# Proposed Warehouse Development

FINAL

## Preliminary Hydrogeological Assessment

**Project Location:**
12035 Dixie Road, Caledon, Ontario

**Prepared for:**
Tribal Partners (Canada) Inc.
201-2700 Steeles Avenue West
Vaughan, ON

**Prepared by:**
MTE Consultants
123 St. George St.,
London, ON

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**MTE File No.:** 47477-400

Engineers, Scientists, Surveyors.

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# 1.0 Introduction

MTE Consultants Inc. (MTE) was retained by Tribal Partners (Canada) Inc. (Tribal) to carry out a preliminary hydrogeological assessment to support the proposed development of 12035 Dixie Road in Caledon, Ontario (hereinafter referred to as the "Site"). The approximate location of the Site is shown on **Figure 1**.

The Site is approximately 59.5 hectares (~147 acres) in area and is located on the east side of Dixie Road and the north side of Mayfield Road in an agricultural area of Caledon, Ontario. The Site is currently agricultural cropland with rural residences and associated outbuildings.

Based on the Concept Plan prepared by Baldassarra Architects Inc., the Site will be developed as an industrial warehousing complex consisting of four slab on-grade buildings with associated at-grade parking and a stormwater management facility. A copy of the Concept Plan is provided in **Appendix A**.

## 1.1 Study Objectives

The objectives of the preliminary hydrogeological assessment were to:

- Summarize the local hydrogeological conditions;
- Provide hydrogeological input to the Site design;
- Provide a qualitative assessment of the dewatering and permitting requirements;
- Identify groundwater receptors and assess the potential for hydrogeological impacts on these receptors as a result of the proposed development; and
- Provide recommendations for additional work, groundwater monitoring and/or mitigation, as required.

# 2.0 Background Review

The following sections present the results of the background information review and describe the Site setting in a regional context.

## 2.1 Previous Investigations

A Phase I environmental investigation was completed by MTE (report dated September 20, 2020). The Phase I recommended that a Phase II ESA be completed, which was undertaken concurrently with this investigation. The results of the Phase II ESA were provided under separate cover.

No other hydrogeological, geotechnical, environmental or natural heritage reports are known to have been previously completed for the Site.

To support the design of the proposed development, a concurrent geotechnical investigation was also completed by MTE.

Although the results of the concurrent geotechnical and Phase II ESA investigations are provided under separate cover, relevant subsurface information has been reviewed and incorporated into the hydrogeological assessment, where appropriate.

In addition, the following additional studies have been undertaken concurrently by WSP to support the proposed development and may be relevant to the hydrogeological assessment:

- Comprehensive Environmental Impact Study and Management Plan (CEISMP);
- Stormwater Management Report;
- Functional Servicing Report; and
- Naturalized Channel Design.

## 2.2 Terrain

### 2.2.1 Topography and Drainage

Based on a Plan of Survey prepared by R. Avis Surveying Inc., the Site topography slopes gently downwards to the east and north, with ground surface elevations ranging from a topographic high of approximately 262 metres (m) above mean sea level (AMSL) along Dixie Road near the central part of the Site to a topographic low of approximately 252 m AMSL within the meander belt of Kilamanagh Creek in the northern portion of the Site.

Kilamanagh Creek, also known as Cambells Cross Creek, is a tributary of the West Humber River. The tributary transects the northern corner of the property, flowing west to east. The approximate length (ignoring sinuosity) of the on-Site reach of the tributary is 340 m.

In the western corner of the Site, another tributary of the West Humber River (Tributary 'A') enters the Site through a culvert beneath Dixie Road and flows east across the central portion of the Site before leaving through a culvert beneath Mayfield Road.

### 2.2.2 Physiography

The landforms within the region are primarily the result of the movement and deposition of sediments as a result of glacial advancement and recession during the most recent periods of glaciation. The Site is located within the broad physiographic region known as the South Slope (Chapman & Putnam, 1984). This region is a sloping till plain that extends from the Oak Ridges Moraine located approximately 10 kilometers (km) northwest of the Site to the Peel Plain, located approximately 3 km to the east.

## 2.3 Regional Geology

### 2.3.1 Overburden

The Quaternary deposits in the region of the Site are mapped as a predominantly clay to silt textured till derived from glaciolacustrine deposits (Ontario Geological Survey, 2003). Along the northern boundary of the Site, modern alluvial deposits consisting of silt, sand and gravel can also be found associated with Kilamanagh Creek (Ontario Geological Survey, 2003). The Quaternary geology in the vicinity of the Site is shown on **Figure 2**.

### 2.3.2 Bedrock

Bedrock topography mapping suggests the elevation of the bedrock surface in the vicinity of the Site ranges from approximately 221 m AMSL in the north to 236 m AMSL in the south (Ontario Department of Mines, 1968). The bedrock consists of Upper Ordivician shales and siltstones of the Queenston Formation (Fm) (Armstrong & Dodge, 2007). The Queenston Formation is characterized by red shale; however, it also contains red siltstone, minor green shale and siltstone, with variable calcareous siltstone to sandstone and limestone interbeds (Johnson, Armstrong, Sanford, Telford, & Rutka, 1992). The Queenston Formation gradationally overlies the Georgian Bay Formation and the Carlsbad Formation in eastern Ontario (Armstrong & Dodge, 2007).

## 2.4 Regional Hydrogeology

### 2.4.1 Water Well Information System

The MECP Water Well Information System (WWIS) was queried for data pertaining to all wells located within an approximate 500 m radius of the Site and resulted in data for 44 wells. The well records corresponded to the following:

- Eleven records were for wells reportedly used as a water supply;
    a. These records included five large diameter bored or dug wells completed at shallow to intermediate depths within the glacial till that are anticipated to have low yields and primarily rely on storage to meet supply demands;
    b. The remaining water supply wells were primarily completed within deep confined overburden or bedrock aquifers;
- Eleven records were reported to be used as test holes, monitoring or observation wells;
- One record reportedly corresponded to a cluster of 18 dewatering wells;
- Thirteen records were for wells reported to have been abandoned; and
- Eight records did not include information on well status or use.

The approximate locations of these wells, as indicated in the MECP well records, are shown on **Figure 3**. Pertinent information from these well records is summarized in **Table 1**.

### 2.4.2 Permit to Take Water Database

The MECP Permit to Take Water (PTTW) database (Ministry of Environment, Conservation and Parks, 2021) was queried for data pertaining to all wells located within an approximate 500 m radius of the Site and resulted in records for two permits. The permits corresponded to the following water takings:

- An inactive permit (2005-ATKP3Z) previously issued to the Regional Municipality of Peel for a water taking at the intersection of Dixie and Mayfield road immediately south of the Site. The permit was issued in December 2017, allowed 365 days of water taking and expired December 2018. It was issued for the purpose of construction dewatering and allowed daily water takings of up to 4,000,000 litres per day (L/day) at a maximum rate of 2,778 litres per minute (L/min).

- An inactive permit (1252-6P8LA4) previously issued to Bianchi Contracting Inc. for a water taking located approximately 400 m west of the Site. The permit was issued in May 2006, allowed 30 days of water taking and expired October 2006. It was issued for the purpose of construction dewatering and allowed daily water takings of up to 398,800 L/day at a maximum rate of 277 L/min.

#### 2.4.3 Source Protection

The Source Protection Information Atlas (Ministry of Environment, Conservation and Parks, 2021) was used to confirm that the Site is not within:

- an Intake Protection Zone (IPZ);
- a Wellhead Protection Area (WHPA);
- a Highly Vulnerable Aquifer (HVA); or
- a Significant Groundwater Recharge Area (SGRA).

### 2.5 Natural Heritage Features

No Environmentally Significant Areas (ESAs) (Region of Peel, 2008) or Areas of Natural and Science Interest (ANSIs) were identified within 500 m of the Site (Land Information Ontario, 2020). A Provincially Significant Wetland (PSW), associated with the Heart Lake Wetland Complex, is located approximately 400 m southwest of the Site (Land Information Ontario, 2020).

The CEISMP identified the following local natural heritage features in the vicinity of the Site:

- Kilamanagh Creek (designated as coldwater) and associated riparian wetland communities in the northeast corner of the Site; and
- Tributary 'A', an intermittent/ephemeral watercourse flowing east through the central portion of the Site.

The approximate locations of the above natural heritage features are shown on **Figure 4**. For detailed information on these features, reference should be made to the CEISMP (WSP, 2021).

No groundwater dependent plant species were identified on-Site during the fieldwork completed for the CEISMP (WSP, 2021).

## 3.0 Field Investigation

### 3.1 Drilling Program

The drilling program for the concurrent geotechnical investigation was carried out between October 30 and November 13, 2020. Fifty-four boreholes were drilled at the approximate locations shown on **Figure 4.** The boreholes were advanced with either a CME 75 or a Geoprobe 7822DT track-mounted drill rig each equipped with continuous flight solid or hollow stem augers. The drill rigs were supplied and operated by Tri-Phase Group under the supervision of MTE. The stratigraphy encountered in the boreholes is shown on the borehole logs provided in **Appendix B**. Particle size distribution curves for representative soil samples are provided in **Appendix C**.

## 3.2 Monitoring Wells

Upon completion of drilling, monitoring wells were installed in eight boreholes and designated MW101-20 to MW108-20. The remaining boreholes were backfilled in general accordance with Ontario Regulation (O.Reg.) 903, as amended, under the Ontario Water Resources Act.

Monitoring wells MW101-20, MW104-20 to MW108-20 were screened within the confined saturated granular deposits interbedded within the glacial till. MW102-20 and MW103-20 were screened entirely within the glacial till deposits. Each of the monitoring wells were constructed with 0.9 to 1.5-metre long, nominal 50 mm inside diameter (ID), slot 10, Schedule 40 polyvinyl chloride (PVC) well screens threaded to PVC riser pipes. A sand pack consisting of commercially available silica sand was used to backfill the borehole annulus surrounding the well screen. The annulus above the sand pack was backfilled with bentonite to near ground surface and hydrated in place. The monitoring wells were secured with monument-style protective casings cemented in place.

Following their construction, the monitoring wells were mechanically developed using a hydrolift pump and dedicated low density polyethylene (LDPE) tubing equipped with an inertial foot valve and surge block. The monitoring wells were purged of a minimum of three standing well volumes or until dry three times.

Details of the monitoring well construction and encountered groundwater levels are provided on the borehole logs in **Appendix B**. The approximate locations of the monitoring wells are shown on **Figure 4**.

The monitoring wells were installed in general accordance with O.Reg. 903, as amended. The construction, maintenance and abandonment of the wells are regulated under the Ontario Water Resources Act (OWRA).

## 3.3 Staff Gauges and Mini-Piezometers

On November 19, 2020 three staff gauges (SG1, SG2, SG3) were installed within the on-Site watercourses in order to monitor stage and assess groundwater and surface water interactions.

A mini-piezometer (P1) was also installed on November 19, 2020 and was located on the southern bank of Kilamanagh Creek, near SG2. The auger hole was manually advanced to a refusal depth of 0.8 m BGS. Based on the observed auger samples, the shallow sediments consisted of topsoil to approximately 0.2 m BGS, underlain by clayey silt with some sand to approximately 0.6 m BGS, followed by gravelly sand with some silt to the auger hole terminus.

The mini-piezometer was constructed with a 0.15 m long, nominal 25 mm inside diameter (ID), slot 10, Schedule 40 PVC well screen threaded to PVC riser pipe. A sand pack consisting of commercially available silica sand was used to backfill the annulus surrounding the well screen. The annulus above the sand pack was backfilled with granular bentonite to near ground surface and hydrated in place.

The approximate staff gauge and mini-piezometer locations are shown on **Figure 4.**

### 3.4 Elevation Survey

The ground surface elevations at the borehole locations, top of pipe elevations for the monitoring wells and mini-piezometer, and top of steel elevations for the staff gauges were surveyed by MTE and referenced to geodetic datum.

### 3.5 Hydraulic Conductivity Testing

Single well response tests were conducted in monitoring wells MW101-20, MW103-20 MW105-20 and MW108-20 to estimate the hydraulic conductivity of the saturated granular deposits confined beneath the glacial till deposits at the Site and to confirm the hydraulic conductivity of the glacial till. Prior to initiating the tests, each monitoring well was instrumented with a pressure transducer equipped with a datalogger to measure water levels at a suitable frequency during the tests.

The water level dataset collected during the single well response tests was analyzed using the AquiferTest Pro software package. Hydraulic conductivity ($K$) values for each test were estimated using the Hvorslev analytical solution (Hvorslev, 1951). The results of the single well response tests are provided in **Appendix D** and summarized in **Table 2**.

The results of the hydraulic testing analyses indicate that the estimated $K$ values for the confined sand deposits range between approximately $1 \times 10^{-5}$ and $3 \times 10^{-6}$ meters per second (m/s), with a geometric mean of approximately $4 \times 10^{-6}$ m/s (n = 10). The $K$ values estimated from the single well response tests are consistent with the range of hydraulic conductivity values reported by Freeze and Cherry (1979) for silt, silty sand and sand deposits.

In comparison, the results of the single well response testing on MW103-20 estimate a hydraulic conductivity of $2 \times 10^{-7}$ m/s (n = 2) for the glacial till deposits.

### 3.6 Monitoring Program

Pressure transducers equipped with dataloggers were installed in five monitoring wells (MW101-20, MW102-20, MW104-20, MW105-20 and MW108-20). The dataloggers were configured to record water levels at one hour intervals and the data was downloaded on a quarterly basis. The transducer readings were compensated for changes in atmospheric pressure using data collected by a barometric pressure transducer installed at the Site for the duration of the monitoring period. During the compensation process, level offsets using corresponding manual water level measurements collected at the time of download were applied to the data to convert the water levels to geodetic elevations. Hydrographs of the compensated groundwater elevations are provided in **Appendix E**.

Groundwater and surface water elevations are manually measured in all eight monitoring wells, one piezometer and at three staff gauge locations during each quarterly monitoring event. The results obtained over the period of record (November to December 2020) are summarized in **Table 3**.

Quarterly download of the dataloggers and manual measurement of groundwater and surface water levels will continue until September 2021, at which time the need for continuation of the groundwater monitoring program will be reassessed.

# 4.0 Hydrostratigraphy

## 4.1 Stratigraphy

The simplified stratigraphy inferred from the boreholes is shown on the cross-sections provided on **Figure 5**, **Figure 6** and **Figure 7**. The stratigraphy encountered in each borehole is shown on the borehole logs provided in **Appendix B**. Particle size distribution curves for representative soil samples are provided in **Appendix C**.

In general, the encountered stratigraphy typically consisted of topsoil and/or surficial fill overlying glacial till deposits interbedded with sand and silt deposits. The till deposits are considered an aquitard ($K$ ~ 2 x $10^{-7}$ m/s) and act as a confining layer for the saturated granular deposits ($K$ ~ 4 x $10^{-6}$ m/s). Further details on the composition of these strata are provided in the following subsections and in the Geotechnical Report (MTE Consultants, 2021).

### 4.1.1 Glacial Till Deposits

The till is grey to brown in colour with mottled to monochrome appearance and typically ranges in composition from sandy clayey silt to sandy silt and gravel to silt. Seams of sand and silt were encountered in the till deposits. Cobbles were present within the till deposits encountered in some boreholes. Boulders and cobbles should be expected in the glacial till strata. **Table 4.1** summarizes the variability in the particle size composition within the encountered glacial till deposits.

**Table 4.1 – Particle Size Distribution Results for Glacial Till Deposits**

| Borehole ID | Sample Depth (m) | Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|
| MW102-20 | 9.9 – 10.5 | 7 | 33 | 39 | 21 |
| MW103-20 | 7.6 – 8.1 | 8 | 27 | 43 | 22 |
| MW108-20 | 10.7 – 11.1 | 0 | 4 | 81 | 15 |
| BH130-20 | 1.5 – 2.1 | 7 | 34 | 37 | 22 |
| BH148-20 | 3.0 – 3.5 | 5 | 39 | 37 | 19 |

### 4.1.2 Granular Deposits

Granular deposits were encountered as interbedded sand and silt deposits within or beneath the glacial till. The sand deposits are grey to brown in colour and typically range in composition from sand and silt to sand to gravelly sand. Cobbles were present within the sand deposit encountered in one borehole. The silt is grey to brown in colour and typically range in composition from silt to sandy silt.

These granular deposits were encountered at elevations ranging from approximately 256.0 to 244.8 m AMSL, corresponding to depths ranging from 2.3 to 11.0 m BGS. The total thickness of the encountered granular deposits ranged from approximately 0.5 to 5.8 m in thickness, though several boreholes were terminated within these deposits. **Table 4.2** summarizes the variability in the particle size composition within the encountered granular deposits.

**Table 4.2 – Particle Size Distribution Results for Granular Deposits**

| Borehole ID | Sample Depth (m) | Gravel (%) | Sand (%) | Silt (%) | Clay (%) |
|---|---|---|---|---|---|
| MW101-20 | 11.4 – 12 | 7 | 48 | 36 | 9 |
| MW104-20 | 9.9 – 10.5 | 0 | 12 | 81 | 7 |
| MW105-20 | 6.9 – 7.3 | 0 | 87 | 7 | 6 |
| MW106-20 | 6.6 – 7.9 | 0 | 26 | 67 | 7 |
| MW107-20 | 9.1 – 9.8 | 0 | 75 | 19 | 6 |

## 4.2 Groundwater Elevations

The encountered groundwater levels are shown on the borehole logs in **Appendix B** and manually measured groundwater levels are summarized in **Table 3**. Hydrographs of the compensated groundwater elevations are provided in **Appendix E**.

During drilling, groundwater was encountered within the sand or silt deposits in Boreholes MW101-20, MW105-20, MW106-20, MW108-20, BH137-20, MW155-21 at depths of 3.0 to 11.0 m below the ground surface. The remaining boreholes were dry during drilling.

The measured groundwater elevations within the confined granular deposits have ranged from a maximum of 252.34 m AMSL at MW108-20 to a minimum of 243.79 m AMSL at MW104-20 over the monitoring period to date (November to December 2020). The hydrographs show a muted response following significant precipitation events, remaining relatively consistent over the period of record, as expected for granular deposits confined by laterally extensive low permeability glacial till deposits.

The relatively linear trend in the measured groundwater elevations recorded by the datalogger at MW102-20 is suspect. Groundwater elevations at this location will be further assessed following the next quarterly monitoring event.

The groundwater elevations at MW101-20, MW107-20 and MW1087-20 are noted to be above the top of the aquifer indicating artesian conditions are present at these locations.

It is noted that the monitoring period to date has coincided with a period when regional groundwater levels in southern Ontario are typically increasing as they rise towards their seasonally high levels in the late winter or early spring and then begin to decline towards their seasonally low levels, which generally occur in late summer or early fall. Though the observed muted response to precipitation events over the period of record suggests that recharge is somewhat independent of local precipitation, for the purposes of design, groundwater elevations potentially one metre higher should be anticipated during the period of seasonally high groundwater levels following the spring freshet. Groundwater monitoring at the Site is currently scheduled to continue until September 2021. The amplitude of the seasonal variation will be further assessed following completion of the proposed monitoring period.

Because MW102-20 and MW103-20 were constructed with their well screens within the low permeability glacial till deposits, caution should be used when interpreting their groundwater level measurements. In general, groundwater level measurements within an aquitard should be limited to assessing vertical gradients within or between strata.

**Figure 8** shows the inferred potentiometric surface and flow direction across the Site for December 2020. The results indicate that the groundwater flow direction is generally towards the east, with an approximate gradient (i.e., slope) of 0.013 m/m over the Site.

Groundwater conditions may subsequently differ from those described herein due to seasonal and inter-annual variations in groundwater levels and in response to significant precipitation events. The groundwater conditions at the time of construction should be confirmed by the contractor and their work plan modified as appropriate.

### 4.3 Groundwater and Surface Water Quality

Groundwater was sampled from two representative monitoring wells ((MW101-20 and MW105-20) on November 20, 2020. The samples were collected using dedicated inertial pumps and low-density polyethylene tubing. Prior to sampling, the wells were purged of a minimum of three equivalent well volumes of groundwater or purged dry three consecutive times.

A surface water sample was collected from Kilamanagh Creek in the vicinity of SG2.

The samples were collected into the appropriate bottles supplied by the analytical laboratory with the applicable preservatives added by the laboratory. Upon collection, the water samples were placed on ice in coolers and submitted under chain of custody to the Bureau Veritas Laboratories (BV Labs) depot in London, Ontario for analysis at their Mississauga laboratory.

No sheen, odours, free product or other evidence of potential environmental contamination were observed in the samples collected at these locations.

The samples were analyzed for a suite of general water quality parameters to establish a water quality baseline prior to development and assess groundwater-surface water interactions. The analytical results were compared to the Provincial Water Quality Objectives (PWQO) to assess if pumped groundwater could be discharged to a surface watercourse and three exceedances were reported. The results are summarized in **Table 4** and a copy of the laboratory Certificate of Analysis is provided in **Appendix F**.

The following parameters had concentrations that exceeded applicable PWQO criteria for the sample location specified:

- Dissolved Cobalt (Co) – PWQO criterion is 0.9 micrograms per litre (µg/L)
    i. MW105-20 ~ 2.1 µg/L
- Dissolved Iron (Fe) – PWQO criterion is 300 µg/L
    i. MW101-20 ~ 1700 µg/L
- Dissolved Uranium (U) – PWQO criterion is 5 µg/L
    i. MW105-20 ~ 5.3 µg/L

No other exceedances of PWQO criteria were noted.

Recommendations for additional water quality sampling are provided in Section 9.0.

# 5.0 Water Balance

Water balances for the pre- and post-development conditions were completed for the Site to assess potential impacts of the proposed development on infiltration.

## 5.1 Methodology

Following the Thornthwaite and Mather (1957) approach, the annualized water balance for the Site may be expressed as:

$$P = RO + ET + I + \Delta S$$

Where:

| | |
|---|---|
| $P$ | = precipitation |
| $RO$ | = runoff |
| $ET$ | = evapotranspiration |
| $I$ | = infiltration |
| $\Delta S$ | = change in groundwater storage (assumed to be negligible over long term) |

The difference between precipitation and evapotranspiration is the water surplus ($WS$) available for infiltration ($I$) and runoff ($RO$).

$$WS = P - ET$$

The water surplus is used to estimate infiltration by applying an infiltration factor ($IF$).

$$I = WS \ x \ IF$$

This infiltration factor ($IF$) is estimated based on topography, soil type and ground cover, as described in the MECP Stormwater Management Planning and Design Manual (Ministry of the Environment, 2003).

And finally, runoff ($RO$) is estimated from:

$$RO = WS - I$$

The following sections provide a summary of the on-Site catchments and input parameters for the water balance equation.

### 5.1.1 Catchment Areas

Details of the catchments for the pre- and post-development conditions are described in the *Stormwater Management Report* (WSP, 2021b).

The pre- and post-development catchments are shown on **Figure 9** and **Figure 10**, respectively, which include details on the total area of each catchment and the percentage of impervious area within the catchment.

### 5.1.2 Precipitation

The average annual precipitation measured at the Toronto Lester B. Pearson International Airport Climate Station (Climate ID 6158733) for the period from 1981 to 2010 was 786 millimetres per year (mm/yr) (Environment Canada, 2021).

### 5.1.3 Evapotranspiration

The average annual evapotranspiration rates were estimated using the MECP Stormwater Management Planning and Design Manual (Ministry of the Environment, 2003), which provides a range of evapotranspiration values depending on ground and vegetative cover and the hydrologic soil group.

## 5.2 Results

The results of the water balance for the Site are summarized below in **Table 5.1** and a copy of the water balance worksheet is provided in **Appendix G**.

**Table 5.1 – Water Balance Summary**

| Parameter | Pre-Development [$m^3$/year] | Post-Development (Unmitigated) [$m^3$/year] | Difference [$m^3$/year] | % Change [%] |
|---|---|---|---|---|
| Precipitation (P) | 506,800 | 506,800 | 0 | 0 |
| Evapotranspiration (ET) | 258,000 | 133,900 | -124,100 | -48 |
| Infiltration (I) | 96,900 | 36,600 | -60,300 | -62 |
| Runoff (RO) | 151,900 | 336,300 | 184,400 | 121 |

NOTES:

1. Negative value indicates a decrease following development.

The proposed development is anticipated to increase the impervious surface area of the Site catchments from approximately 11% under the existing conditions to approximately 68% following development. This is anticipated to result in an estimated decrease in infiltration of approximately 62% and increase in runoff of approximately 121%. Mitigation strategies are discussed in Section 7.3.1.

# 6.0 Dewatering Review

The following sections provide a qualitative discussion of the potential dewatering and permitting requirements for the project.

Final design details for site servicing, foundations, the elevator pit and stormwater management pond were not available at the time of this review. Once available, MTE should be requested to review the design and complete a quantitative dewatering assessment to confirm the findings described herein.

## 6.1 Temporary Construction Dewatering

### 6.1.1 Foundations

It is understood that the proposed buildings will be constructed with spread or strip footings and slab-on-grade floors. Footing depths are anticipated to be approximately 1.4 m BGS. The approximate locations of the buildings are shown on **Figure 10**.

Given the shallow foundations used for slab-on-grade buildings, construction dewatering is not anticipated to be required for their excavation.

### 6.1.2 Elevator Pit for Building A

It is understood that an elevator pit will be installed for Building A at the Site. The proposed elevator pit will be located near MW107-20 (see **Figure 4**). A final design elevation for the bottom of the pit was not yet available. For the purposes of the preliminary dewatering assessment, it was assumed that the base of the elevator pit will be less than 4 m BGS.

Based on the assumed depth of the elevator pit and the observed subsurface conditions in that area, proactive construction dewatering is not anticipated to be required during its excavation. Nuisance dewatering of groundwater seepage may be required should the excavation encounter sand/silt seams within the glacial till. Groundwater seepage from these sand/silt seams should be adequately handled by pumping from properly constructed sumps and/or interceptor trenches.

### 6.1.3 Services

The proposed development will be municipally serviced with piped water supply, storm and sanitary sewers. Inverts for the watermain and sewers are assumed to be at conventional depths of up to approximately 3 m BGS.

Based on the assumed depth of the service trench and the general subsurface conditions at the Site, proactive construction dewatering is not anticipated to be required. Nuisance dewatering of groundwater seepage will be required where trench excavations for the services encounter sand/silt seams within the glacial till. Groundwater seepage from these sand/silt seams should be adequately handled by pumping from properly constructed sumps and/or interceptor trenches.

It is noted, however, that saturated granular deposits were encountered as interbeds within the glacial till at variable depths and locations at the Site. Should any excavations encounter these saturated granular deposits, temporary construction dewatering will be required to control groundwater inflow from these deposits.

### 6.1.4 Stormwater Management Pond

The proposed development plan includes a lined SWM pond. The location of the proposed SWM Pond is shown on **Figure 10**. The base of the SWM pond will be 251.5 m AMSL (WSP, 2021b).

Based on proposed elevation for the base of the pond and the observed subsurface conditions in the vicinity of the proposed SWM pond, granular deposits may be encountered near the base of the excavation in the southern and western areas of the pond. Further north and east, granular deposits were not encountered at or above an elevation of 251.5 m AMSL.

Groundwater elevations at MW105-20, located in the vicinity of the proposed SWM pond, have ranged from 250.60 to 250.70 m AMSL over the period of record. Given the muted groundwater level response observed for the saturated granular deposits, groundwater levels may be similar throughout the year. However, due to the limited groundwater level dataset, it is recommended that the need for proactive construction dewatering during excavation of the SWM pond be further assessed following the June quarterly groundwater level monitoring event.

In other areas of the excavation, nuisance dewatering of groundwater seepage may be required where sand/silt seams are encountered within the glacial till. Groundwater seepage from these sand/silt seams should be adequately handled by pumping from properly constructed sumps.

### 6.2 Dewatering Permitting Requirements

Based on the encountered subsurface conditions, it is our opinion that with appropriate staging and scheduling considerations, the daily water taking volumes for nuisance dewatering within open excavations should be less than the threshold of 50,000 litres per day (L/day) above which a water taking permit is required. However, should excavations encounter the saturated granular deposits interbedded within the glacial till, the daily water taking volumes may exceed 50,000 L/day and an Environmental Activity Sector Registration (EASR) would be required.

An EASR is required for temporary construction dewatering with daily pumping volumes greater than 50,000 L/day, but less than 400,000 L/day. This is an online registration supported by Water Taking and Discharge Plans prepared by a Qualified Professional (QP).

Given the aggressive timeline for construction, it is recommended that an EASR be obtained as a precaution to avoid potential delays should these interbedded saturated granular deposits be encountered during excavation. Obtaining an EASR also has the benefit of maintaining staging and scheduling flexibility should large areas or multiple excavations require concurrent nuisance dewatering.

At least two weeks should be allowed in the project schedule to prepare the supporting documents and complete the online registration.

## 7.0 Impact Assessment

### 7.1 Inventory of Groundwater Receptors

#### 7.1.1 Water Supply Wells

Based on the MECP WWRs, there are eleven water supply wells within 500 metres of the Site. Six of these wells are completed within deep confined overburden or bedrock aquifers. The remaining five wells are large diameter bored or dug wells completed at shallow to intermediate depths within the glacial till. These large diameter wells are anticipated to have low yields and primarily rely on storage to meet supply demands. The approximate locations of the water supply wells, as provided in the WWRs, are shown on **Figure 4**.

### 7.1.2 Watercourses

Two watercourses were identified on-Site:

- One permanent tributary of the West Humber River (Kilamanagh Creek) in the northeast corner of the Site; and
- One intermittent/ephemeral watercourse (Tributary 'A'), flowing east through the central portion of the Site.

The approximate locations of these watercourses are shown on **Figure 4.**

Although Kilamanagh Creek is designated as coldwater, given the low permeability of the shallow sediments encountered in the adjacent boreholes (MW102-20 and MW103-20), as well as the observed separation between the channel bed and groundwater levels at the Site, flow within this watercourse is not anticipated to rely on groundwater contributions in the vicinity of the Site.

Given the intermittent/ephemeral nature of Tributary 'A', combined with the low permeability of the shallow sediments encountered in the nearby boreholes (MW101-20, BH117-20, BH123-20, MW107-20, BH140-20 and MW104-20) and the observed separation between the channel bed and groundwater levels at the Site, flow within Tributary 'A' is not anticipated to rely on groundwater contributions in the vicinity of the Site.

### 7.1.3 Wetlands

As discussed in Section 2.5, the CEISMP identified wetland communities along the riparian zone of Kilamanagh Creek. Based on the low permeability of the encountered glacial till and apparent separation from groundwater, the hydrologic functions of the identified wetland communities are not considered to be dependent on groundwater. It is anticipated that the hydrologic function of these wetlands is primarily supported by runoff and poor drainage conditions.

## 7.2 Potential Groundwater Impacts during Construction

### 7.2.1 Temporary Construction Dewatering

It is anticipated that only nuisance dewatering of groundwater seepage from sand/silt seams within the glacial till will be required during construction. The nuisance dewatering would likely be completed using sumps and pumps and is not anticipated to have a significant impact on nearby groundwater receptors.

In the event that construction dewatering is required to control groundwater inflow into excavations for services or the stormwater management pond, the low yield large diameter water supply wells located within approximately 250 metres of the Site may be susceptible to well interference during temporary construction dewatering. The potential impact on these water supply wells would be further assessed as part of the water taking permitting process.

Given that the identified watercourses and wetland community are not considered to be dependent on groundwater, no impacts to these natural heritage features are anticipated as a result of temporary construction dewatering of the excavations, if required.

No other groundwater related impacts are anticipated should construction dewatering be required.

### 7.2.2 Spills

The proposed construction will require the use of heavy machinery and equipment and, as such, there is some potential for associated petroleum hydrocarbons, such as fuel or lubricants, to impact the shallow groundwater.

These risks are readily minimized by:

- implementing Best Management Practices (BMPs) for all refueling, fuel and lubricant storage and equipment maintenance activities;
- prohibiting refueling and maintenance activities within 30 m of any waterbody, if any; and
- implementing a spill contingency plan during construction.

With the above control measures in place, the residual risk of spills potentially impacting shallow groundwater is considered to be very low.

### 7.2.3 Water Supply Wells

Since proactive construction dewatering is not anticipated to be required, potential impacts to water supply wells in the vicinity of the Site are anticipated to be limited to spills and vibrations from heavy construction equipment. As discussed in Section 7.2.2, the risks from spills is minimized by implementing BMPs for refueling and maintenance activities. Vibrations from heavy construction equipment may disturb existing accumulated sediment in the bottom of the well casing and/or scale from the walls of the casing temporarily resulting in an increase in Total Suspended Solids (TSS). Poorly maintained water supply wells are generally more susceptible.

A door to door well inventory should be completed to confirm the locations and installation depths of water supply wells in the immediate vicinity of the Site. A request should also be submitted to the Municipality to confirm properties that are on a piped municipal water supply.

Following completion of the door to door well inventory, a monitoring and contingency plan would be recommended for wells susceptible to interference during construction.

### 7.2.4 Soil Compaction

Compaction of soils by heavy machinery traffic during construction may reduce the infiltration capacity of surficial soils. These impacts may be mitigated, at least partially, by implementing a best practices Soil Management Plan (SMP) during clearing, grading and construction with the goal to preserve or restore the pre-development infiltration capacity of the native soils and subsoils in areas that will remain pervious following development. The SMP may include:

- Allowing the proposed pervious areas to remain undisturbed, to the extent possible, and protecting them from compaction during construction; and/or
- Restoration of compacted subsoils following construction using a combination of de-compaction treatments (e.g. ripping, scarification, tilling) and application of organic soil amendments to increase the organic matter content.

## 7.3 Potential Post-Development Groundwater Impacts

### 7.3.1 Infiltration and Runoff

Following development, the increase in the impervious surface area at the Site is anticipated to decrease infiltration and increase runoff relative to the existing conditions.

Appropriate low impact development (LID) measures may mitigate the anticipated decrease in post-development infiltration. Subject to site limitations, specific mitigation measures may include:

- Reduction of the amount of impervious surface area, where feasible;
- Storage of precipitation for subsequent use to satisfy landscape irrigation requirements;
- Topsoil thickening to provide additional storage;
- Promote diffused infiltration of stormwater so that, where feasible, runoff from impervious surfaces sheet flows over adjacent pervious surfaces that are managed to optimize infiltration capacity;
- Construction of bioretention cells and/or bioswales within proposed greenspaces, boulevards or landscaped areas to allow for the diversion of overland flow and subsequent infiltration, where feasible; and
- Use of permeable pavements, where feasible (i.e., driveways, parking lots, sidewalks, patios, etc.).

It is recommended that suitable LID mitigation measures be implemented to maintain approximately 90% of the pre-development infiltration following development. Due to the low permeability of the surficial glacial till, the proposed LID mitigation measures must be suitably designed for use in fine-textured soils with percolation rates of less than 15 millimeters per hour (mm/hr).

Design considerations for infiltration in low permeability soils include, but are not limited to:

- Use of underdrains with storage reservoirs below the underdrain;
- Longer drawdown periods and overflows;
- Vertical orientation of storage to increase hydraulic head;
- Matric potential and groundwater mounding;
- Compaction of soils within footprint of facility by heavy machinery during construction; and
- Decrease in infiltration performance over time and system maintenance requirements.

In-situ infiltration testing in areas considered for infiltration is highly recommended to assess feasibility and provide a site-specific infiltration rate of the soils in those areas to inform the design. The testing program should include profiling of infiltration rates with depth.

### 7.3.2 Groundwater Recharge

Though the Site is not considered to be an area of significant groundwater recharge, by implementing appropriate LID mitigation measures to maintain approximately 90% of the pre-development infiltration and implementing a SMP to mitigate the reduction in infiltration due to soil and subsoil compaction, no significant change in groundwater recharge is anticipated following development.

### 7.3.3 Water Supply Wells

As discussed in Section 7.3.1, mitigation measures will be implemented to maintain approximately 90% of the pre-development infiltration at the Site. As a result, no significant change in the long-term available drawdown of existing water supply wells is expected as a result of the proposed development.

### 7.3.4 Watercourses and Riparian Wetland

As discussed in Sections 7.1.2 and 7.1.3, the watercourses and riparian wetlands identified on-Site are not considered to be dependent on groundwater. No groundwater related impacts to these features are anticipated as a result of the proposed development.

The proposed development includes the realignment of the Tributary ‘A’ channel to along the northwest and northeast property boundaries. The channel will continue to enter and exit the Site at the existing locations and will follow the proposed setbacks along Kilamanagh Creek.

# 8.0 Conclusions

Based on the foregoing discussion, it is concluded that:

i. Stratigraphic conditions consist of low permeability glacial till deposits ranging in composition from silt to clayey silt interbedded with saturated granular deposits ranging in composition from sand and silt to gravelly sand.

ii. Groundwater elevations within the confined granular deposits ranged from a maximum of 252.34 m AMSL to a minimum of 243.79 m AMSL over the period of record.

iii. Artesian conditions may be encountered in the saturated granular deposits.

iv. Nuisance dewatering may be required during excavation to control groundwater seepage from saturated sand/silt seams within the glacial till, where encountered.

v. Proactive construction dewatering is not anticipated to be required to facilitate excavations for foundations and/or the elevator pit for Building A.

vi. There is a risk of encountering saturated granular deposits, particularly in the southern portion of the Site, that will require construction dewatering to facilitate excavation of the SWM pond and servicing trenches.

vii. The sampled groundwater exceeded the PWQO for dissolved Co, Fe and U suggesting that groundwater pumped during construction dewatering is unlikely to meet the PWQO for direct surface water discharge without some form of treatment.

viii. The identified watercourses and associated riparian wetland are not considered to be groundwater dependent.

ix. If unmitigated, the increase in the impervious surface area at the Site following development is anticipated to decrease infiltration by ~62% and increase runoff ~121% relative to the existing conditions.

x. The surficial soils may be susceptible to compaction by heavy machinery traffic during construction, which may further reduce their infiltration capacity.

xi. Nearby water supply wells may be susceptible to well interference due to heavy construction equipment vibrations, spills and/or temporary construction dewatering, if any.

xii. No other significant impacts on groundwater receptors are anticipated as a result of the proposed development or related construction activities.

# 9.0 Recommendations

It is recommended that:

i. The groundwater level monitoring program described above should be continued to provide up to date groundwater levels for final design, approvals, permitting, tendering and construction.

ii. Additional water quality sampling be completed to confirm the results described above and assess discharge options for pumped groundwater should construction dewatering be required.

iii. Given the aggressive timeline for construction, it is recommended that an EASR be obtained as a precaution to avoid potential delays should the interbedded saturated granular deposits be encountered during excavation and to maintain staging and scheduling flexibility should large areas or multiple excavations require concurrent nuisance dewatering.

iv. To reduce the likelihood of construction dewatering being required, it is recommended that excavations for the SWM pond and servicing trenches proceed during mid to late summer when groundwater levels are generally at their lowest.

v. To identify nearby water supply wells that may be susceptible to well interference from equipment vibrations, spills and/or temporary construction dewatering should it be required, a door to door well survey should be undertaken for properties that are not connected to a piped municipal water supply and are located within 250 metres of the Site.

vi. Based on the results of the door to door well inventory, a monitoring and contingency plan should be developed for wells that are considered susceptible to interference during construction.

vii. A best practices SMP should be developed and implemented during clearing, grading and construction with the goal to preserve or restore the pre-development infiltration capacity of the native soils and subsoils in areas that will remain pervious following development.

viii. Suitable LID strategies should be implemented, where feasible, to mitigate the potential decrease in infiltration following development and maintain at least 90% of the pre-development infiltration.

ix. A location-specific investigation of subsurface conditions and in-situ infiltration testing should be carried out to support LID design.

x. Post-development runoff contributions to Kilamanagh Creek and associated riparian wetland communities should be similar to the existing conditions. Mitigation of thermal impacts of the post-development runoff contributed to Kilamanagh Creek should be included in the stormwater management design.

xi. Post-development runoff contributions to Tributary 'A' should be similar to the existing conditions.

xii. Following completion of groundwater monitoring, the monitoring wells should be properly abandoned in accordance with O.Reg. 903, as amended.

# 10.0 Limitations

Services performed by MTE Consultants Inc. (MTE) were conducted in a manner consistent with the level of care and skill ordinarily exercised by members of the Geoscience Consulting profession practicing under similar conditions in the same geographic area where the services are provided. No other warranty or representation expressed or implied as to the accuracy of the information, conclusions or recommendations is included or intended in this report.

This report was completed for the sole use of the Tribal Partners (Canada) Inc. This report is not intended to be exhaustive in scope or to imply a risk-free site. As such, this report may not deal with all issues potentially applicable to the site and may omit aspects which are or may be of interest to the reader.

In addition, it should be recognized that a discrete soil sample represents one distinct portion of a site at the time it is collected, and that the findings of this report are based on conditions as they existed during the time period of the investigation. The material in the report reflects our opinions using the information available at the time the report was written. The soil and groundwater conditions between and beyond the test holes may differ from those encountered in the test holes. Should subsurface conditions arise that are different from those noted herein, MTE should be notified to determine whether or not changes should be made as a result of these conditions.

It should be recognized that the passage of time may affect the views, conclusions and recommendations (if any) provided in this report because groundwater and soil conditions of a property can change, along with regulatory requirements. All design details were not known at the time of submission of this report and it is recommended that MTE be retained to review the final design documents prior to construction to confirm they are consistent with our report recommendations. Should additional or new information become available, MTE recommends that it be brought to our attention in order that we may determine whether it affects the contents of this report.

Any use which another party makes of this report, or any reliance on, or decisions to be made based upon it, are the responsibility of such parties. MTE accepts no responsibility for liabilities incurred by or damages, if any, suffered by another party as a result of decisions made or actions taken, based upon this report. Others with interest in the site should undertake their own investigations and studies to determine how or if the condition affects them or their plans. The contractors bidding on this project or undertaking the construction should make their own interpretation of the factual information and draw their own conclusions as to how subsurface conditions may affect their work.

The benchmark and elevations provided in this report are primarily established to identify differences between the test hole locations and should not be used for other purposes such as, planning, development, grading, and excavation.

All of which is respectfully submitted,

**MTE Consultants Inc.**


**Mackenzie Costello**
Environmental Scientist
+1 (519) 204-6510 ext. 2212
mcostello@mte85.com

PROFESSIONAL GEOSCIENTIST
March 15/21
JOHN D. McNEIL
PRACTISING MEMBER
2014
ONTARIO

**John McNeil, M.Sc., P.Geo.**
Manager, Environmental Division
Senior Hydrogeologist
+1 (519) 204-6510 ext. 2228
jmcneil@mte85.com


MBC/JDM:vlf

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# 11.0 References


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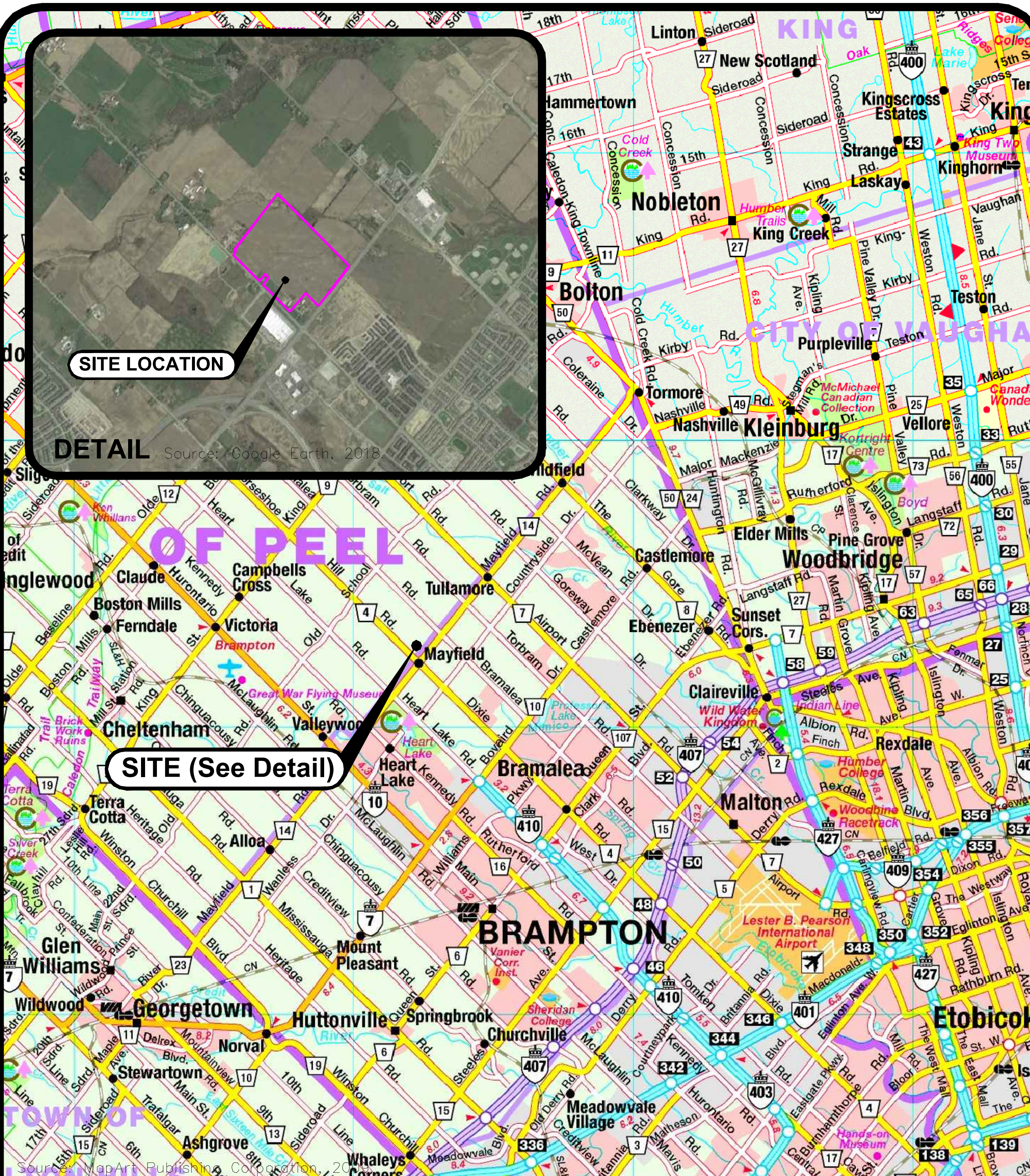
# Figures




March 10, 2021 — 8:43 AM — Plotted By: SLemieux 1 SITE LOCATION MAP Project: 47477-400 CAD: P:\P\47477\400\47477-400-MS1.DWG

MTE
Engineers, Scientists, Surveyors
Ph. (905) 639-2552

0 2 4 6 8 10km
Scale(8.5x11): 1:200 000

| | |
|---|---|
| CLIENT | Tribal Partners (Canada) Inc. |
| TITLE | Site Location Map |
| PROJECT | Preliminary Hydrogeological Assessment |
| SITE | 12035 Dixie Road, Caledon, ON |
| Reviewed By | JDM |
| Prepared By | MBC |
| Drawn By | SGL |
| Date | March 2021 |
| Project No. | 47477-400 |
| Figure No. | 1 |

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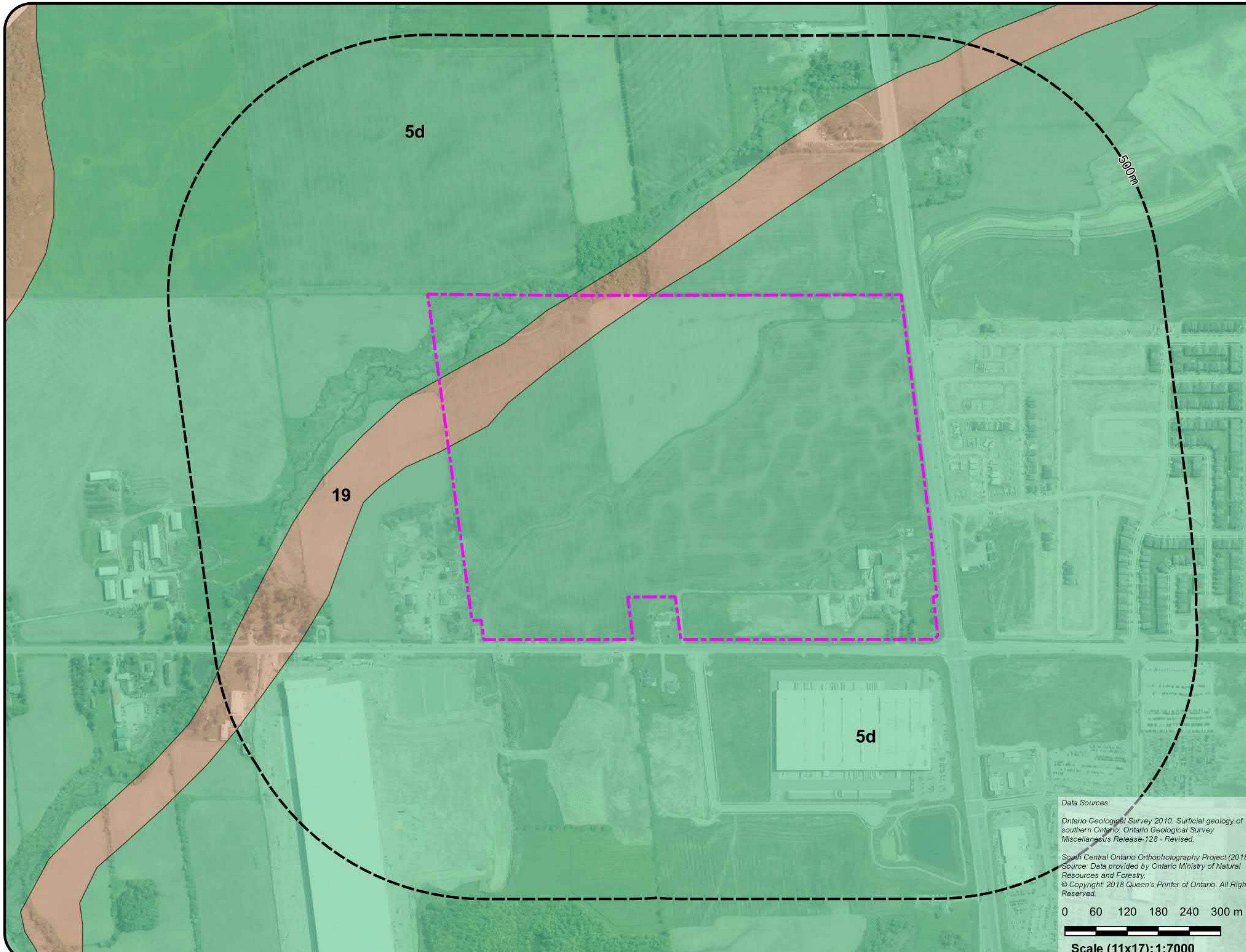



NORTH

PROJECT NORTH

## Legend

- Site Boundary
- 500m Study Area

**Quaternary Geology**

Quaternary

- 19. Modern alluvial deposits: clay, silt, sand, gravel, may contain organic remains

5. Till:

- 5d. Clay to silt-textured till (derived from glaciolacustrine deposits or shale)

Project CRS: NAD83 / UTM zone 17N

MTE

Engineers,Scientists, Surveyors

Ph. (519) 204-6510

Client: Tribal Partners (Canada) Inc.

