the reporting period, the highest recorded PID measurement in the soil vapor was 36,7 ppm on January 8. This indicates decreased contaminant mass in the extracted soil vapor, which can be an indication that the peak of the contamination might have been passed.

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 first VGAC vessel was saturated and desorbing. During the site meeting on January 16, the decision was made to disconnect the first carbon filter and not connect the large carbon filter, which is filled with 10 m^3 of activated carbon. Temporary operation proceeded with only one carbon filter (18 m^3 of activated carbon). This was permitted, based on a calculation note provided by TEC. In response to OVAM's request, an additional carbon filter with 1 m^3 of activated carbon will be mobilized delivered on January 22. Another Mach4X vessel, containing 10 m^3 of GAC, is still on site as spare.

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 second GAC filter consistently was 0,0 ppm. TEC will periodically take vapor samples from the influent and effluent of each vessel.

7 Condensate and water treatment

During the reporting period 345 m^3 of water was recovered via condensed water by the vapor recovery system. A total of 642 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.

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 34 kg. The total mass recovered from the subsurface since the start of the project is circa 322 kg **(Figure 3.)**.

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, little presence of CVOC in daily ambient air monitoring was measured (0,1 ppm). This was measured on the 8th of January in the equipment zone, and between the 12th and 16th of January in the basement of Statielei 113. This concentration does not exceed the set limits. No leaks were found in these zones and a similar concentration did not occur before or after these dates. The rest of the measurements showed 0,0 ppm. 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 on the right side.

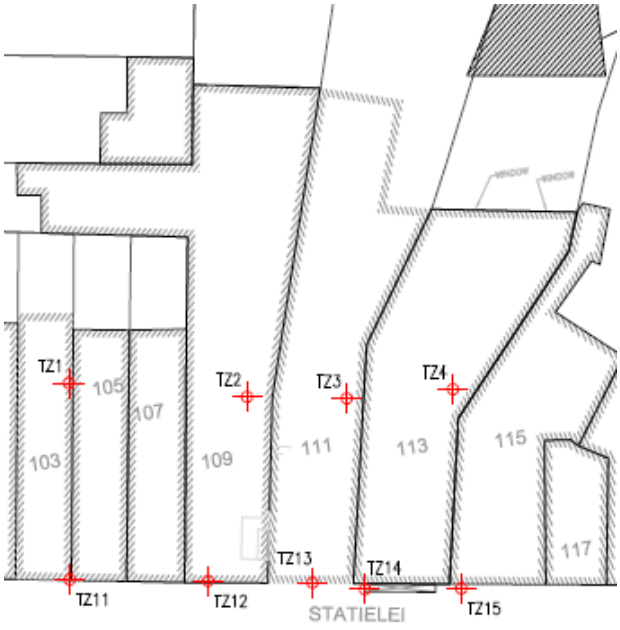


Table 2. Results settlement measurements

dossier nr.:	#
werf:	Wegrosan - Mortsel Statielei
datum:	12/01/2024
Operator:	K.J. - S.B.

ZETTINGSMETING

Nr. pt	19/04/23	Δ	TOT Δ	15/12/23	Δ	TOT Δ	22/12/23	Δ	TOT Δ	05/01/24	Δ	TOT Δ	11/01/24	Δ	TOT Δ	16/01/24	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
TZ2	8,780			8,778	0	-2	8,778	0	-2	8,778	0	-2	8,778	0	-2	8,778	0	-2
TZ3	12,178			12,177	0	-1	12,176	-1	-2	12,176	0	-2	12,176	0	-2	12,176	0	-2
TZ4	9,256			9,256	0	0	9,256	0	0	9,256	0	0	9,256	0	0	9,256	0	0
TZ11	5,211			5,209	0	-2	5,209	0	-2	5,209	0	-2	5,209	0	-2	5,209	0	-2
TZ12	8,150			8,147	0	-3	8,147	0	-3	8,147	0	-3	8,147	0	-3	8,147	0	-3
TZ13	11,095			11,095	0	0	11,095	0	0	11,095	0	0	11,095	0	0	11,095	0	0
TZ14	8,922			8,922	0	0	8,922	0	0	8,922	0	0	8,922	0	0	8,923	1	1
TZ15	3,971			3,971	0	0	3,970	-1	-1	3,970	0	-1	3,970	0	-1	3,971	1	0

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

Limited settlements (2 – 3 mm) have been measured in buildings Statielei 103, 109 and 111. This period very small changes in settlement occurred, these settlements are not expected to cause any trouble. Settlements will be monitored on a weekly basis.

11 Planned Activities

Planned activities for the following two weeks (4 and 5) involve:

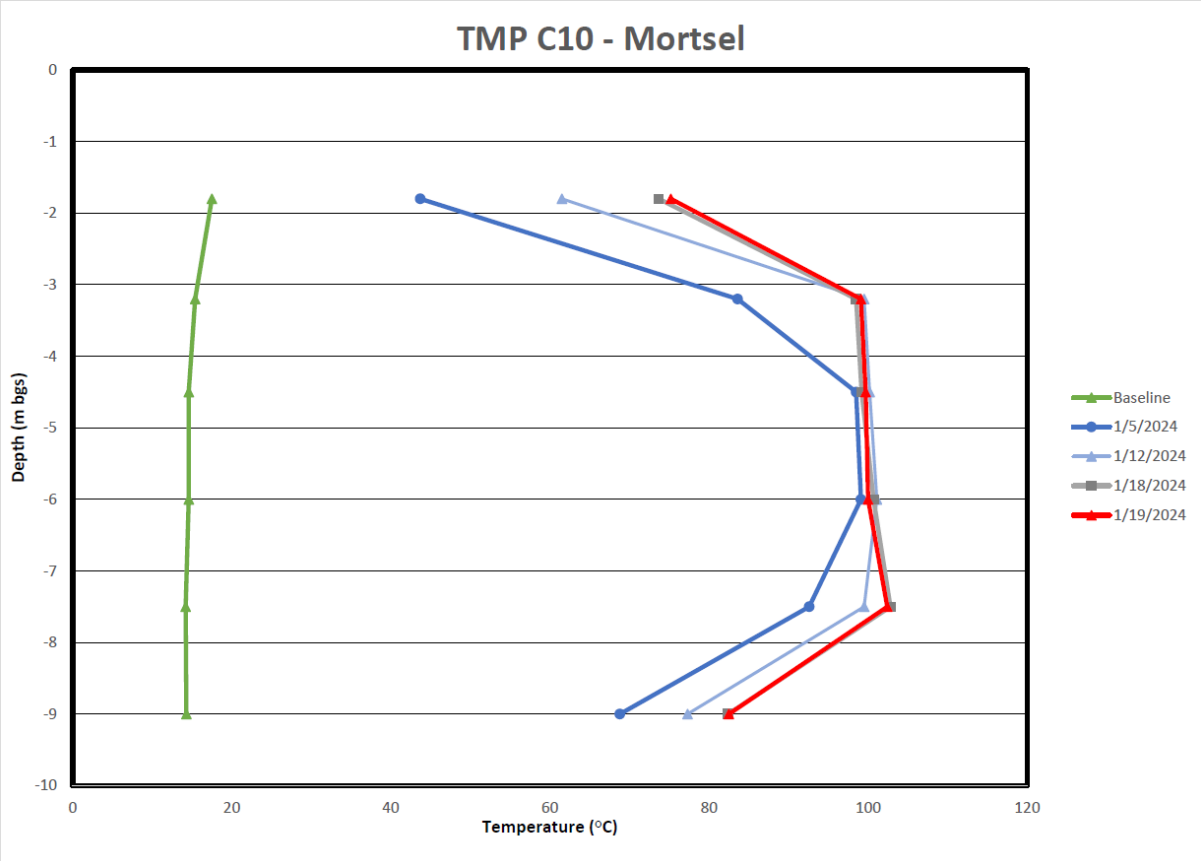
- Regular monitoring and maintenance activities
- Installing the new pump housing for the Busch blowers
- Optimize electrode settings
- Increase dripping
- Hot soil and groundwater monitoring