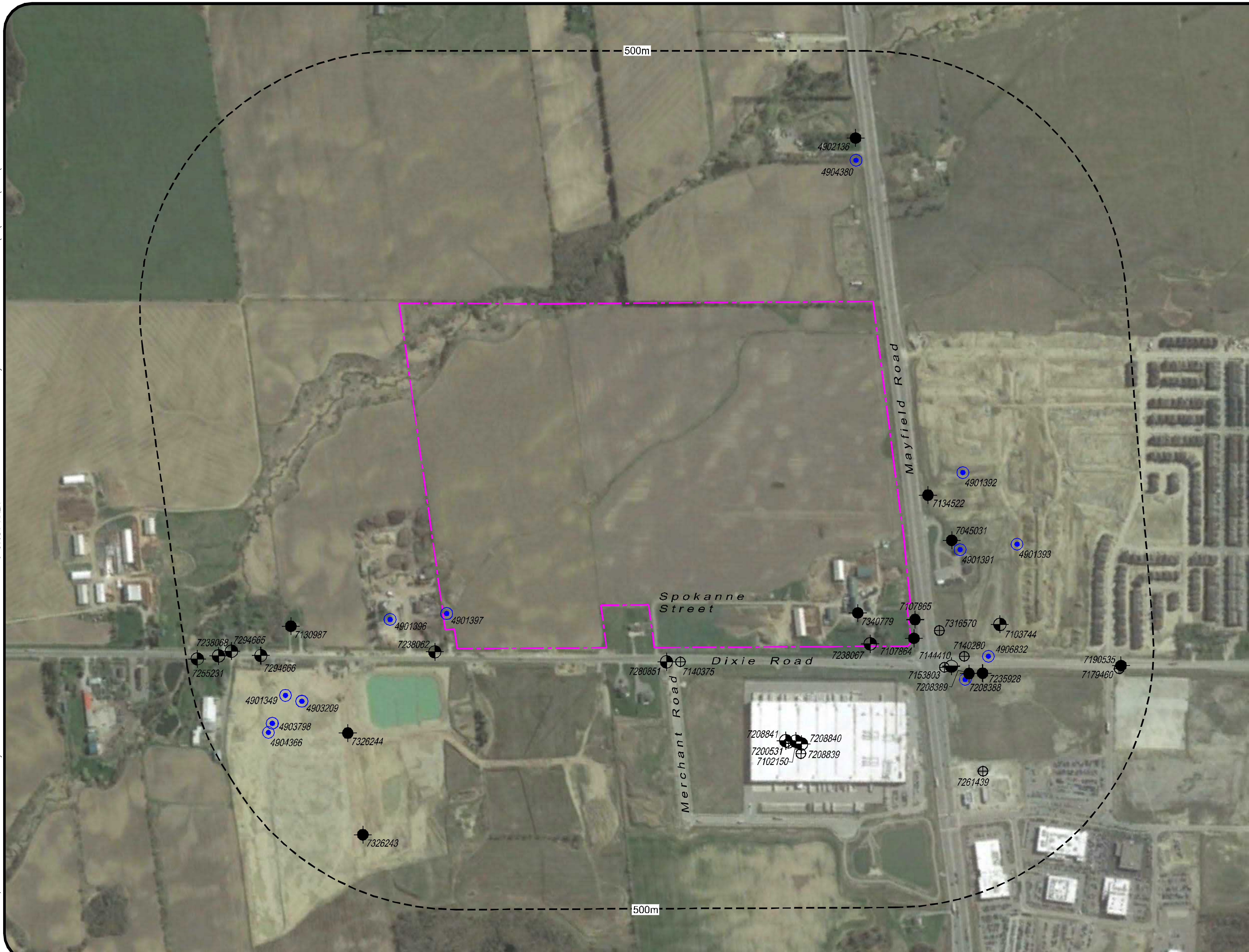
Project: Preliminary Hydrogeological Assessment

Site: 12035 Dixie Road, Caledon, ON

Title: **Quaternary Geology**

| | | | |
|---|---|---|---|
| Reviewed By | JDM | | |
| Prepared By | MBC | Project No | 47477-400 |
| Drawn By | SAR | Figure No | 2 |
| Date | January 2021 | | |

March 11, 2021 — 8:36 AM — Plotted By: SLemieux    3 STUDY AREA    Project: 47477-400    CAD: P:\P\47477\400\47477-400-MS1.DWG




NORTH

PROJECT NORTH

LEGEND

- Property Line
- Study Area

Ontario Water Well Records:

- Observation Well
- Water Supply
- Dewatering Well
- Abandoned Well
- Unknown Well

Notes:

- All Locations are Approximate

0 70 140 210 280 350m

Scale(11x17): 1:7000

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Engineers, Scientists, Surveyors

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CLIENT

Tribal Partners (Canada) Inc.

PROJECT

Preliminary Hydrogeological Assessment

SITE

12035 Dixie Road
Caledon, ON

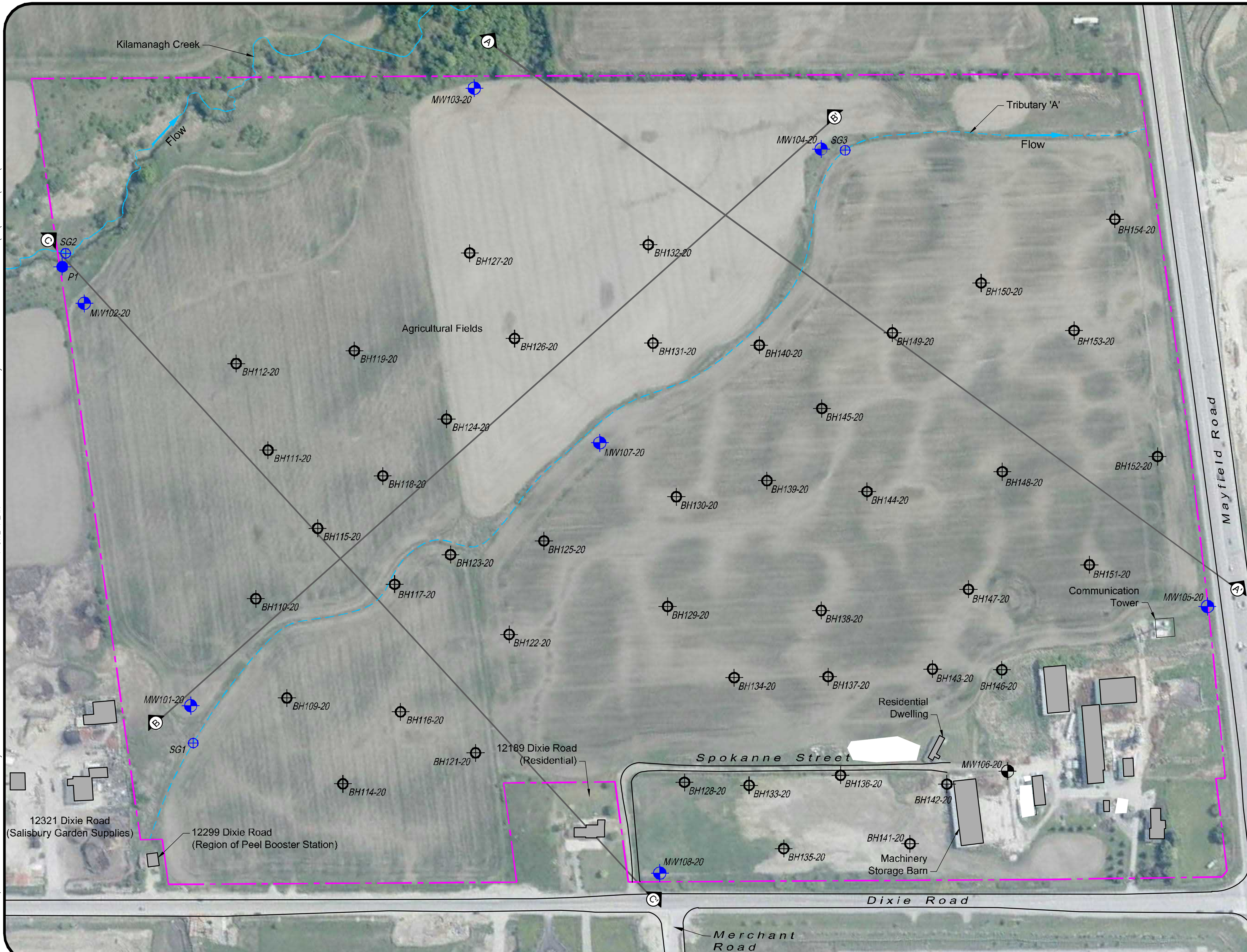
TITLE

**Water Wells**

| | | | |
|---|---|---|---|
| Reviewed By | JDM | | |
| Prepared By | MBC | Project No. | 47477-400 |
| Drawn By | SGL | Figure No. | 3 |
| Date | March 2021 | | |

Project: 47477-400 CAD: P:\P\47477\400\47477-400-MS1.DWG

March 12, 2021 — 8:24 AM — Plotted By: SLemieux — 4 SITE PLAN




NORTH

PROJECT NORTH

LEGEND

- Property Line
- Existing Building
- Watercourse
- Intermittent/Ephermeral Watercourse
- Borehole
- Monitoring Well (Phase II ESA)
- Monitoring Well (Hydrogeological Assessment)
- Piezometer
- Staff Gauge
- Cross-Section Line

0 30 60 90 120 150m

Scale(11x17): 1:3000

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CLIENT

Tribal Partners (Canada) Inc.

PROJECT

Preliminary Hydrogeological Assessment

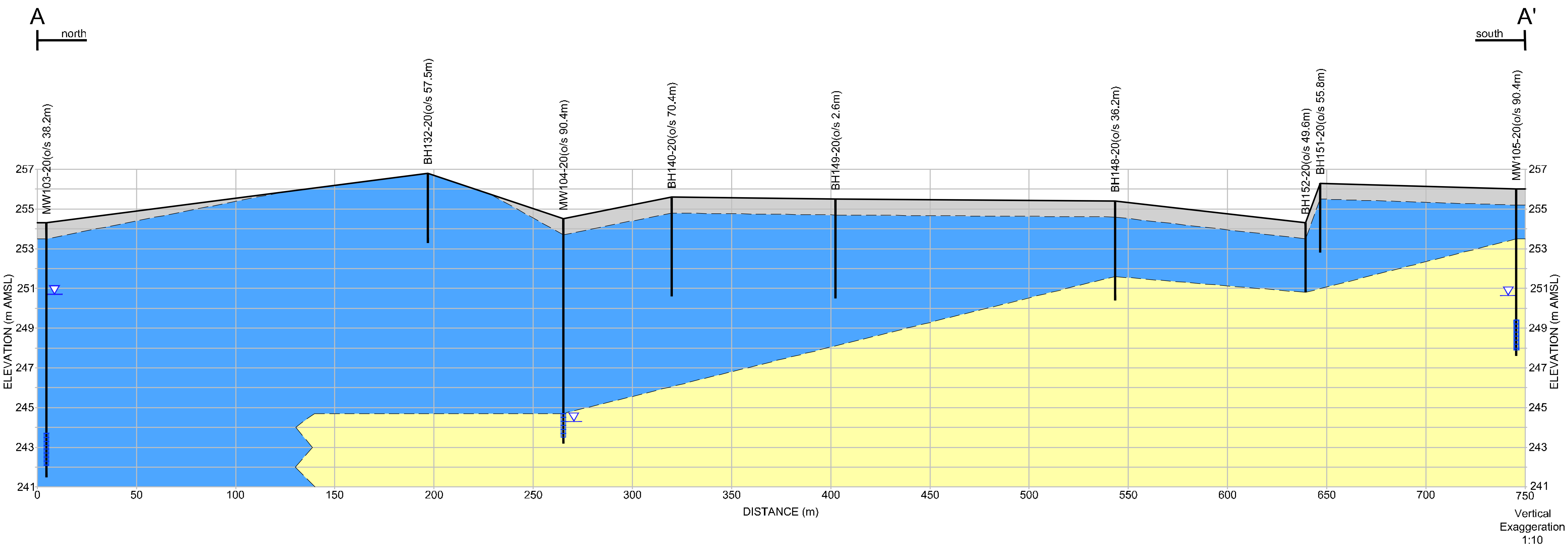
SITE

12035 Dixie Road
Caledon, ON

TITLE

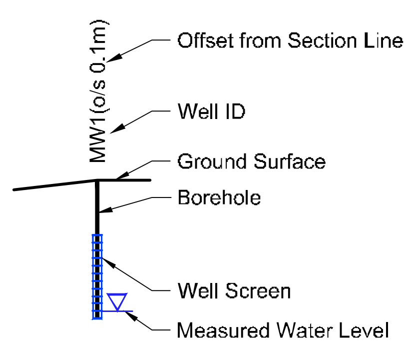
**Site Plan**

| | | | |
|---|---|---|---|
| Reviewed By | JDM | | |
| Prepared By | MBC | Project No. | 47477-400 |
| Drawn By | SGL | Figure No. | 4 |
| Date | March 2021 | | |




LEGEND

- Fill
- Sand/ Silty Sand
- Clayey Silt Till/ Sandy Silt Till




NOTES:

1. Cross-Section locations are shown in Figure 4
2. Simplified stratigraphy shown above is based on the observed subsurface conditions at the borehole locations
3. Subsurface conditions may vary between and beyond each borehole locations
4. m AMSL - metres above mean sea level
5. Water levels measured on 2020/12/14

Scale(11x17): N.T.S.

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| | |
|---|---|
| CLIENT | Tribal Partners (Canada) Inc. |
| PROJECT | Preliminary Hydrogeological Assessment |
| SITE | 12035 Dixie Road Caledon, ON |
| TITLE | **Cross-Section A-A'** |
| Reviewed By | JDM |
| Prepared By | MBC |
| Drawn By | SGL |
| Date | March 2021 |
| Project No. | 47477-400 |
| Figure No. | 5 |

Project: 47477-400 CAD: P:\P\47477\400\47477-400-MS2.DWG

5 CS A-A'

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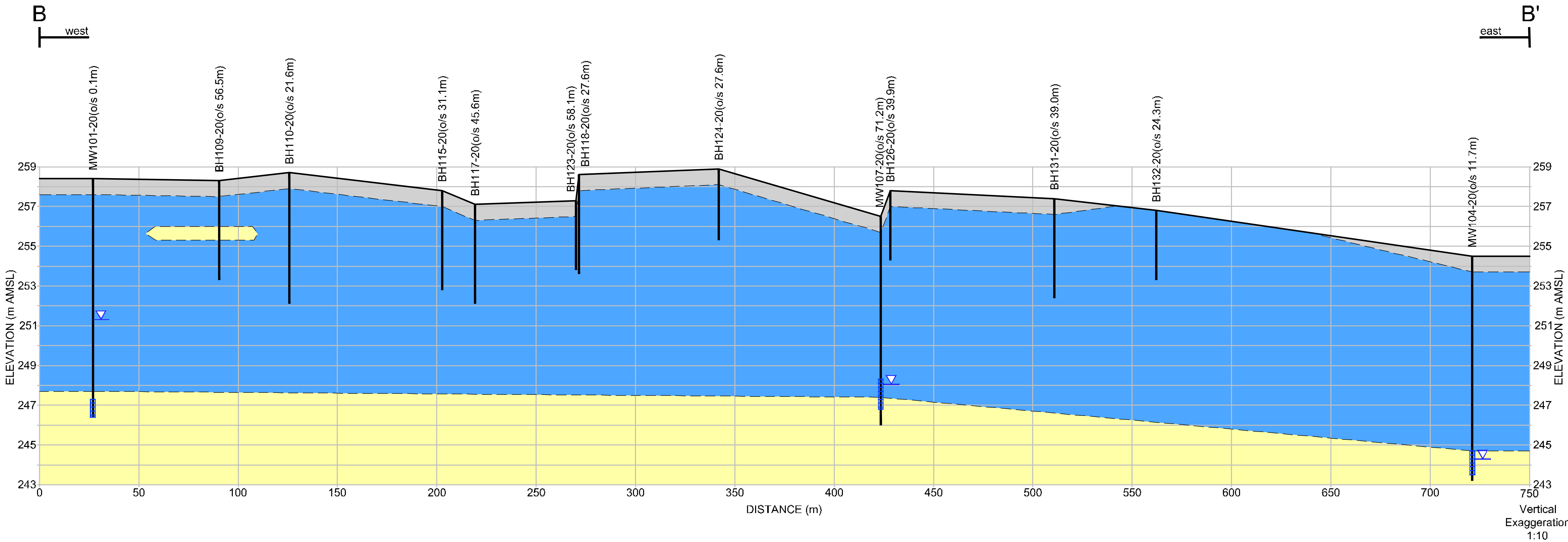


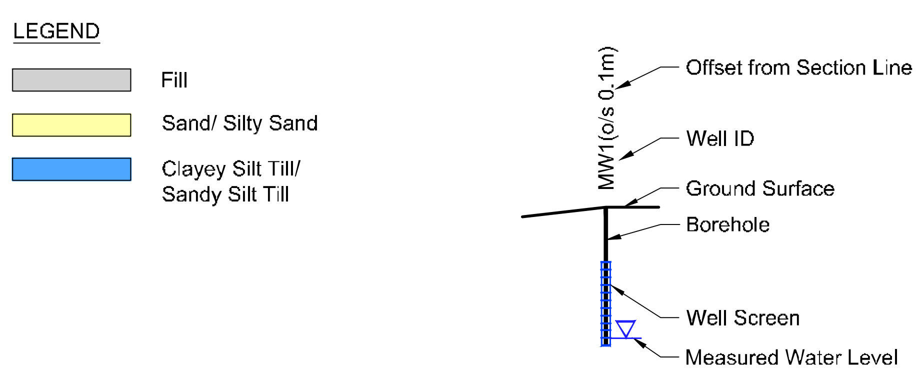


NOTES:

1. Cross-Section locations are shown in Figure 4
2. Simplified stratigraphy shown above is based on the observed subsurface conditions at the borehole locations
3. Subsurface conditions may vary between and beyond each borehole locations
4. m AMSL - metres above mean sea level
5. Water levels measured on 2020/12/14

Scale(11x17): N.T.S.

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CLIENT
Tribal Partners (Canada) Inc.

PROJECT
Preliminary Hydrogeological Assessment

SITE
12035 Dixie Road
Caledon, ON

TITLE
**Cross-Section B-B'**

| | | | |
|---|---|---|---|
| Reviewed By | JDM | | |
| Prepared By | MBC | Project No. | 47477–400 |
| Drawn By | SGL | Figure No. | 6 |
| Date | March 2021 | | |

Project: 47477–400 CAD: P:\P\47477\400\47477–400–MS2.DWG

6 CS B-B'

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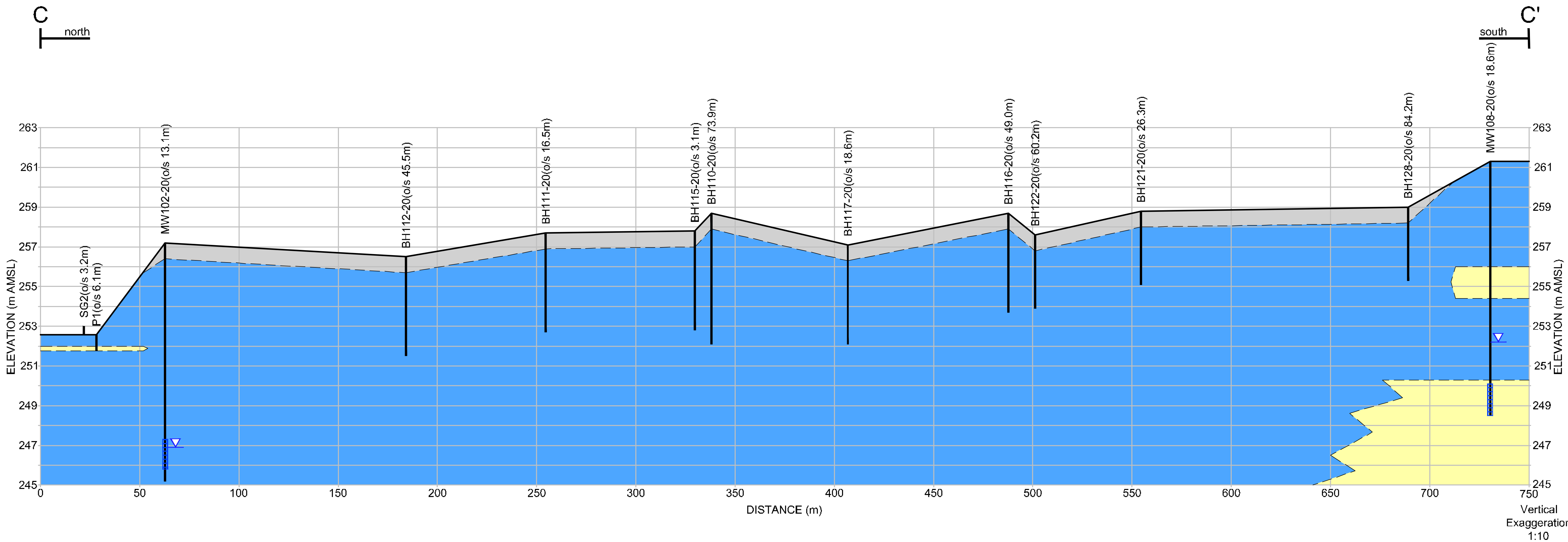
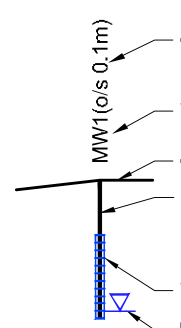



LEGEND

Fill

Sand/ Silty Sand

Clayey Silt Till/ Sandy Silt Till




NOTES:

1. Cross-Section locations are shown in Figure 4
2. Simplified stratigraphy shown above is based on the observed subsurface conditions at the borehole locations
3. Subsurface conditions may vary between and beyond each borehole locations
4. m AMSL - metres above mean sea level
5. Water levels measured on 2020/12/14

Scale(11x17): N.T.S.

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Ph. (905) 639-2552

CLIENT
Tribal Partners (Canada) Inc.

PROJECT
Preliminary Hydrogeological Assessment

SITE
12035 Dixie Road
Caledon, ON

TITLE
**Cross-Section C-C'**

| | | | |
|---|---|---|---|
| Reviewed By | JDM | | |
| Prepared By | MBC | Project No. | 47477–400 |
| Drawn By | SGL | Figure No. | 7 |
| Date | March 2021 | | |

Project: 47477–400 CAD: P:\P\47477\400\47477–400–MS2.DWG
7 CS C-C'
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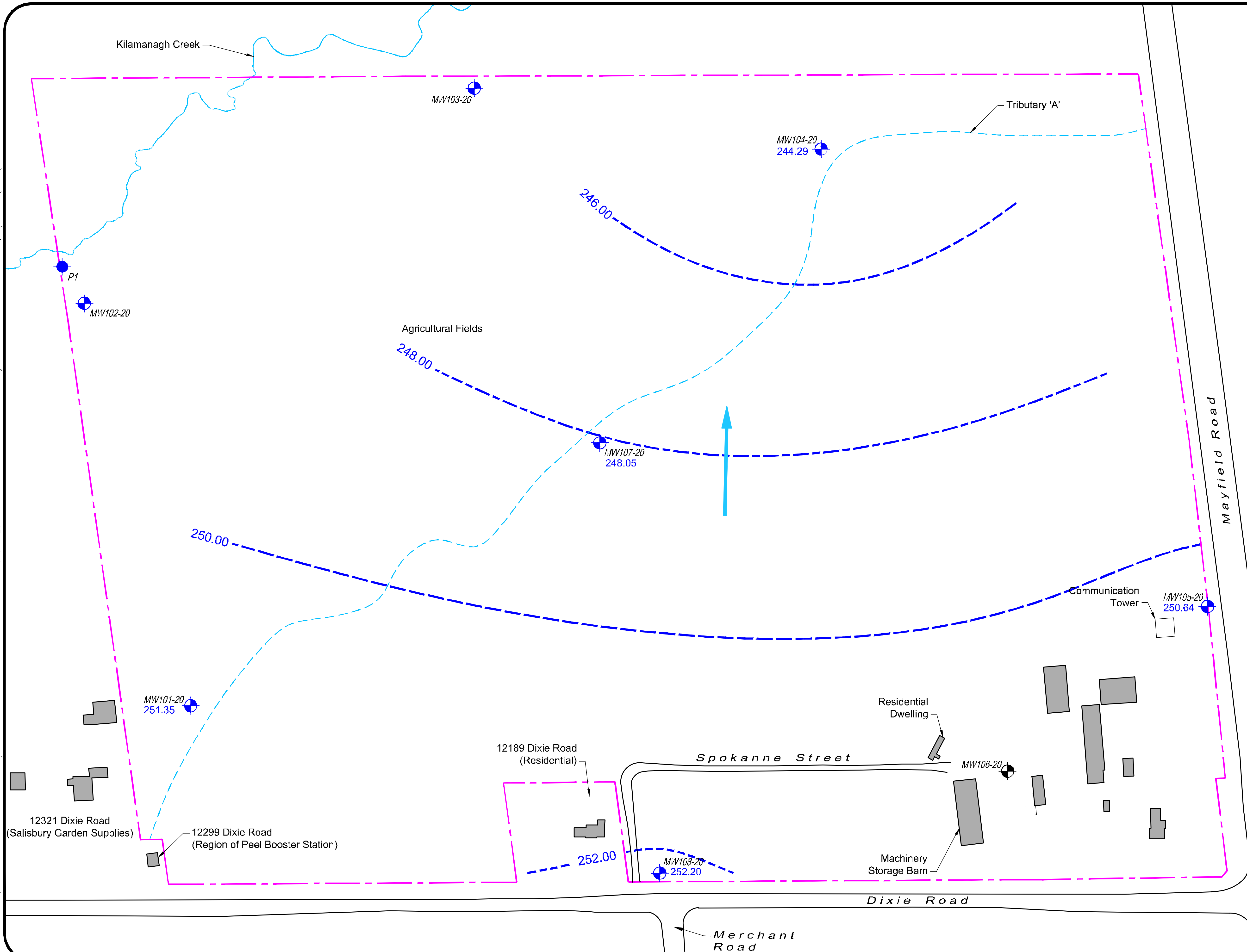



NORTH

PROJECT NORTH

LEGEND

- Property Line
- Existing Building
- Watercourse
- Intermittent/Ephermeral Watercourse
- Monitoring Well (Phase II ESA)
- Monitoring Well (Hydrogeological Assessment)
- Piezometer
- 244.29 Groundwater Elevation (m AMSL)
- 248.00 Groundwater Contour (m AMSL)
- Inferred Direction of Groundwater Flow

NOTES:

Water levels measured on 2020/12/14

m AMSL - metres above mean seal level

0 30 60 90 120 150m

Scale(11x17): 1:3000

MTE

Engineers, Scientists, Surveyors

Ph. (905) 639-2552

CLIENT

Tribal Partners (Canada) Inc.

PROJECT

Preliminary Hydrogeological Assessment

SITE

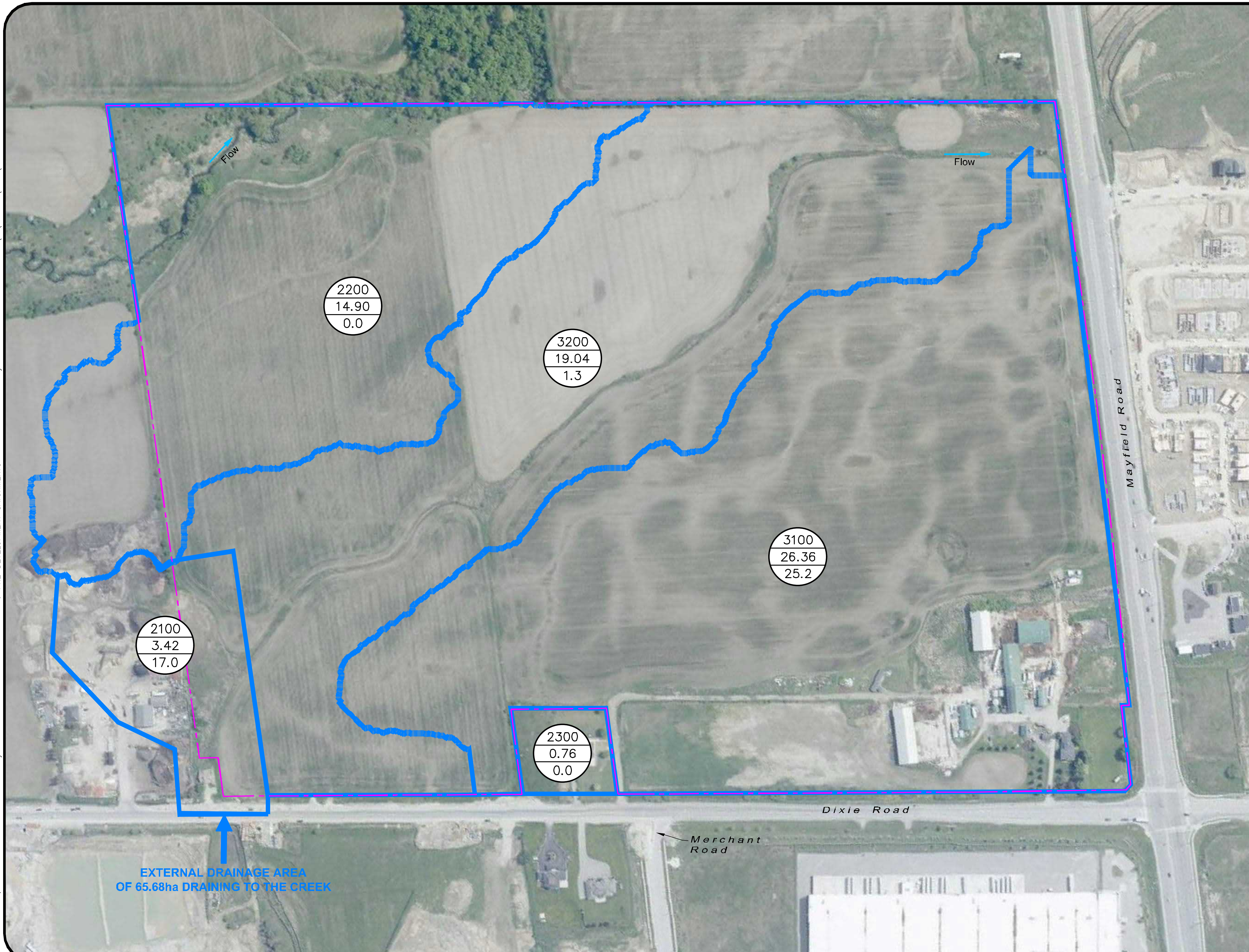
12035 Dixie Road
Caledon, ON

TITLE

**Groundwater Flow in Confined Sands**

| | | | |
|---|---|---|---|
| Reviewed By | JDM | | |
| Prepared By | MBC | Project No. | 47477–400 |
| Drawn By | SGL | Figure No. | 8 |
| Date | March 2021 | | |

March 12, 2021 — 8:23 AM — Plotted By: SLemieux 8 GW FLOW MAP Project: 47477–400 CAD: P:\P\47477\400\47477–400–MS1.DWG




NORTH

PROJECT NORTH

LEGEND

- Property Line
- Catchment

103 — Catchment ID
7.25 — Area (ha.)
0 — % IMP

Notes:
- All Locations are Approximate
- Catchments Assessed and Provided by WSP (2021)

0 35 70 105 140 175m

Scale(11x17): 1:3500

MTE

Engineers, Scientists, Surveyors

Ph. (905) 639-2552

CLIENT

Tribal Partners (Canada) Inc.

PROJECT

Preliminary Hydrogeological Assessment

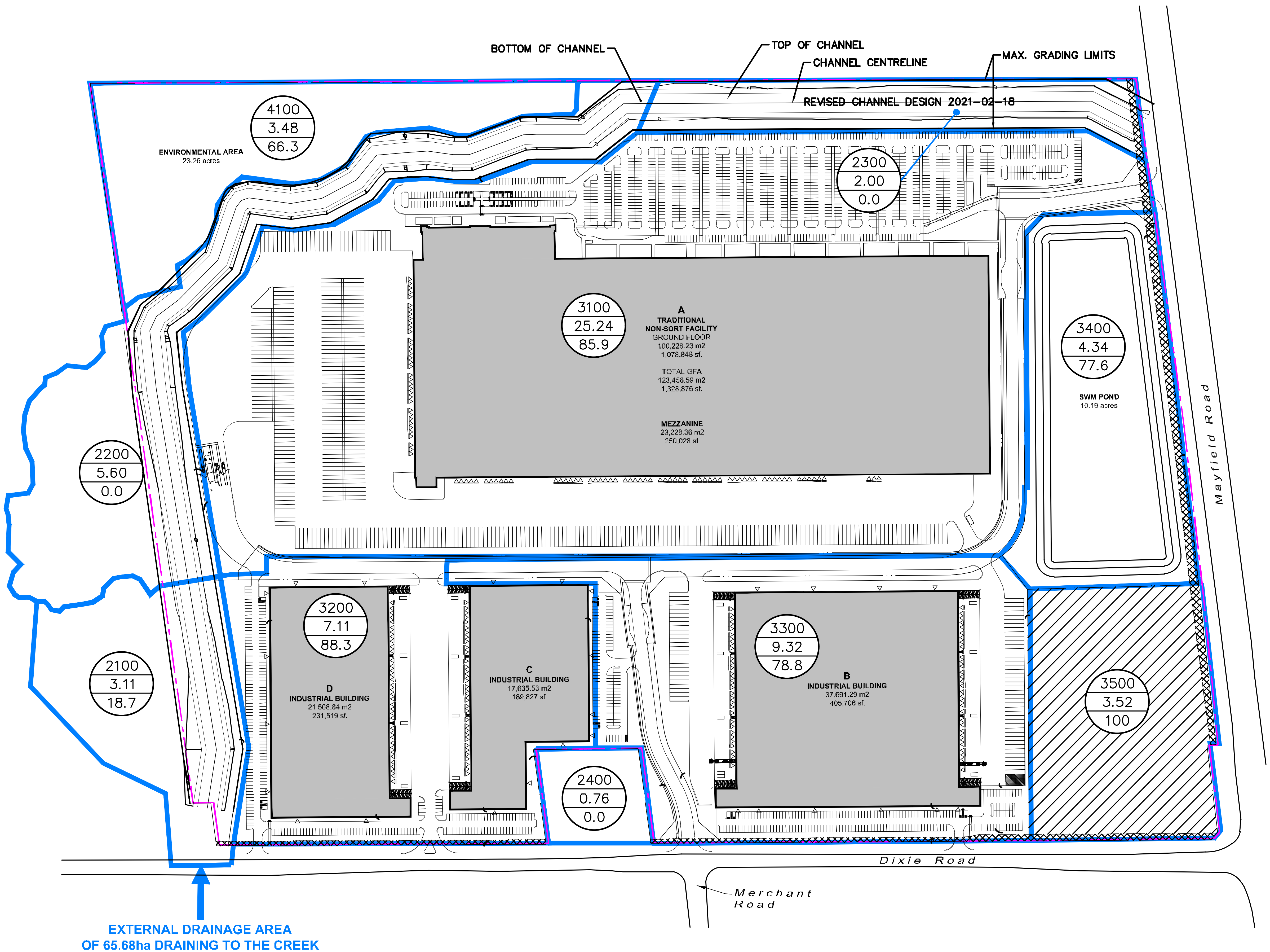
SITE

12035 Dixie Road
Caledon, ON

TITLE

**Pre-Development Catchments**

| | | | |
|---|---|---|---|
| Reviewed By | JDM | | |
| Prepared By | MBC | Project No. | 47477-400 |
| Drawn By | SGL | Figure No. | 9 |
| Date | March 2021 | | |




NORTH

PROJECT NORTH

LEGEND

Property Line

Catchment

3100 — Catchment ID
25.24 — Area (ha.)
85.9 — % IMP

Notes:

- All Locations are Approximate
- Catchments Assessed and Provided by WSP (2021)

0 35 70 105 140 175m

Scale(11x17): 1:3500

MTE
Engineers, Scientists, Surveyors
Ph. (905) 639-2552

CLIENT
Tribal Partners (Canada) Inc.

PROJECT
Preliminary Hydrogeological Assessment

SITE
12035 Dixie Road
Caledon, ON

TITLE
**Post-Development Catchments**

| | | | |
|---|---|---|---|
| Reviewed By | JDM | | |
| Prepared By | MBC | Project No. | 47477-400 |
| Drawn By | SGL | Figure No. | 10 |
| Date | March 2021 | | |

# Tables

# Table 1: Summary of MECP Water Well Records

| MECP Well No. | UTM Coordinates (NAD83 Zone 17) Easting | UTM Coordinates (NAD83 Zone 17) Northing | Year Drilled | Nominal Casing Diameter (millimetres) | Drilling Method | Well Status | Well Use | Water Quality | Water Found (m BGS) | Total Depth (metres) | Interval Screened Top (m BGS) | Interval Screened Bottom (m BGS) | Static Level (m BGS) | Pumping Test Level (m BGS) | Pumping Test Rate (L/min) | Pumping Test Duration (hours) | Stratigraphy Depth to Unit Base (m BGS) | Stratigraphy Colour | Stratigraphy Description Material 1 | Stratigraphy Description Material 2 | Stratigraphy Description Material 3 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7144410 | 597208 | 4846162 | 2010 | 51 | Auger | Dewatering | Dewatering | Fresh | 7.5 | 15.0 | 13.5 | 15.0 | - | - | - | - | 1.0 | brown | fill | - | - |
| | | | | | | | 18 wells in cluster | | | | | | | | | | 12.0 | brown | silt | sandy | clayey |
| | | | | | | | | | | | | | | | | | 15.0 | brown | silt | sandy | - |
| 4901391 | 597373 | 4846080 | 1952 | 102 | Cable Tool | Water Supply | Domestic | Fresh | 24.3 | 24.3 | - | - | 9.1 | 21.3 | 15 | 4 | 1.8 | brown | clay | - | - |
| | | | | | | | | | | | | | | | | | 18.6 | blue | clay | - | - |
| | | | | | | | | | | | | | | | | | 24.3 | grey | shale | - | - |
| 4906832 | 597281 | 4846119 | 1988 | 762 | Boring | Water Supply | Domestic | - | 6.1 | 10.4 | - | - | 4.0 | 9.1 | 11.4 | 1.0 | 0.3 | brown | loam | hard | - |
| | | | | | | | | | | | | | | | | | 7.6 | brown | clay | hard | - |
| | | | | | | | | | | | | | | | | | 10.4 | red | sand | loose | - |
| 4904380 | 597762 | 4846752 | 1974 | 762 | Boring | Water Supply | Domestic / | Fresh | 7.3 | 12.2 | - | - | 1.8 | 6.7 | 53.0 | 1.0 | 0.3 | brown | topsoil | - | - |
| | | | | | | | Stock | | | | | | | | | | 4.6 | brown | clay | stones | packed |
| | | | | | | | | | | | | | | | | | 7.3 | grey | clay | stones | packed |
| | | | | | | | | | | | | | | | | | 8.2 | brown | sand | gravel & stones | loose |
| | | | | | | | | | | | | | | | | | 12.2 | grey | clay | sand & stones | packed |
| 7208388 | 611218 | 4904390 | 2013 | 1219 | - | Water Supply | Not Used | - | - | 2.4 | - | - | 0.3 | - | - | - | 2.4 | - | fill | clay | - |
| 4901393 | 597473 | 4846233 | 1954 | 102 | Cable Tool | Water Supply | Domestic / | Fresh | 20.4 | 25.0 | - | - | 7.6 | 25.0 | 7.6 | - | 0.6 | - | loam | - | - |
| | | | | | | | Livestock | | | | | | | | | | 7.0 | blue | clay | - | - |
| | | | | | | | | | | | | | | | | | 11.9 | - | sand | - | - |
| | | | | | | | | | | | | | | | | | 20.4 | blue | clay | gravel | - |
| | | | | | | | | | | | | | | | | | 25.0 | blue | shale | - | - |
| 4901392 | 597482 | 4846181 | 1952 | 102 | Cable Tool | Water Supply | Domestic / | Fresh | 28.3 | 28.3 | - | - | 12.2 | 12.2 | 60.6 | 2.0 | 13.4 | previously dug | | - | - |
| | | | | | | | Livestock | | | | | | | | | | 24.0 | clay | stoney | - | - |
| | | | | | | | | | | | | | | | | | 27.4 | gravel | sandy | - | - |
| | | | | | | | | | | | | | | | | | 28.3 | gravel | - | - | - |
| 7179460 | 597442 | 4845924 | 2011 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7190535 | 597449 | 4845926 | 2012 | - | - | Abandoned - Other | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7208389 | 597231 | 4846122 | 2013 | 914 | - | Abandoned - Other | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7238067 | 597137 | 4846297 | 2015 | 52 | Boring | Observation Wells | Monitoring | - | - | 7.6 | 4.6 | 7.6 | - | - | - | - | 2.1 | brown | fill | sand | loose |
| | | | | | | | | | | | | | | | | | 7.6 | grey | clay | silt | packed |
| 4902136 | 597806 | 4847006 | 1950 | 152 | Cable Tool | Abandoned - Supply | - | - | - | 22.9 | - | - | - | - | - | - | 0.9 | - | loam | clay | - |
| | | | | | | | | | | | | | | | | | 4.0 | - | clay | boulders | - |
| | | | | | | | | | | | | | | | | | 7.9 | - | gravel | - | - |
| | | | | | | | | | | | | | | | | | 9.4 | - | clay | - | - |
| | | | | | | | | | | | | | | | | | 14.3 | - | clay | boulders | - |
| | | | | | | | | | | | | | | | | | 16.2 | - | clay | sand | - |
| | | | | | | | | | | | | | | | | | 22.9 | - | sand | clay | - |
| 7340779 | 597162 | 4846356 | 2019 | 127 | - | Abandoned - Other | | - | 11.6 | - | - | - | - | - | - | - | - | - | - | - | - |
| 7045031 | 597389 | 4846327 | 2007 | 102 | - | Abandoned - Other | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7134522 | 597418 | 4846421 | 2009 | 900 | - | Abandoned - Other | - | - | - | 4.6 | - | - | - | - | - | - | - | - | - | - | - |
| 7140280 | 597248 | 4846152 | 2009 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7153803 | 597208 | 4846162 | 2010 | 51 | - | Abandoned - Other | Dewatering | - | - | 15.0 | - | - | - | - | - | - | 1.0 | - | fill | - | - |
| | | | | | | | 18 cluster | | | | | | | | | | 12.0 | - | silt | clayey | sandy |
| | | | | | | | | | | | | | | | | | 15.0 | - | silt | sandy | - |
| 7235928 | 597250 | 4846104 | 2015 | 102 | - | Abandoned - Other | Not used | - | - | 18.9 | - | - | 14.6 | - | - | - | - | - | - | - | - |
| 7261439 | 597117 | 4845970 | 2015 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7316570 | 597249 | 4846221 | 2018 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7103744 | 597340 | 4846147 | 2008 | 127 | Boring | Observation Wells | Not Used | - | 10.0 | 10.8 | - | - | - | 10.0 | - | - | 0.3 | brown | loam | - | - |
| | | | | | | | | | | | | | | | | | 5.0 | brown | clay | silty | till |
| | | | | | | | | | | | | | | | | | 10.8 | grey | clay | silty | till |
| 7107864 | 597204 | 4840245 | 2008 | 133 | - | Abandoned - Other | - | - | - | 19 | - | - | - | - | - | - | - | - | - | - | - |
| 7107865 | 597231 | 4846269 | 2008 | 106 | - | Abandoned - Other | - | - | - | 4.6 | - | - | - | - | - | - | - | - | - | - | - |
| 7238062 | 596533 | 4846879 | 2015 | 52 | Boring | Observation Wells | Monitoring | - | - | 7.6 | 4.6 | 7.6 | - | - | - | - | 1.5 | brown | fill | - | loose |
| | | | | | | | | | | | | | | | | | 3.1 | brown | sand | silt | loose |
| | | | | | | | | | | | | | | | | | 7.6 | grey | clay | silt | packed |
| 7238068 | 596233 | 4847168 | 2015 | 52 | Boring | Observation Wells | Monitoring | - | - | 7.6 | 4.6 | 7.6 | - | - | - | - | 2.1 | brown | fill | sand | loose |
| | | | | | | | | | | | | | | | | | 7.6 | grey | clay | silt | packed |
| 4904366 | 596182 | 4846773 | 1974 | 127 | Rotary | Water Supply | Domestic / | Fresh | 22.9 | 26.2 | 23.5 | 26.2 | 15.2 | 15.5 | 37.8 | 2.0 | 13.7 | grey | clay | stones | - |
| | | | | | | | Stock | | | | | | | | | | 22.9 | grey | sand | silt | - |
| | | | | | | | | | | | | | | | | | 26.2 | - | sand | gravel | - |
| 4903798 | 596215 | 4847003 | 1971 | 762 | Boring | Water Supply | Industrial | Fresh | 18.3 | 18.3 | - | - | 14.6 | 18.3 | 18.9 | - | 0.3 | brown | loam | - | - |
| | | | | | | | | | | | | | | | | | 4.9 | brown | clay | stones | - |
| | | | | | | | | | | | | | | | | | 18.3 | grey | clay | silt | stones |
| 7294666 | 596291 | 4847111 | 2016 | 51 | Auger | Observation Wells | Monitoring | - | 6.1 | 10.7 | 6.1 | 10.7 | - | - | - | - | 6.1 | grey | silt | clay | hard |
| 7255231 | 596200 | 4847193 | 2015 | 51 | Rotary | Observation Well | Monitoring | - | 6.1 | 6.1 | 4.6 | 6.1 | - | - | - | - | 1.8 | brown | sand | gravel | hard |
| | | | | | | | | | | | | | | | | | 3.7 | brown | sand | silt | hard |
| | | | | | | | | | | | | | | | | | 6.1 | grey | silt | sand | hard |
| 7280851 | 596835 | 4846550 | 2016 | 51 | Auger | Observation Wells | Monitoring | - | - | 15.2 | - | - | - | - | - | - | 15.2 | brown | sand | - | - |
| 4903209 | 596270 | 4846770 | 1969 | 168 | - | - | - | Fresh | 42.7 | 43.2 | - | - | 16.5 | 32.0 | 1.9 | 4.0 | 17.7 | - | previously drilled | - | - |
| | | | | | | | | | | | | | | | | | 27.4 | - | sand | - | - |
| | | | | | | | | | | | | | | | | | 32.9 | - | gravel | sand | - |
| | | | | | | | | | | | | | | | | | 43.2 | grey | shale | - | - |
| 4901349 | 596256 | 4846800 | 1966 | 762 | Boring | Water Supply | Domestic | Fresh | 13.1 | 17.7 | - | - | 13.1 | - | 3.8 | - | 1.5 | brown | loam | clay | - |
| | | | | | | | | | | | | | | | | | 13.1 | grey | clay | stones | - |
| | | | | | | | | | | | | | | | | | 17.7 | - | sand | - | - |

# Table 1: Summary of MECP Water Well Records

| | UTM Coordinates (NAD83 Zone 17) | | | | | | | | | | Interval Screened | | | Pumping Test | | | Stratigraphy | | Description | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| MECP Well No. | Easting | Northing | Year Drilled | Nominal Casing Diameter (millimetres) | Drilling Method | Well Status | Well Use | Water Quality | Water Found (m BGS) | Total Depth (metres) | Top (m BGS) | Bottom (m BGS) | Static Level (m BGS) | Level (m BGS) | Rate (L/min) | Duration (hours) | Depth to Unit Base (m BGS) | Colour | Material 1 | Material 2 | Material 3 |
| 7102150 | 596903 | 4846766 | 2008 | 50 | Boring | Observation Well | Not Used | - | - | 6.1 | - | - | - | - | - | - | 6.1 | brown | silt | sand | - |
| 4901397 | 596587 | 4846692 | 1964 | 127 | Boring | Water Supply | Domestic | Fresh | 30.5 | 34.1 | - | - | 14.6 | 30.5 | 15.1 | 4.0 | 5.5 | brown | clay | - | - |
| | | | | | | | | | | | | | | | | | 15.5 | blue | clay | - | - |
| | | | | | | | | | | | | | | | | | 29.6 | - | sand | silt | - |
| | | | | | | | | | | | | | | | | | 34.1 | blue | shale | - | - |
| 7294665 | 596257 | 4847157 | 2016 | 51 | Auger | Observation Well | Monitoring | - | 9.1 | 13.7 | 9.1 | 13.7 | - | - | - | - | 9.1 | grey | silt | clay | soft |
| 4901396 | 596502 | 4846761 | 1962 | 168 | Boring | Water Supply | Livestock | Fresh | 16.8 | 21.3 | 18.9 | 21.3 | 9.4 | 18.9 | 15.1 | 20.0 | 4.9 | brown | clay | - | - |
| | | | | | | | | | | | | | | | | | 10.7 | blue | clay | - | - |
| | | | | | | | | | | | | | | | | | 11.9 | blue | clay | soft | - |
| | | | | | | | | | | | | | | | | | 16.8 | - | sand | - | - |
| | | | | | | | | | | | | | | | | | 21.3 | - | sand | - | - |
| 7130987 | 596372 | 4847110 | 2009 | 112 | - | Abandoned | - | - | - | 24.5 | - | - | 1.1 | - | - | - | - | - | - | - | - |
| 7140375 | 596854 | 4846531 | 2009 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7200531 | 596890 | 4846273 | 2013 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7208839 | 596893 | 4846242 | 2012 | 51 | Rotary | - | - | - | - | 4.6 | 3.0 | 4.6 | - | - | - | - | - | - | - | - | - |
| 7208840 | 596907 | 4846254 | 2012 | 51 | Rotary | Observation Well | Monitoring | - | - | 7.6 | 4.6 | 7.6 | - | - | - | - | - | - | - | - | - |
| 7208841 | 596890 | 4846280 | 2012 | 51 | Rotary | Observation Well | Monitoring | - | - | 7.6 | 4.6 | 7.6 | - | - | - | - | - | - | - | - | - |
| 7326244 | 596304 | 4846887 | 2018 | - | - | Abandoned - Other | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 7326243 | 596186 | 484728 | 2018 | - | - | Abandoned - Other | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

Notes:
1. Table to be read in conjunction with accompanying report.
2. Well records queried electronically from Ontario Ministry of the Environment, Conservation and Parks in December 2020.
3. "-" indicates this information was not provided in the well record.
4. Refer to Figure 2 for well locations.
5. 'm BGS' defined as metres below ground surface.

Table 2: Summary of Single Well Response Tests

| Monitoring Well | Screened Interval [m BGS] | Hydrostratigraphy | Stratigraphic Description | Test | K (m/s) | Geometric Mean, K (m/s) |
|---|---|---|---|---|---|---|
| MW101-20 | 11.1 - 12.0 | Confined Aquifer | dense grey SAND, trace silt and clay<br>very dense grey SAND AND SILT, trace clay and gravel | Falling Head 1 | 2.6E-06 | 3.E-06 |
| | | | | Rising Head 1 | 3.2E-06 | |
| | | | | Falling Head 2 | 3.0E-06 | |
| | | | | Rising Head 2 | 3.6E-06 | |
| MW103-20 | 10.7 - 12.2 | Aquitard | very still to hard grey SANDY CLAYEY SILT, trace to some gravel | Falling Head 1 | 1.2E-07 | 2.E-07 |
| | | | | Rising Head 1 | 2.6E-07 | |
| MW105-20 | 6.6 - 8.1 | Confined Aquifer | dense brown to grey SAND, trace to some silt | Falling Head 1 | 2.2E-06 | 2.E-06 |
| | | | | Rising Head 1 | 1.7E-06 | |
| MW108-20 | 11.3 - 12.8 | Confined Aquifer | dense to very dense grey SAND, trace silt | Falling Head 1 | 8.5E-06 | 1.E-05 |
| | | | | Rising Head 1 | 1.1E-05 | |
| | | | | Falling Head 2 | 9.4E-06 | |
| | | | | Rising Head 2 | 1.1E-05 | |

Notes:
1. Table to be read in conjunction with accompanying report.
2. K values provided in metres per second (m/s).
3. Screened intervals provided in metres (m) below ground surface (BGS).
4. Refer to Figure 4 for well locations.
5. Refer to Borehole Logs for installation details.

Table 3: Summary of Manually Measured Groundwater Elevations

| Well ID | Ground Surface Elevation (m AMSL) | Top of Pipe Elevation (m AMSL) | 2020-11-13 | | 2020-11-19 | | 2020-11-23 | | 2020-11-30 | | 2020-12-14 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Water Level (m BTOP) | Elevation (m AMSL) | Water Level (m BTOP) | Elevation (m AMSL) | Water Level (m BTOP) | Elevation (m AMSL) | Water Level (m BTOP) | Elevation (m AMSL) | Water Level (m BTOP) | Elevation (m AMSL) |
| MW101-20 | 258.43 | 259.46 | 8.11 | 251.35 | 8.14 | 251.32 | 8.16 | 251.30 | - | - | 8.11 | 251.35 |
| MW102-20 | 257.15 | 257.93 | 11.90 | 246.03 | 11.49 | 246.44 | - | - | 11.43 | 246.50 | 11.03 | 246.90 |
| MW103-20 | 254.31 | 255.25 | 8.76 | 246.49 | 6.38 | 248.87 | - | - | 7.05 | 248.20 | 5.18 | 250.07 |
| MW104-20 | 254.52 | 255.35 | 11.05 | 244.31 | 11.11 | 244.24 | - | - | 10.98 | 244.37 | 11.06 | 244.29 |
| MW105-20 | 256.04 | 256.92 | 6.24 | 250.67 | 6.24 | 250.68 | 6.28 | 250.64 | - | - | 6.27 | 250.64 |
| MW106-20 | 257.86 | 257.77 | 6.58 | 251.19 | 6.59 | 251.18 | - | - | 6.61 | 251.16 | 6.64 | 251.13 |
| MW107-20 | 256.48 | 257.31 | 9.34 | 247.96 | 9.39 | 248.04 | - | - | - | - | 9.26 | 248.05 |
| MW108-20 | 261.27 | 262.20 | 9.92 | 252.28 | 10.00 | 252.20 | 9.98 | 252.22 | - | - | 10.00 | 252.20 |
| SG1 | - | 259.25 | - | - | 1.22 | 258.03 | - | - | - | - | 1.18 | 258.07 |
| SG2 | - | 253.54 | - | - | 1.43 | 252.11 | - | - | - | - | 1.19 | 252.35 |
| SG3 | - | 255.35 | - | - | 1.21 | 254.14 | - | - | - | - | 1.15 | 254.19 |
| P1 | 252.57 | 253.34 | - | - | 1.43 | 251.91 | - | - | - | - | 0.95 | 252.38 |

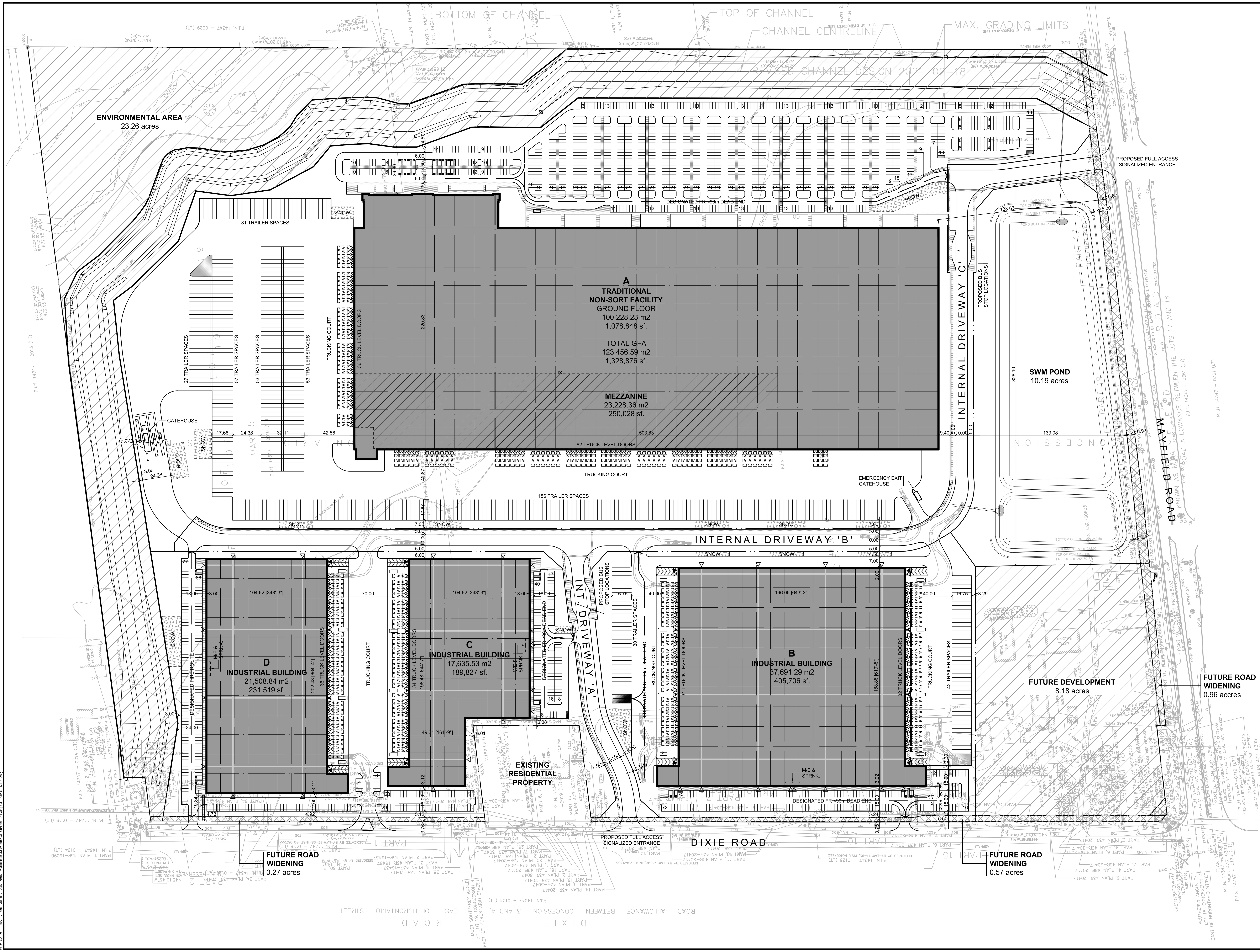
Notes:
1. Table to be read in conjunction with accompanying report.
2. See Borehole Log for installation details.
3. Dates are provided in Standard International (SI) format (i.e., yyyy-mm-dd).
4. Water Levels provided in metres (m) below top of pipe (BTOP).
5. Elevations are provided in metres (m) above mean sea level (AMSL).
6. Reference elevations surveyed by MTE November 25, 2020 relative to geodetic datum.

| Parameters | Unit | RDL | PWQO Criteria | | Sample Location | MW101-20 | MW105-20 | SG2 |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Sample Name** | **MW101-20** | **MW105-20** | **SG2** |
| | | | | | **Lab Job #** | **C0V1545** | **C0V1545** | **C0V1545** |
| | | | | | **Laboratory ID** | **OFV696** | **OFV697** | **OFV695** |
| | | | | | **Sampling Date** | **20-Nov-2020** | **20-Nov-2020** | **20-Nov-2020** |
| | | | | | **Well Screen Interval (m bgs)** | **11.1 - 12.0** | **6.6 - 8.1** | **NA** |
| | | | | | **Maximum Concentration** | | | |
| **Calculated Parameters** | | | | | | | | |
| Anion Sum | me/L | NA | NV | | 23.1 | 13.4 | 23.1 | 8.83 |
| Bicarb. Alkalinity (calc. as CaCO3) | mg/L | 1.0 | NV | | 470 | 280 | 470 | 270 |
| Calculated TDS | mg/L | 1.0 | NV | | 1300 | 740 | 1300 | 480 |
| Carb. Alkalinity (calc. as CaCO3) | mg/L | 1.0 | NV | | 3.6 | 1.7 | 2 | 3.6 |
| Cation Sum | me/L | NA | NV | | 25.5 | 13.8 | 25.5 | 9.08 |
| Hardness (CaCO3) | mg/L | 1.0 | NV | | 900 | 610 | 900 | 370 |
| Ion Balance (% Difference) | % | NA | NV | | 4.88 | 1.17 | 4.88 | 1.38 |
| Langelier Index (@ 20C) | NA | NA | NV | | 1.17 | 0.946 | 1.13 | 1.17 |
| Langelier Index (@ 4C) | NA | NA | NV | | 0.921 | 0.699 | 0.885 | 0.921 |
| Saturation pH (@ 20C) | NA | NA | NV | | 6.98 | 6.87 | 6.52 | 6.98 |
| Saturation pH (@ 4C) | NA | NA | NV | | 7.23 | 7.12 | 6.76 | 7.23 |
| **Inorganics** | | | | | | | | |
| Alkalinity (Total as CaCO3) | mg/L | 1.0 | NV | | 470 | 280 | 470 | 280 |
| Conductivity | umho/cm | 1.0 | NV | | 2200 | 1400 | 2200 | 840 |
| Dissolved Chloride (Cl-) | µg/L | 1000 - 4000 | NV | | 360000 | 210000 | 360000 | 85000 |
| Dissolved Organic Carbon | mg/L | 0.40 | NV | | 5.4 | 2.2 | 4.4 | 5.4 |
| Dissolved Sulphate (SO4) | mg/L | 1.0 | NV | | 160 | 88 | 160 | 42 |
| Nitrate (N) | mg/L | 0.10 | NV | | 2.02 | <0.10 | 2.02 | 0.29 |
| Nitrate + Nitrite (N) | mg/L | 0.10 | NV | | 2.12 | <0.10 | 2.12 | 0.29 |
| Nitrite (N) | mg/L | 0.010 | NV | | 0.101 | <0.010 | 0.101 | <0.010 |
| Orthophosphate (P) | mg/L | 0.010 | NV | | 0.035 | <0.010 | <0.010 | 0.035 |
| pH | pH | NA | 6.5:8.5 | | 8.15 | 7.82 | 7.65 | 8.15 |
| Total Ammonia-N | mg/L | 0.050 | NV | | 0.16 | 0.16 | 0.12 | 0.068 |
| **Metals** | | | | | | | | |
| Dissolved Aluminum (Al) | µg/L | 4.9 | NV | | 56 | 56 | <4.9 | <4.9 |
| Dissolved Antimony (Sb) | µg/L | 0.50 | 20 | < | 0.50 | <0.50 | <0.50 | <0.50 |
| Dissolved Arsenic (As) | µg/L | 1.0 | 100 | | 2.6 | 2.6 | <1.0 | <1.0 |
| Dissolved Barium (Ba) | µg/L | 2.0 | NV | | 200 | 200 | 150 | 54 |
| Dissolved Beryllium (Be) | µg/L | 0.40 | 11 | < | 0.40 | <0.40 | <0.40 | <0.40 |
| Dissolved Boron (B) | µg/L | 10 | 200 | | 160 | 25 | 160 | 22 |
| Dissolved Cadmium (Cd) | µg/L | 0.090 | 0.2 | < | 0.090 | <0.090 | <0.090 | <0.090 |
| Dissolved Calcium (Ca) | µg/L | 200 | NV | | 250000 | 160000 | 250000 | 110000 |
| Dissolved Chromium (Cr) | µg/L | 5.0 | NV | < | 5.0 | <5.0 | <5.0 | <5.0 |
| Dissolved Cobalt (Co) | µg/L | 0.50 | 0.9 | | 2.1 | 0.63 | **2.1** | <0.50 |
| Dissolved Copper (Cu) | µg/L | 0.90 | 5 | | 2.2 | <0.90 | 2.2 | <0.90 |
| Dissolved Iron (Fe) | µg/L | 100 | 300 | | 1700 | **1700** | <100 | <100 |
| Dissolved Lead (Pb) | µg/L | 0.50 | 5 | < | 0.50 | <0.50 | <0.50 | <0.50 |
| Dissolved Magnesium (Mg) | µg/L | 50 | NV | | 67000 | 52000 | 67000 | 22000 |
| Dissolved Manganese (Mn) | µg/L | 2.0 | NV | | 1600 | 110 | 1600 | 14 |
| Dissolved Molybdenum (Mo) | µg/L | 0.50 | 40 | | 3.1 | 2.6 | 3.1 | <0.50 |
| Dissolved Nickel (Ni) | µg/L | 1.0 | 25 | | 4.6 | 1.6 | 4.6 | <1.0 |
| Dissolved Phosphorus (P) | µg/L | 100 | NV | < | 100 | <100 | <100 | <100 |
| Dissolved Potassium (K) | µg/L | 200 | NV | | 5600 | 3900 | 5600 | 3500 |
| Dissolved Selenium (Se) | µg/L | 2.0 | 100 | < | 2.0 | <2.0 | <2.0 | <2.0 |
| Dissolved Silicon (Si) | µg/L | 50 | NV | | 9800 | 9800 | 7900 | 5100 |
| Dissolved Silver (Ag) | µg/L | 0.090 | 0.1 | < | 0.090 | <0.090 | <0.090 | <0.090 |
| Dissolved Sodium (Na) | µg/L | 100 | NV | | 170000 | 34000 | 170000 | 39000 |
| Dissolved Strontium (Sr) | µg/L | 1.0 | NV | | 590 | 380 | 590 | 270 |
| Dissolved Thallium (Tl) | µg/L | 0.050 | 0.3 | | 0.055 | <0.050 | 0.055 | <0.050 |
| Dissolved Titanium (Ti) | µg/L | 5.0 | NV | < | 5.0 | <5.0 | <5.0 | <5.0 |
| Dissolved Uranium (U) | µg/L | 0.10 | 5 | | 5.3 | 0.44 | **5.3** | 0.7 |
| Dissolved Vanadium (V) | µg/L | 0.50 | 6 | < | 0.50 | <0.50 | <0.50 | <0.50 |
| Dissolved Zinc (Zn) | µg/L | 5.0 | 30 | < | 5.0 | <5.0 | <5.0 | <5.0 |

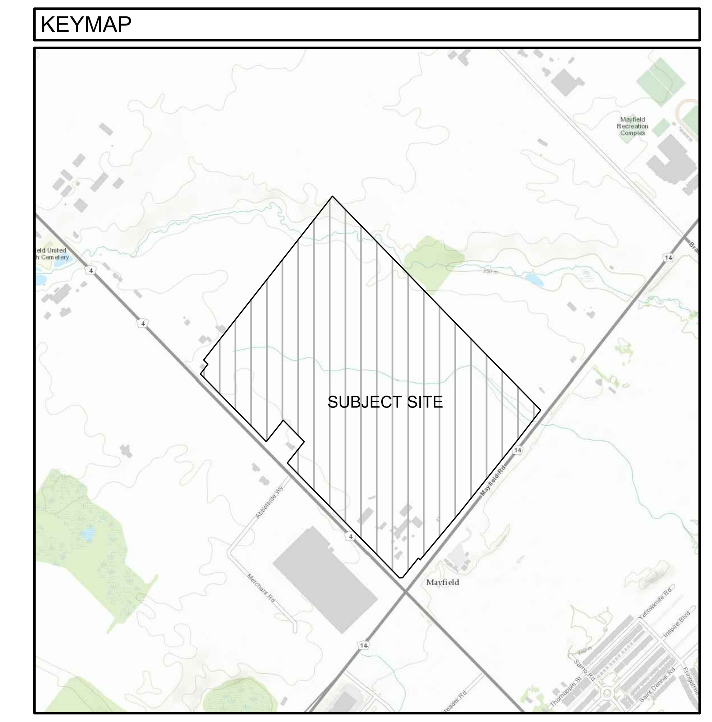
Notes:
1. Criteria for Provincial Water Quality Objectives "PWQO" (Feb. 1999)
2. **Bold** - Exceeds Criteria
3. "-" - parameter not analyzed
4. m bgs - Metres below ground surface
5. RDL - Reported detection limit
6. NV- No Value
7. NA - Not Applicable
8. < - Less than the Reporting Detection Limit
9. µg/L- Micro-grams per Litre
10. mg/L - Milligrams per Litre
11. umho/cm - Micromhos per Centimeter
12. me/L - Milliequivalent per Litre

# Appendix A

# Concept Plan




## KEYMAP




## LEGAL DESCRIPTION

PLAN OF SURVEY OF
PARTS OF WEST HALF OF LOTS 18 AND 19
CONCESSION 4, EAST OF HURONTARIO STREET
TOWN OF CALEDON
REGIONAL MUNICIPALITY OF PEEL

AS PREPARED BY:
R. AVIS SURVEYING INC.
ONTARIO LAND SURVEYORS

PROJECT NORTH

TRUE NORTH

## SITE STATISTICS

| | | | |
|---|---|---|---|
| OVERALL SITE AREA | | 595,187.64 m2 or | 147.07 acres |
| ENVIRONMENTAL AREA | | 94,128.40 m2 or | 23.26 acres |
| FUTURE DEVELOPMENT | | 33,108.72 m2 or | 8.18 acres |
| FUTURE ROAD WIDENING AREA | | 7,289.29 m2 or | 1.80 acres |
| DEVELOPMENT AREA | | 460,661.18 m2 or | 113.83 acres |
| ZONING | | | TO BE REZONED |
| | | REQUIRED | PROVIDED |
| LOT WIDTH | | | 3,355.45 m |
| SETBACKS | FRONT YARD (EAST) MAYFIELD ROAD | TBD | 138.63 m |
| | REAR YARD (WEST) | TBD | 10.02 m |
| | EXTERIOR SIDE YARD (SOUTH) DIXIE ROAD | TBD | 19.84 m |
| | INTERIOR SIDE YARD (NORTH) | TBD | 39.80 m |
| GFA | BUILDING A | 123,456.59 m2 or | 1,328,876 sf. |
| | GROUND FLOOR | 100,228.23 m2 or | 1,078,848 sf. |
| | MEZZANINE | 23,228.36 m2 or | 250,028 sf. |
| | BUILDING B | 37,691.29 m2 or | 405,706 sf. |
| | BUILDING C | 17,635.53 m2 or | 189,827 sf. |
| | BUILDING D | 21,508.84 m2 or | 231,519 sf. |
| | TOTAL | 200,292.24 m2 or | 2,155,928 sf. |
| SITE COVERAGE | | 177,063.88 m2 or | 38.44 % |
| LANDSCAPED AREA | | 110,484.02 m2 or | 23.98 % |
| PAVED AREA | | 173,113.28 m2 or | 37.58 % |
| | | REQUIRED | PROVIDED |
| BUILDING HEIGHT (MAXIMUM) | | TBD | TBD |
| PARKING | WAREHOUSE USE<br>GFA over 20,000 m2<br>168 spaces plus 1 space per 170 m2 of net floor area over 20,000 m2<br>180,292.24 m2 @ 1 space per 170 m2 | 168 spaces<br>1,061 spaces | 1665 spaces (car spaces)<br>449 spaces (trailer spaces) |
| | TOTAL PARKING | 1,229 spaces | 2,114 spaces |
| BARRIER-FREE PARKING<br>For >1000 total required parking spaces:<br>11 barrier-free spaces + 1% of total provided car spaces | | 28 spaces | 28 spaces |
| BICYCLE SPACES | | | |
| SNOW STORAGE<br>% OF PAVED AREA | | 3,932.79 m2 or | 2.27 % |

## SYMBOL LEGEND

| | |
|---|---|
| ▷ | MAN DOOR |
| \|▷ | LOADING DOCK DOOR |
| \|▶ | DRIVE-IN / OVERHEAD DOOR |
| FH | HYDRANT + VALVE |
| FDC | FIRE DEPARTMENT CONNECTION / SIAMESE |
| CB | CATCH BASIN |
| DCB | DOUBLE CATCH BASIN |
| SANMH | SANITARY MAN HOLE |
| CB/MH | CATCH BASIN / MAN HOLE |
| SMH | STORM MAN HOLE |
| HP | HYDRO POLE STANDARD / UTILITY POLE |
| BR | BIKE RACK |
| HT | HYDRO TRANSFORMER |
| | ACCESSIBLE PARKING SPACE |
| | ACCESSIBLE PARKING SPACE SIGNAGE |
| SNW | SNOW STORAGE AREA |

| No. | ISSUED | DATE |
|---|---|---|

| No. | REVISION | DATE |
|---|---|---|

BALDASSARRA Architects Inc.
30 Great Gulf Drive, Unit 20 | Concord ON | L4K 0K7
T. 905.660.0722 | www.baldassarra.ca

OWNERS INFORMATION:
Tribal Partners
201-2700 Steeles Ave. W
Vaughan, ON L4K 3C8
905-567-0808

Tribal

ONTARIO ASSOCIATION OF ARCHITECTS
A. BALDASSARRA
LICENSE
3654

# 12035 Dixie Road

Town of Caledon, Ontario

## SITE PLAN

| DATE: | DRAWN BY: | CHECKED: | SCALE: |
|---|---|---|---|
| MAR. 2021 | LY | | 1:1250 |
| PROJECT No. | | DRAWING No. | |
| P-20146 | | A-1.0 | |

P:\P-20146 Tribal - Mayfield and Dixie Road Masterplan\Drawings\01 Current Drawings\P-20146-A-1_0.dwg, 2021-03-09 1:46:15 PM, LouisY, DWG To PDF.pc3

# Appendix B

# Borehole Logs

The following are abbreviations and symbols commonly used on borehole logs, figures and reports.

## Sample Types

| | |
|---|---|
| AS | Auger Sample |
| CS | Chunk Sample |
| BS | Bulk Sample |
| GS | Grab Sample |
| WS | Wash Sample |
| SS | Split Spoon |
| RC | Rock Core |
| SC | Soil Core |
| TW | Thinwall, Open |
| TP | Thinwall, Piston |

## Soil Tests

| | |
|---|---|
| PP | Pocket Penetrometer |
| FV | Field Vane |
| SPT | Standard Penetration Test |
| CPT | Cone Penetration Test |
| WC | Water Content |
| WL | Water Level |

## Penetration Resistance

| | |
|---|---|
| Standard Penetration Test, N (ASTM D1586) | The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive a 50 mm (2 in.) open spilt spoon sampler for a distance of 300 mm (12 in.). |
| Dynamic Cone Penetration Resistance | The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in.) required to drive an uncased 50 mm (2 in.) diameter, 60o cone attached to “A” size drill rods for a distance of 300 mm (12 in.). |

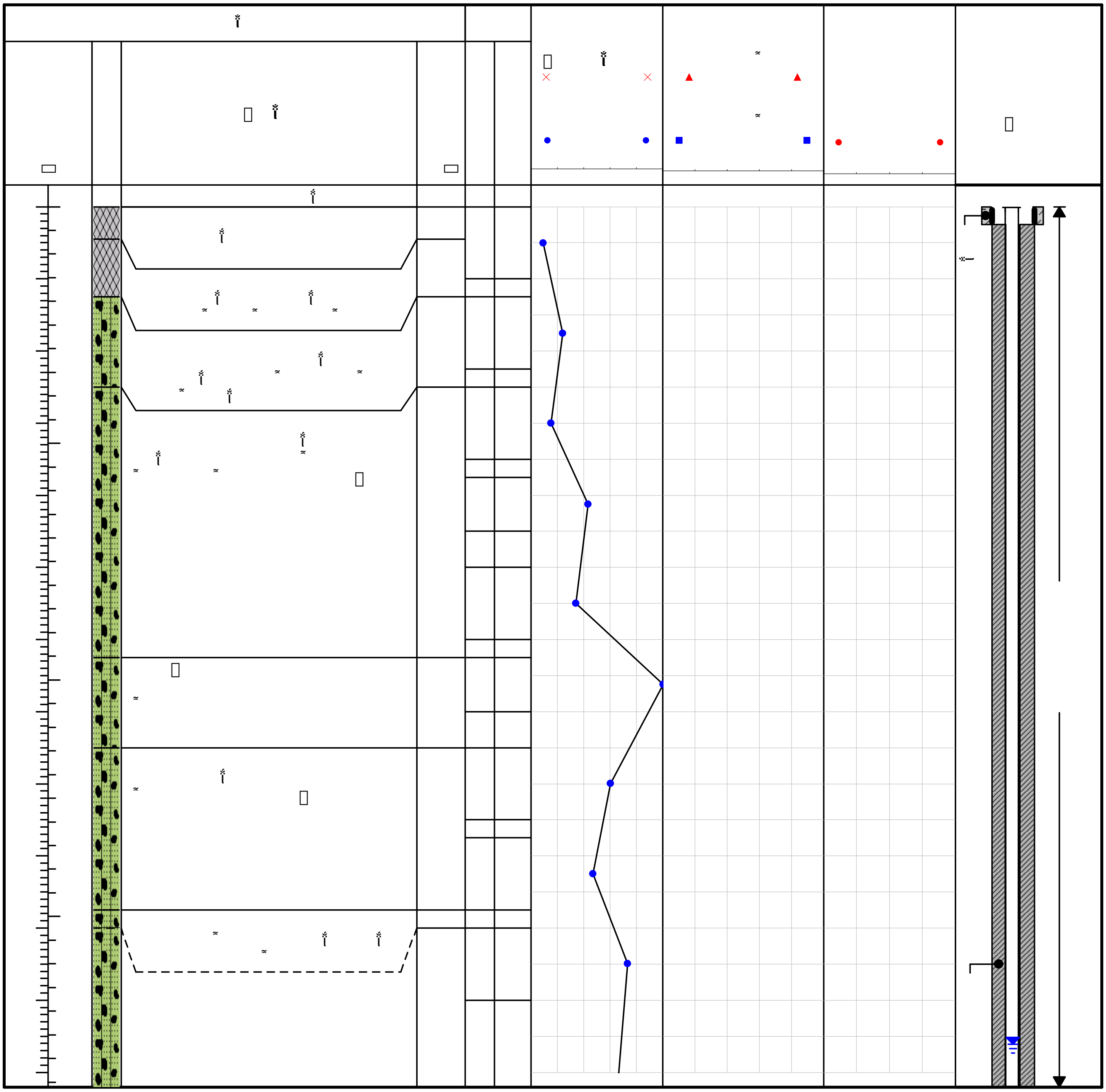
## Soil Description

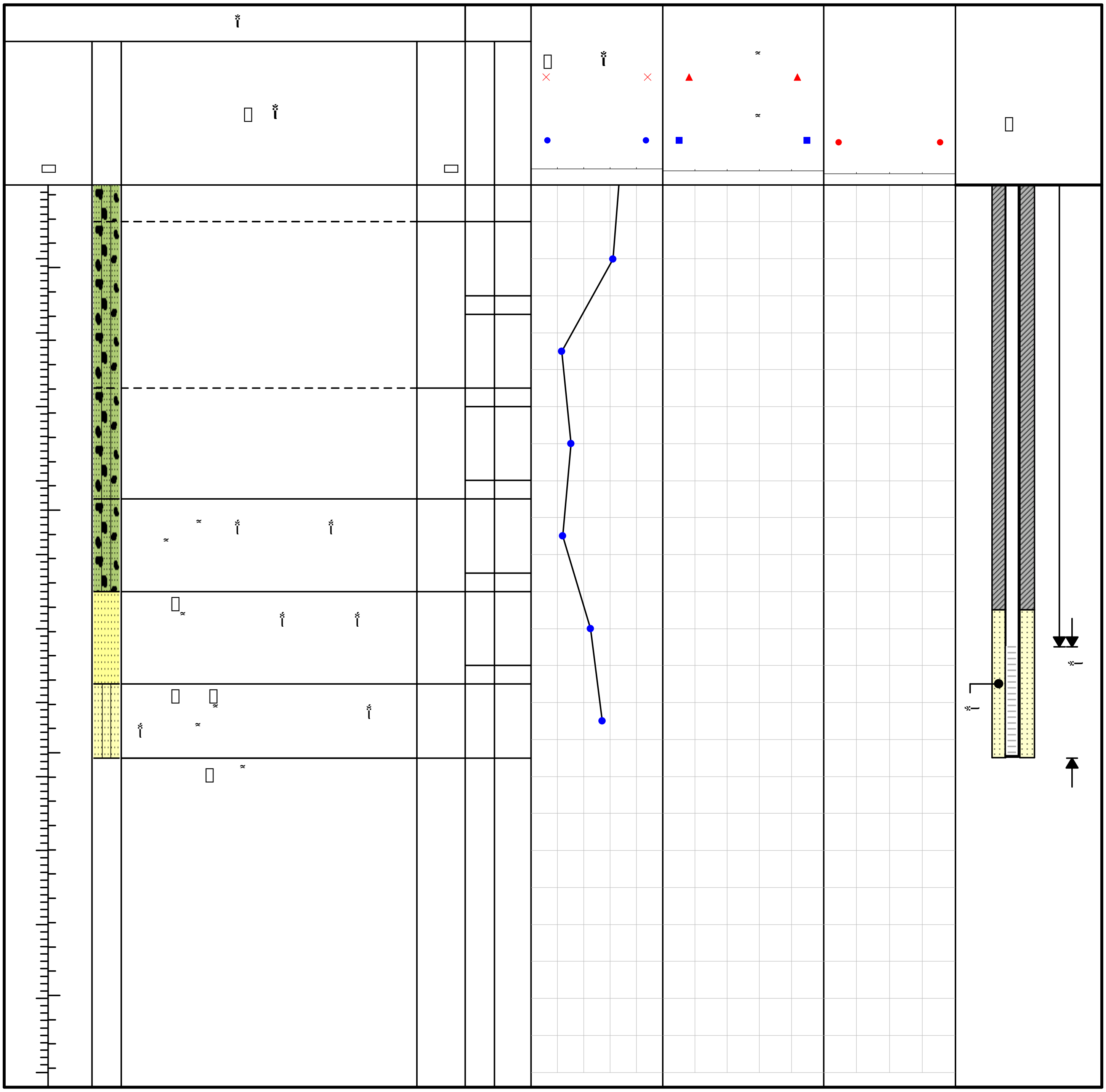
| Cohesive Soils | Undrained Shear Strength (Cu) | |
|---|---|---|
| Consistency | kPa | psf |
| Very Soft | 0 to 12 | 0 to 250 |
| Soft | 12 to 25 | 250 to 500 |
| Firm | 25 to 50 | 500 to 1,000 |
| Stiff | 50 to 100 | 1,000 to 2,000 |
| Very Stiff | 100 to 200 | 2,000 to 4,000 |
| Hard | Above 200 | Above 4,000 |

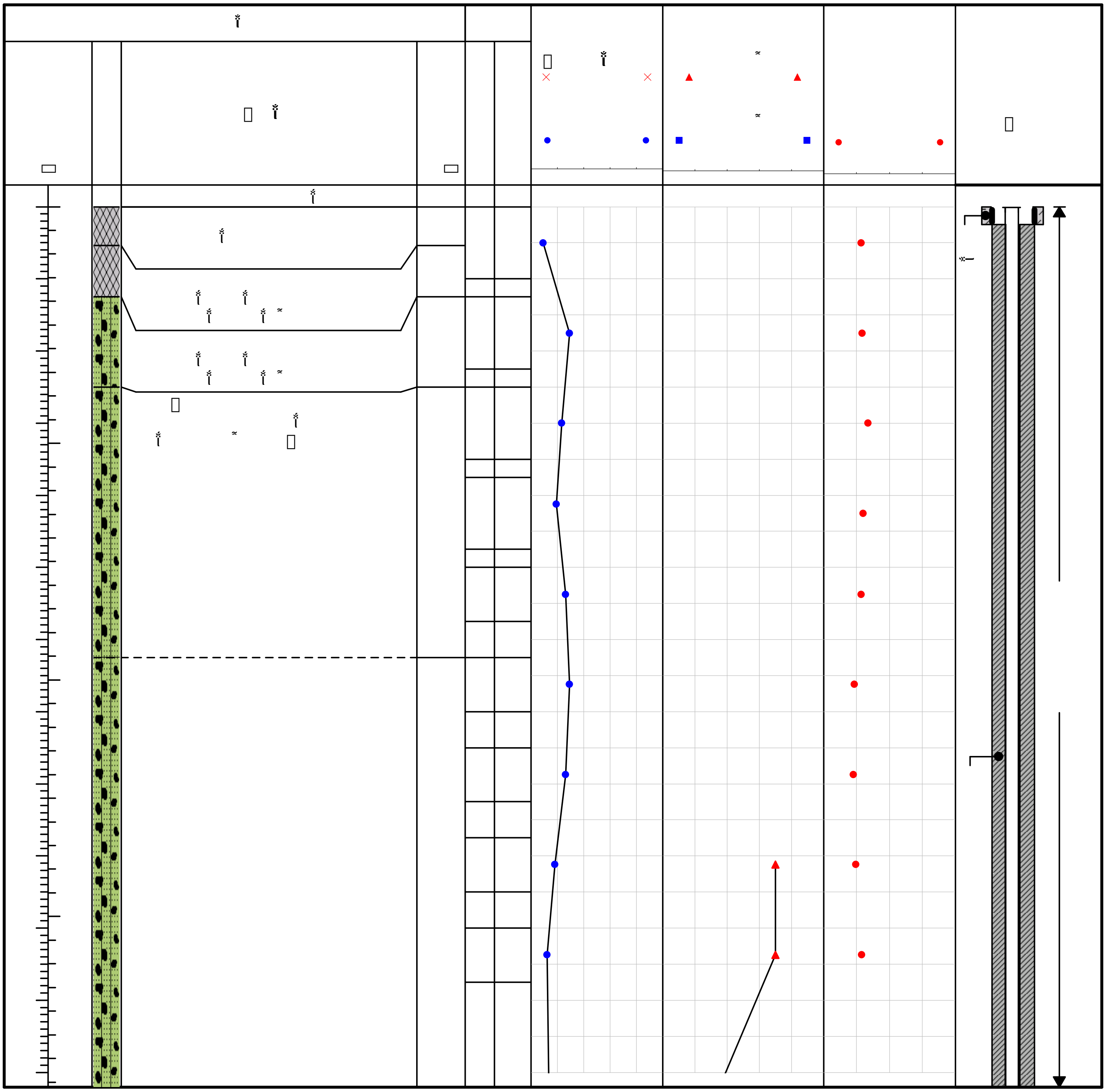
| Cohesionless Soils | |
|---|---|
| Relative Density | SPT N Value |
| Very Loose | 0 to 4 |
| Loose | 4 to 10 |
| Compact | 10 to 30 |
| Dense | 30 to 50 |
| Very Dense | Above 50 |

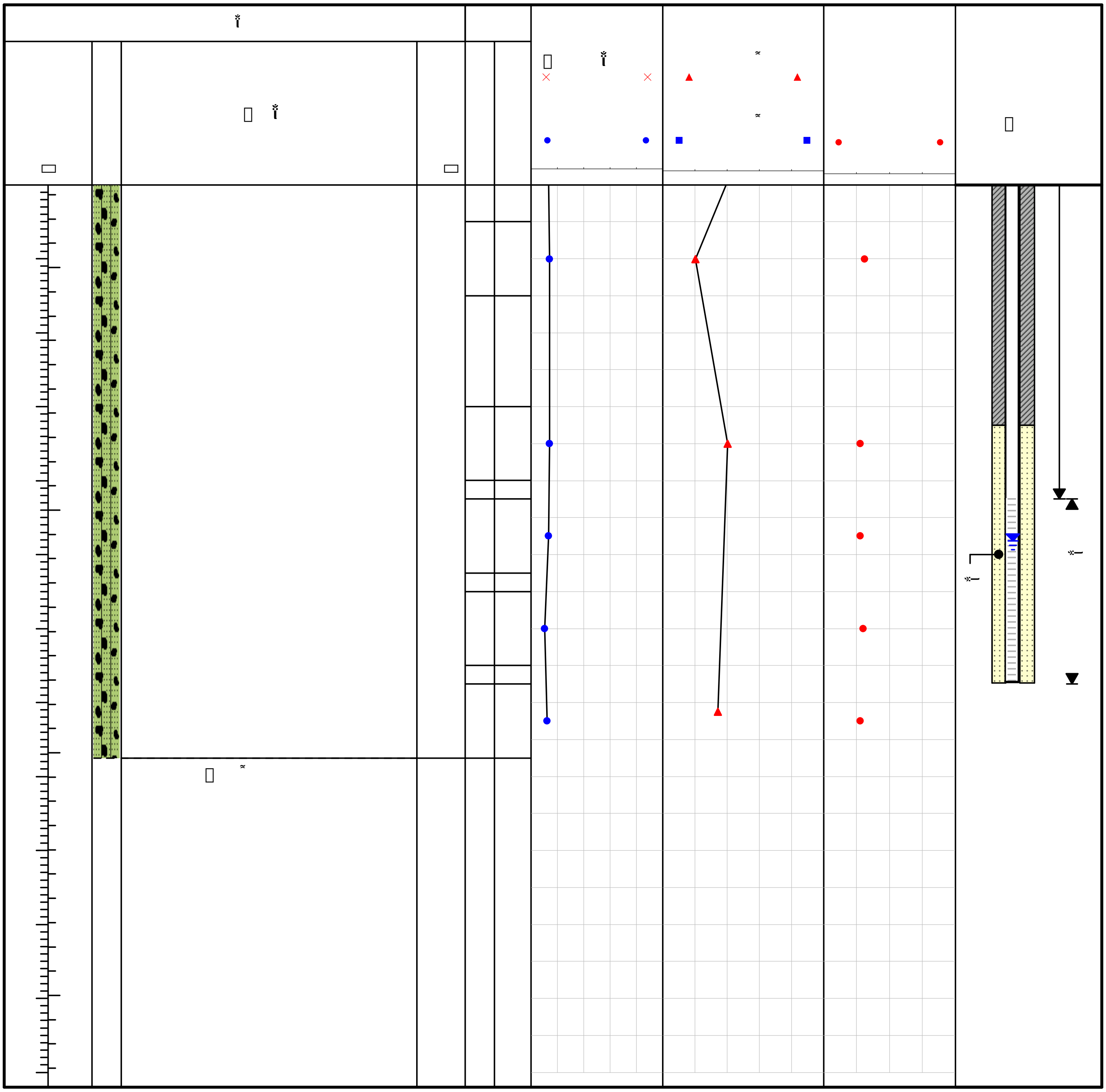
| | |
|---|---|
| WH | Sampler advanced by static weight of hammer |
| WR | Sampler advanced by static weight of drilling rods |
| PH | Sampler advanced by hydraulic force |
| PM | Sampler advanced by manual force |

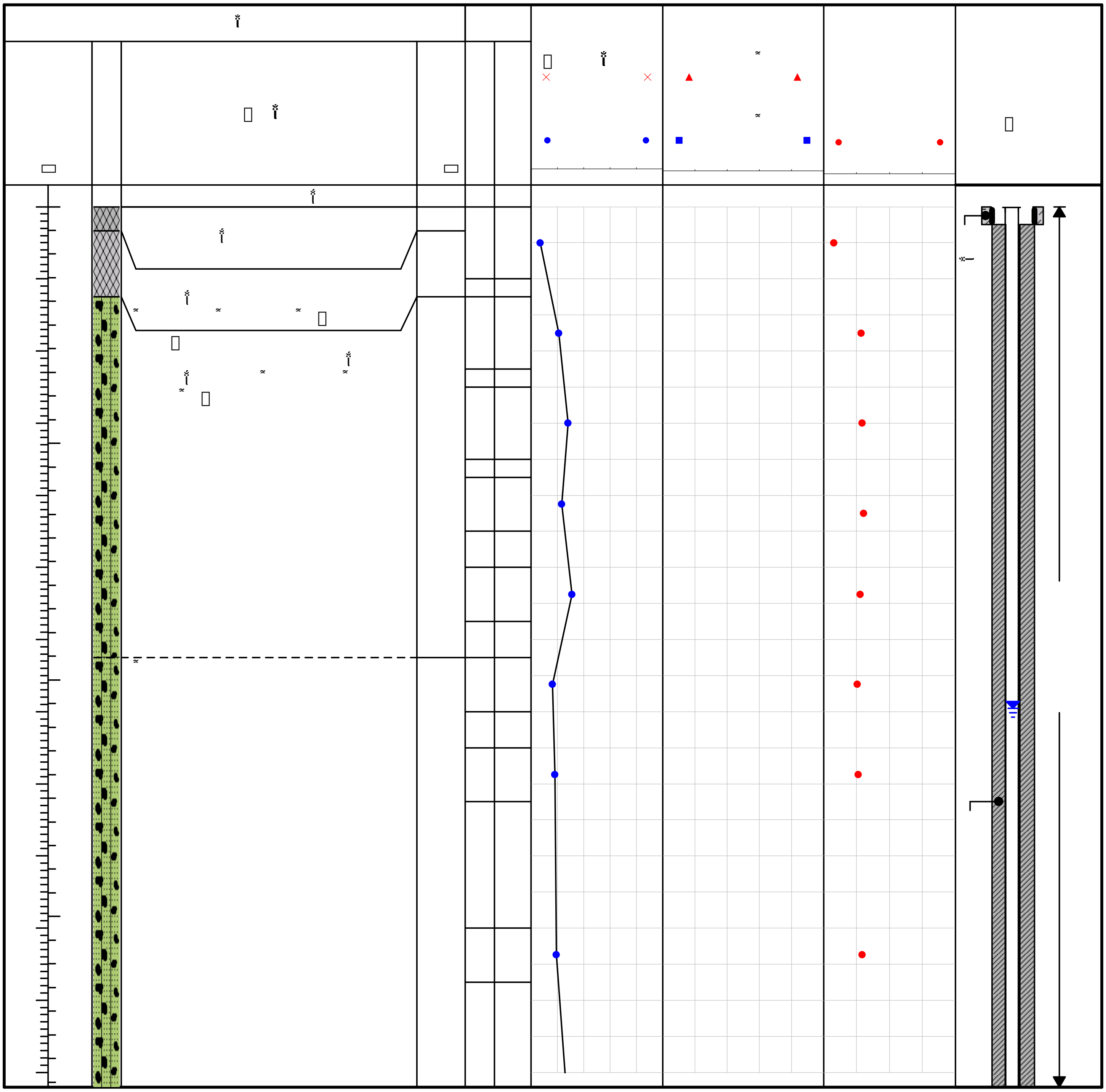
| | |
|---|---|
| DTPL | Drier than Plastic Limit |
| APL | About Plastic Limit |
| WTPL | Wetter than Plastic Limit |
| mbgs | Metres below Ground Surface |