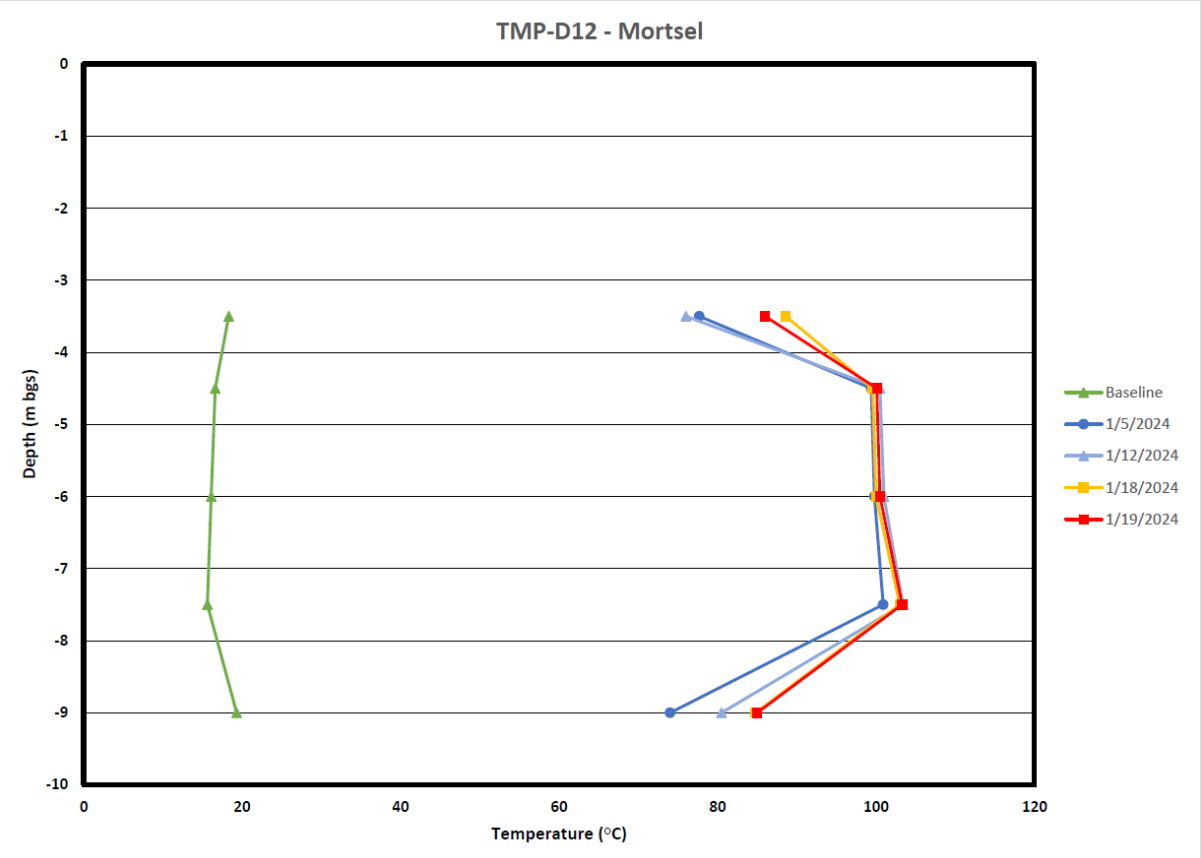
Figures

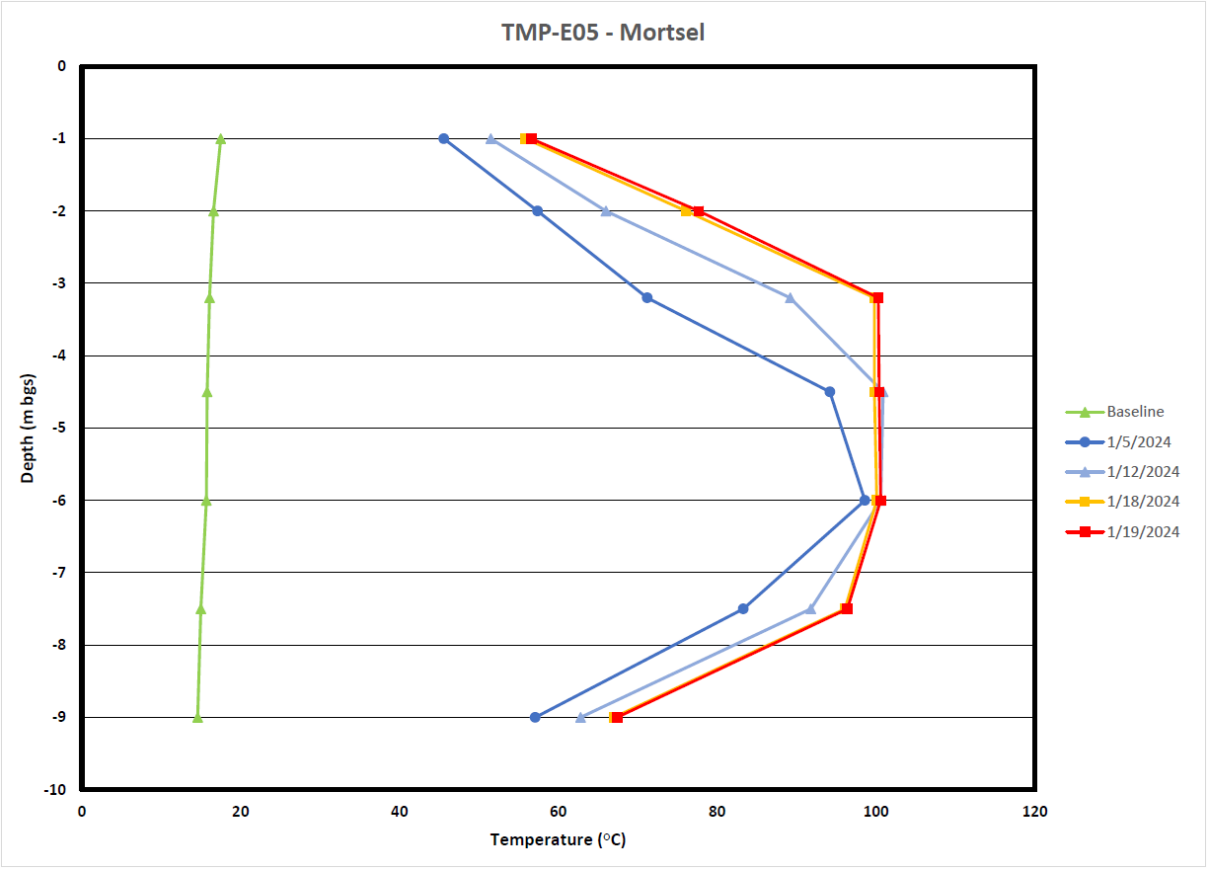