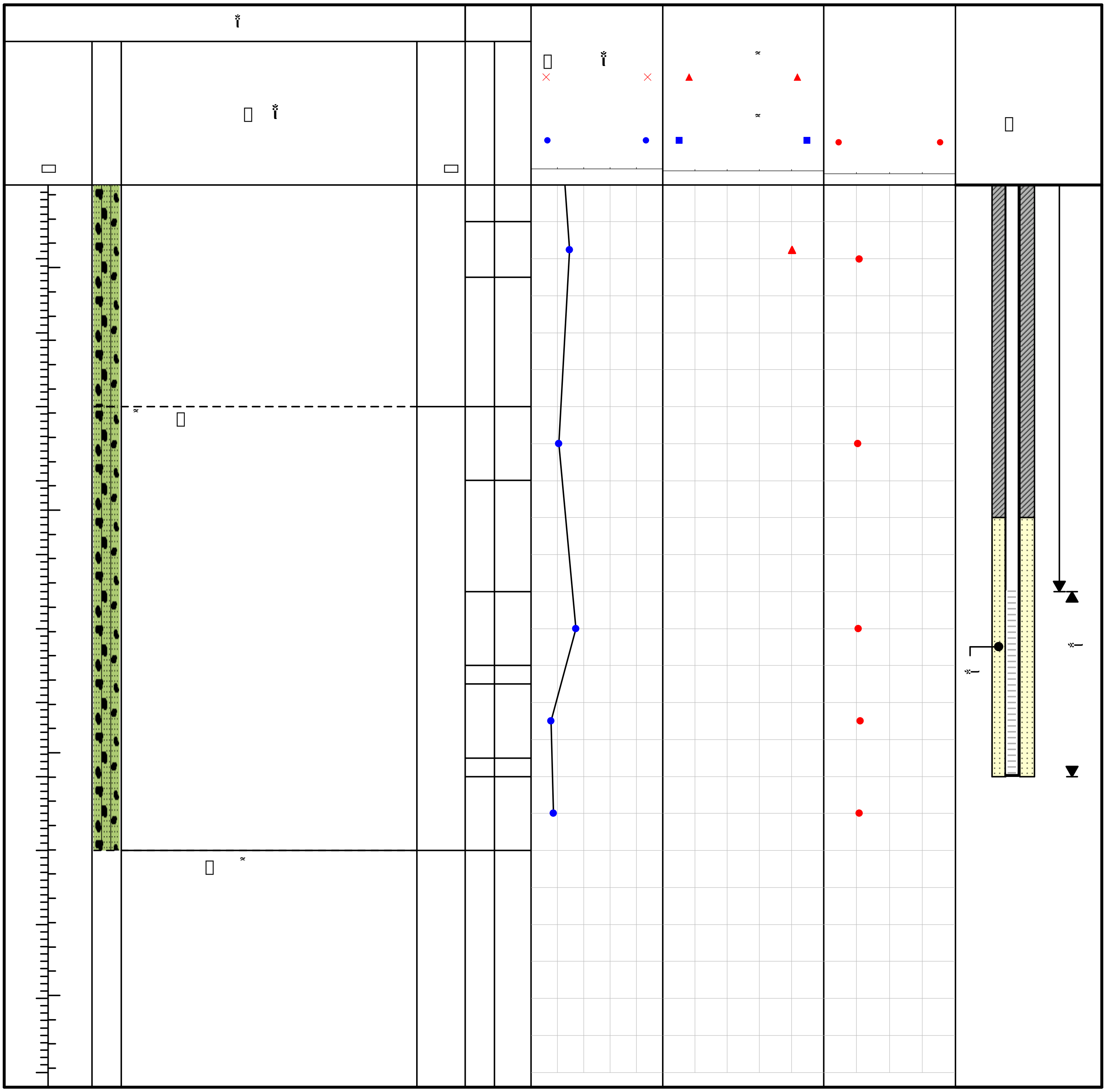


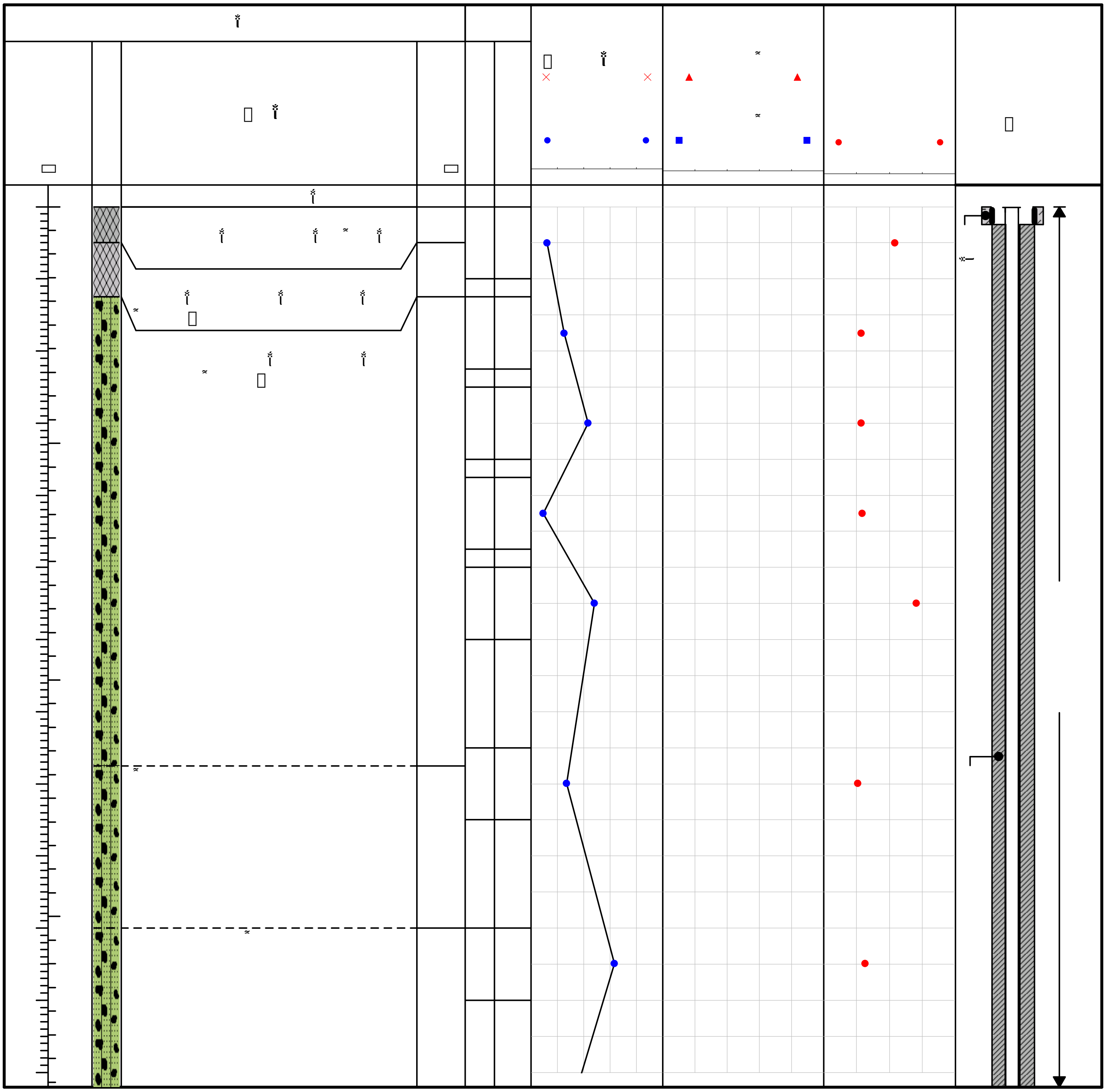


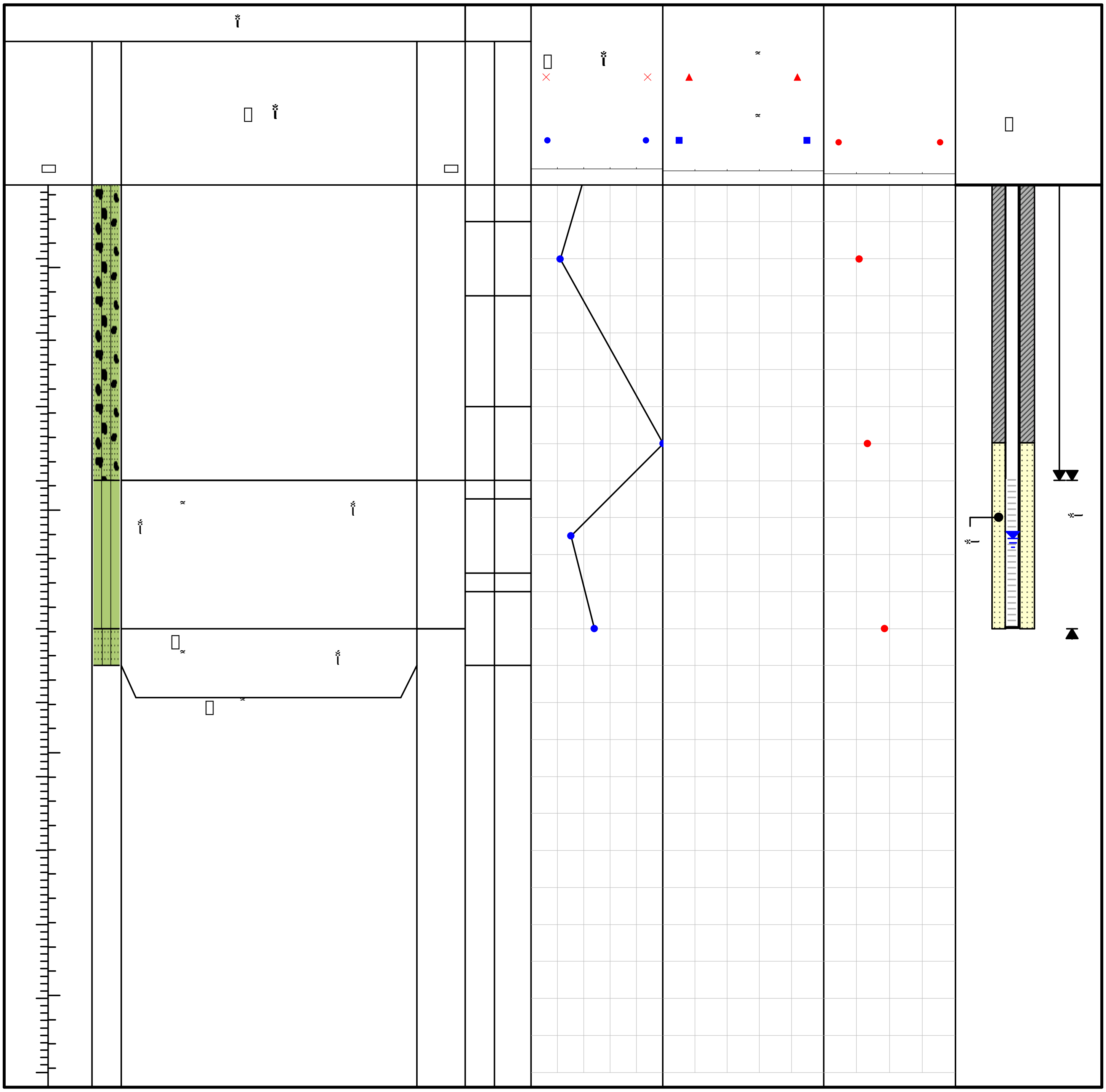


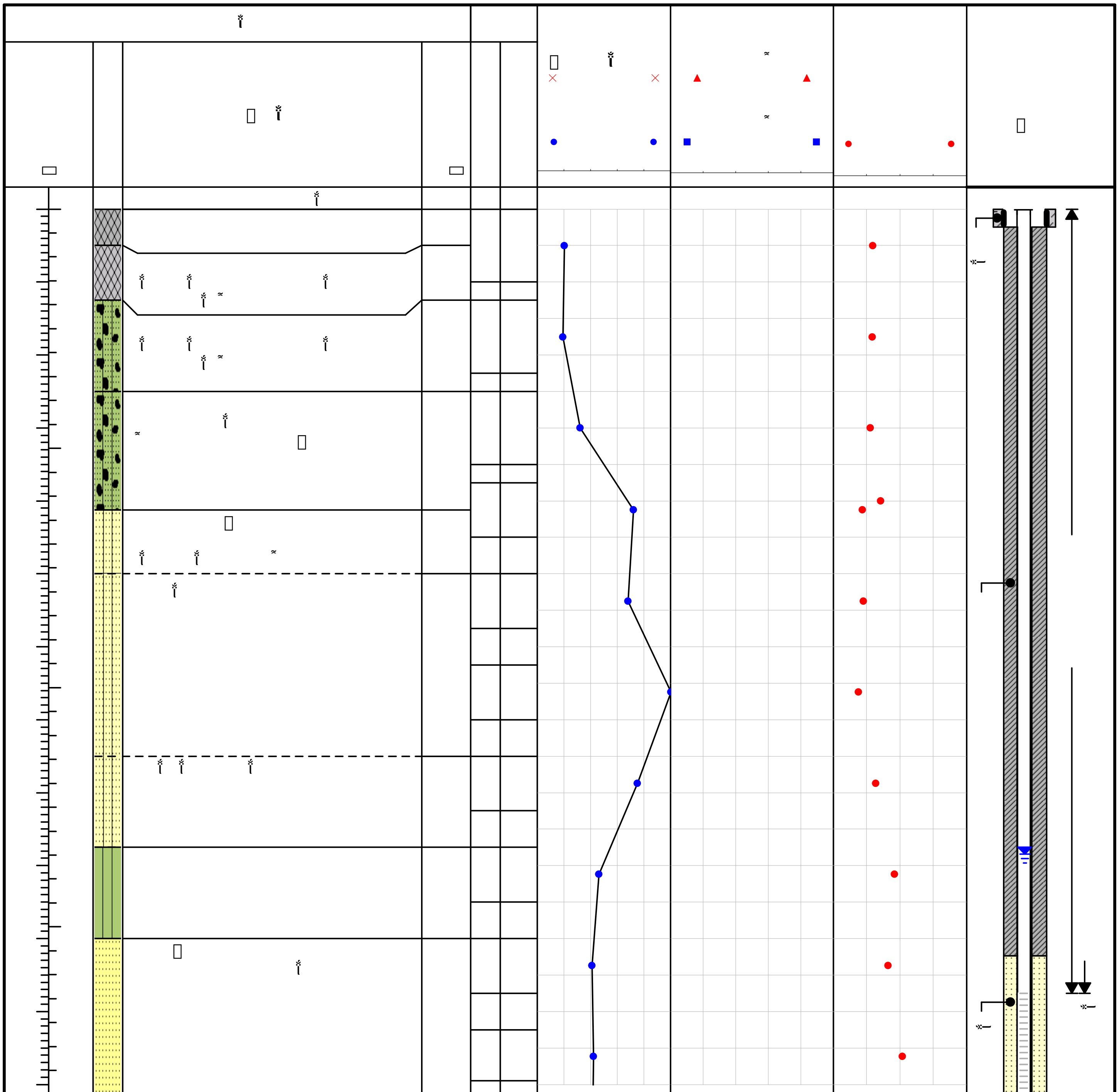


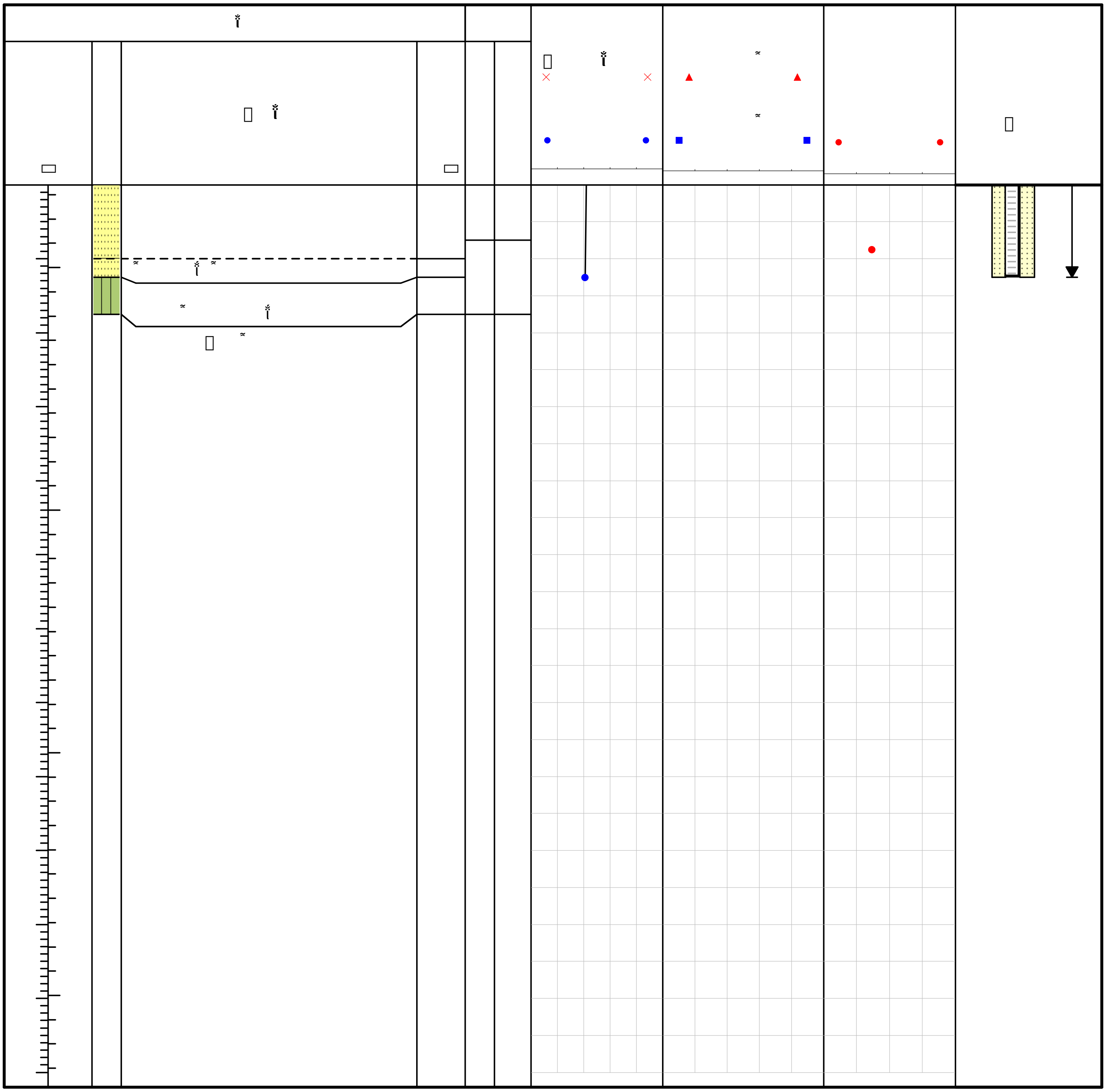


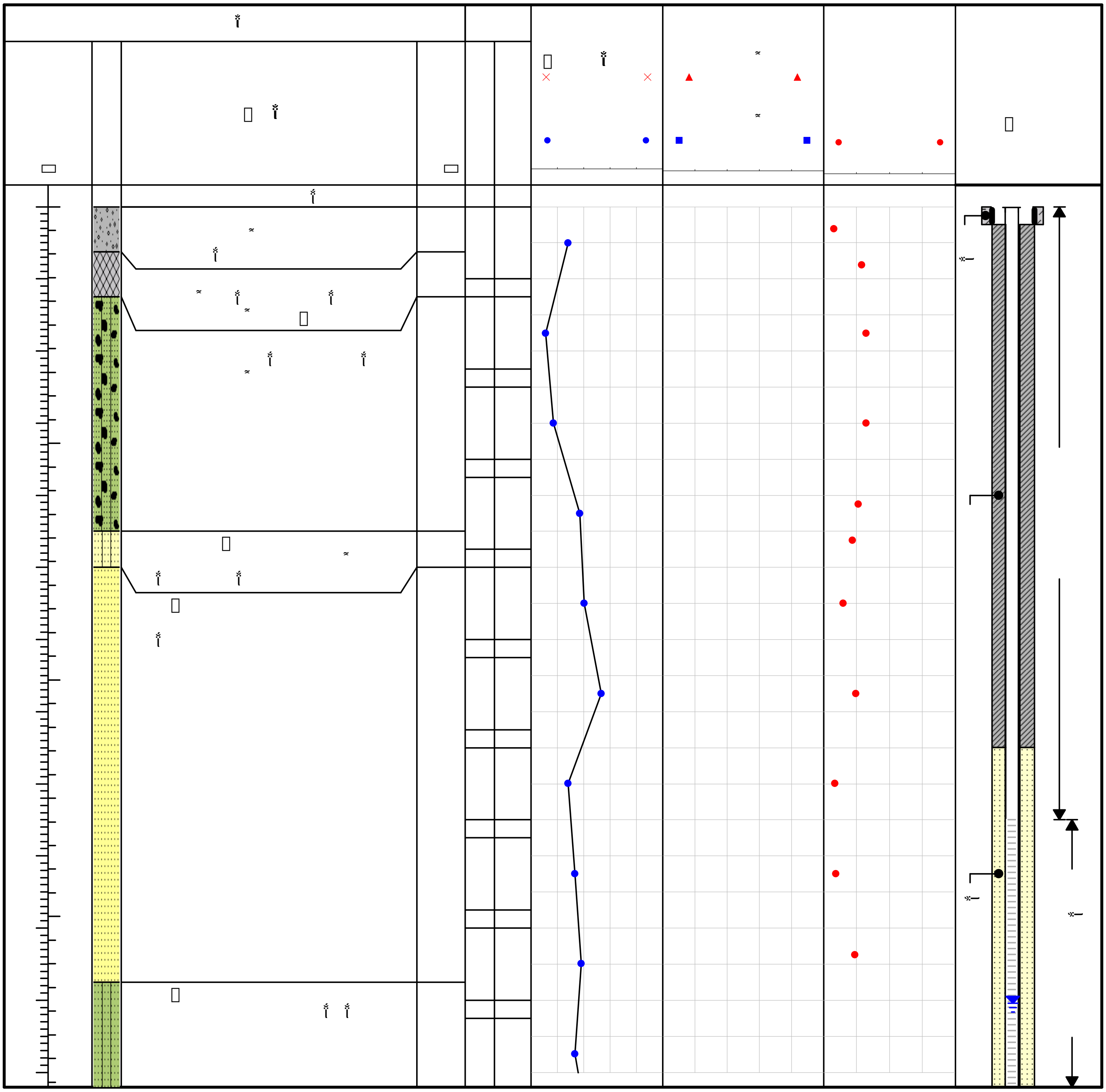


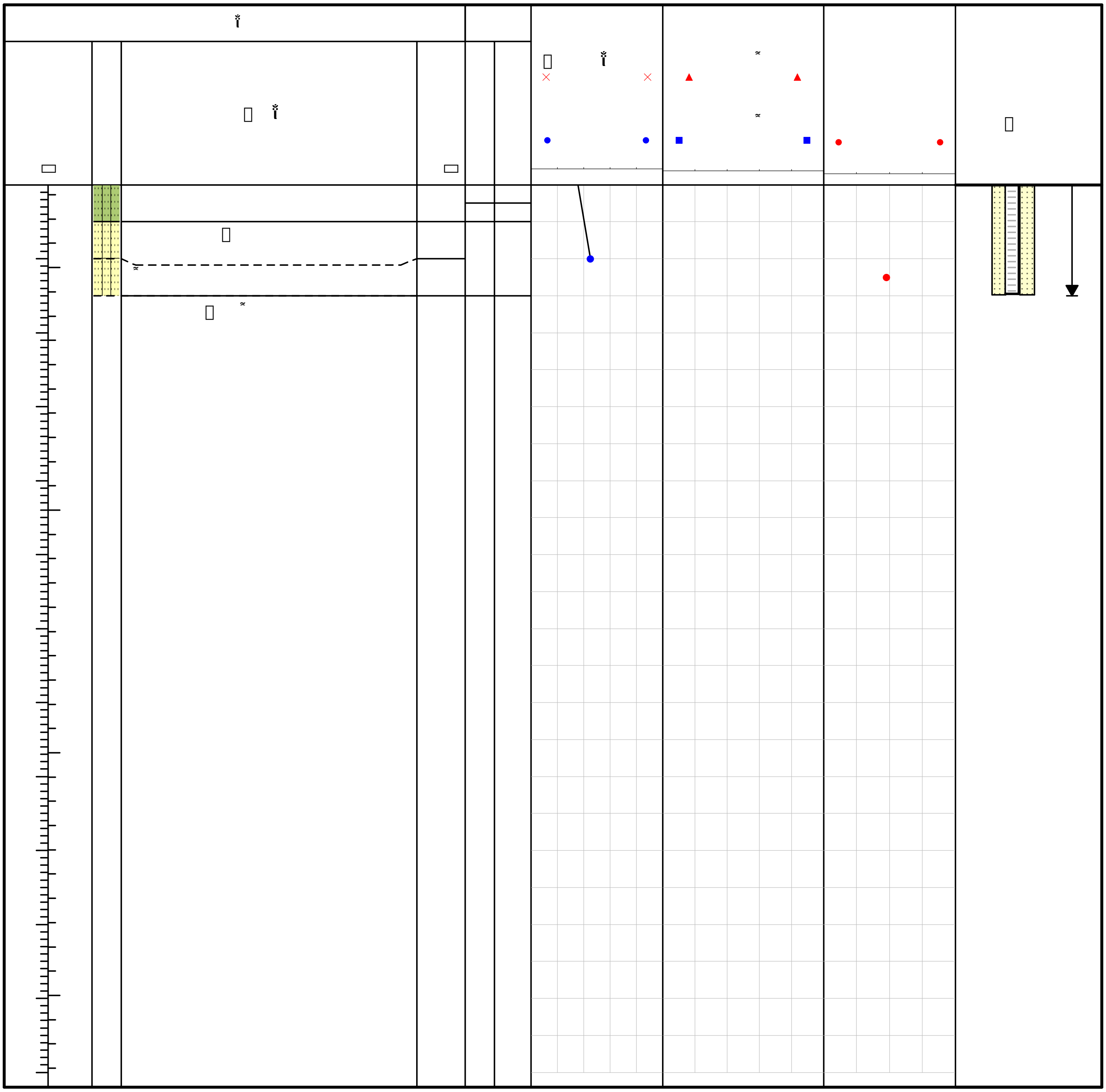


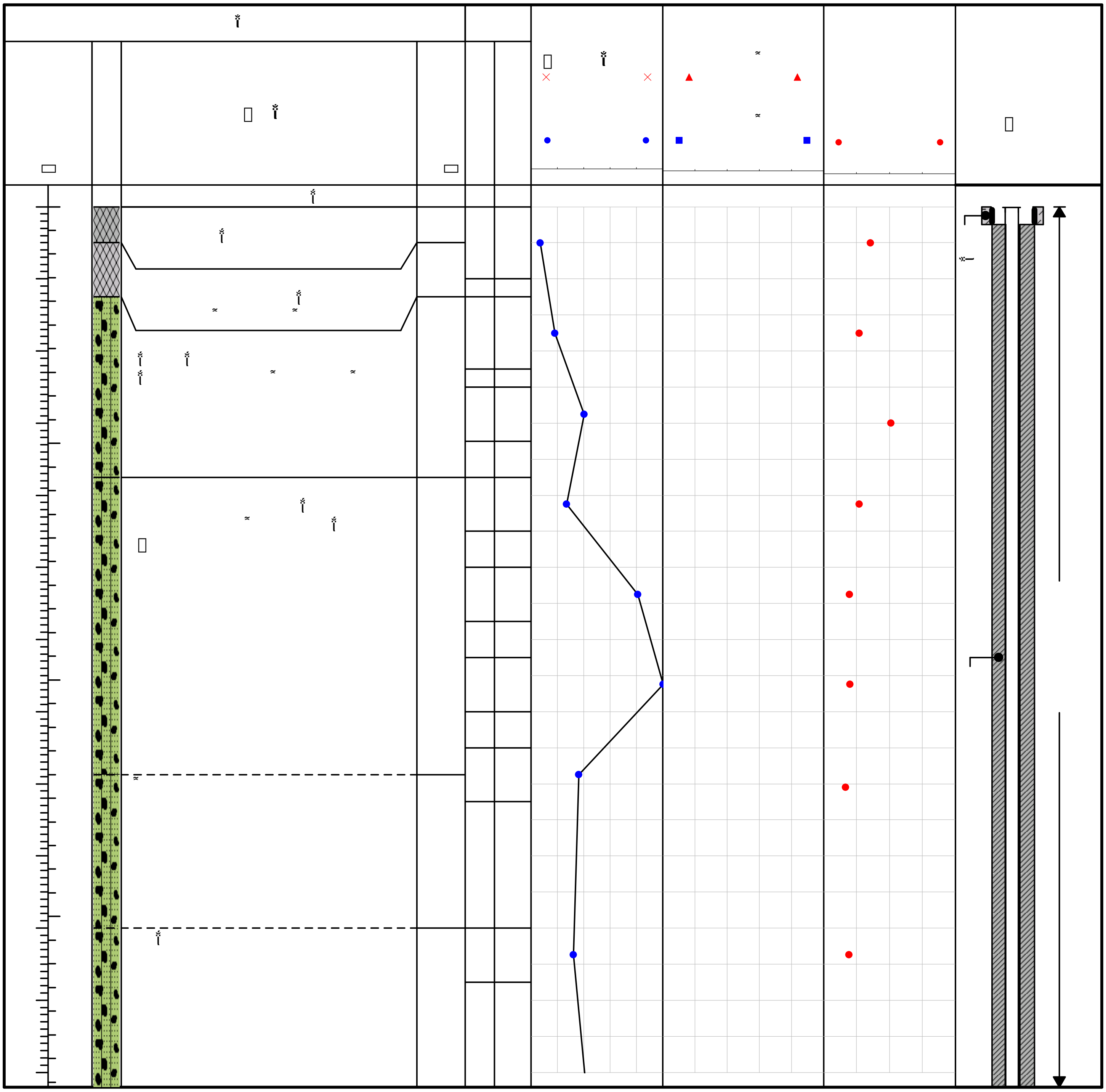


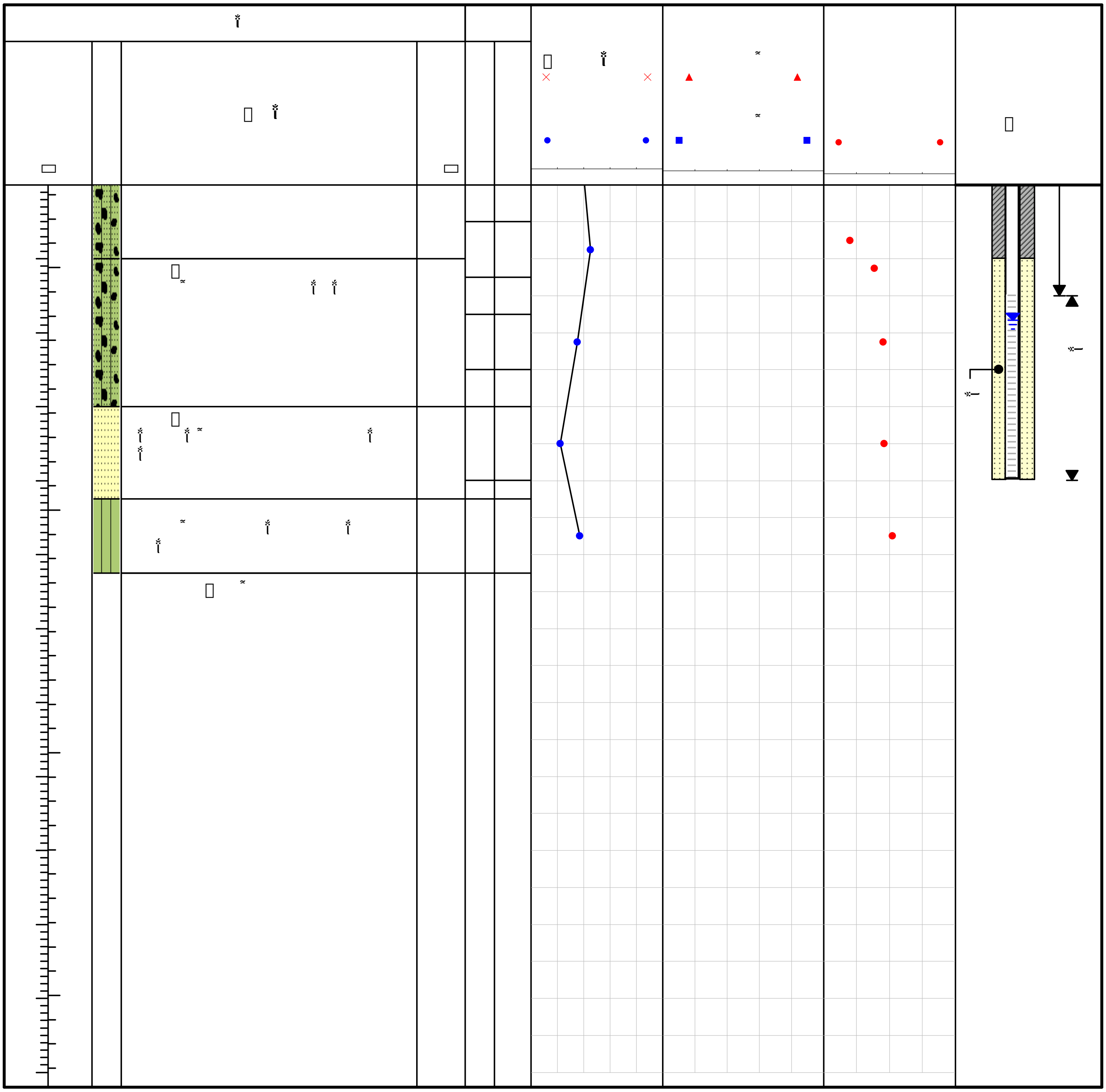


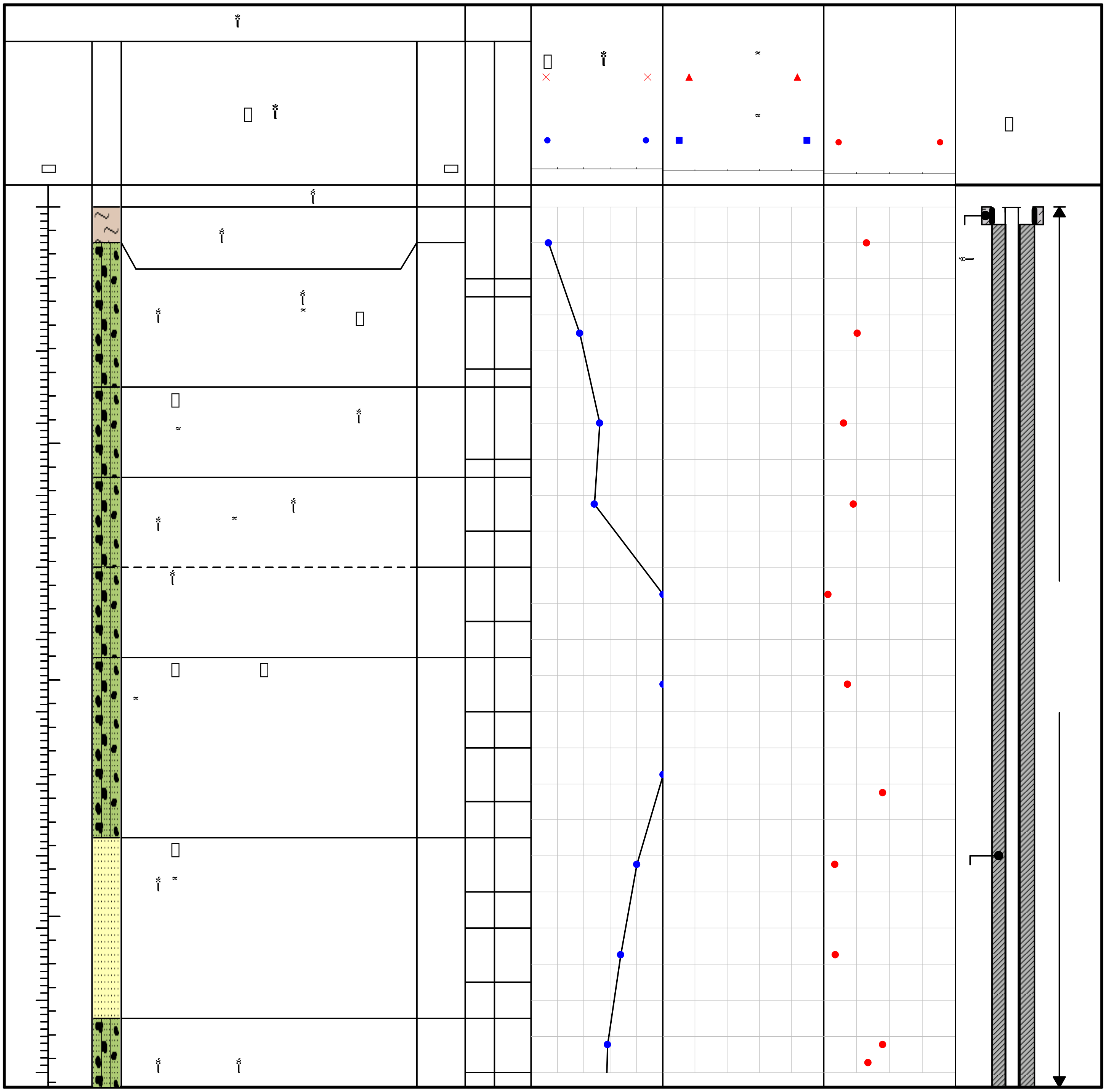


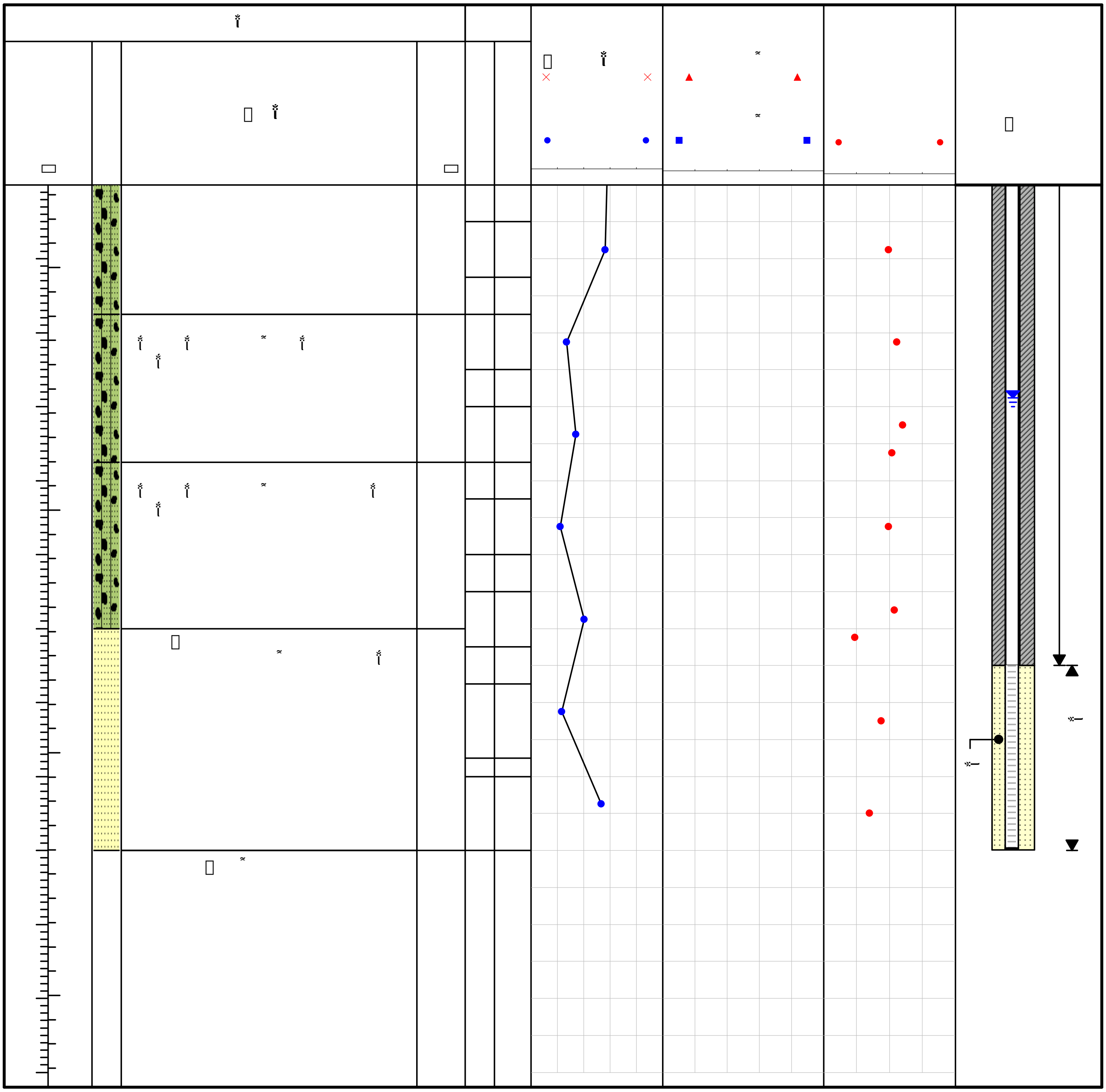


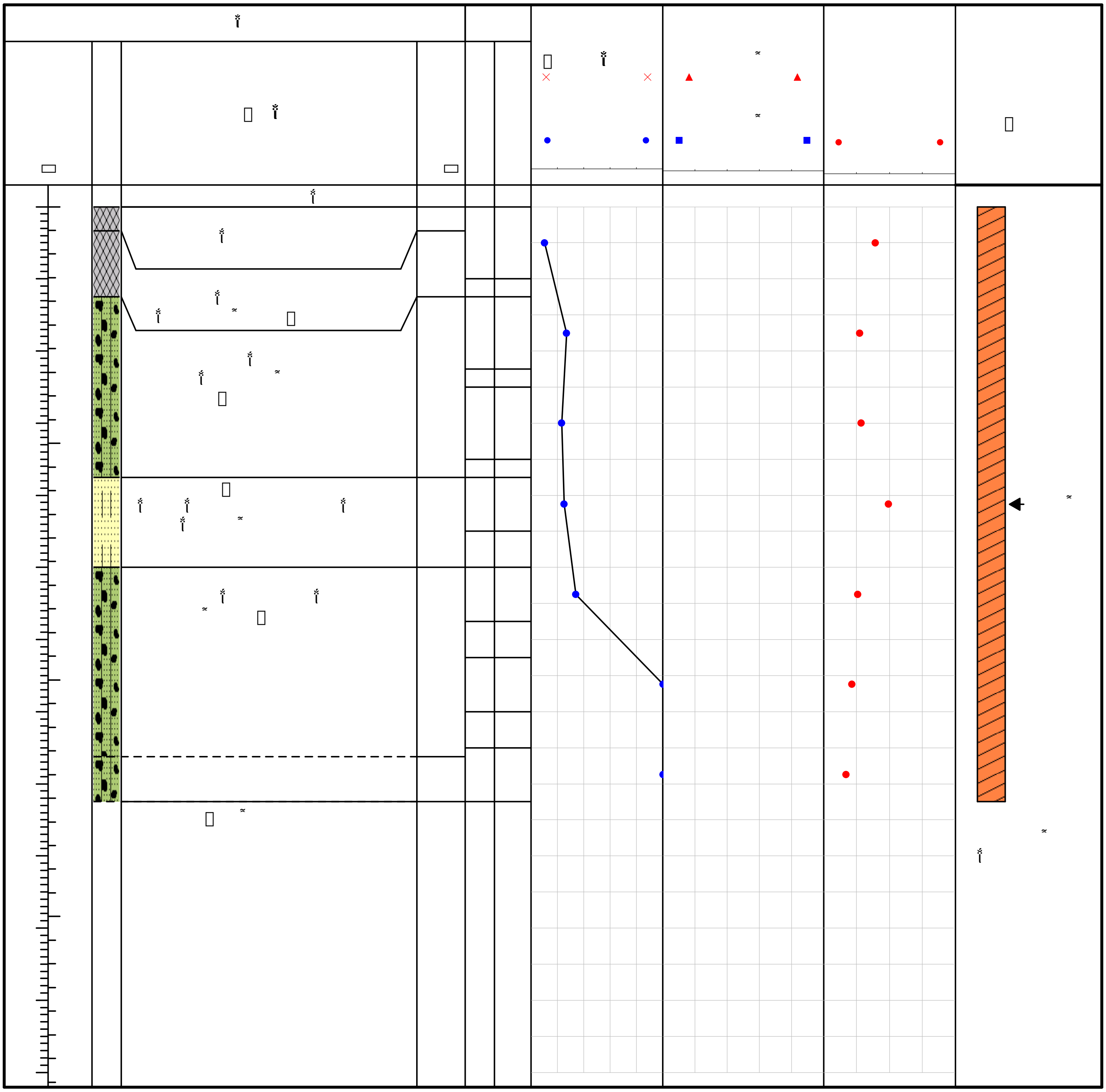


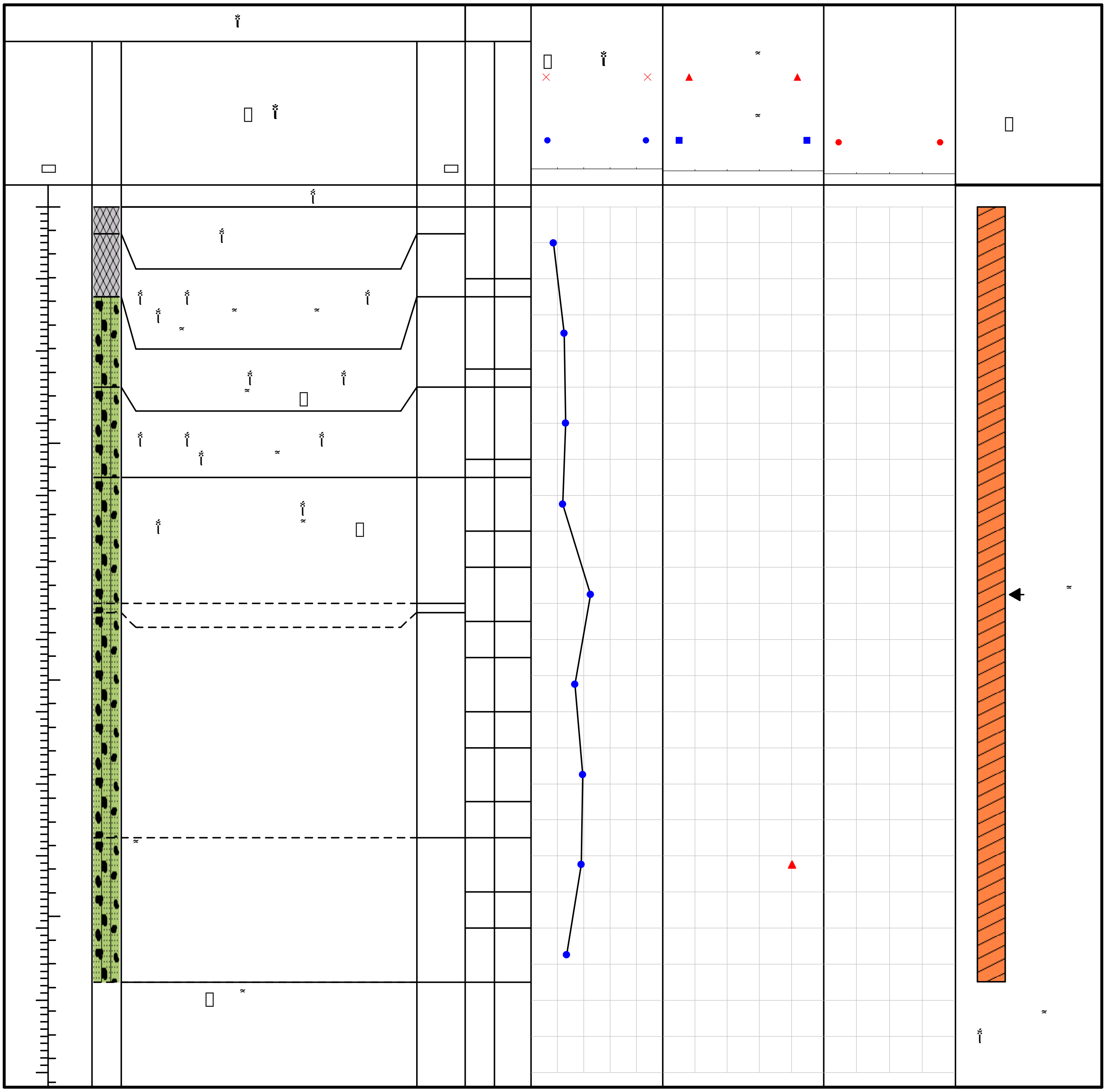


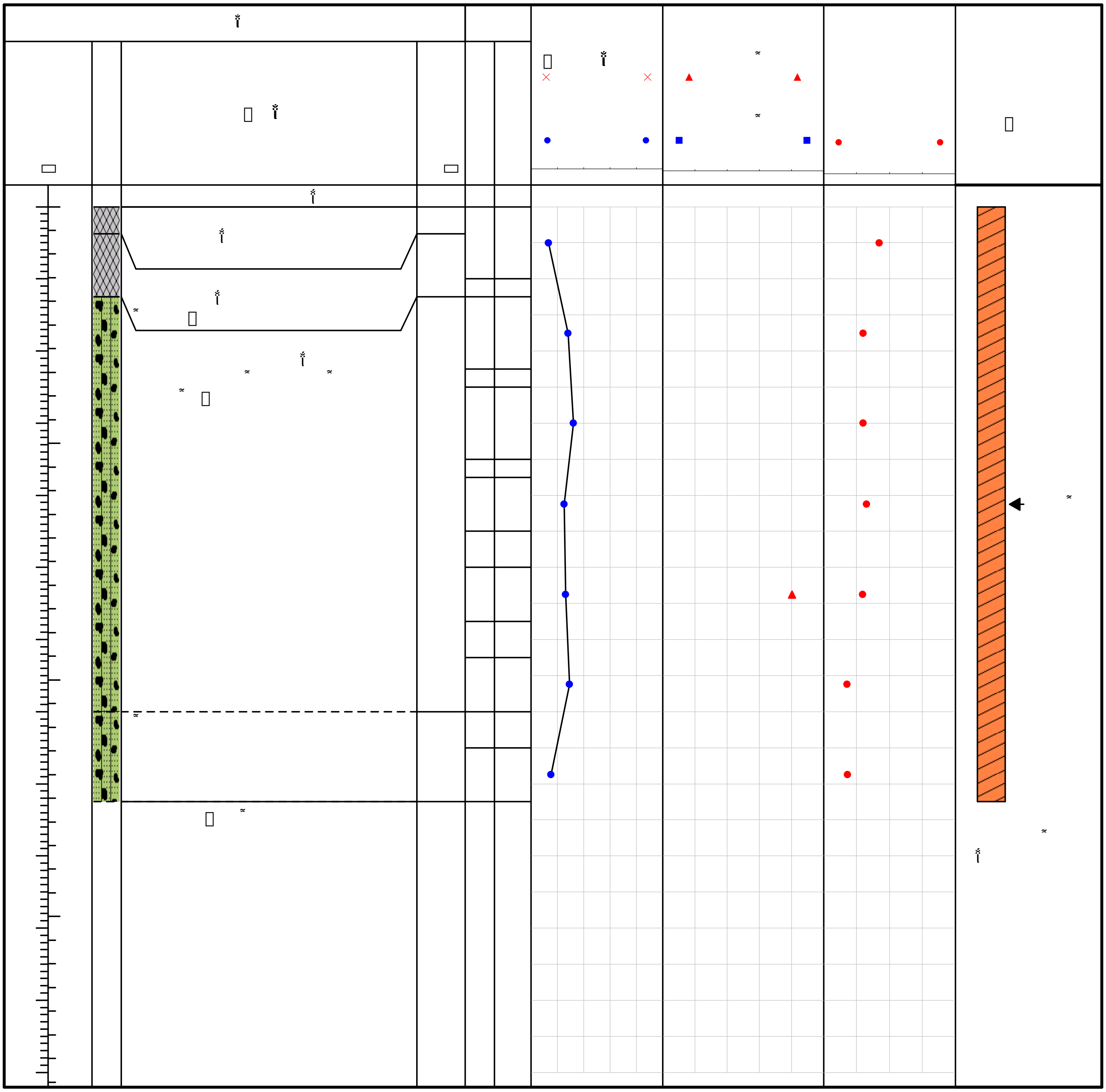


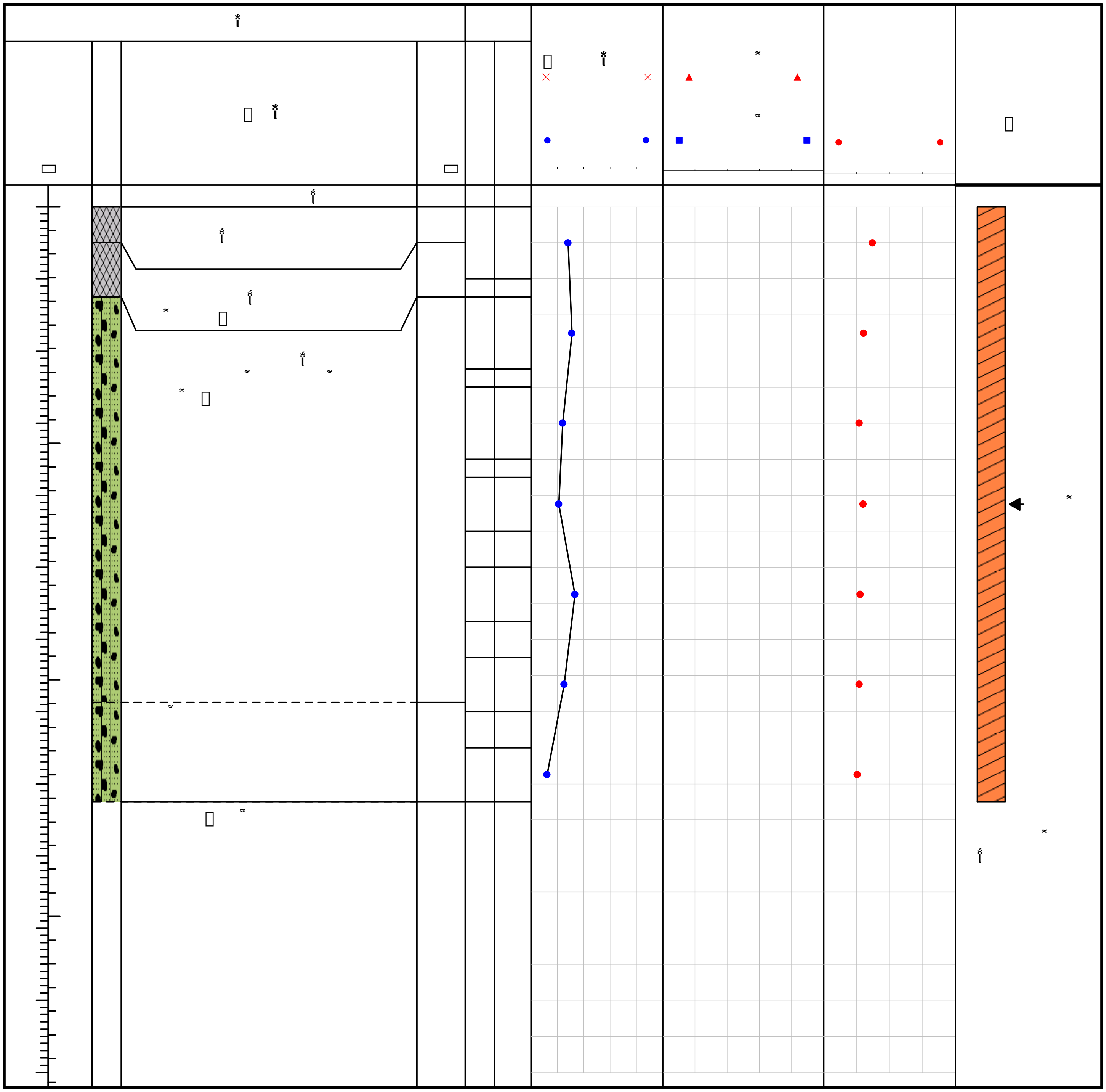


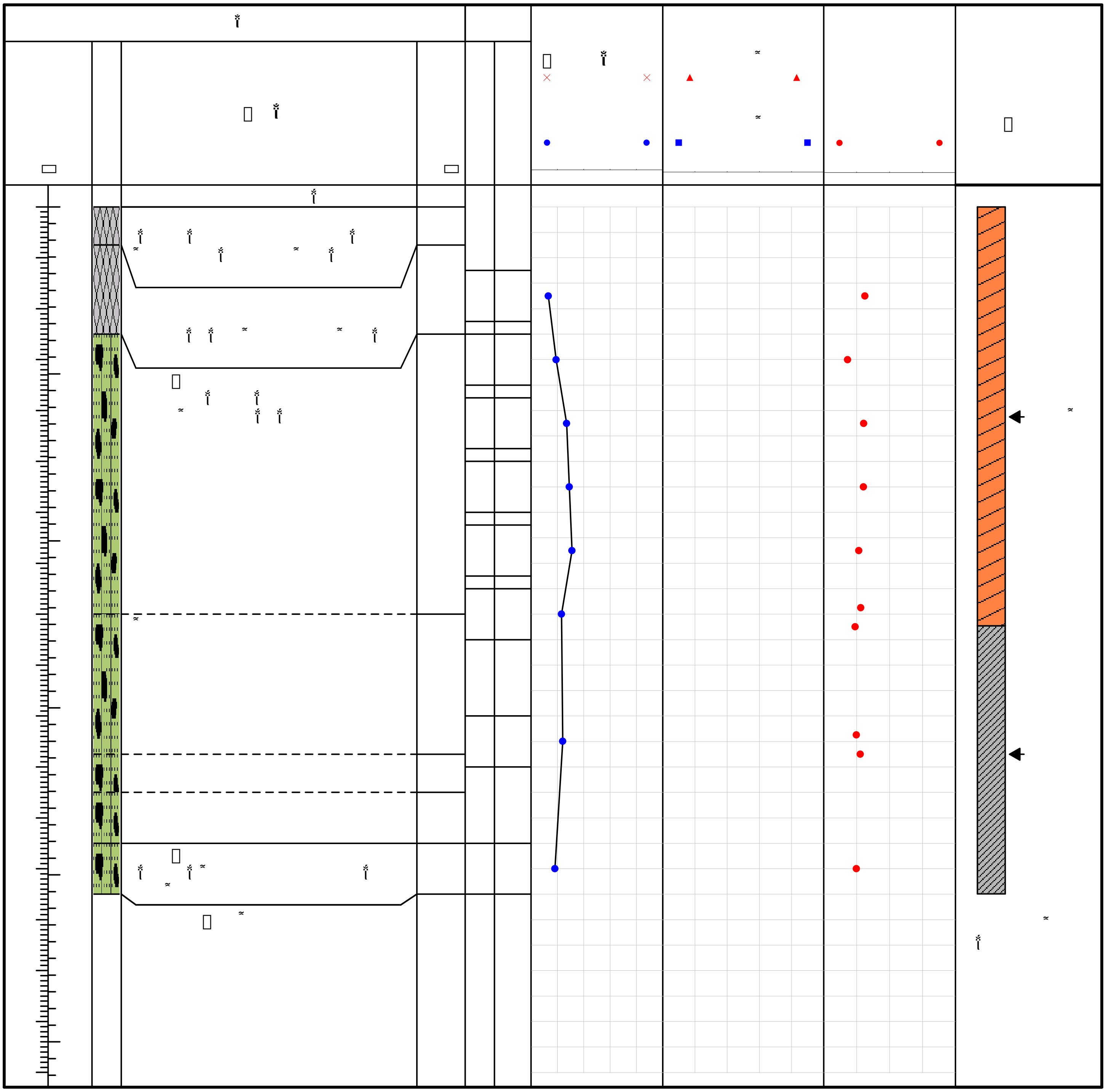


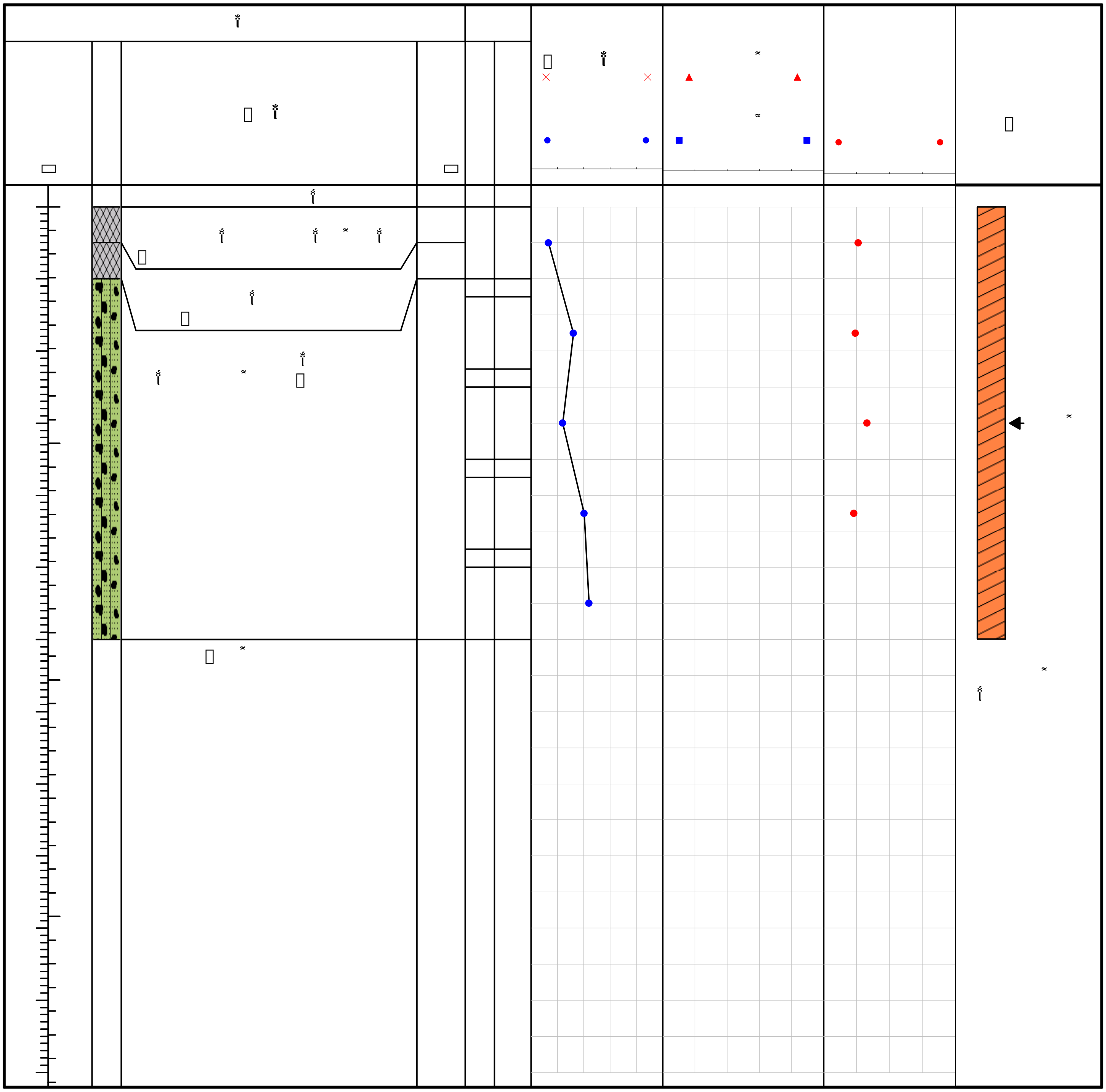


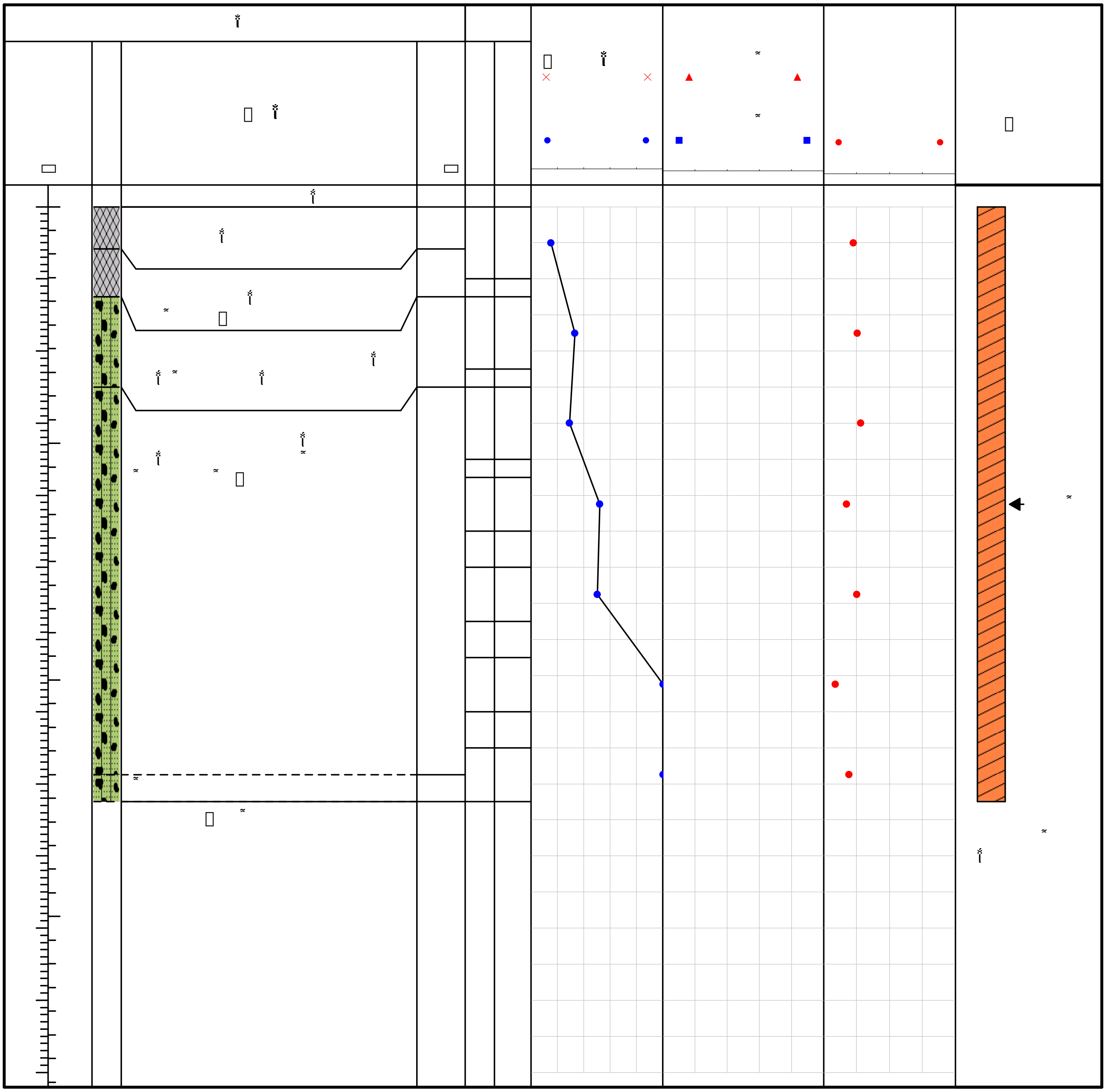


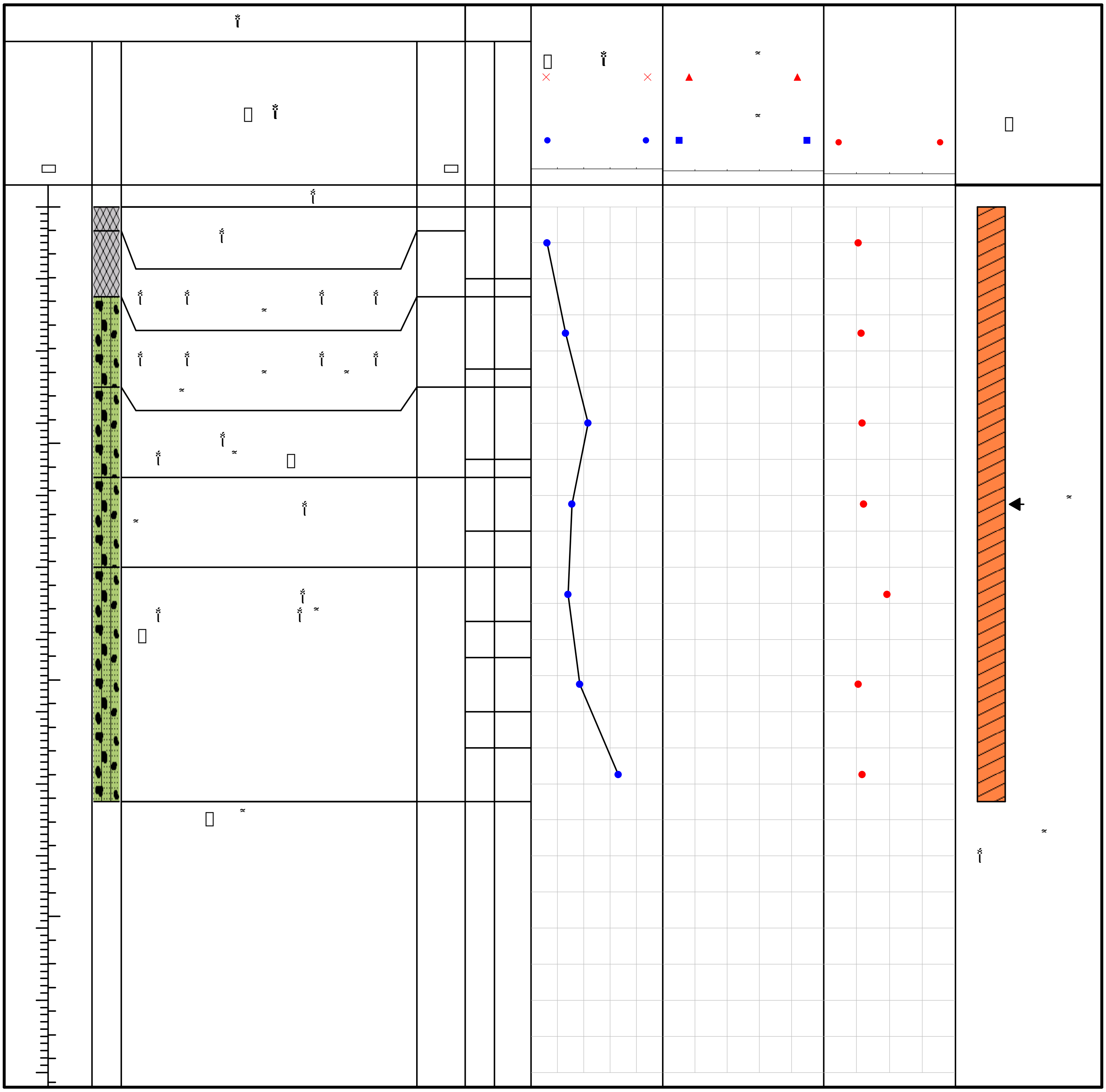












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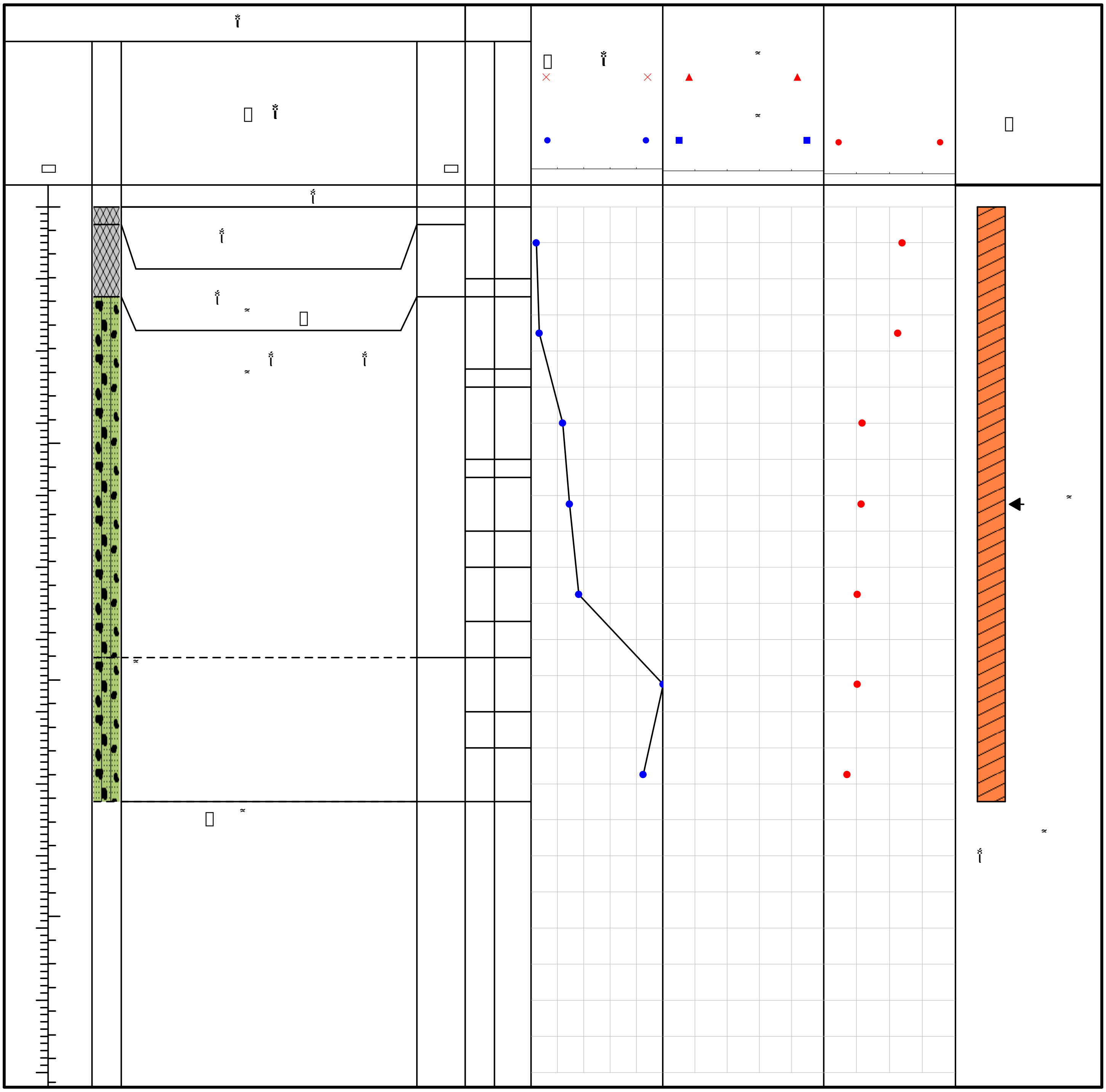

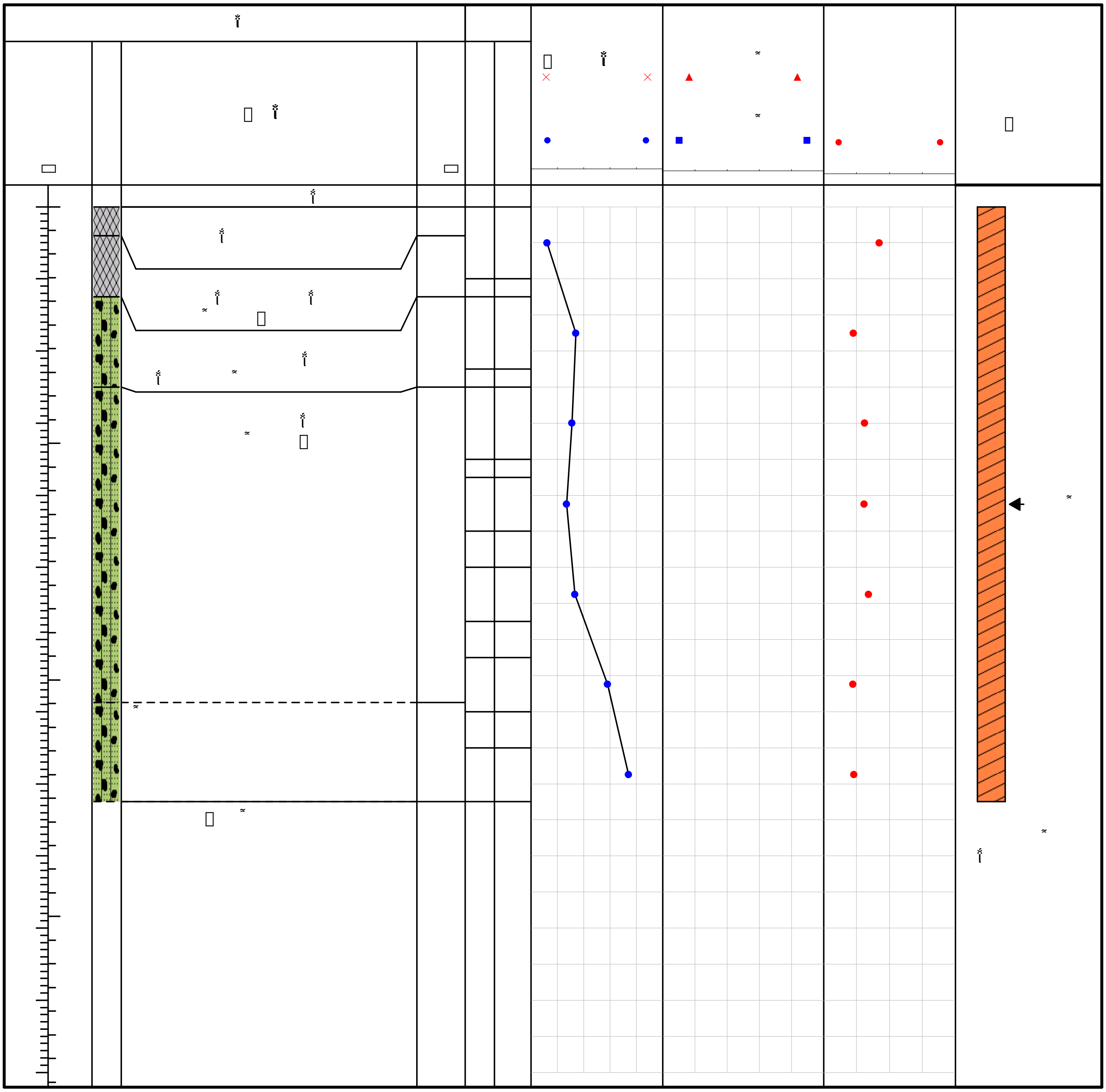

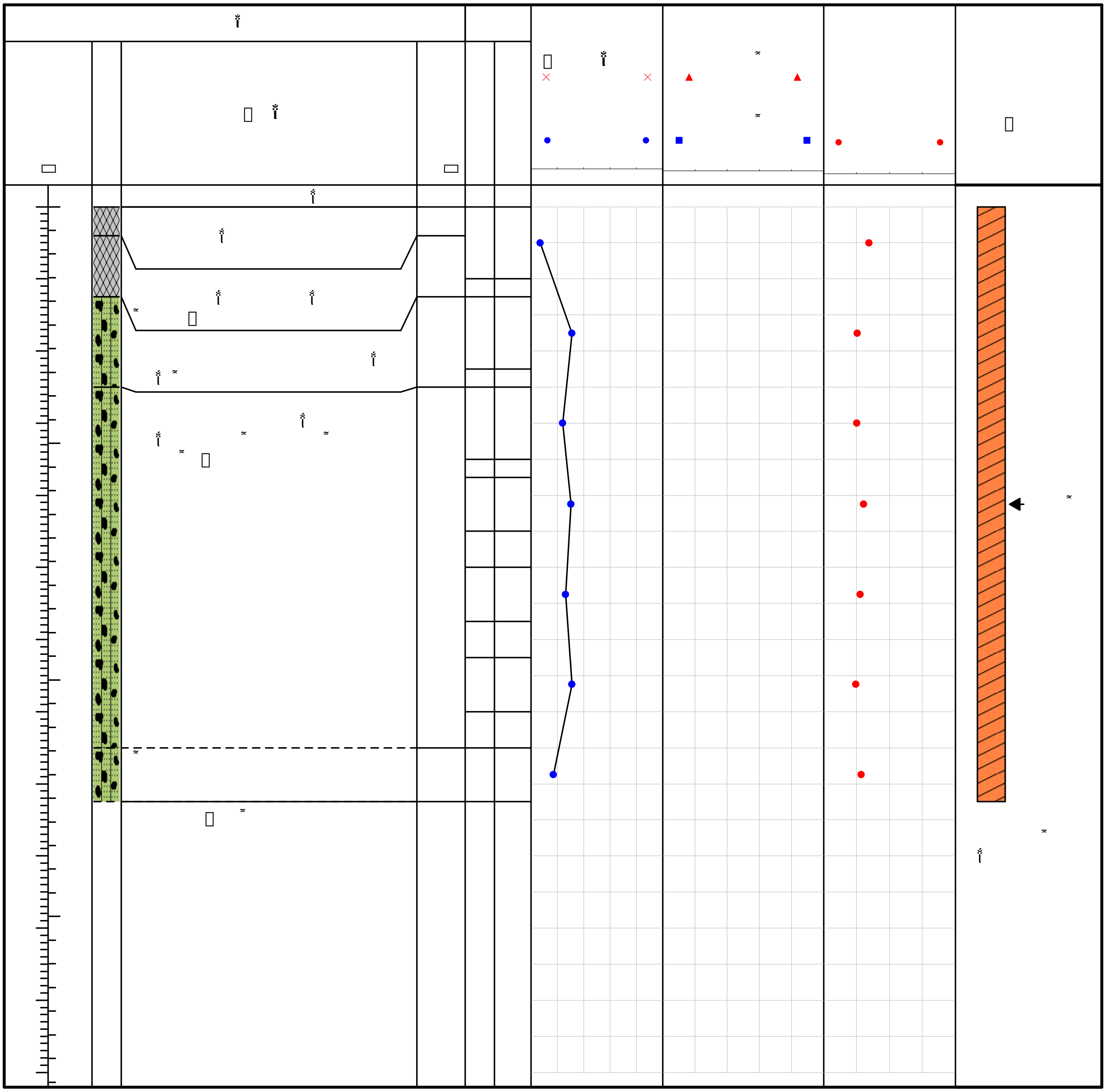

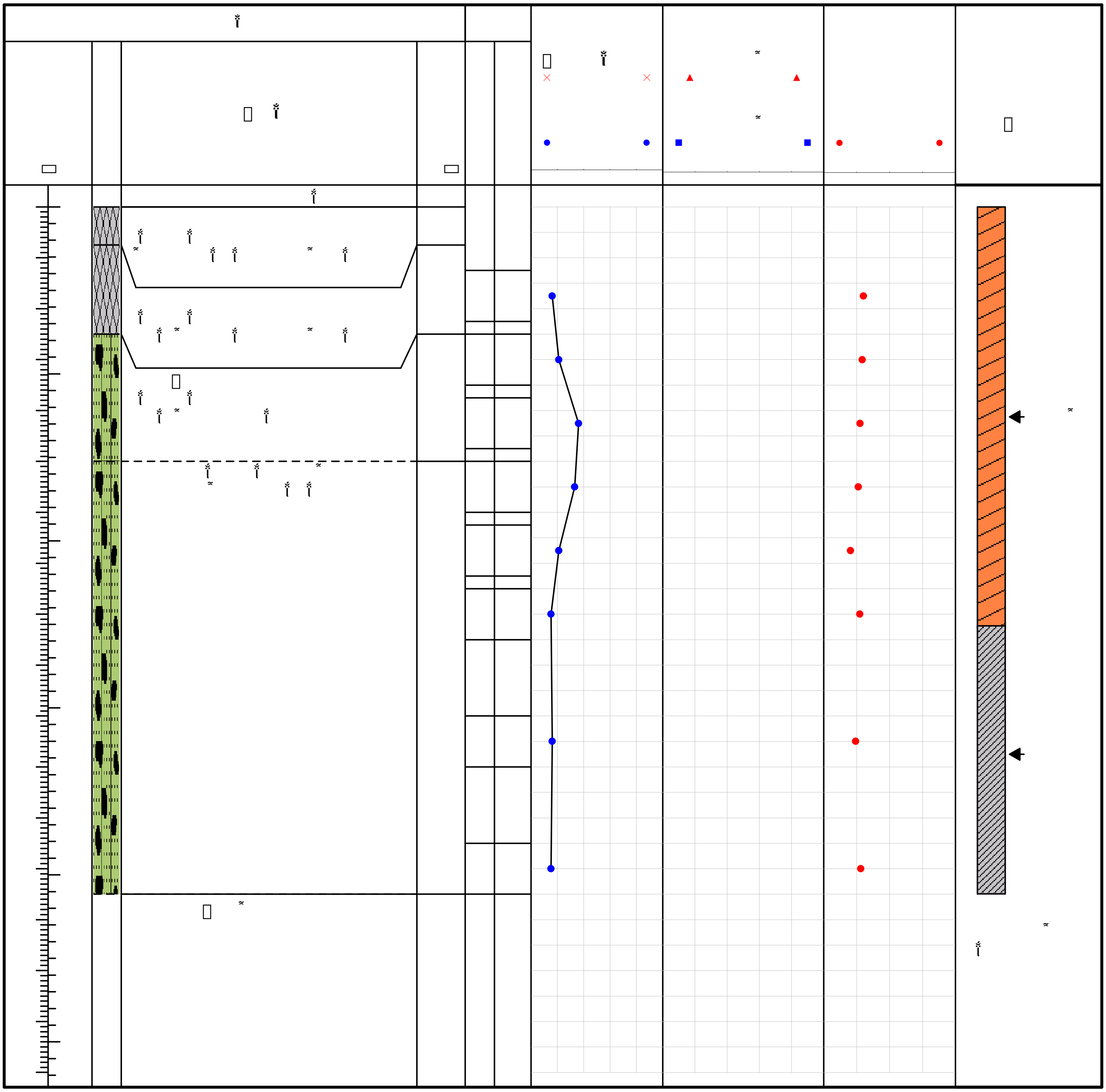

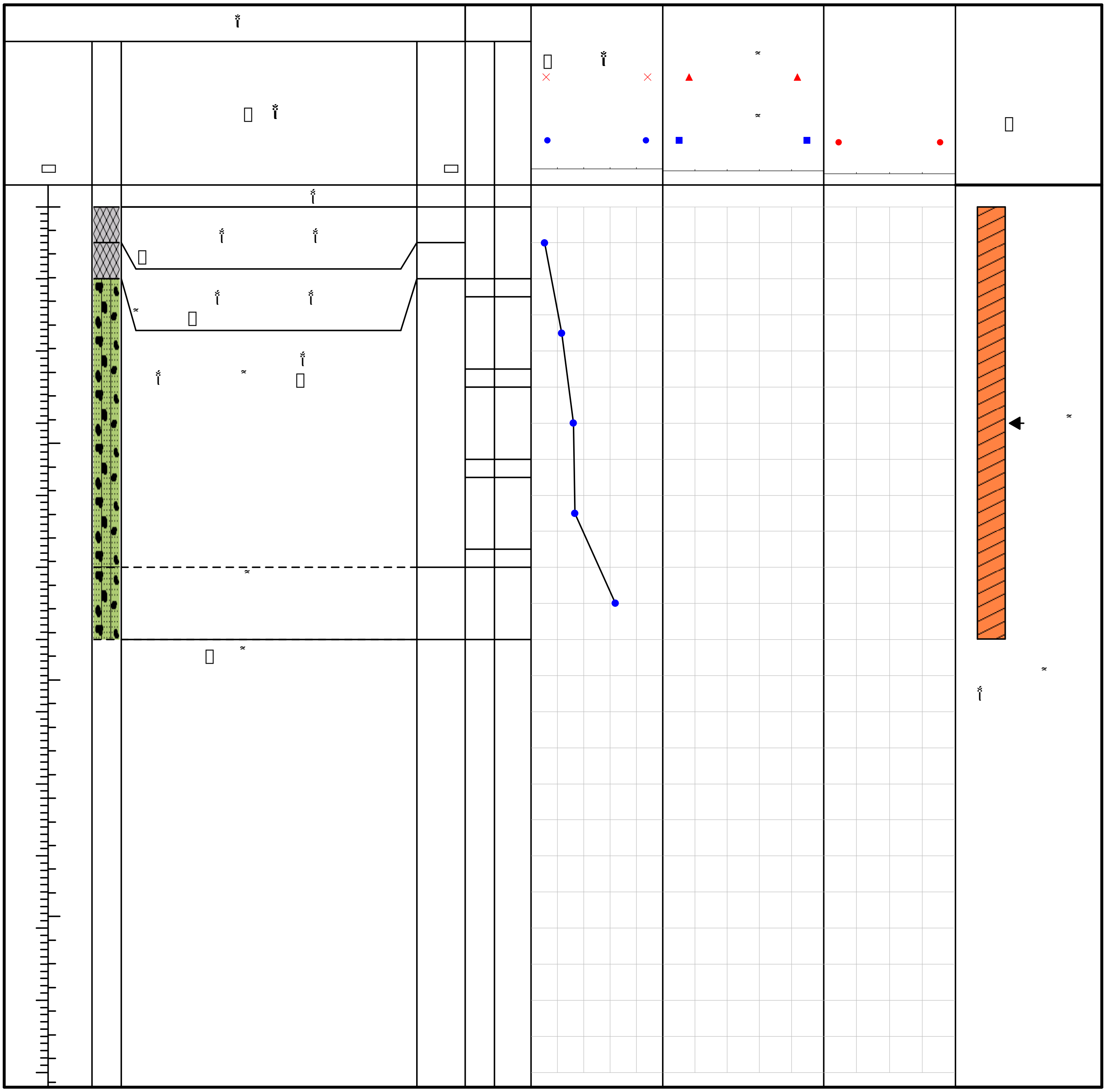

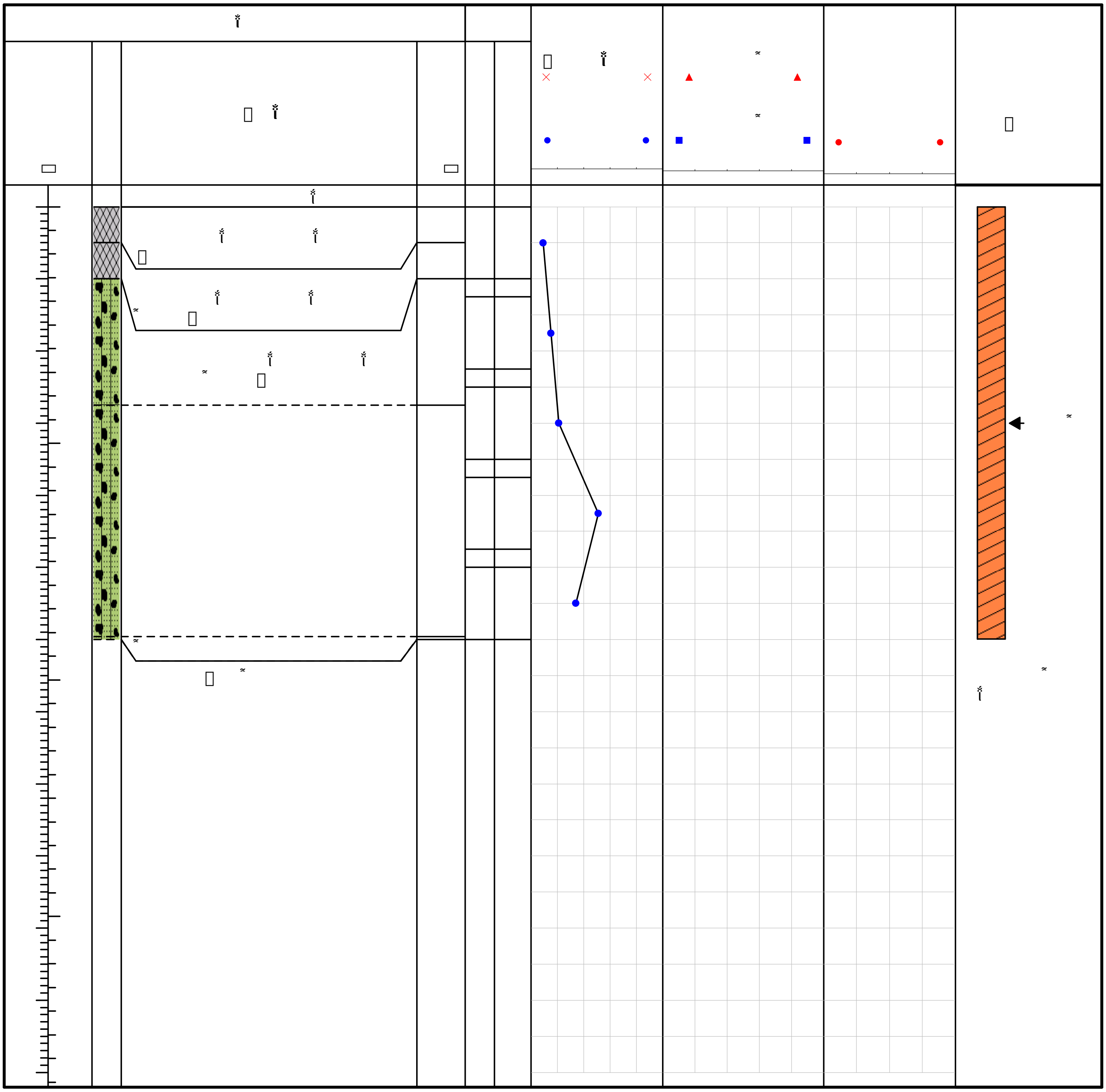

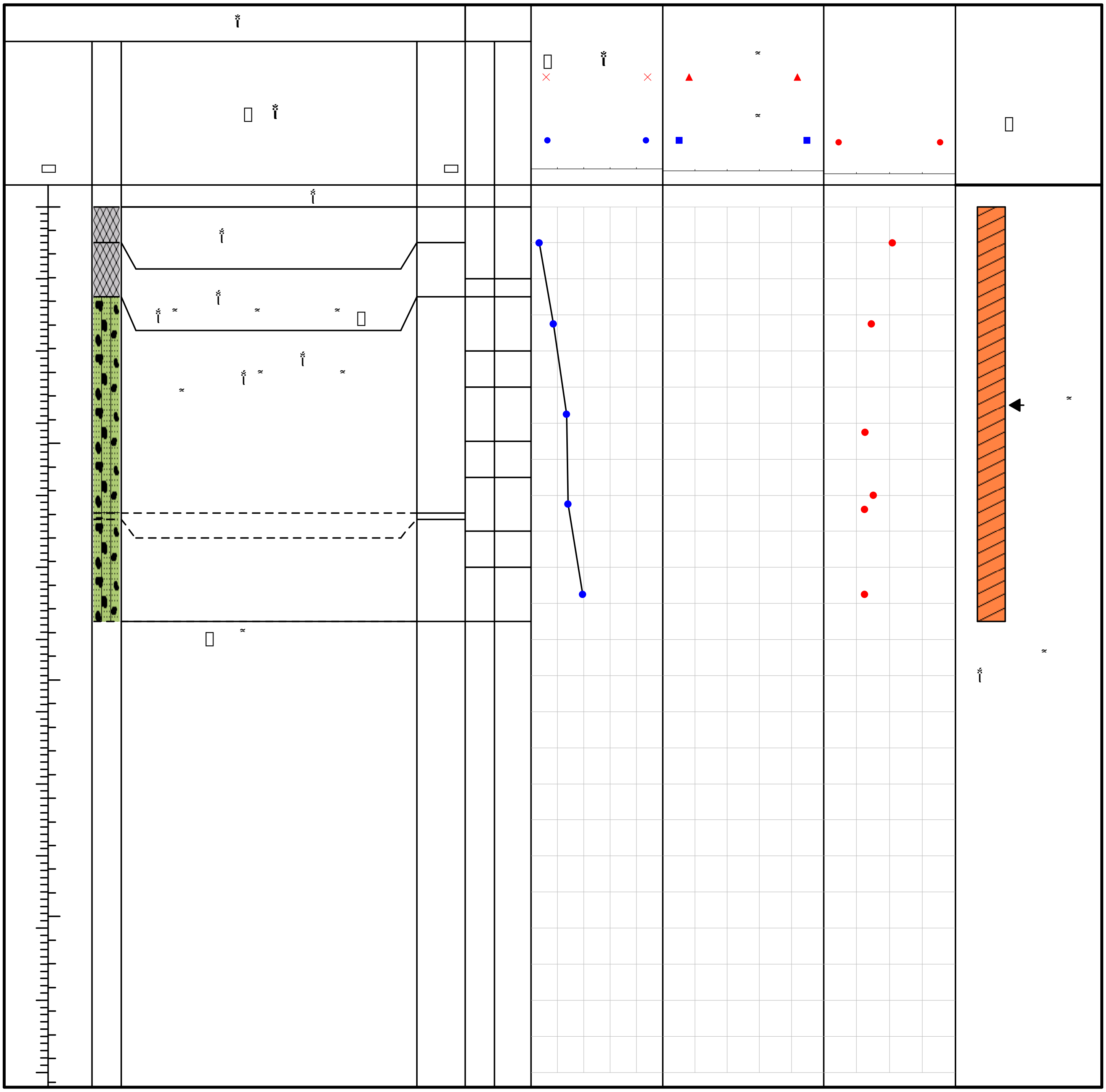

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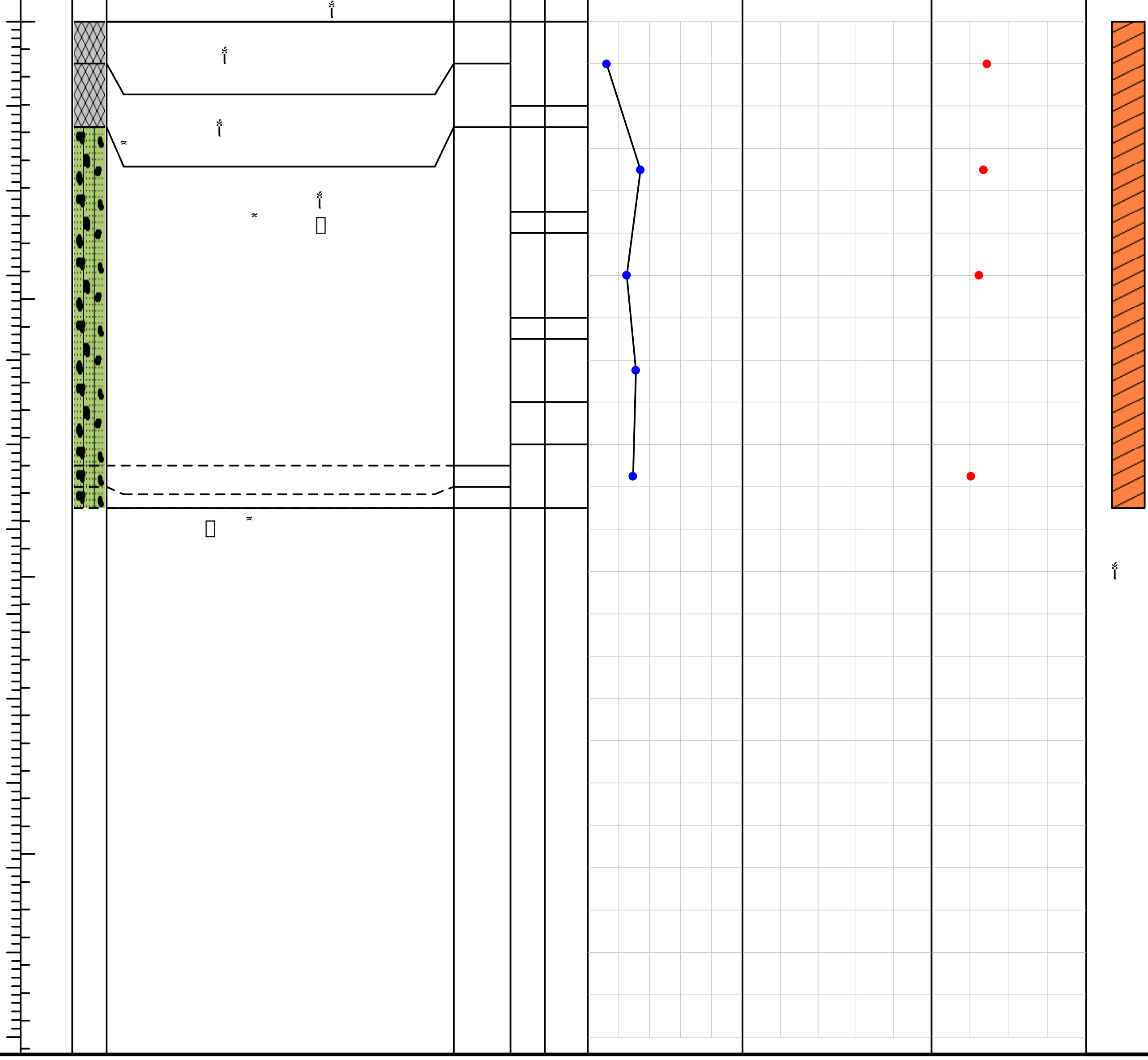