Figure 1: Site plan

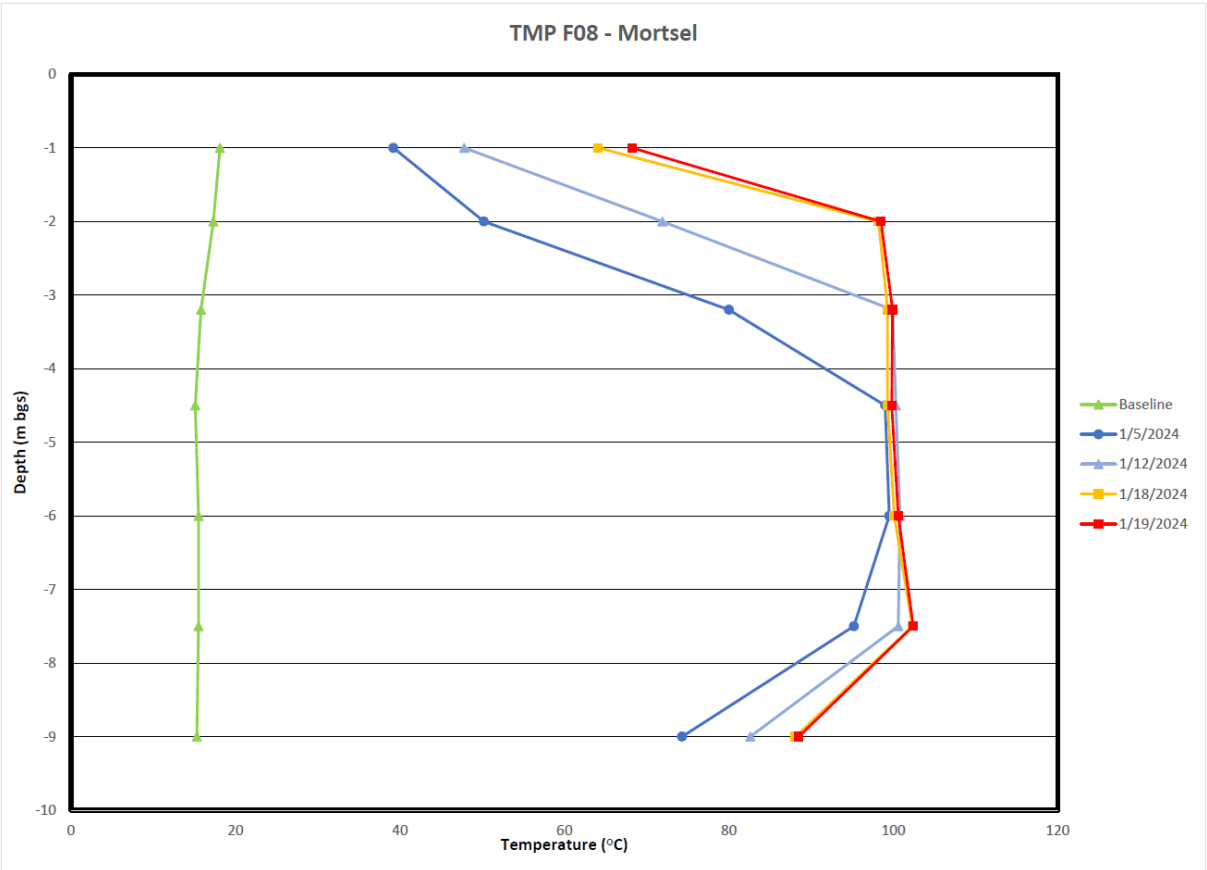
The as built site plan is attached separately

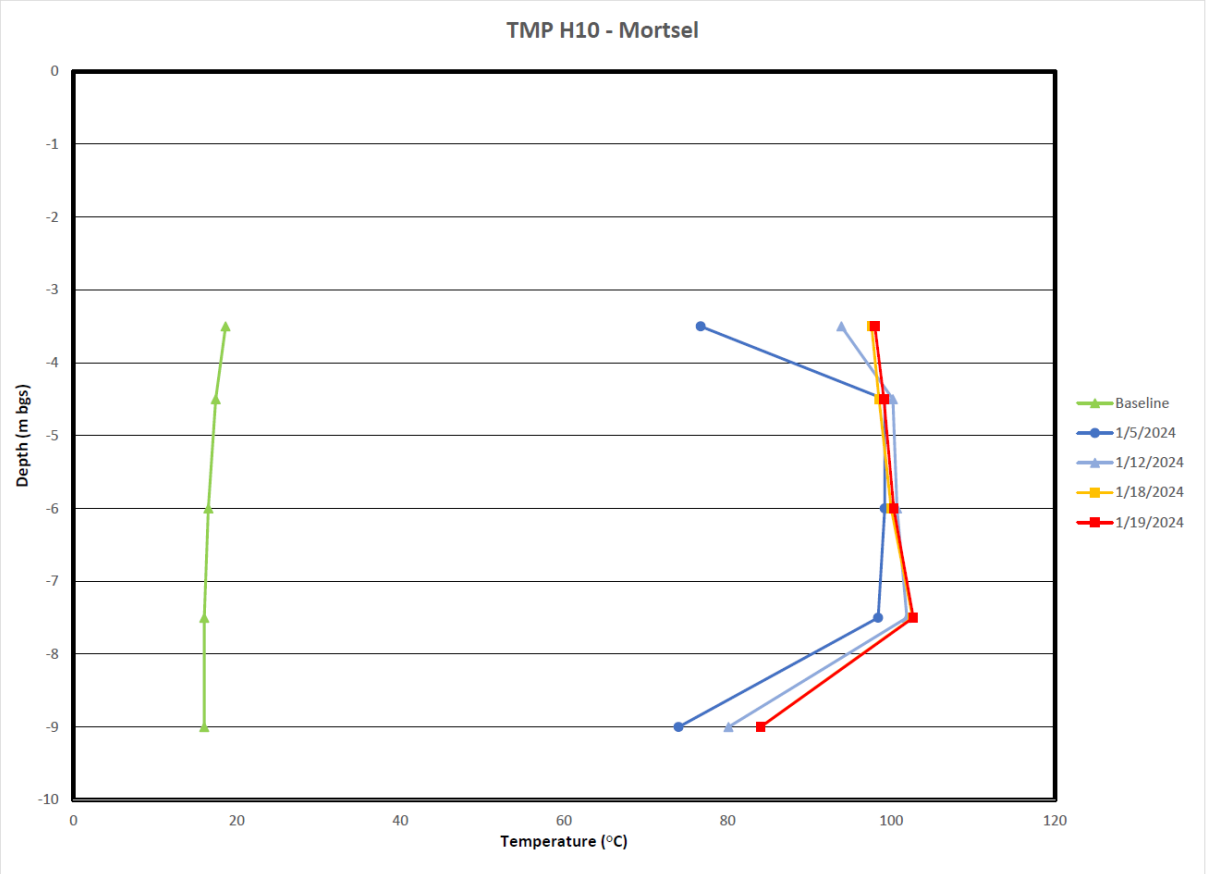
Figure 2. Average Temperature vs. Time (By TMP)