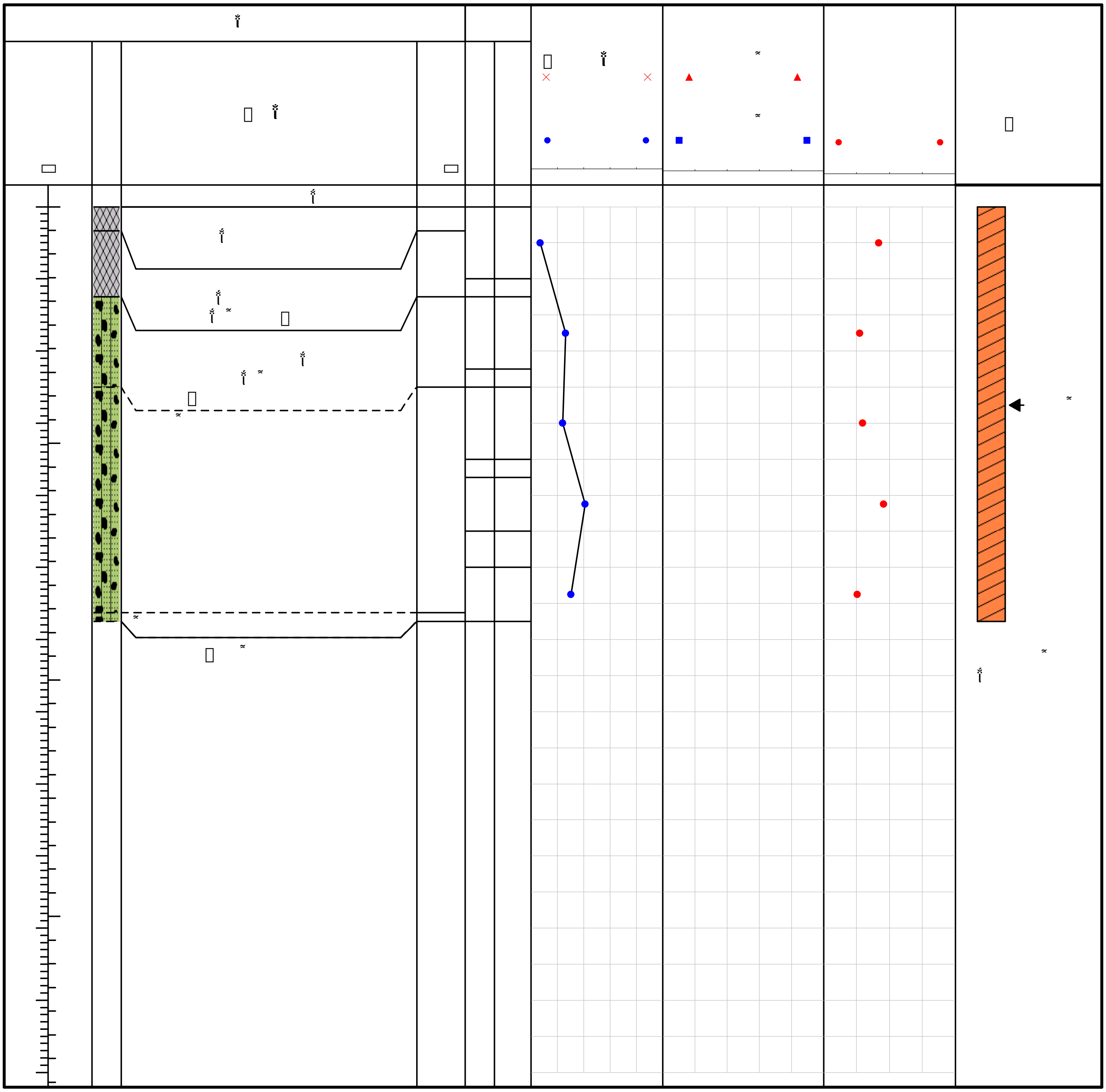

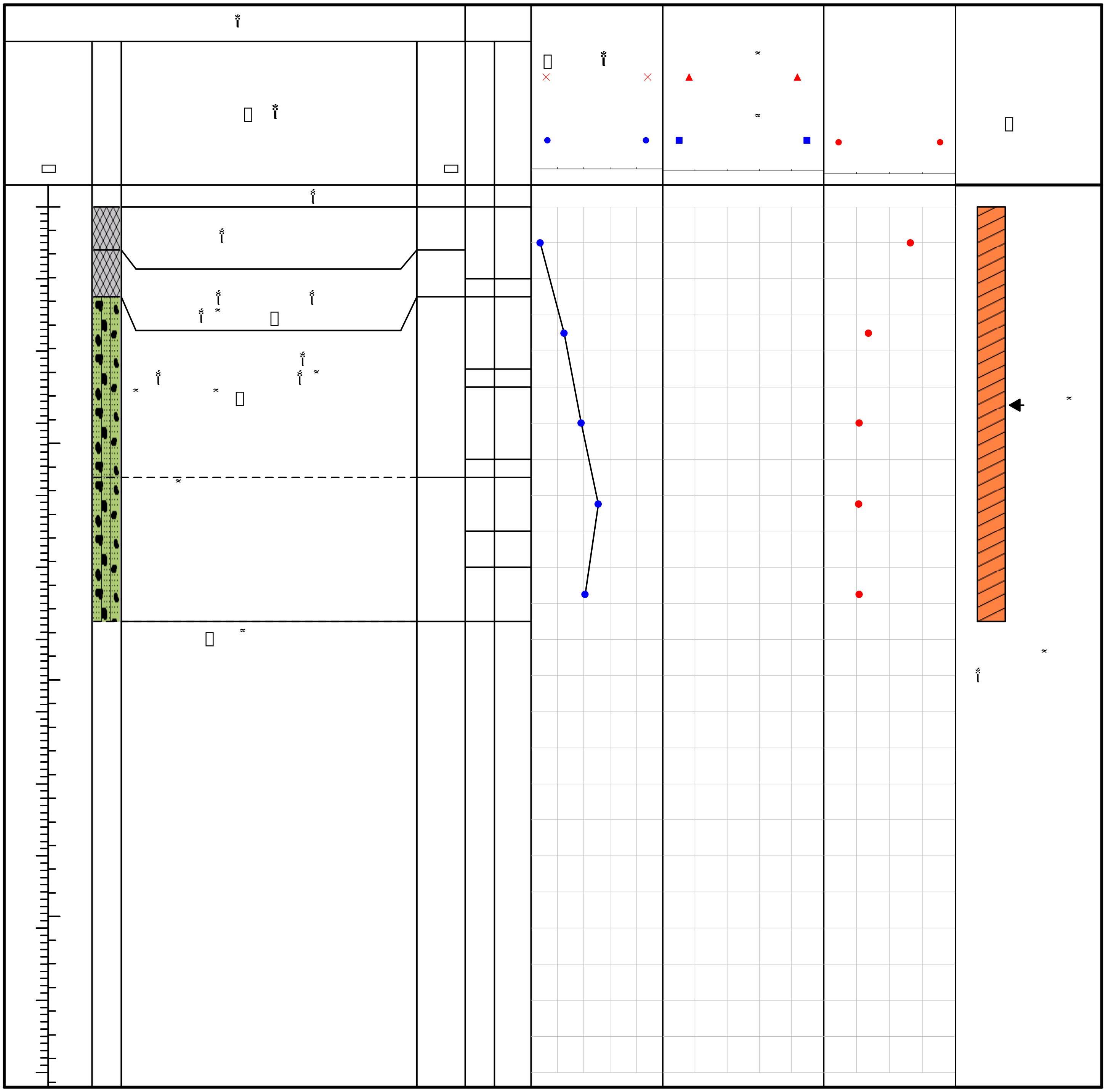

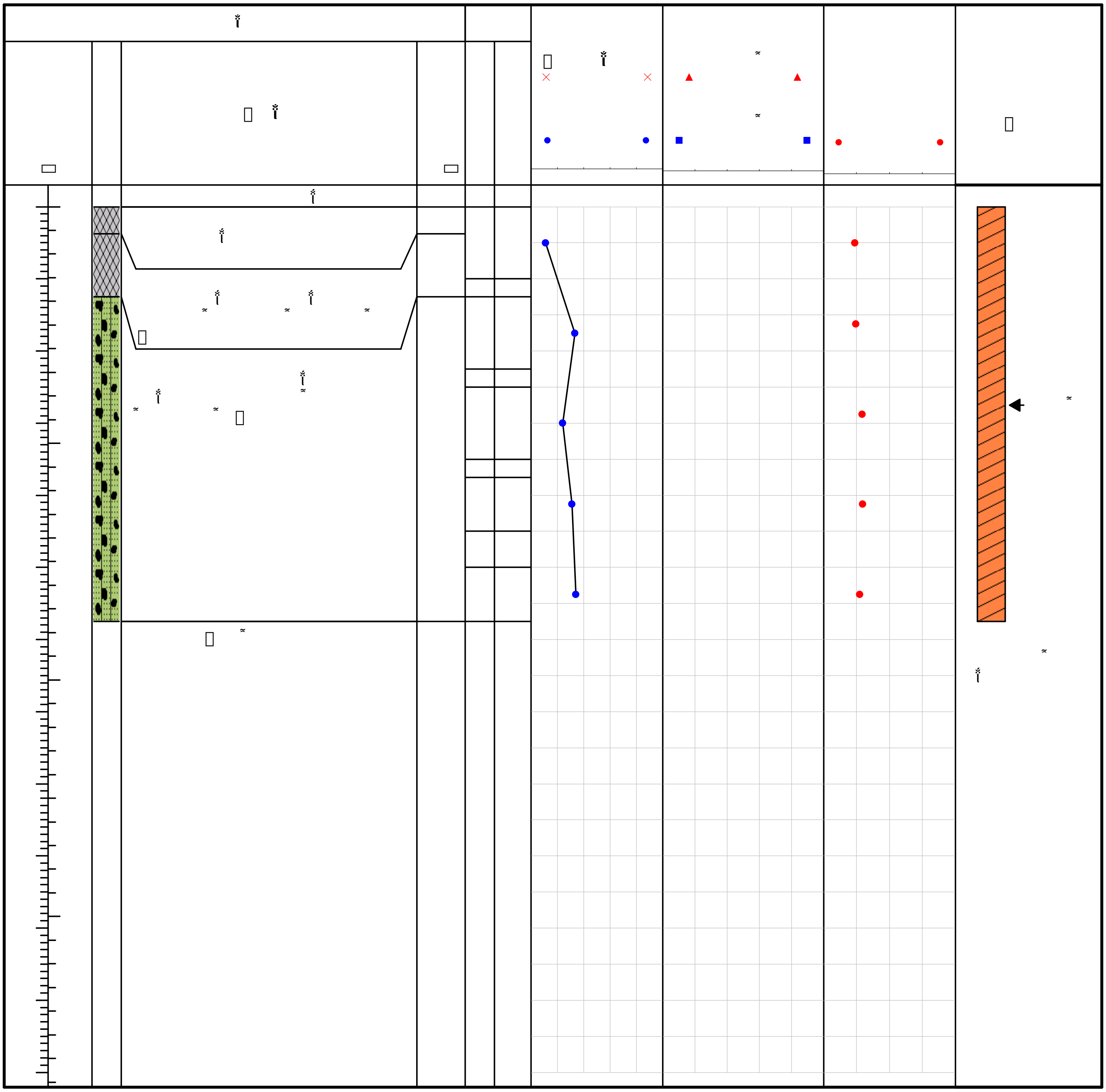

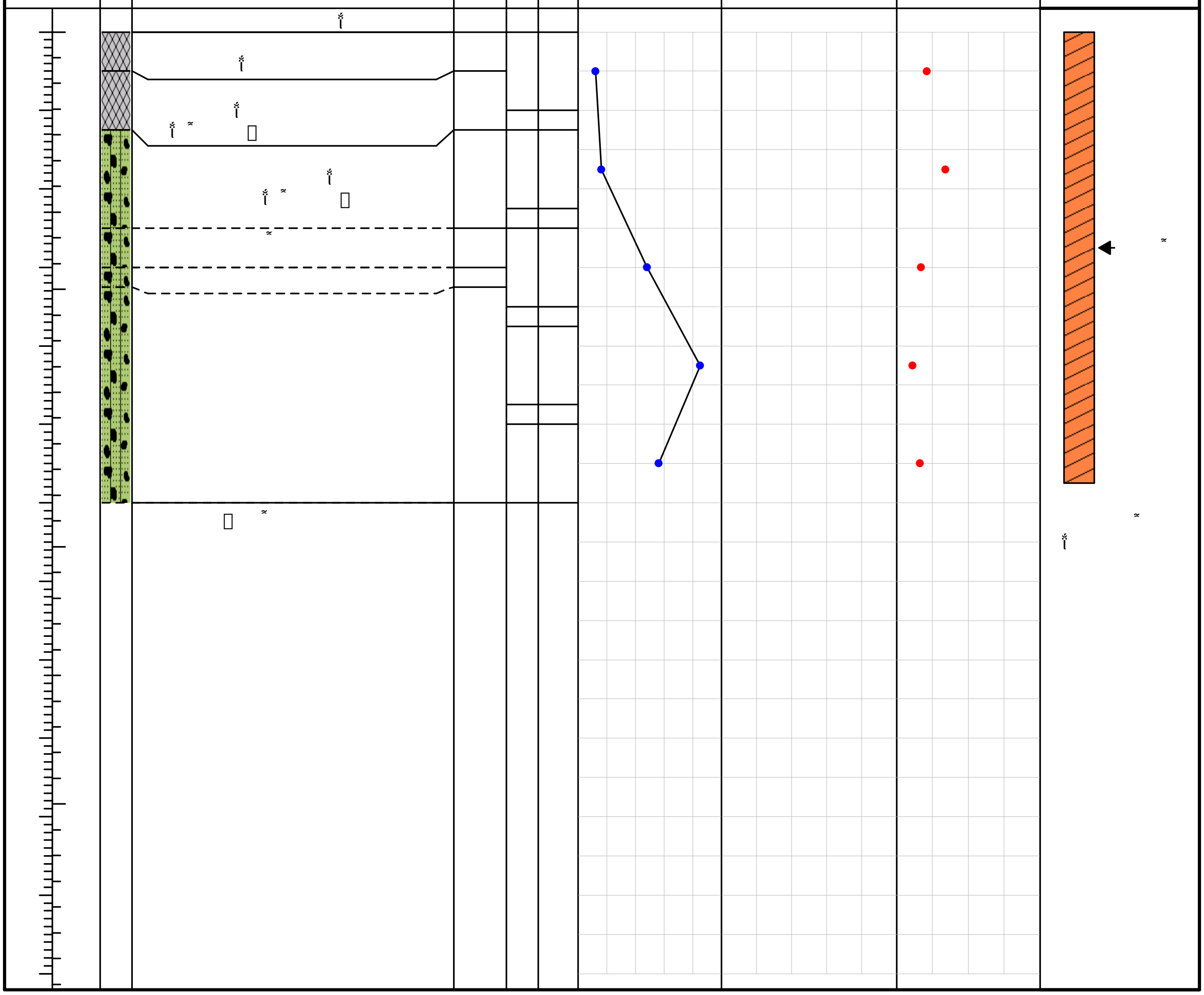

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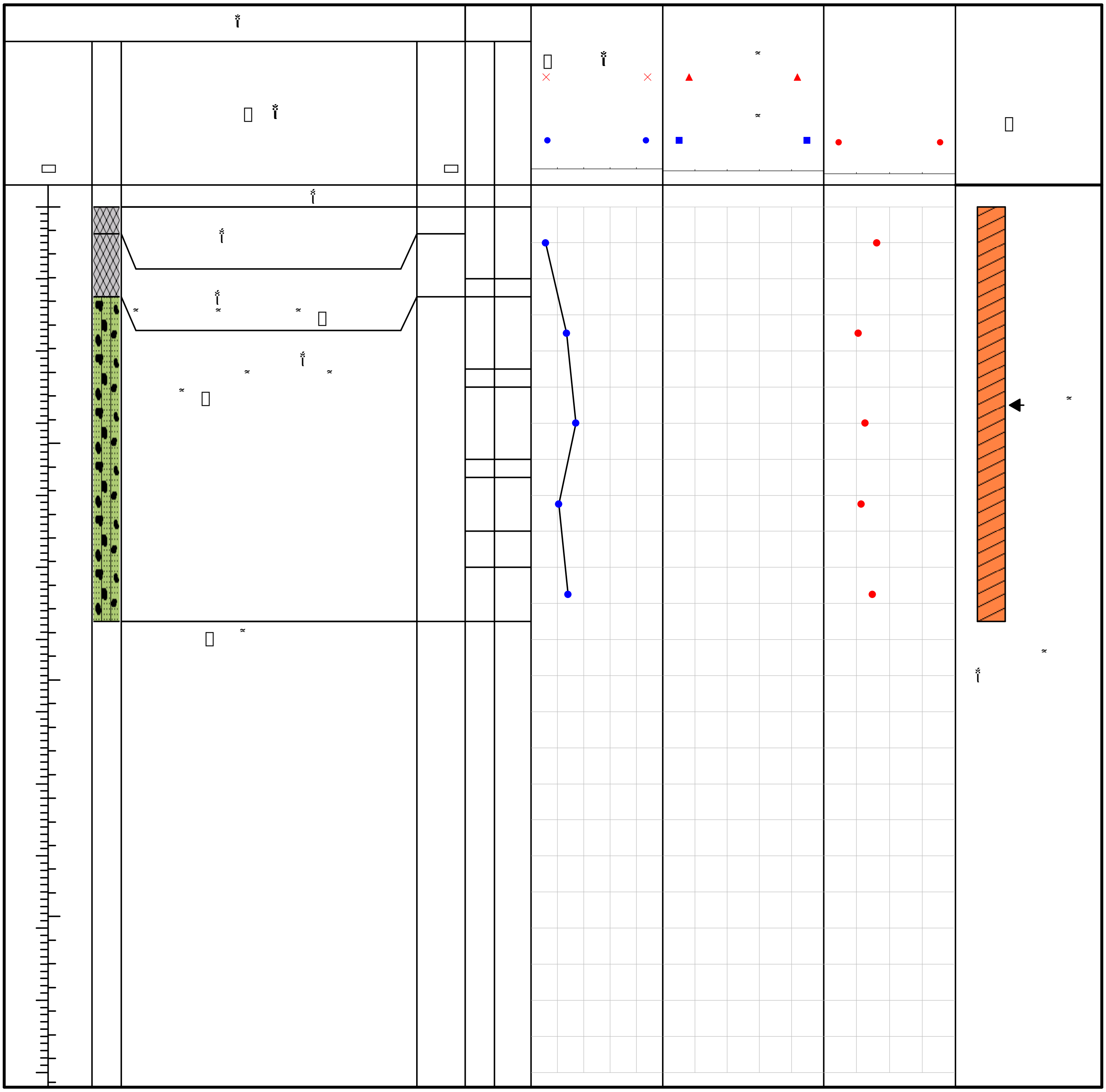

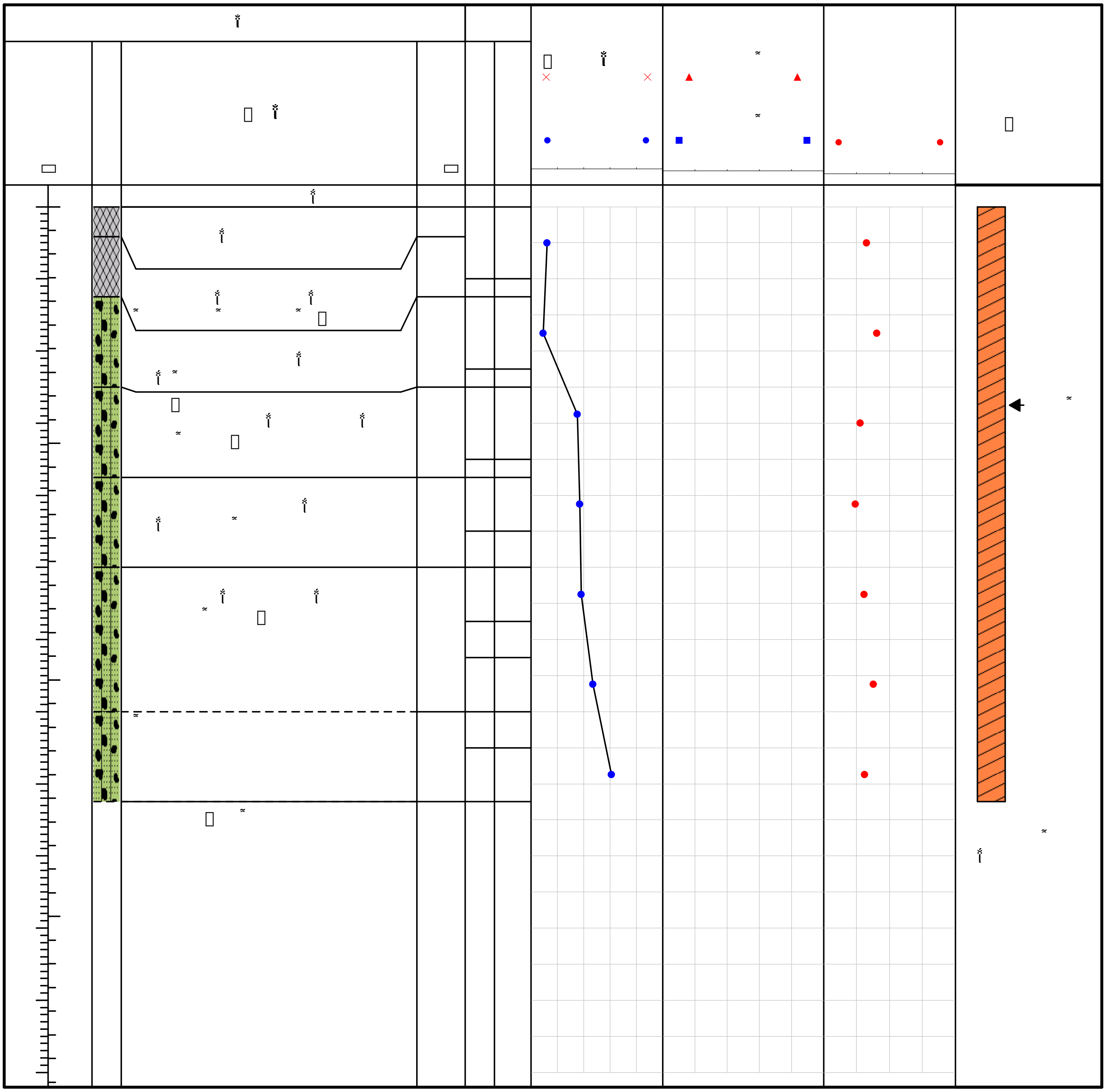

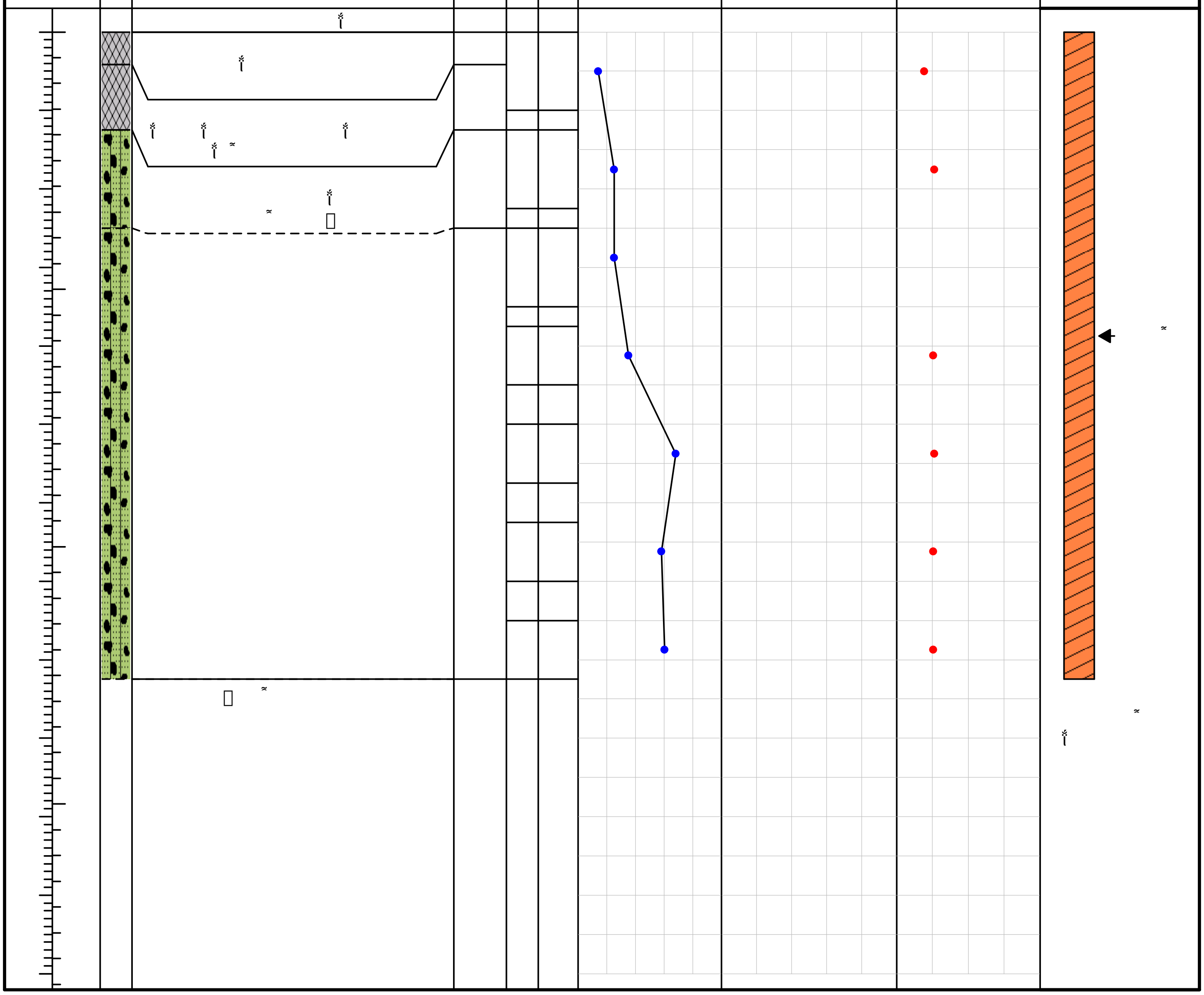

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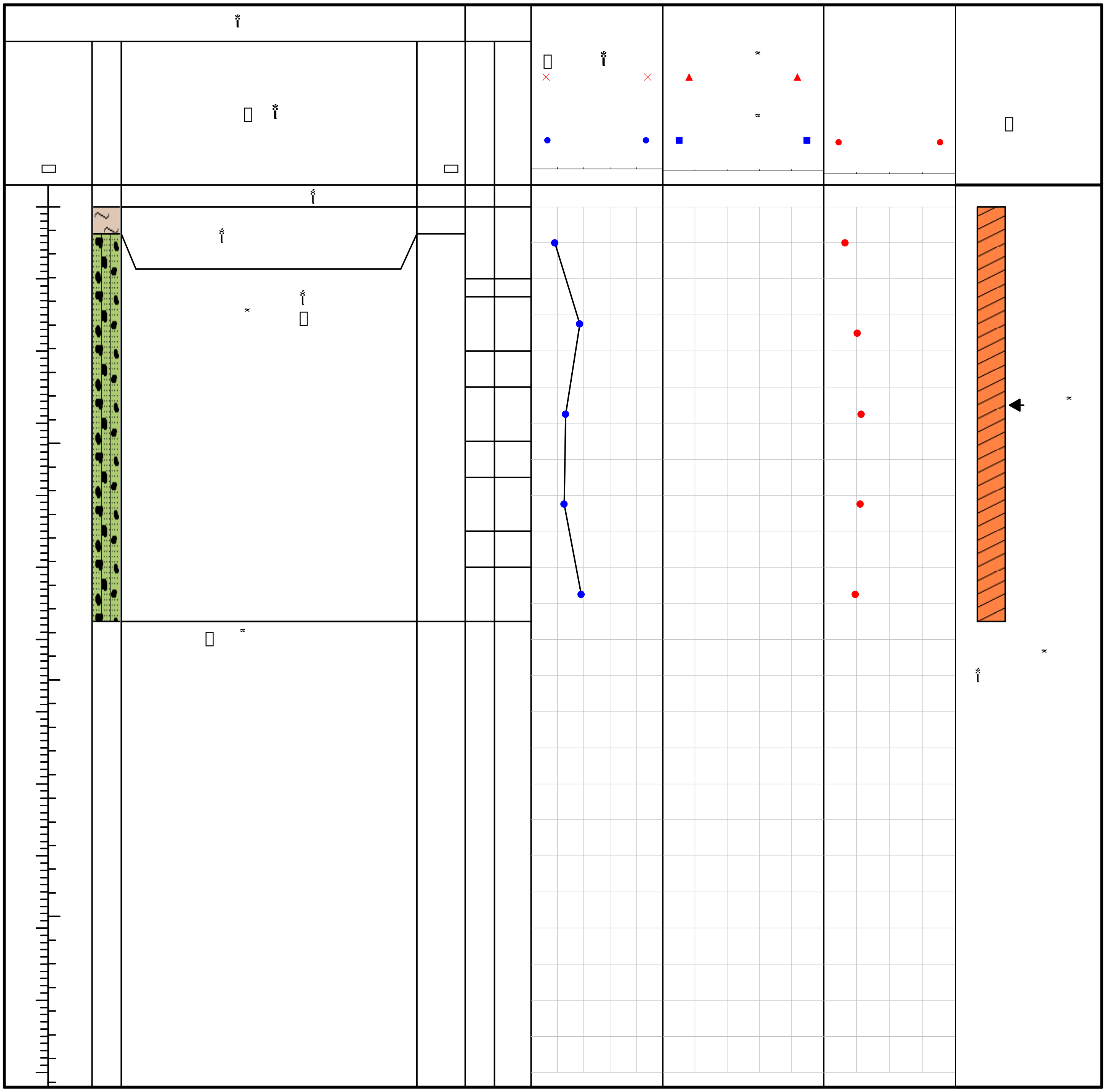
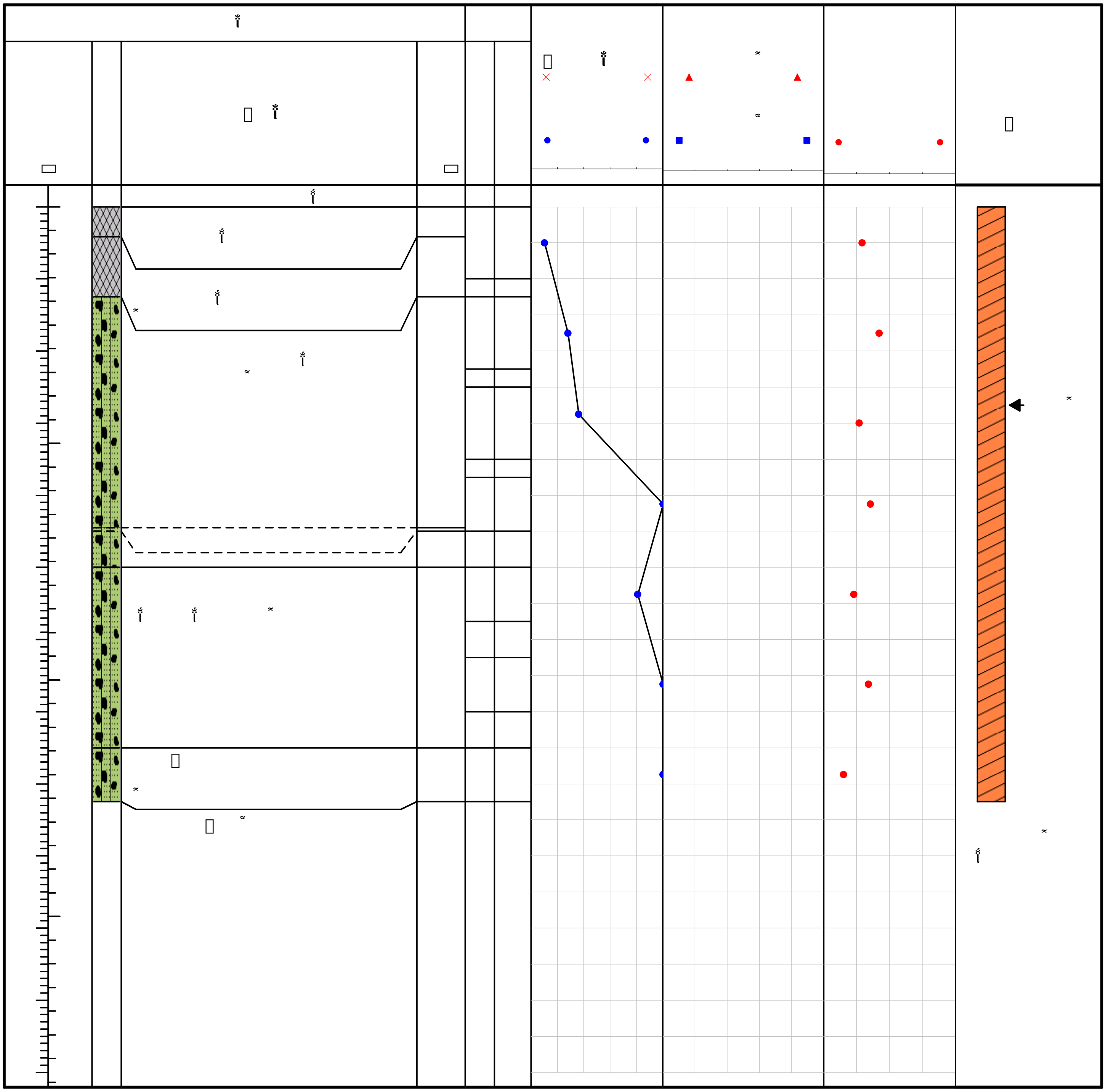
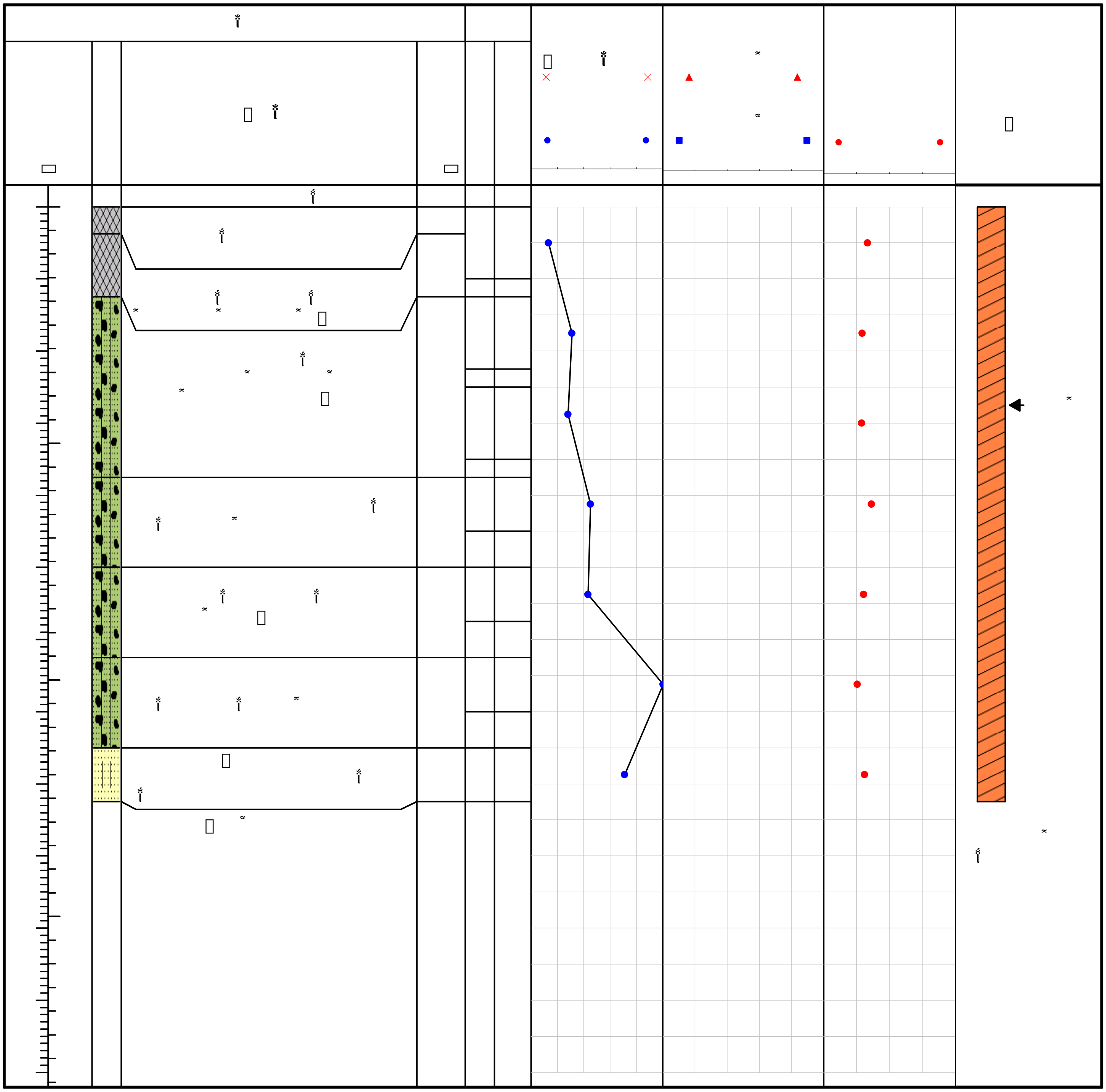
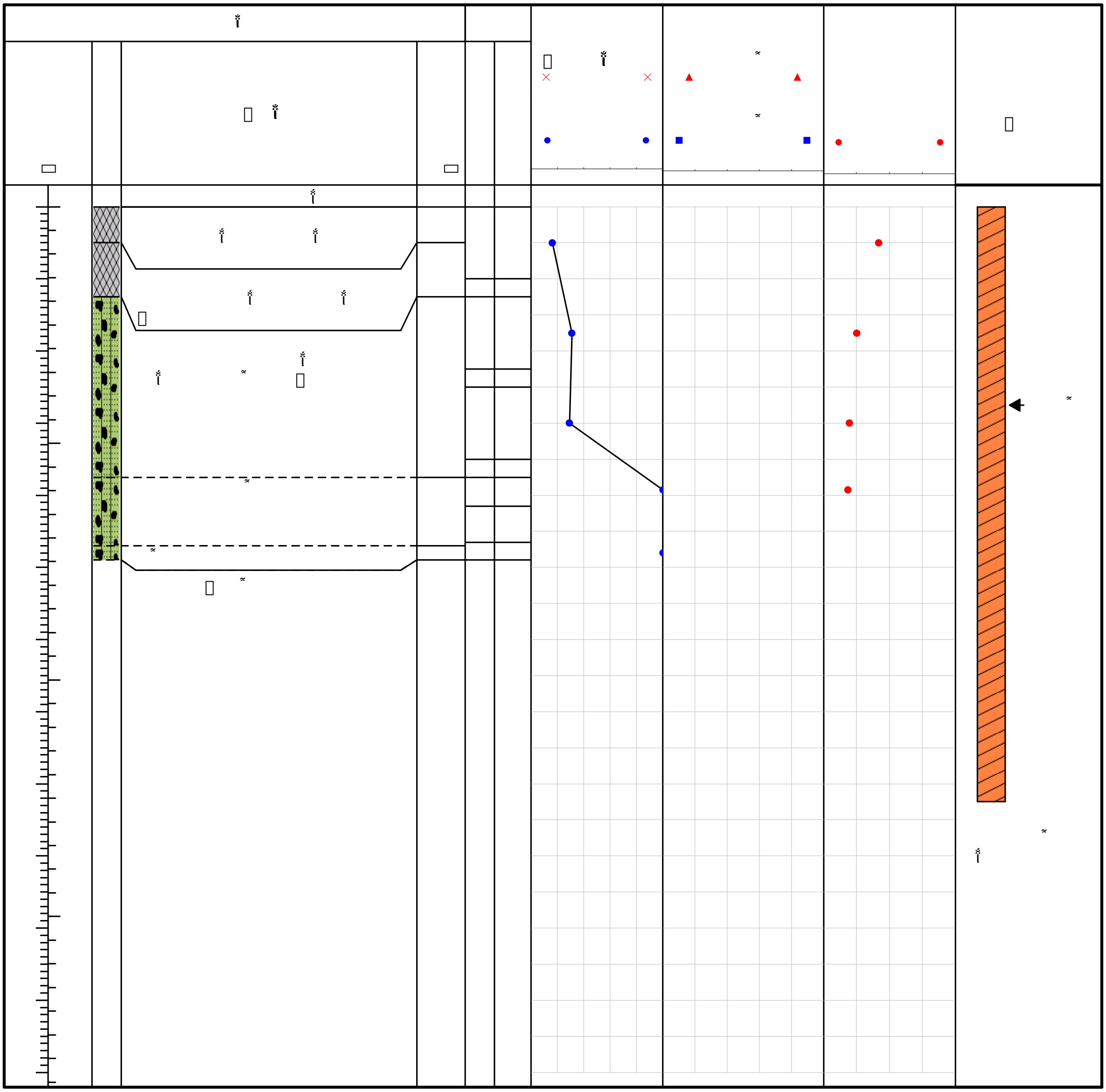
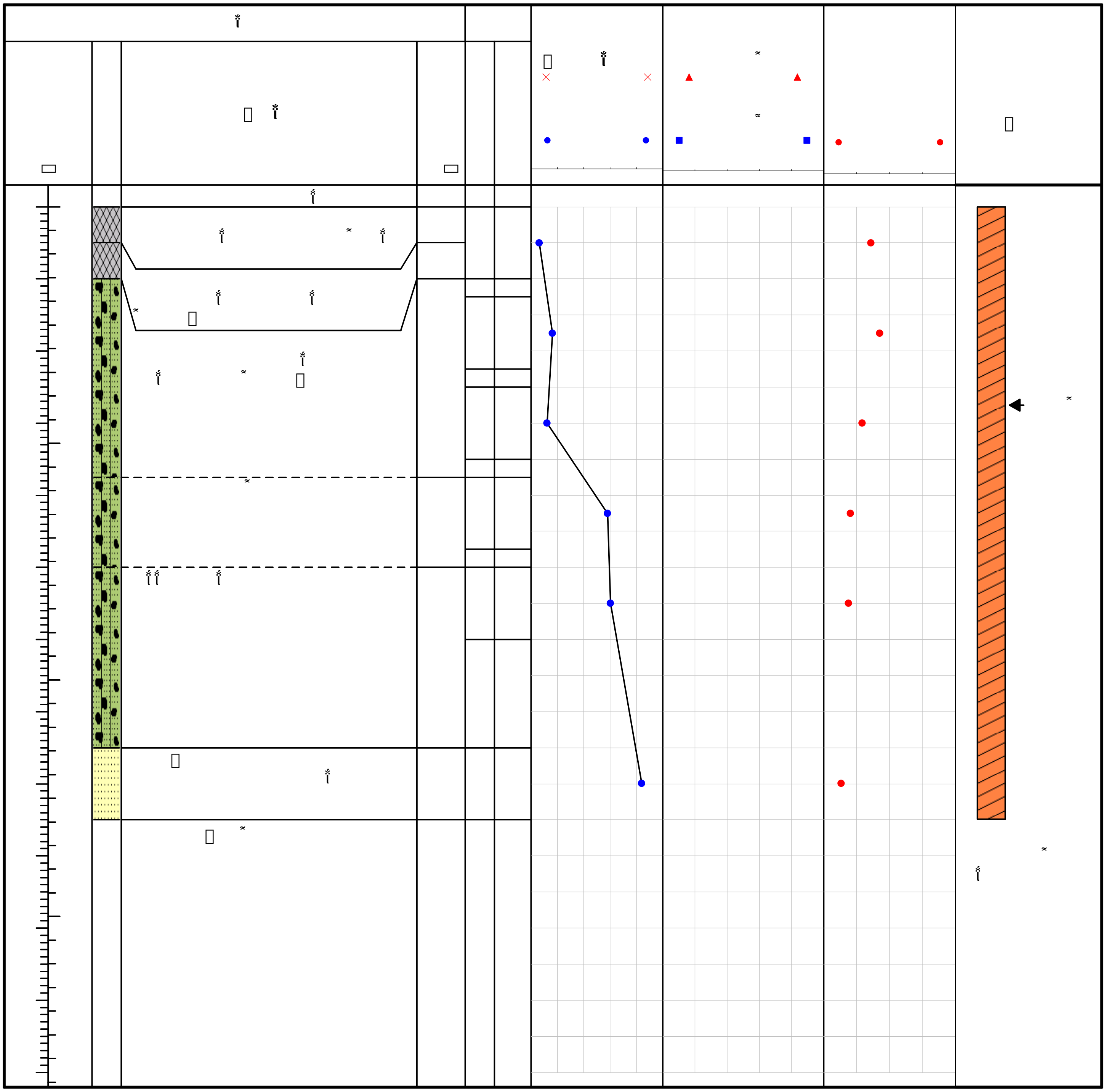
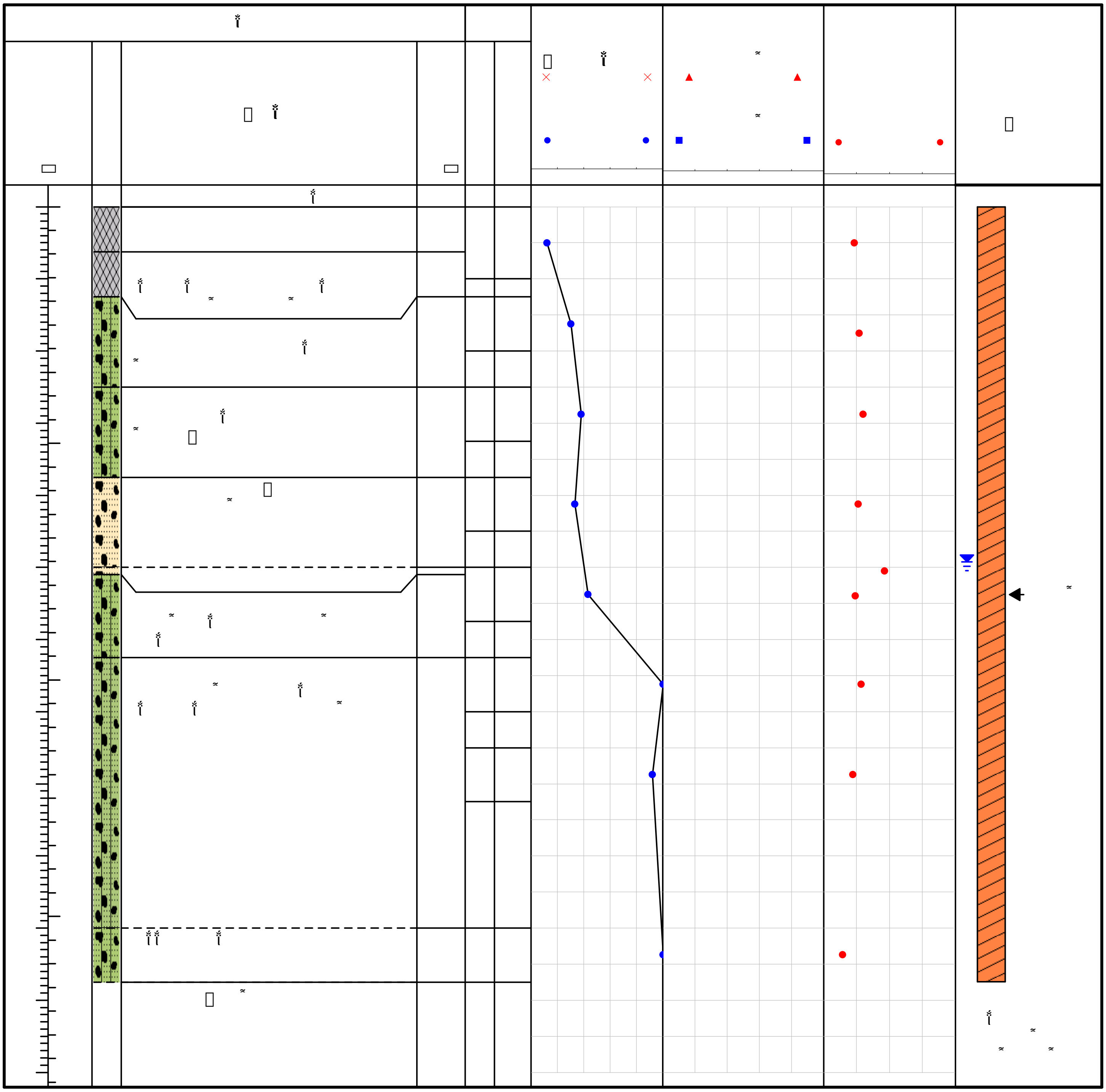