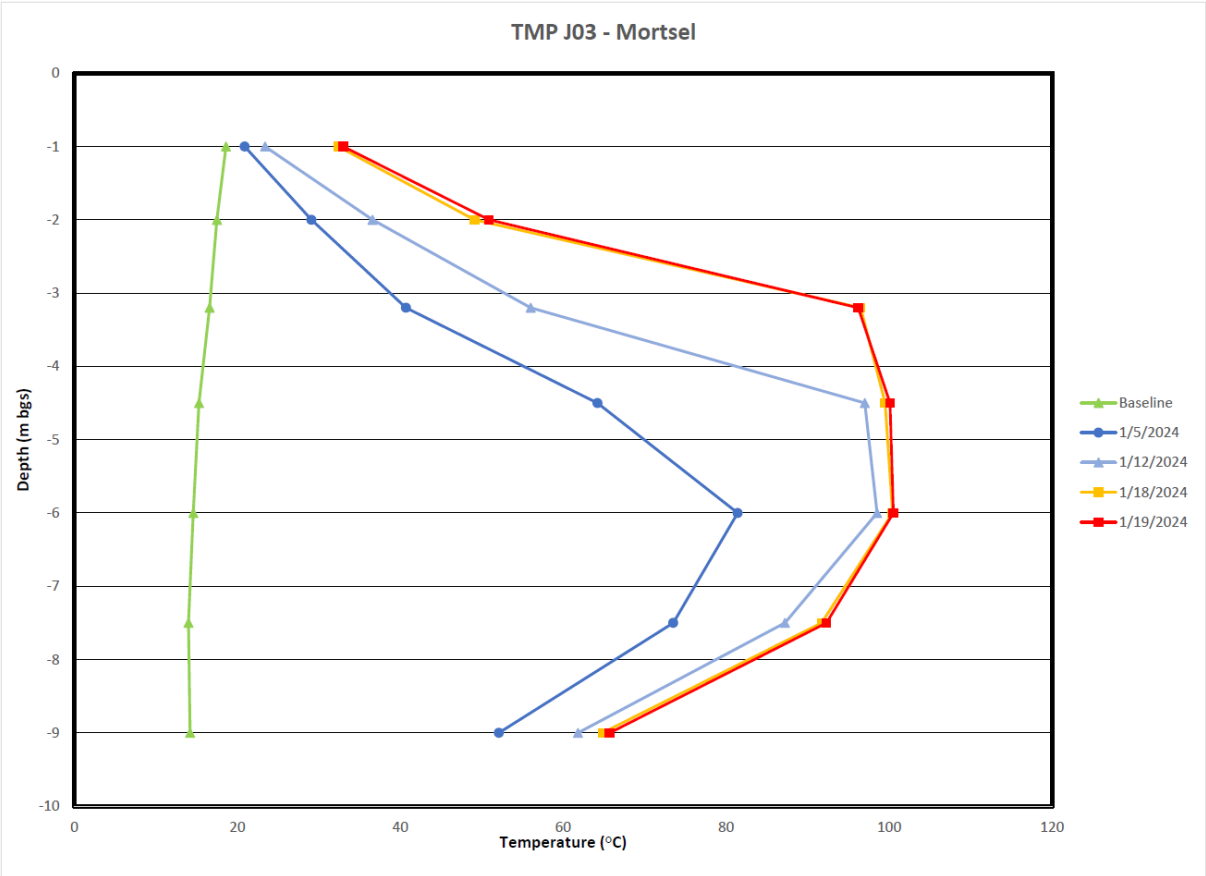


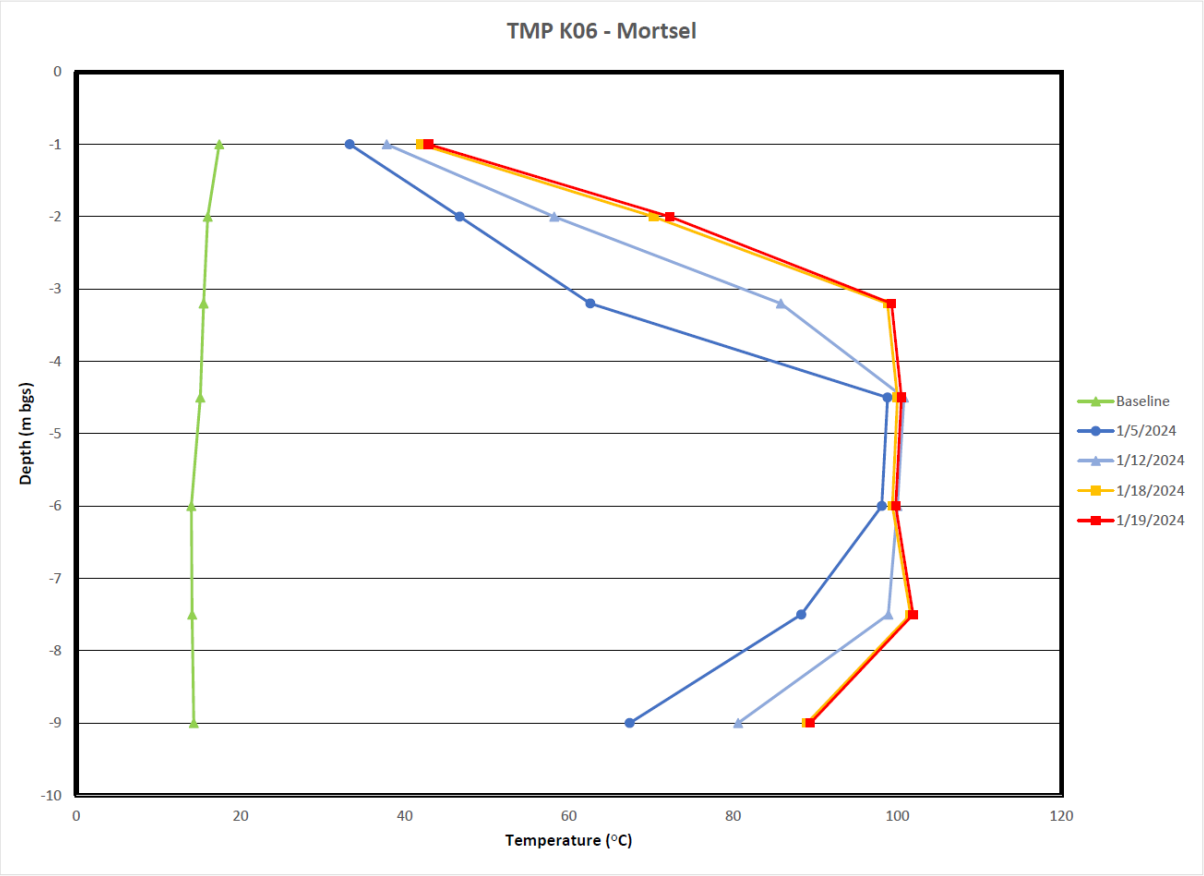


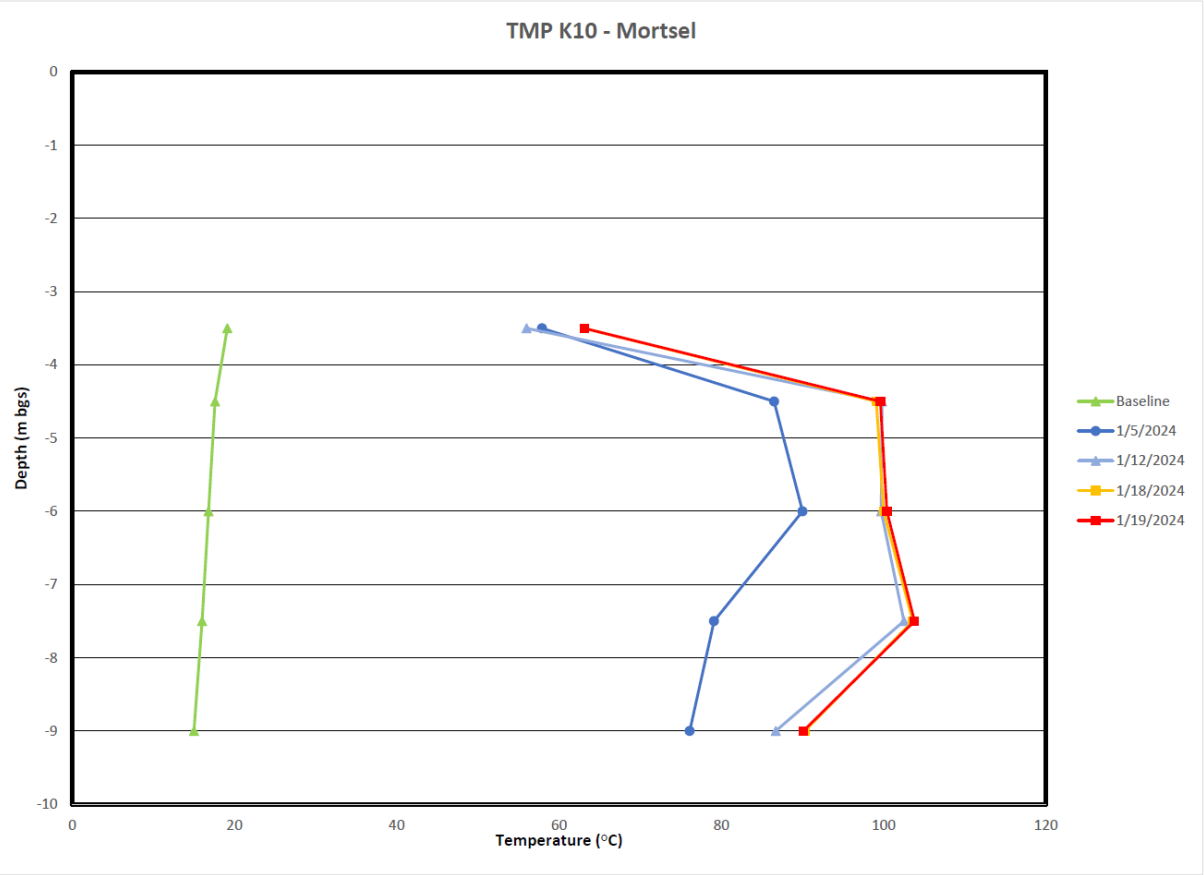

TMP-E05 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
1/5/2024
1/12/2024
1/18/2024
1/19/2024