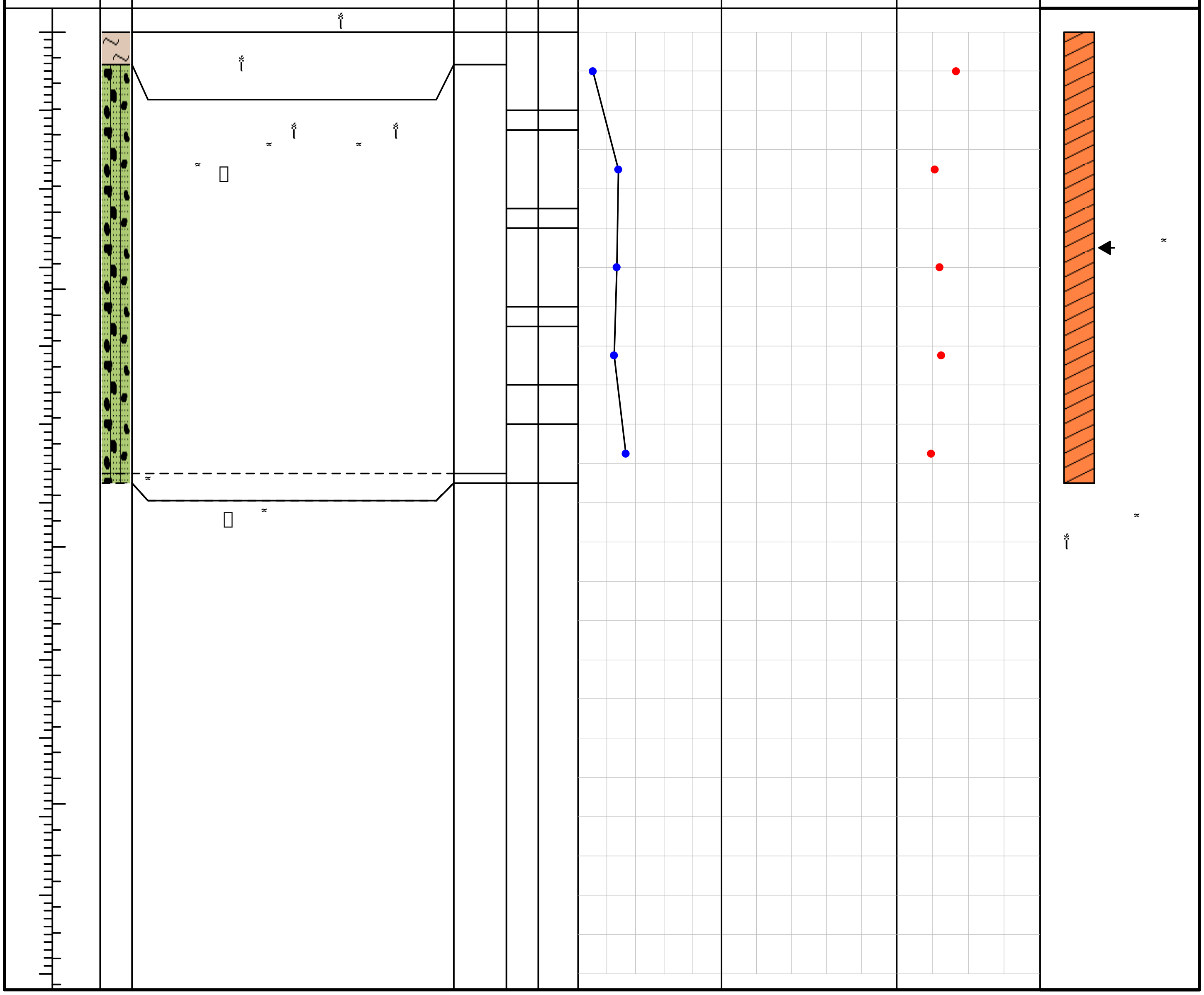


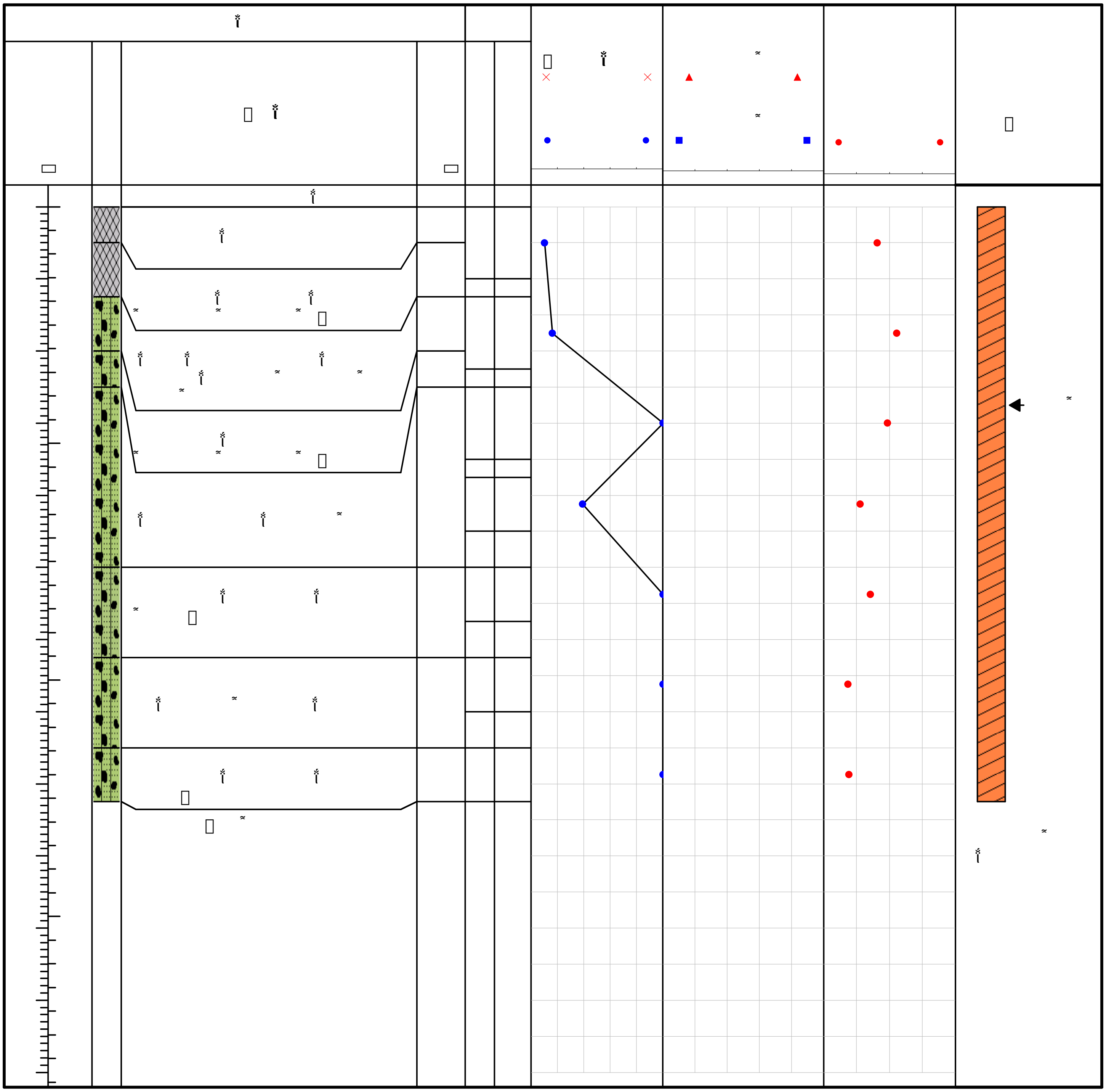


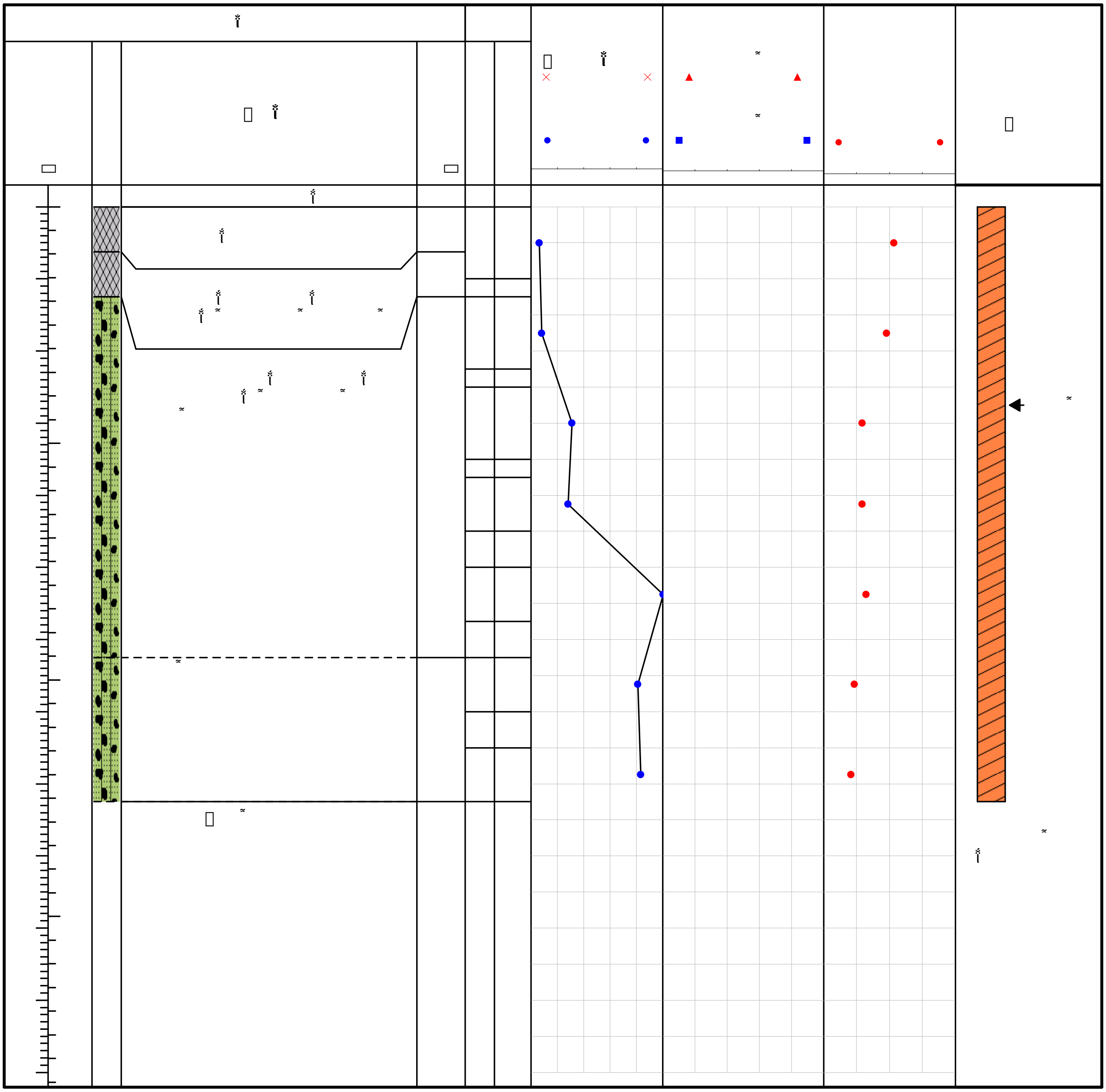


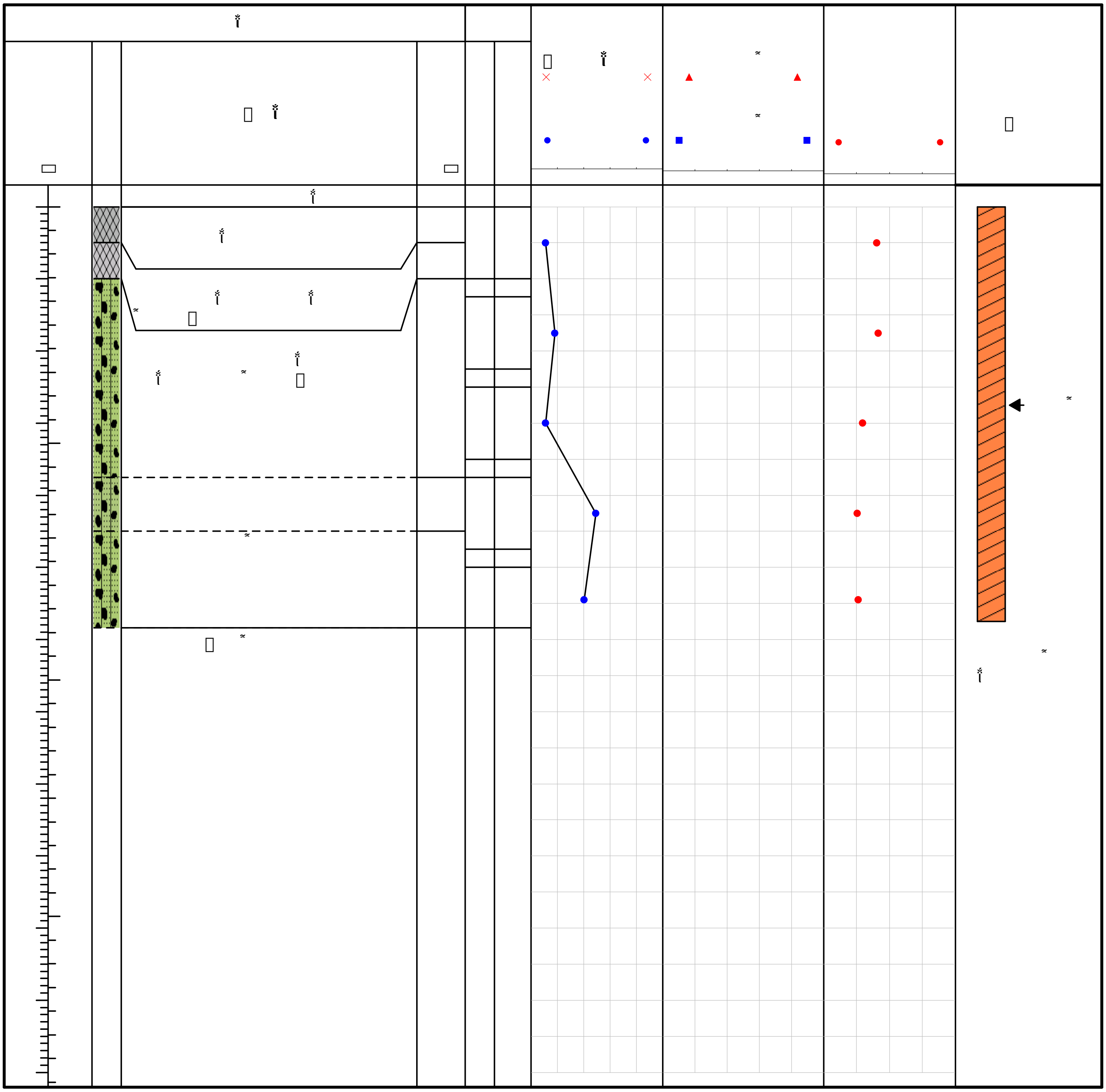


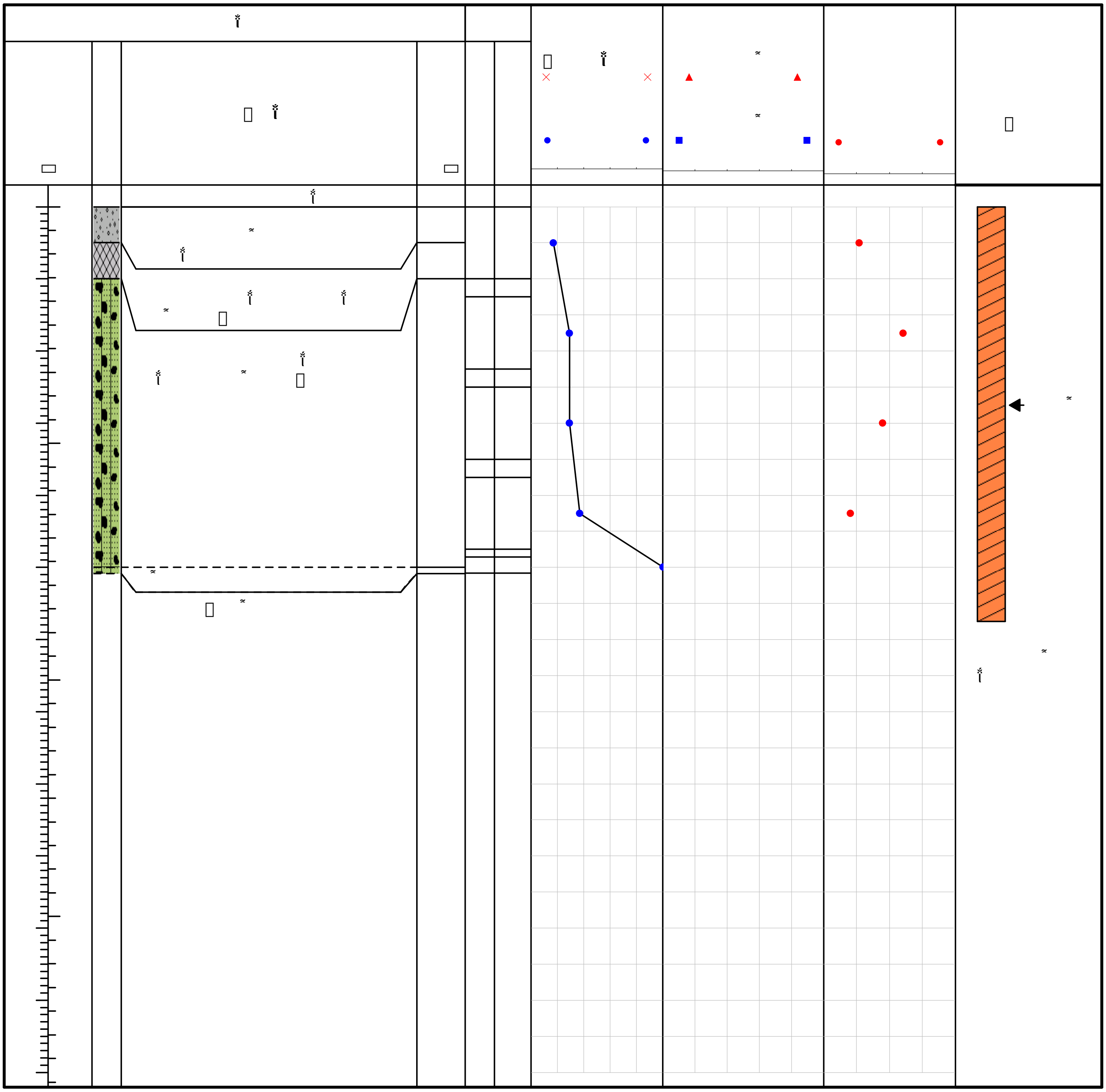


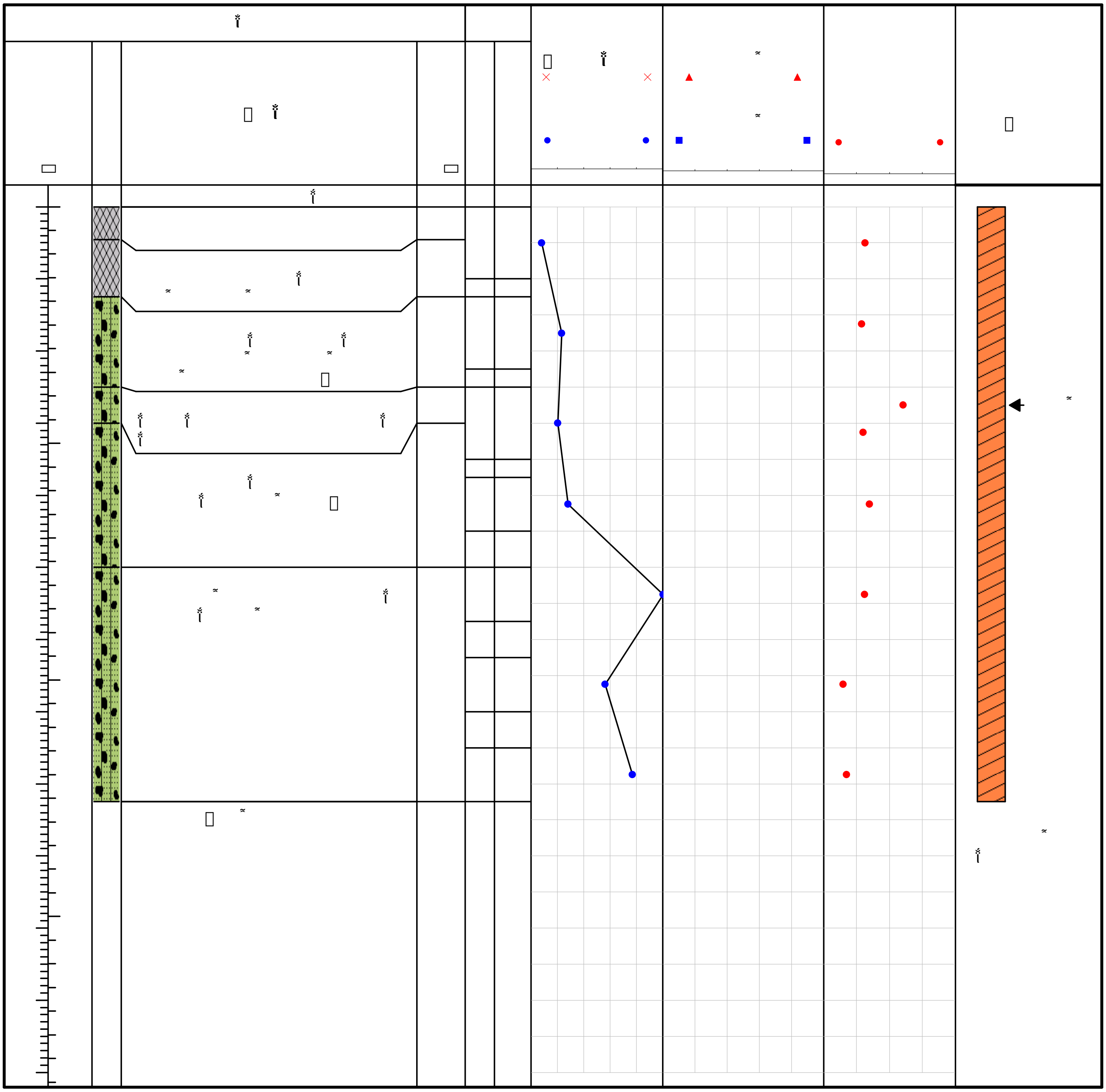


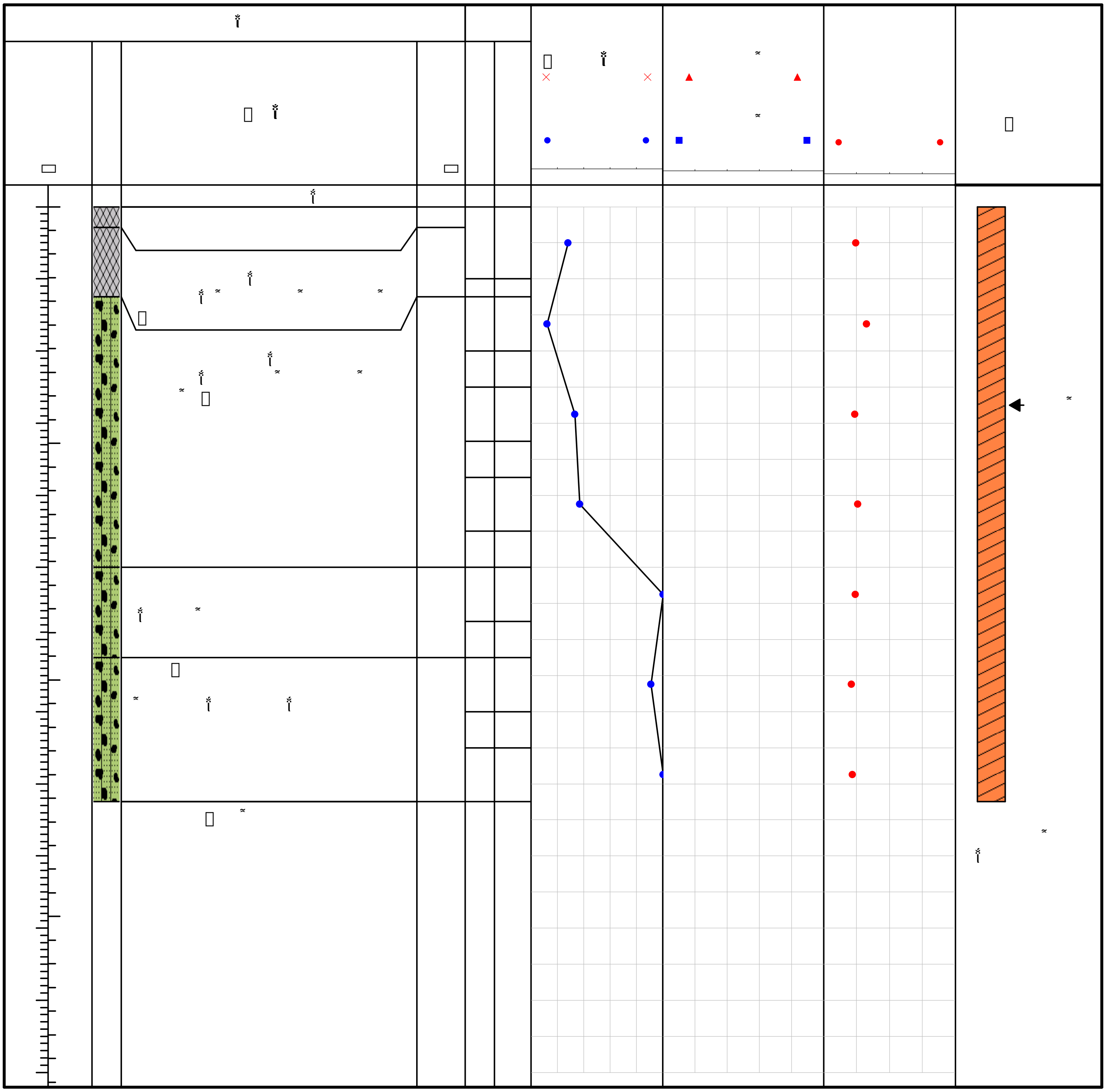


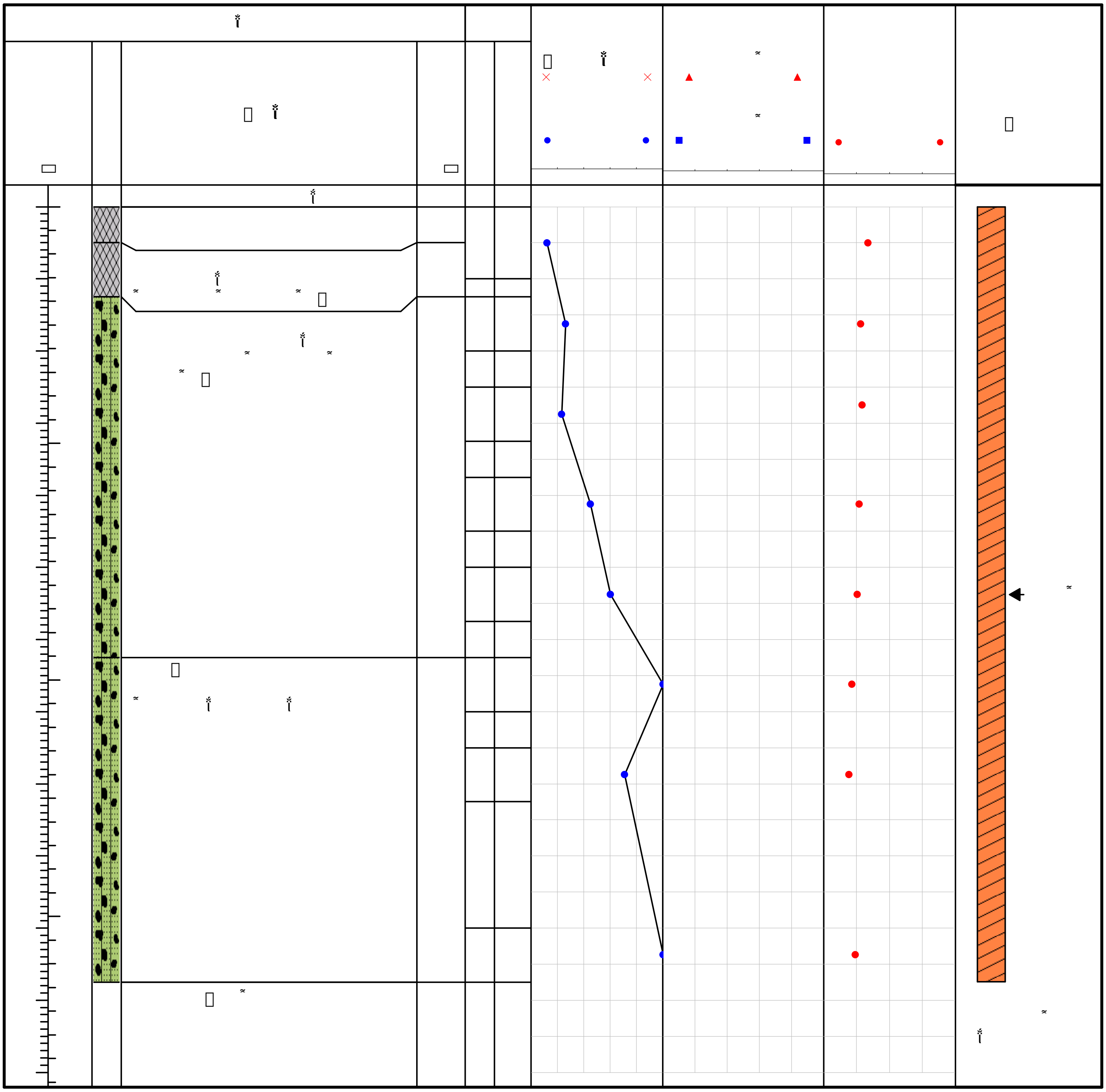


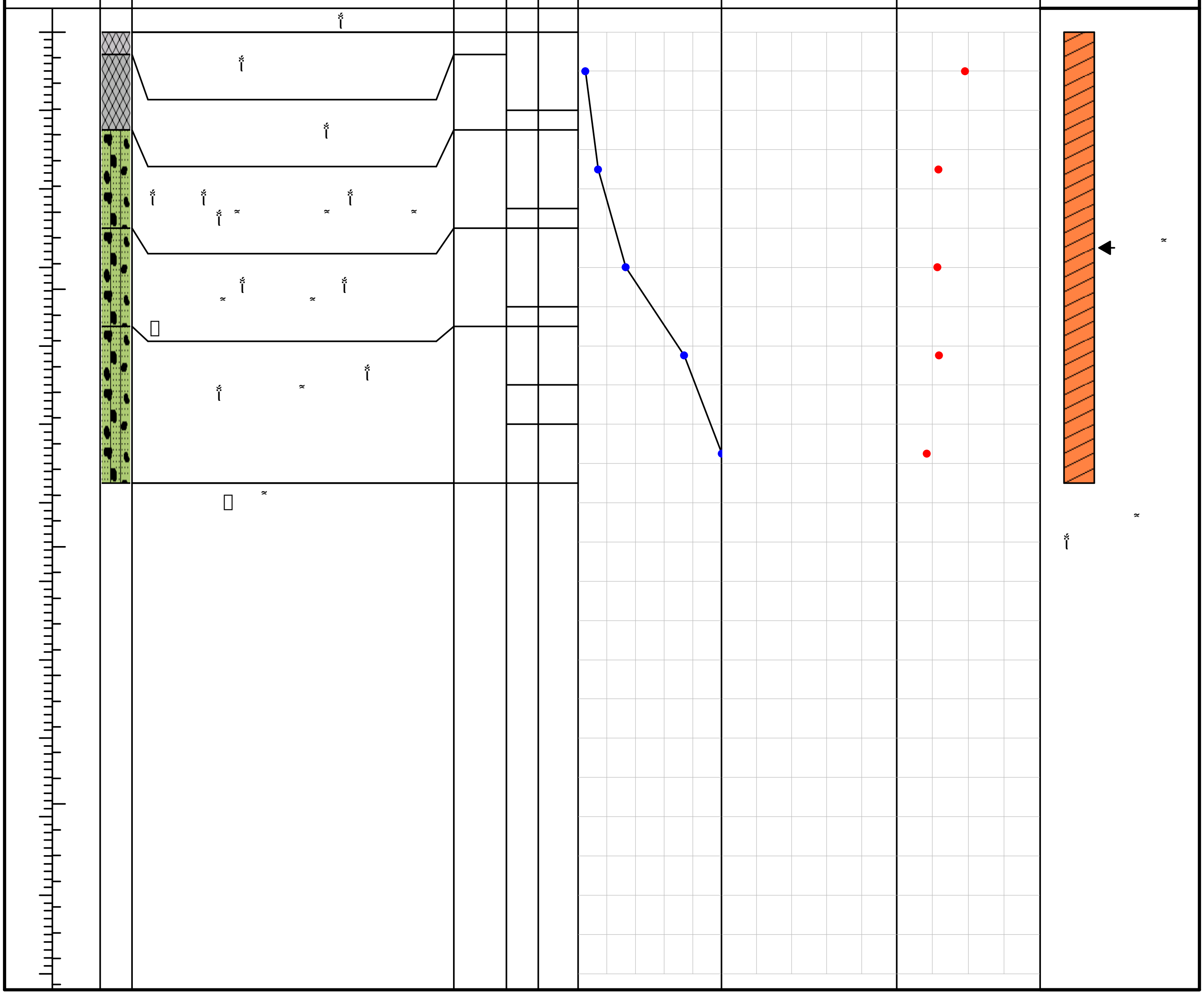


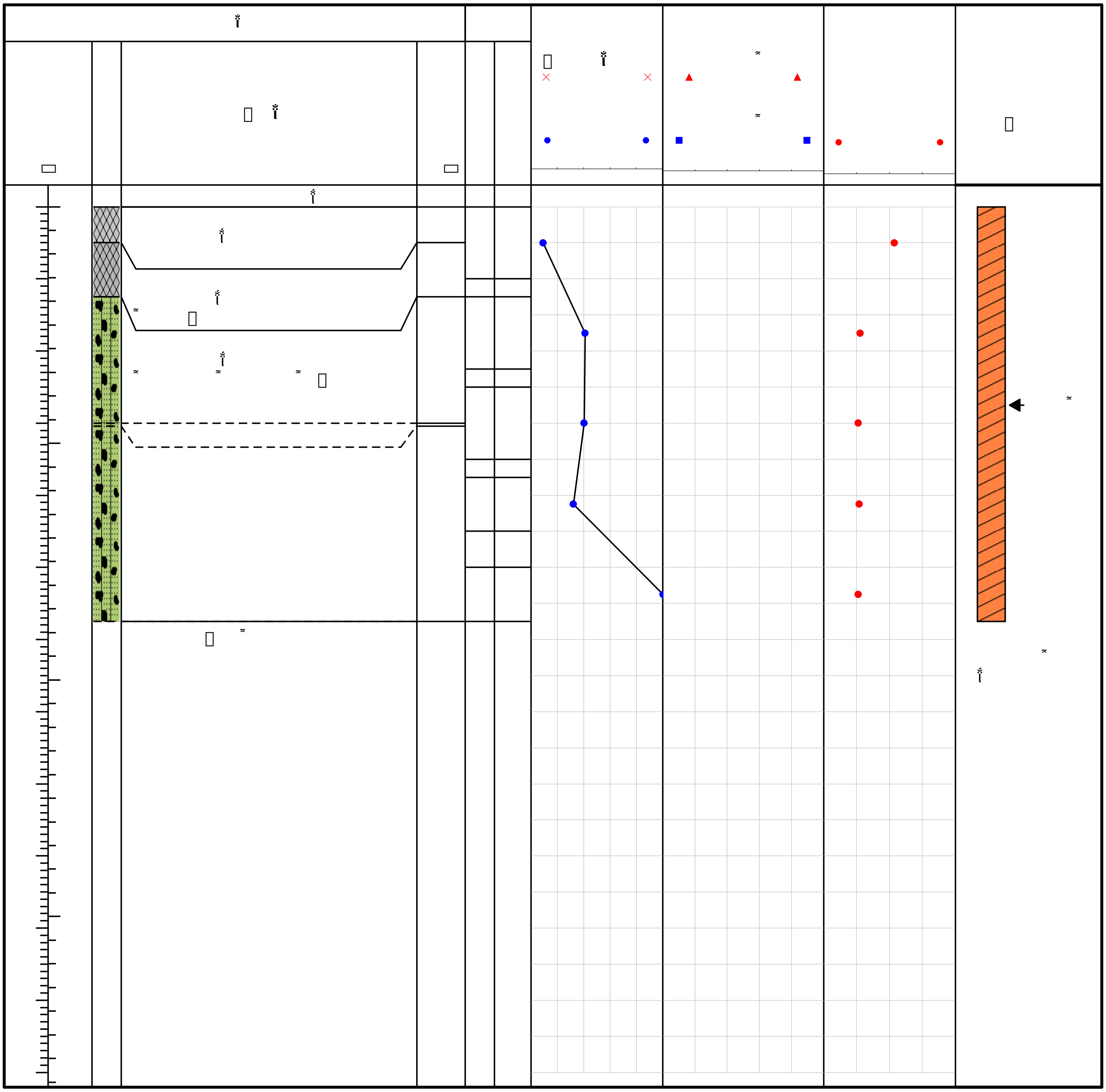




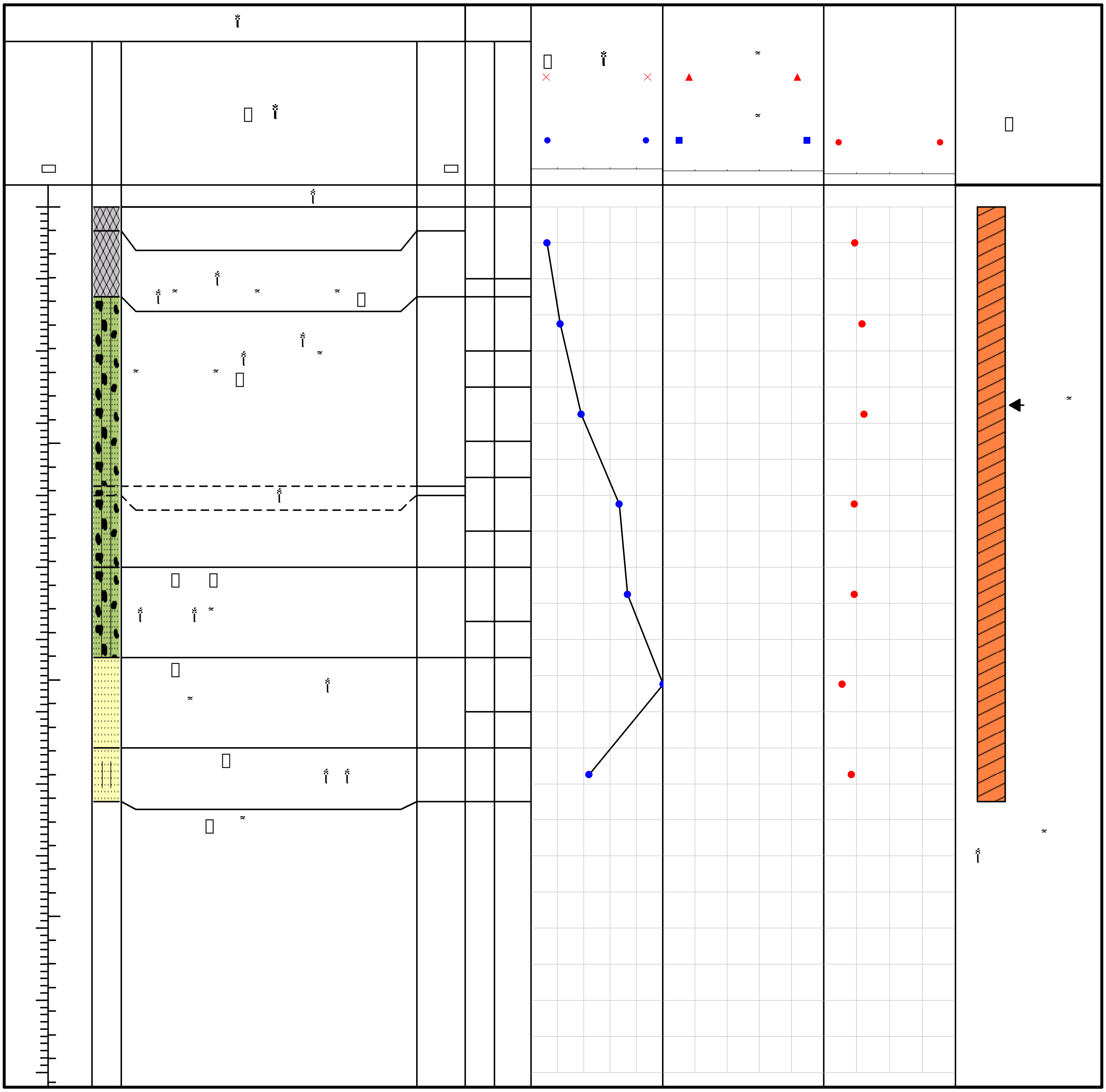


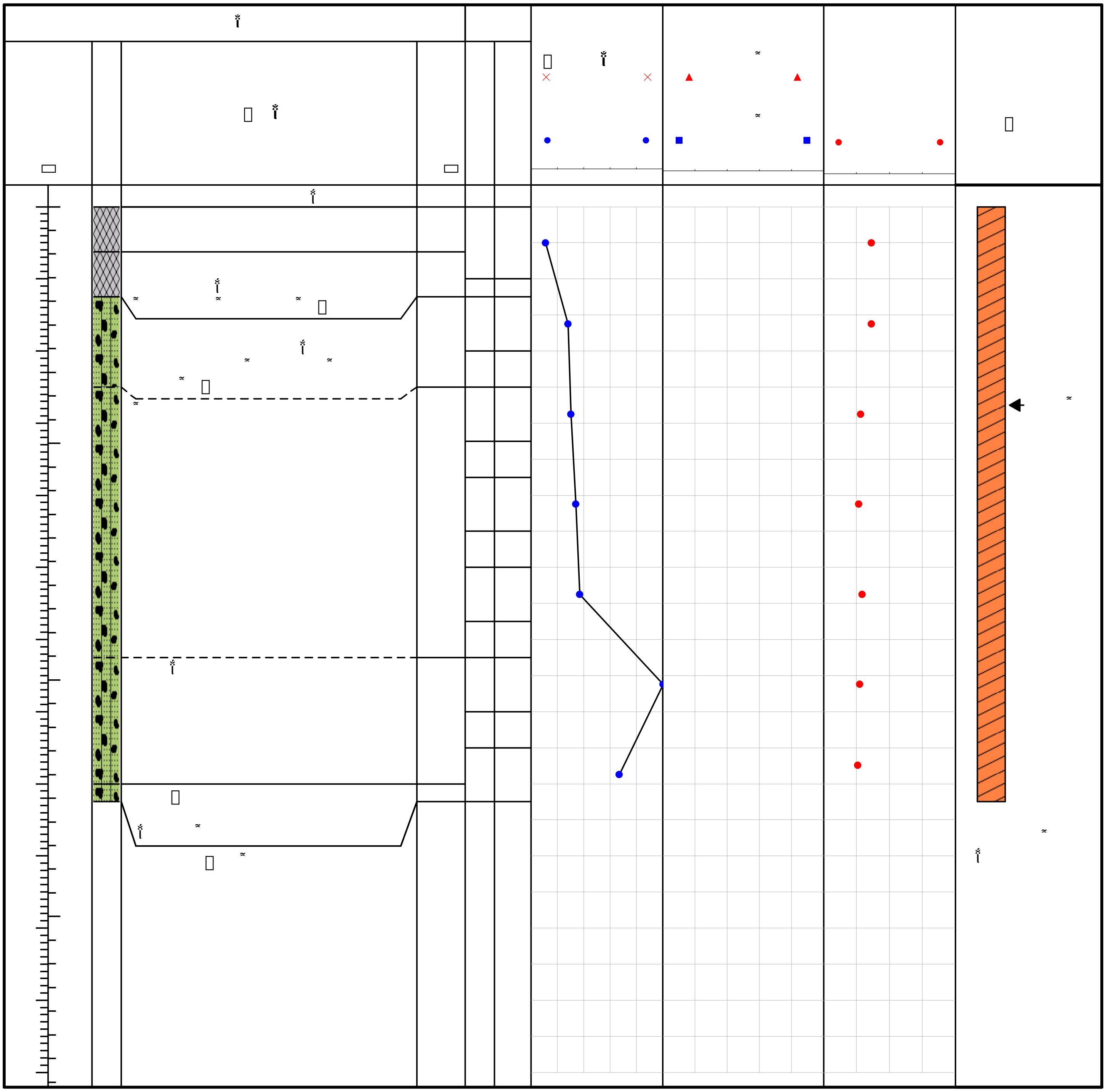


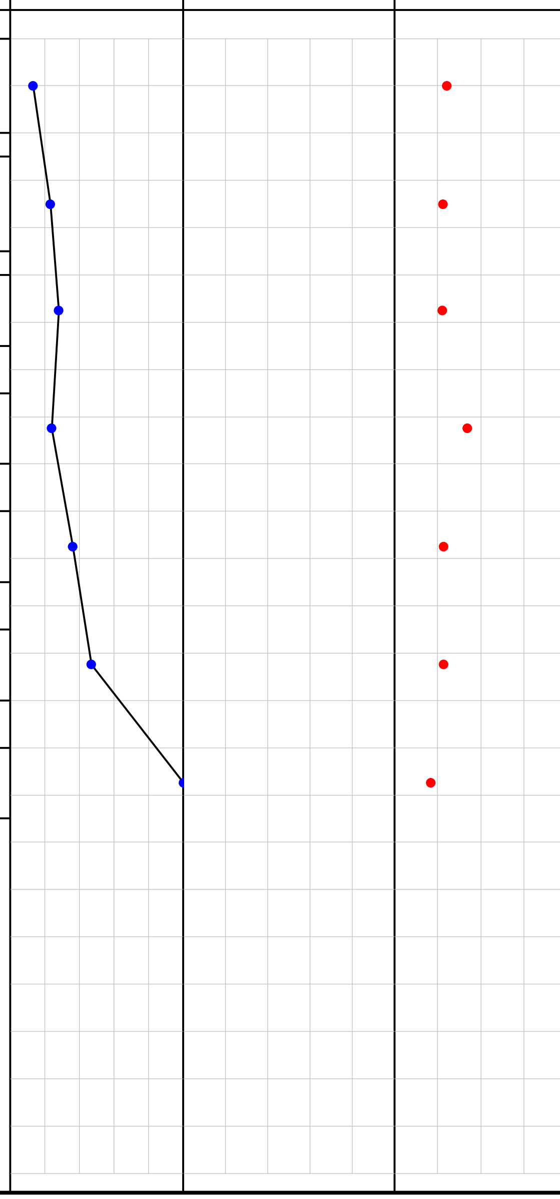


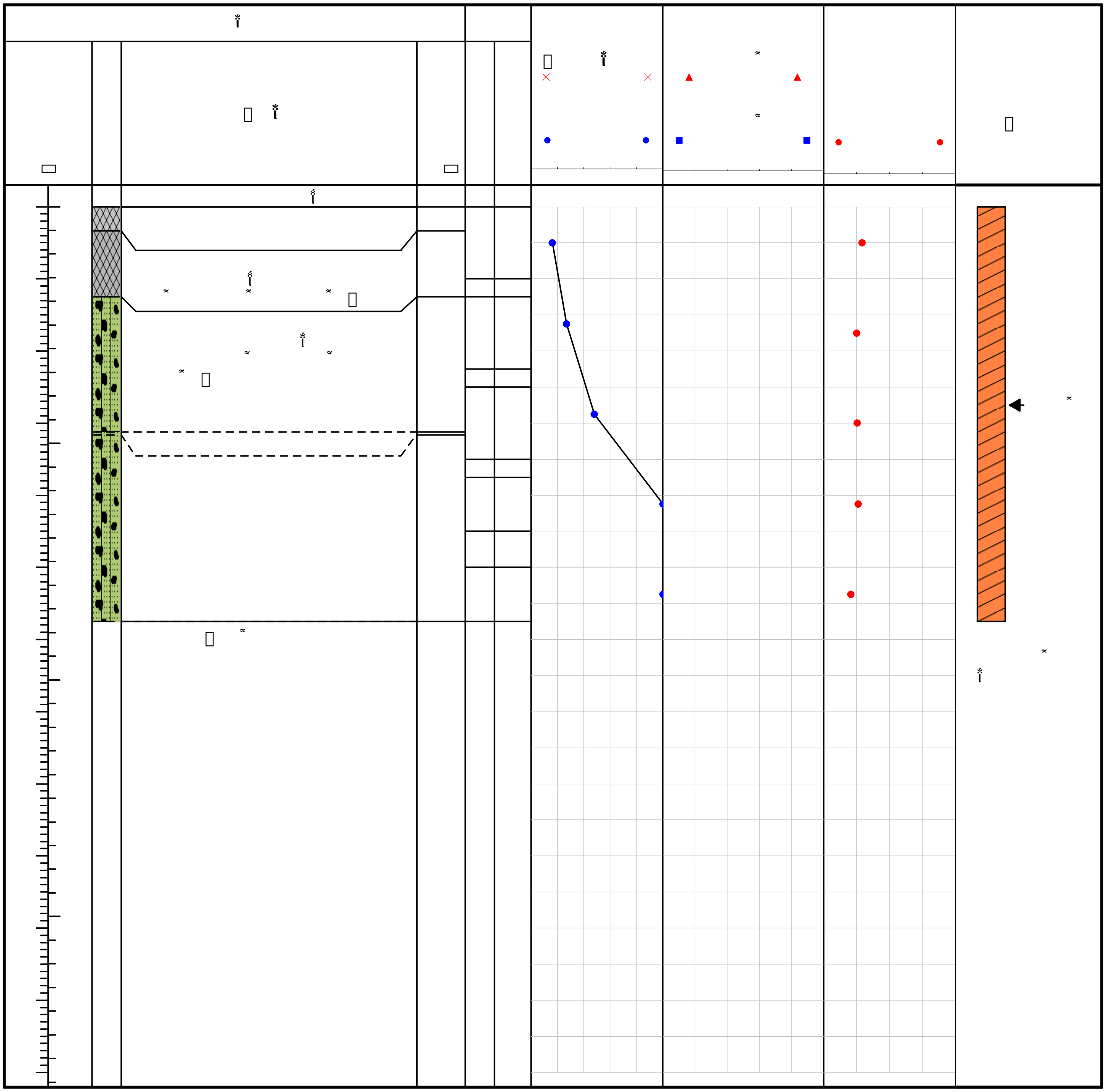


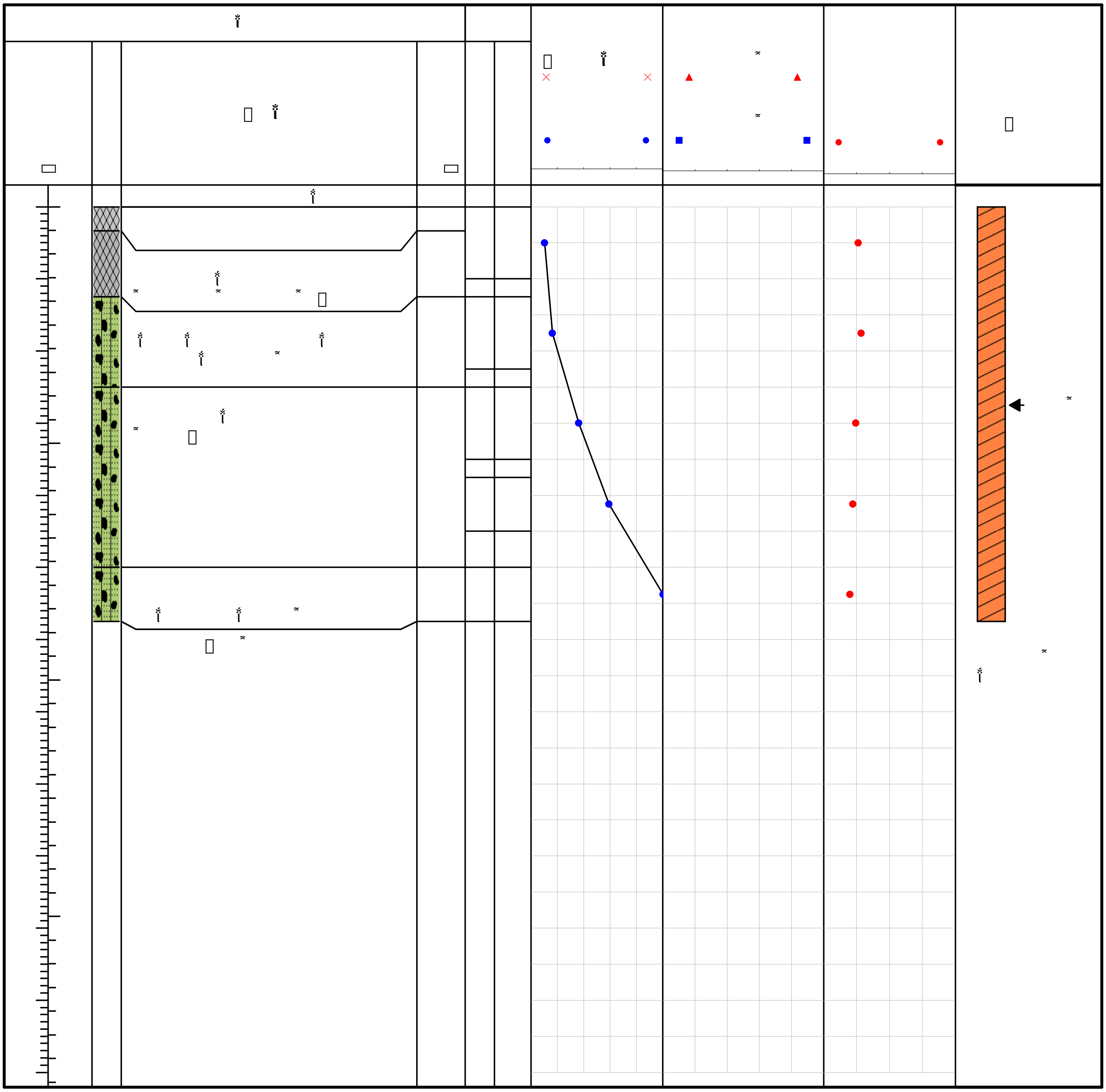
MTE



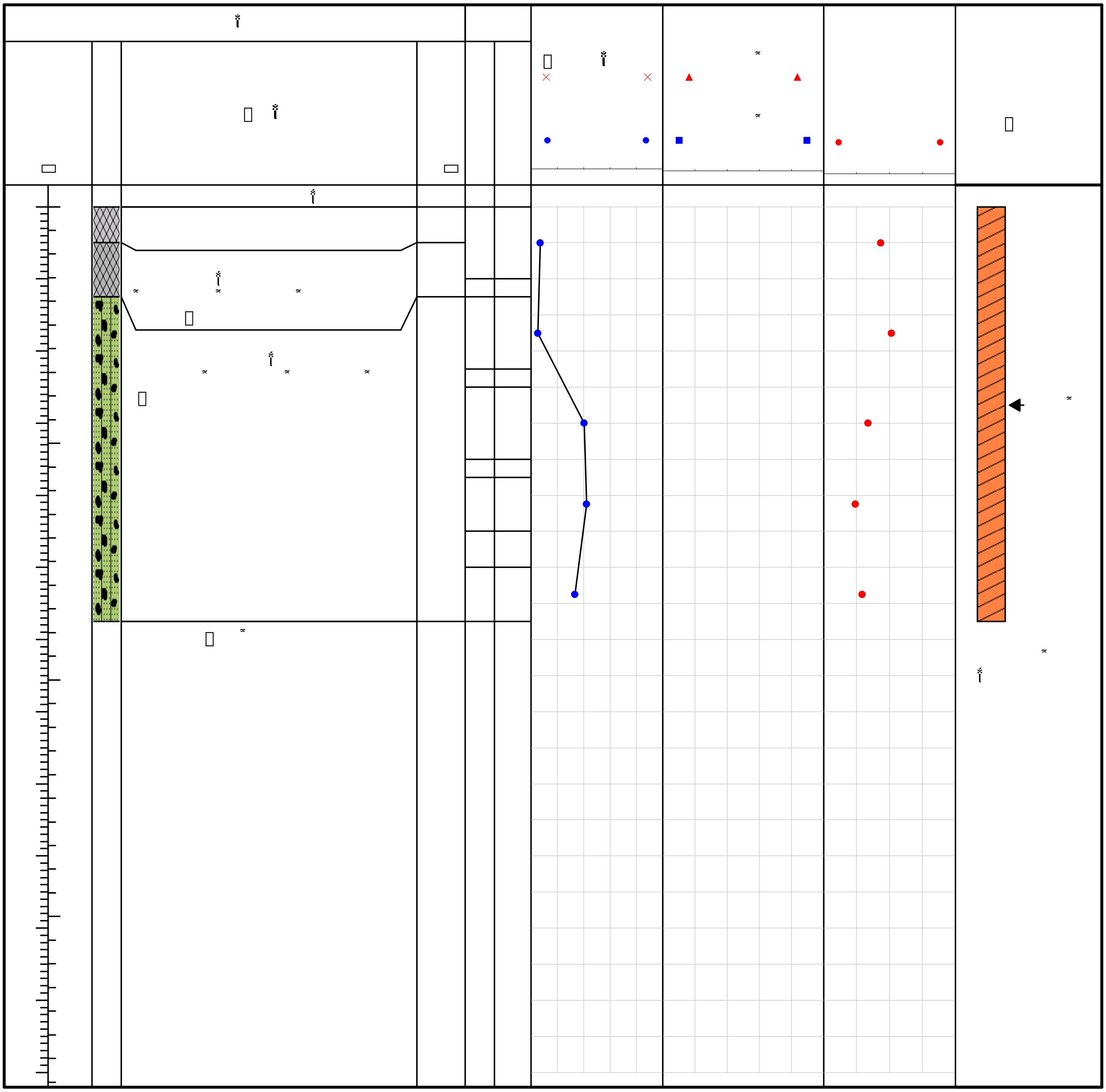


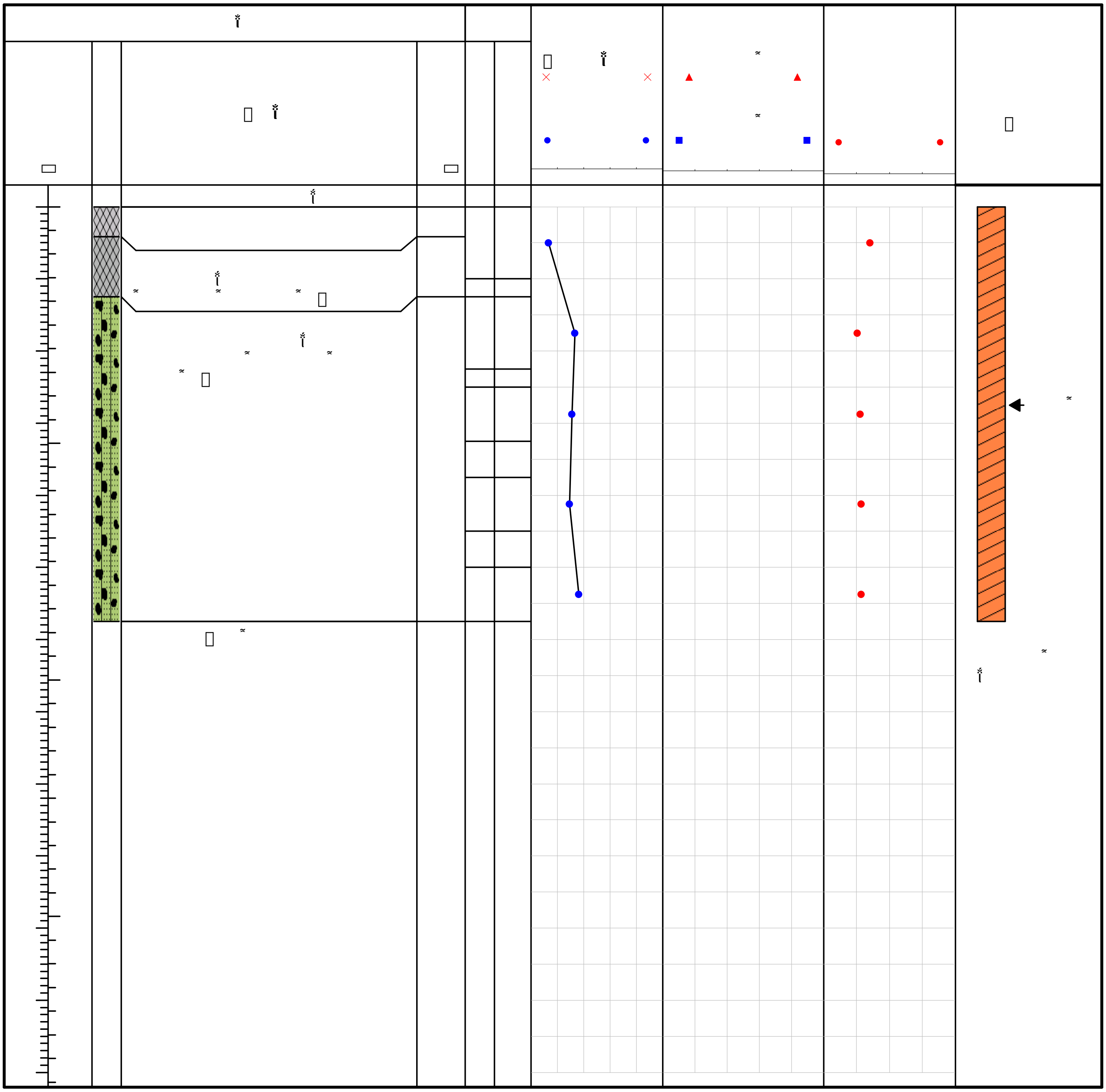






MTE





# Appendix C

# Particle Size Distributions

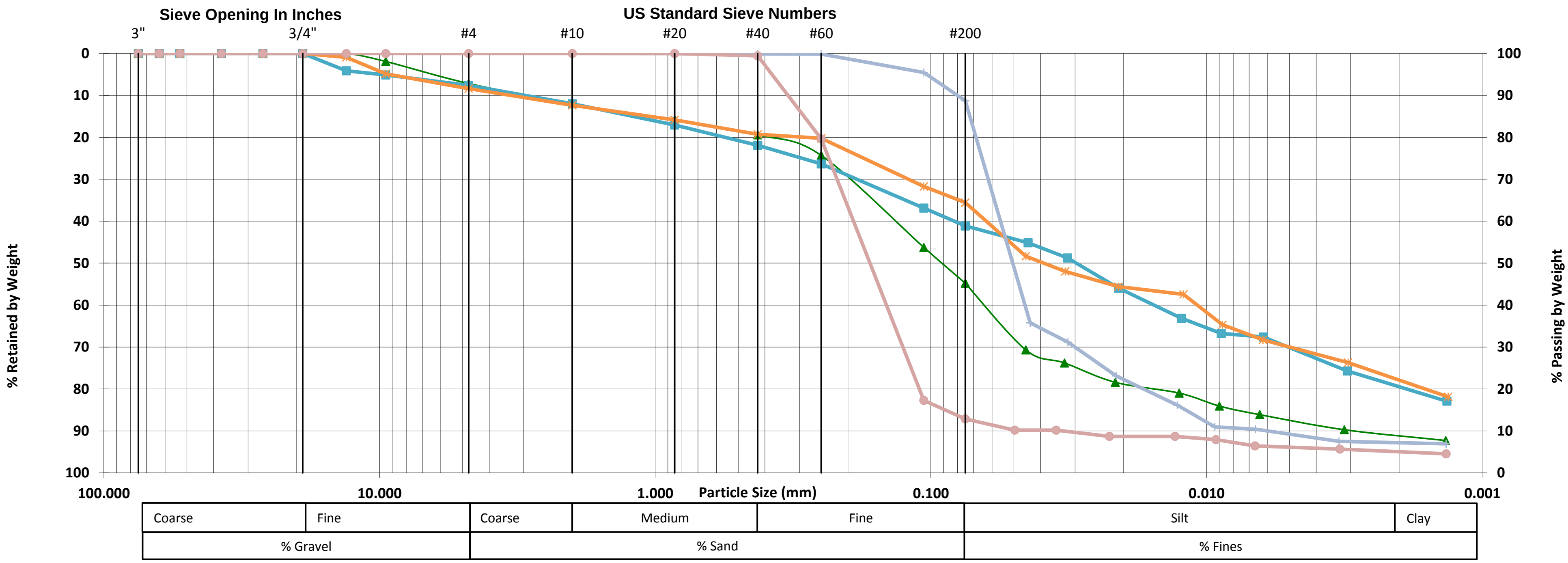
# Particle Size Distribution Analysis Test Results

**Project Name:** 12035 Dixie Road
**Client:** Tribal Partners
**Project Location:** 12035 Dixie Road, Caledon, ON

**Date Sampled:** November 30, 2020
**Date Tested:** December 16, 2020

**MTE File No.:** 47477-300
**Table No:** 101

## Unified Soil Classification




| Symbol | Borehole ID | Sample # | Sample Depth | Description |
|---|---|---|---|---|
| ▲ (green) | MW101-20 | SS-15 | 11.4-12.0 mbgs | SAND and SILT, trace Clay and Gravel |
| ■ (blue) | MW102-20 | SS-12 | 9.9-10.5 mbgs | Sandy Clayey SILT, trace Gravel |
| ✳ (orange) | MW103-20 | SS-11 | 7.6-8.1 mbgs | Sandy Clayey SILT, trace Gravel |
| + (grey) | MW104-20 | SS-10 | 9.9-10.5 mbgs | SILT, some Sand, trace Clay |
| ● (pink) | MW105-20 | SS-10 | 6.9-7.3 mbgs | SAND, trace Silt and Clay |

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Canadian Council of Independent Laboratories
For specific tests as listed on www.ccil.com

**NOTES:**

MTE

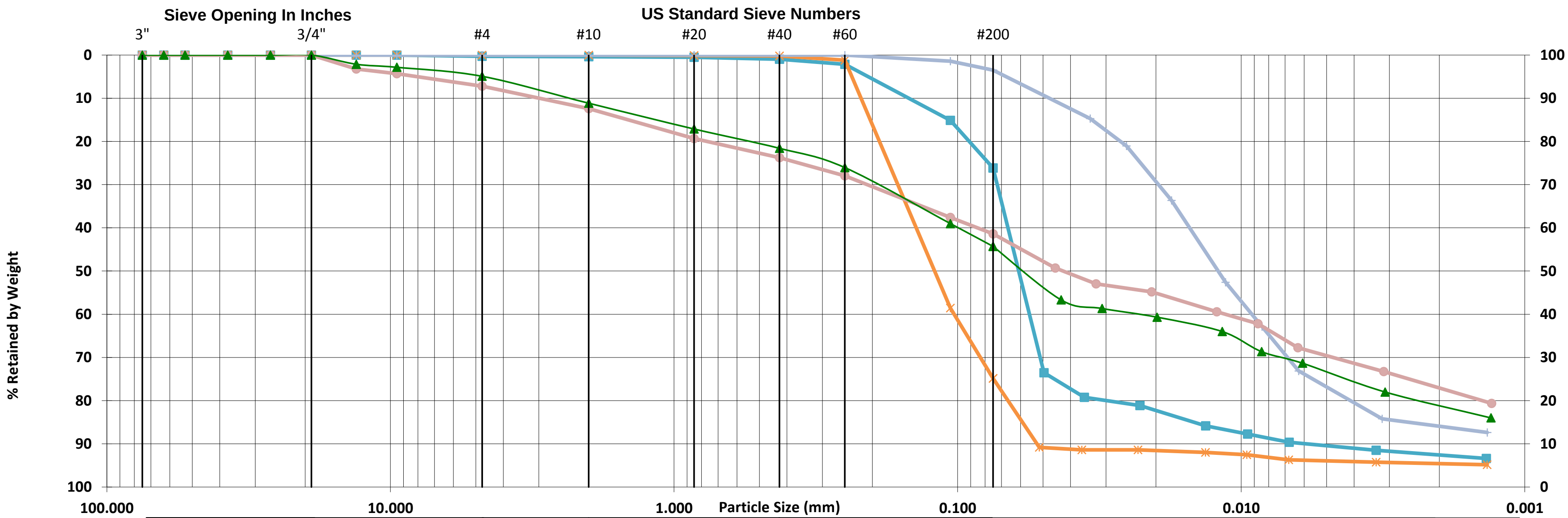
# Particle Size Distribution Analysis Test Results

**Project Name:** 12035 Dixie Road
**Client:** Tribal Partners
**Project Location:** 12035 Dixie Road, Caledon, ON

**Date Sampled:** November 30, 2020
**Date Tested:** December 16, 2020

**MTE File No.:** 47477-300
**Table No:** 102

## Unified Soil Classification




| Coarse | Fine | Coarse | Medium | Fine | Silt | Clay |
|---|---|---|---|---|---|---|
| % Gravel | | % Sand | | | % Fines | |

| Symbol | Borehole ID | Sample # | Sample Depth | Description |
|---|---|---|---|---|
| (blue square) | MW106-20 | SS-10 | 6.6-7.9 mbgs | Sandy SILT, trace Clay |
| (orange star) | MW107-20 | SS-11 | 9.1-9.8 mbgs | SAND, some Silt, trace Clay |
| (grey cross) | MW108-20 | SS-15 | 10.7-11.1 mbgs | SILT, some Clay, trace Sand |
| (pink circle) | BH130-20 | SS-3 | 1.5-2.1 mbgs | Sandy Clayey SILT, trace Gravel |
| (green triangle) | BH148-20 | SS-5 | 3.0-3.5 mbgs | SAND and SILT, some Clay, trace Gravel |

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For specific tests as listed on www.ccil.com

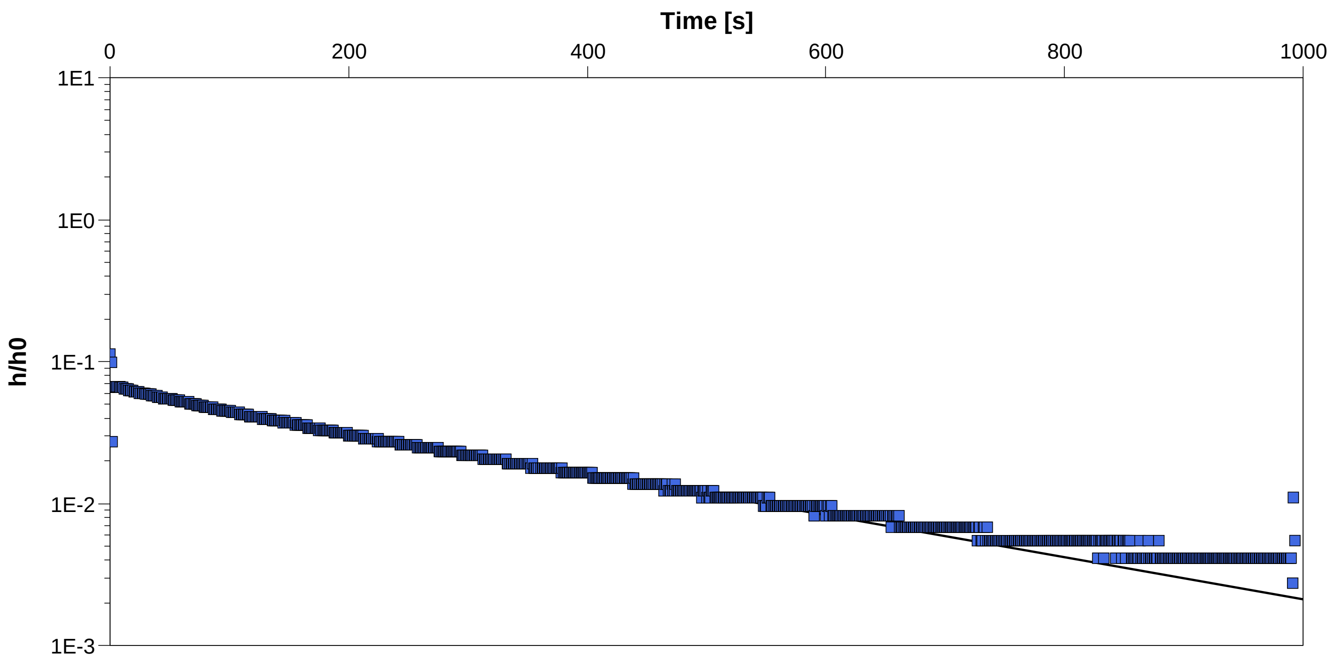
**NOTES:**

# Appendix D

# Single Well Response Tests

| Slug Test Analysis Report | |
|---|---|
| | Project: Hydrogeological Assessment |
| | Number: 47477-400 |
| | Client: Tribal Partner |

| Location: 12035 Dixie Road, Caledon | Slug Test: MW101-20 - Falling Test 1 | Test Well: MW101-20 |
|---|---|---|