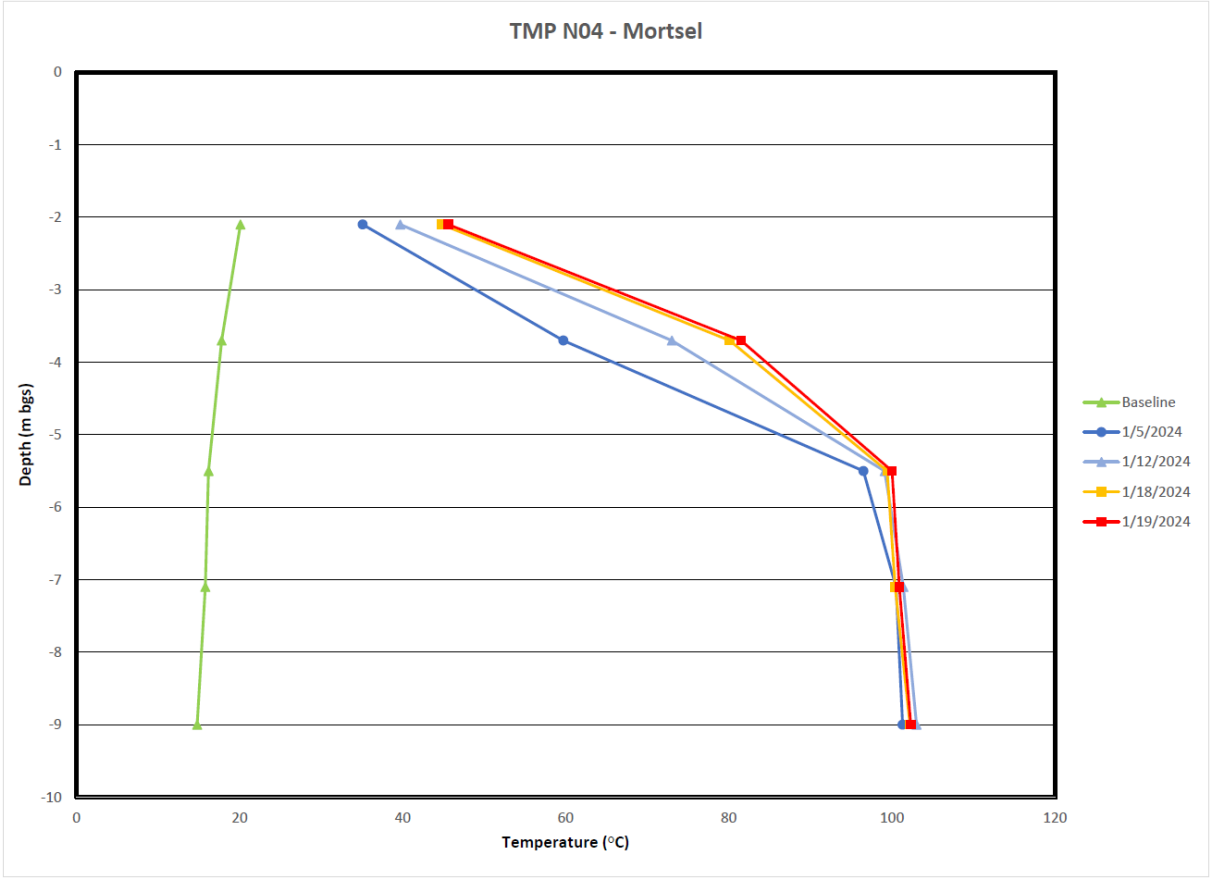

TMP F08 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
1/5/2024
1/12/2024
1/18/2024
1/19/2024


TMP H10 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
1/5/2024
1/12/2024
1/18/2024
1/19/2024


TMP J03 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
1/5/2024
1/12/2024
1/18/2024
1/19/2024


TMP K06 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
1/5/2024
1/12/2024
1/18/2024
1/19/2024


TMP K10 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
1/5/2024
1/12/2024
1/18/2024
1/19/2024


TMP N04 - Mortsel
Depth (m bgs)
0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
0
20
40
60
80
100
120
Temperature (°C)
Baseline
1/5/2024
1/12/2024
1/18/2024
1/19/2024

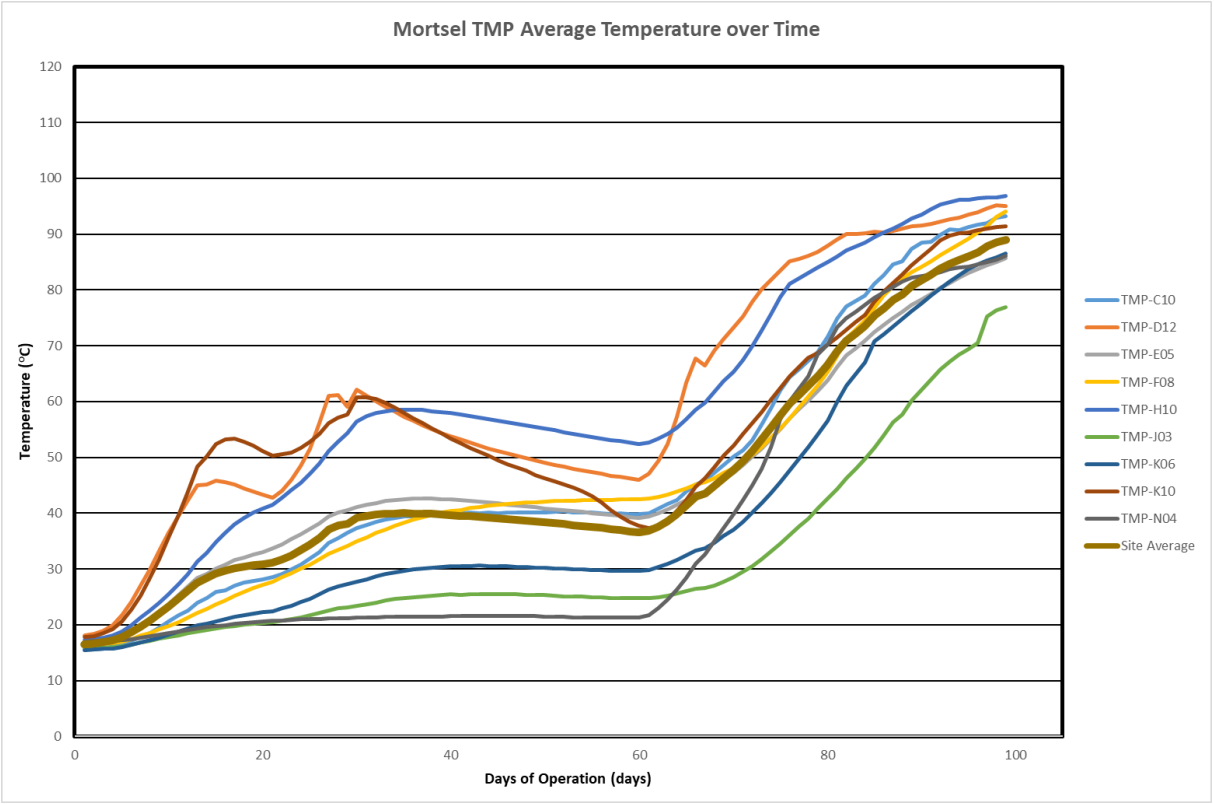

Mortsel TMP Average Temperature over Time
Temperature (°C)
120
110
100
90
80
70
60
50
40
30
20
10
0
0
20
40
60
80
100
Days of Operation (days)
TMP-C10
TMP-D12
TMP-E05
TMP-F08
TMP-H10
TMP-J03
TMP-K06
TMP-K10
TMP-N04
Site Average

Figure 3. Cumulative Mass Removed vs. Time