| Test Conducted by: MBC | | Test Date: 11/23/2020 |
| Analysis Performed by: MBC | MW101-20 - Falling Test 1 | Analysis Date: 11/26/2020 |
| Aquifer Thickness: 1.30 m | | |

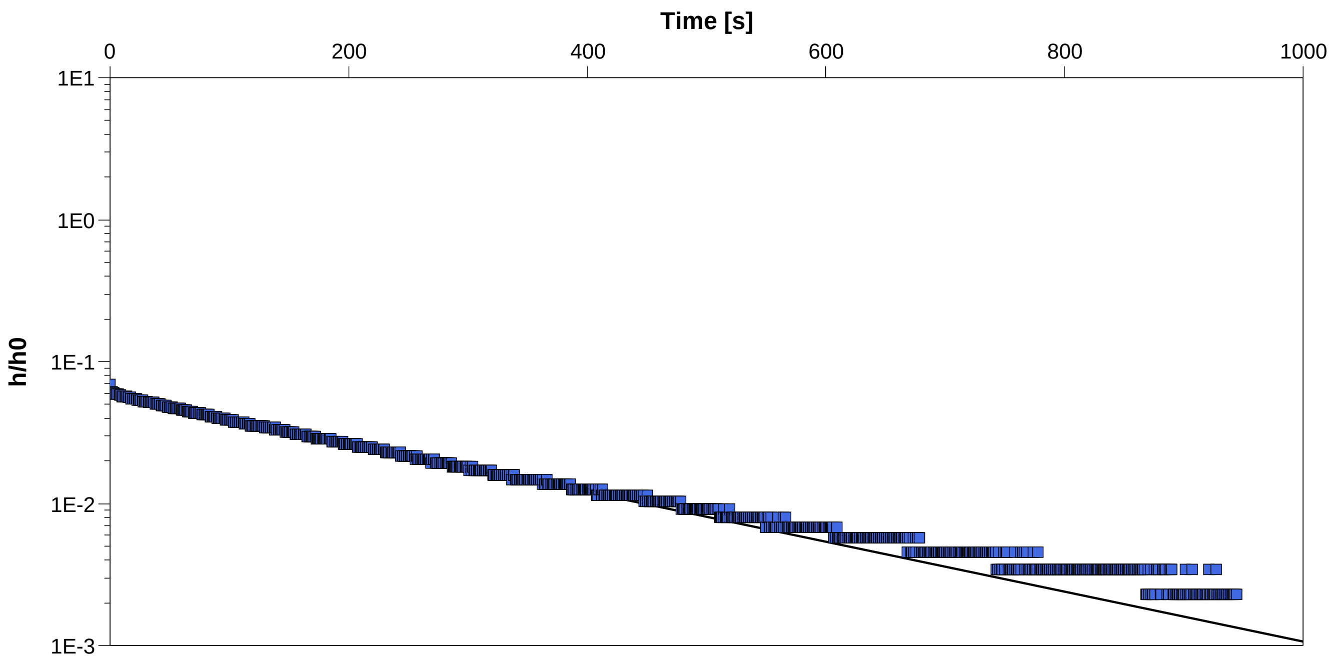



Calculation using Hvorslev

| Observation Well | Hydraulic Conductivity [m/s] | |
|---|---|---|
| MW101-20 | $2.66 \times 10^{-6}$ | |

| | |
|---|---|
| | **Slug Test Analysis Report** |
| | Project: Hydrogeological Assessment |
| | Number: 47477-400 |
| | Client: Tribal Partner |

| Location: 12035 Dixie Road, Caledon | Slug Test: MW101-20 - Rising Test 1 | Test Well: MW101-20 |
|---|---|---|
| Test Conducted by: MBC | | Test Date: 11/23/2020 |
| Analysis Performed by: MBC | MW101-20 - Rising Test 1 | Analysis Date: 11/26/2020 |
| Aquifer Thickness: 1.30 m | | |

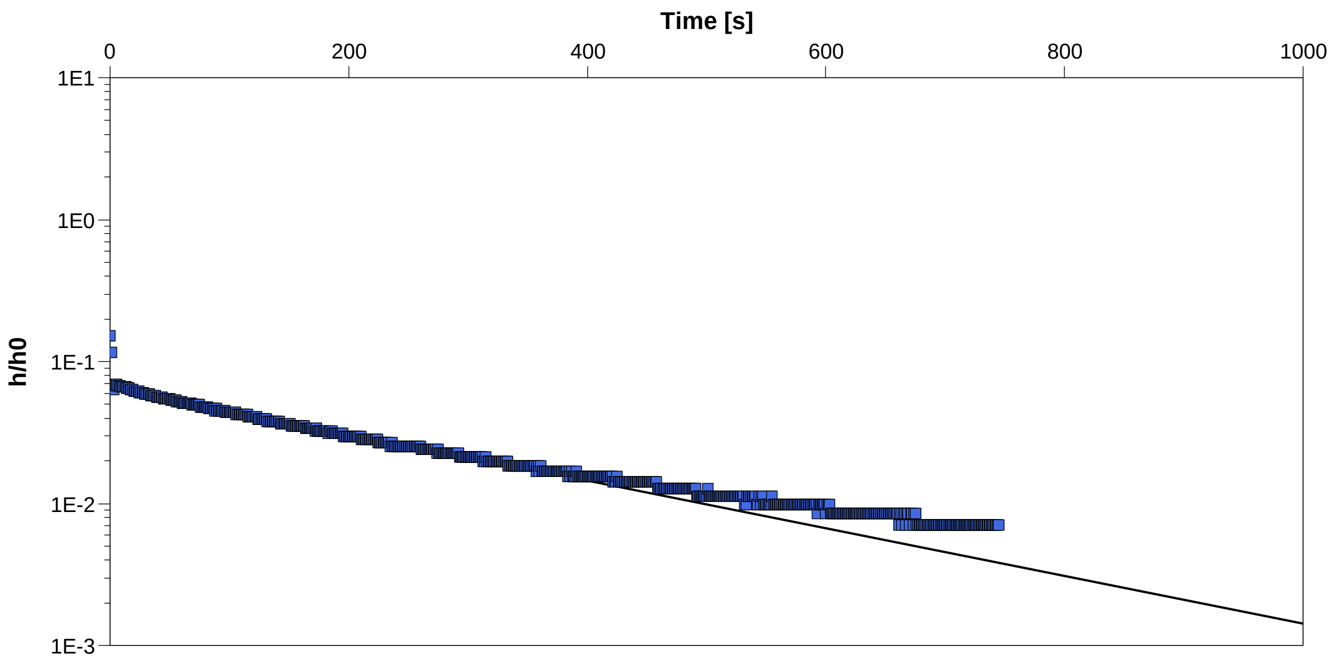



Calculation using Hvorslev

| Observation Well | Hydraulic Conductivity [m/s] | |
|---|---|---|
| MW101-20 | $3.15 \times 10^{-6}$ | |

| | |
|---|---|
| | **Slug Test Analysis Report** |
| | Project: Hydrogeological Assessment |
| | Number: 47477-400 |
| | Client: Tribal Partner |

| | | |
|---|---|---|
| Location: 12035 Dixie Road, Caledon | Slug Test: MW101-20 - Falling Test 2 | Test Well: MW101-20 |
| Test Conducted by: MBC | | Test Date: 11/23/2020 |
| Analysis Performed by: MBC | MW101-20 - Falling Test 2 | Analysis Date: 11/26/2020 |
| Aquifer Thickness: 1.30 m | | |

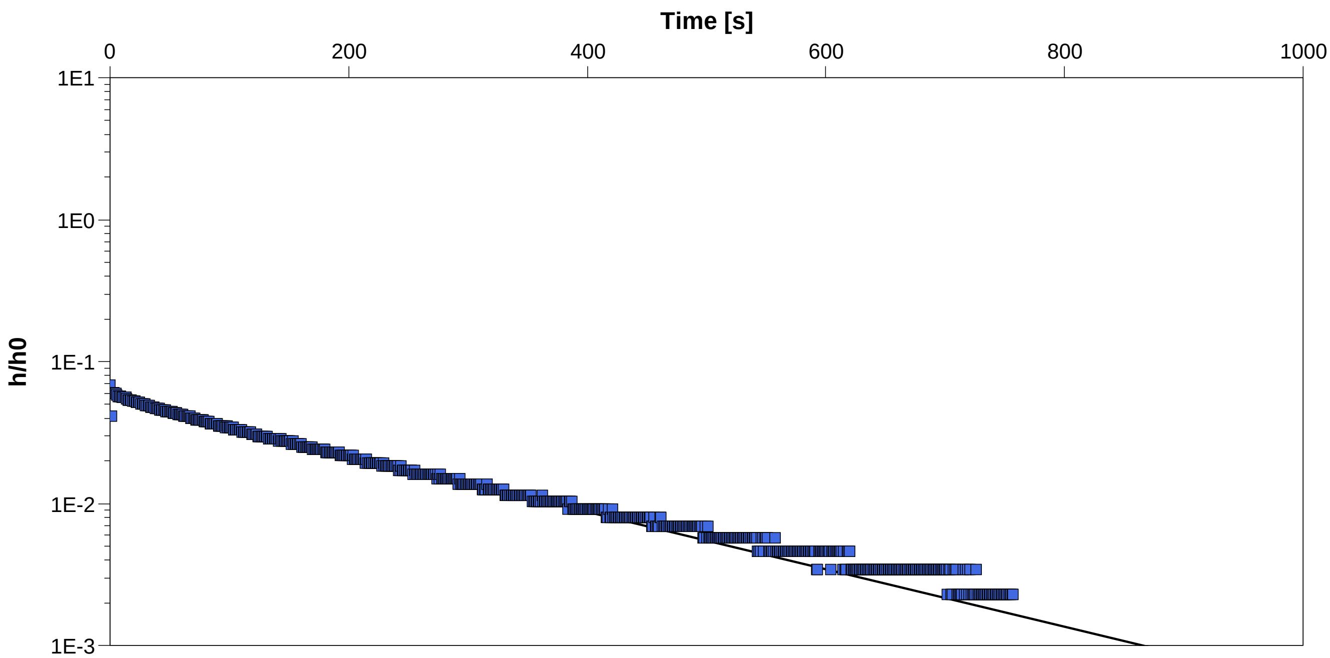



Calculation using Hvorslev

| Observation Well | Hydraulic Conductivity [m/s] | |
|---|---|---|
| MW101-20 | $3.01 \times 10^{-6}$ | |

| | |
|---|---|
| | **Slug Test Analysis Report** |
| | Project: Hydrogeological Assessment |
| | Number: 47477-400 |
| | Client: Tribal Partner |

| Location: 12035 Dixie Road, Caledon | Slug Test: MW101-20 - Rising Test 2 | Test Well: MW101-20 |
|---|---|---|
| Test Conducted by: MBC | | Test Date: 11/23/2020 |
| Analysis Performed by: MBC | MW101-20 - Rising Test 2 | Analysis Date: 11/26/2020 |
| Aquifer Thickness: 1.30 m | | |

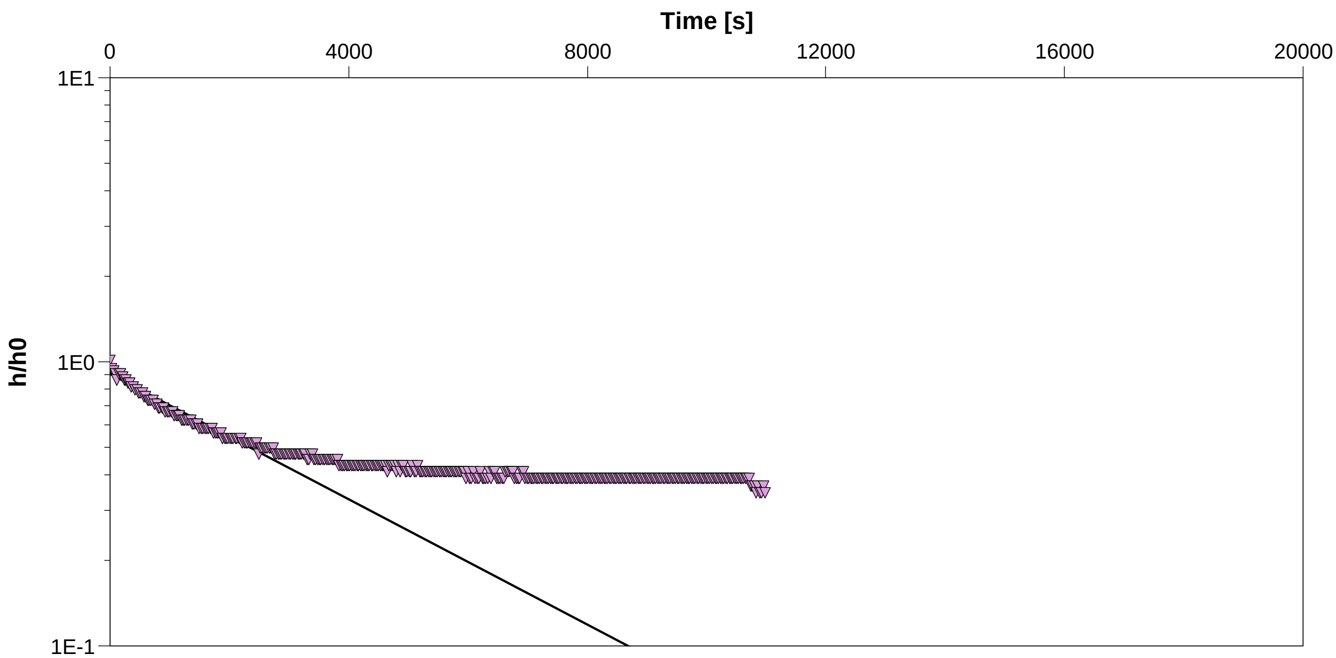



Calculation using Hvorslev

| Observation Well | Hydraulic Conductivity [m/s] | |
|---|---|---|
| MW101-20 | $3.63 \times 10^{-6}$ | |

| | |
|---|---|
| | **Slug Test Analysis Report** |
| | Project: Hydrogeological Assessment |
| | Number: 47477-400 |
| | Client: Tribal Partner |

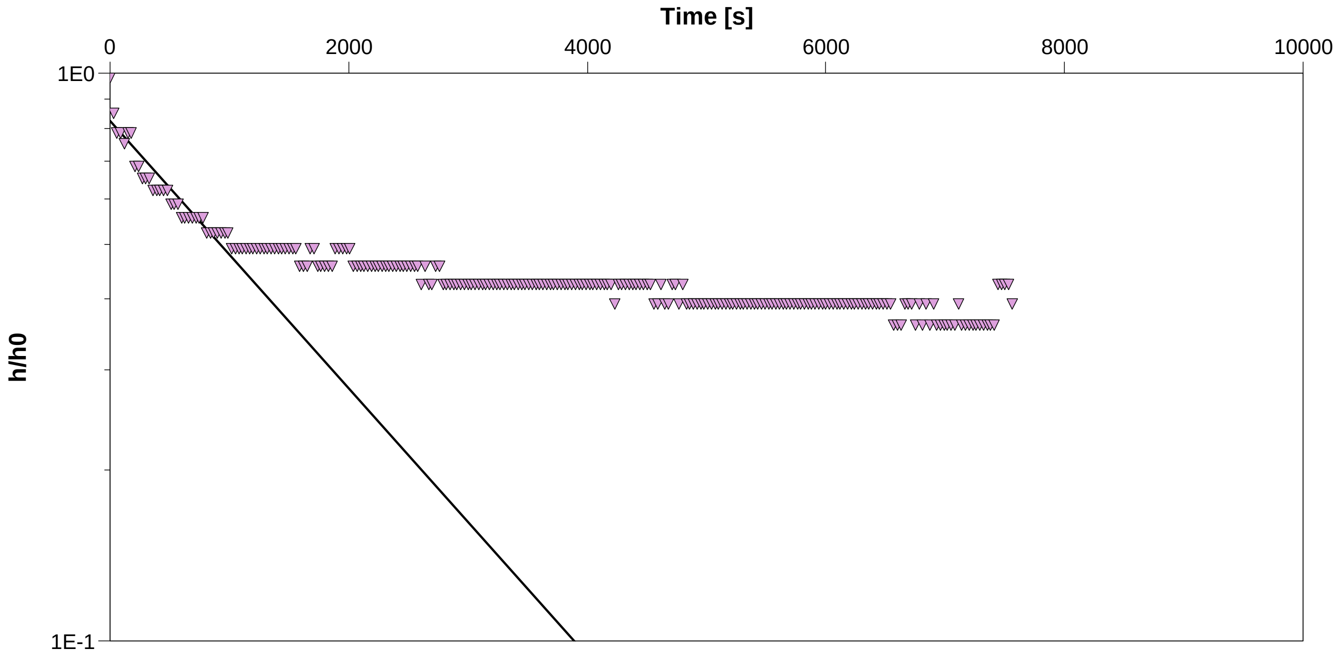
| | | |
|---|---|---|
| Location: 12035 Dixie Road, Caledon | Slug Test: MW103-20 - Falling Test 1 | Test Well: MW103-20 |
| Test Conducted by: MBC | | Test Date: 12/14/2020 |
| Analysis Performed by: MBC | MW103-20 - Falling Test 1 | Analysis Date: 12/17/2020 |
| Aquifer Thickness: 3.10 m | | |




Calculation using Hvorslev

| Observation Well | Hydraulic Conductivity [m/s] | |
|---|---|---|
| MW103-20 | $1.24 \times 10^{-7}$ | |

| | | |
|---|---|---|
| | | **Slug Test Analysis Report** |
| | | Project: Hydrogeological Assessment |
| | | Number: 47477-400 |
| | | Client: Tribal Partner |
| Location: 12035 Dixie Road, Caledon | Slug Test: MW103-20 - Rising Test 1 | Test Well: MW103-20 |
| Test Conducted by: MBC | | Test Date: 12/14/2020 |
| Analysis Performed by: MBC | MW103-20 - Rising Test1 1 | Analysis Date: 12/17/2020 |
| Aquifer Thickness: 3.10 m | | |

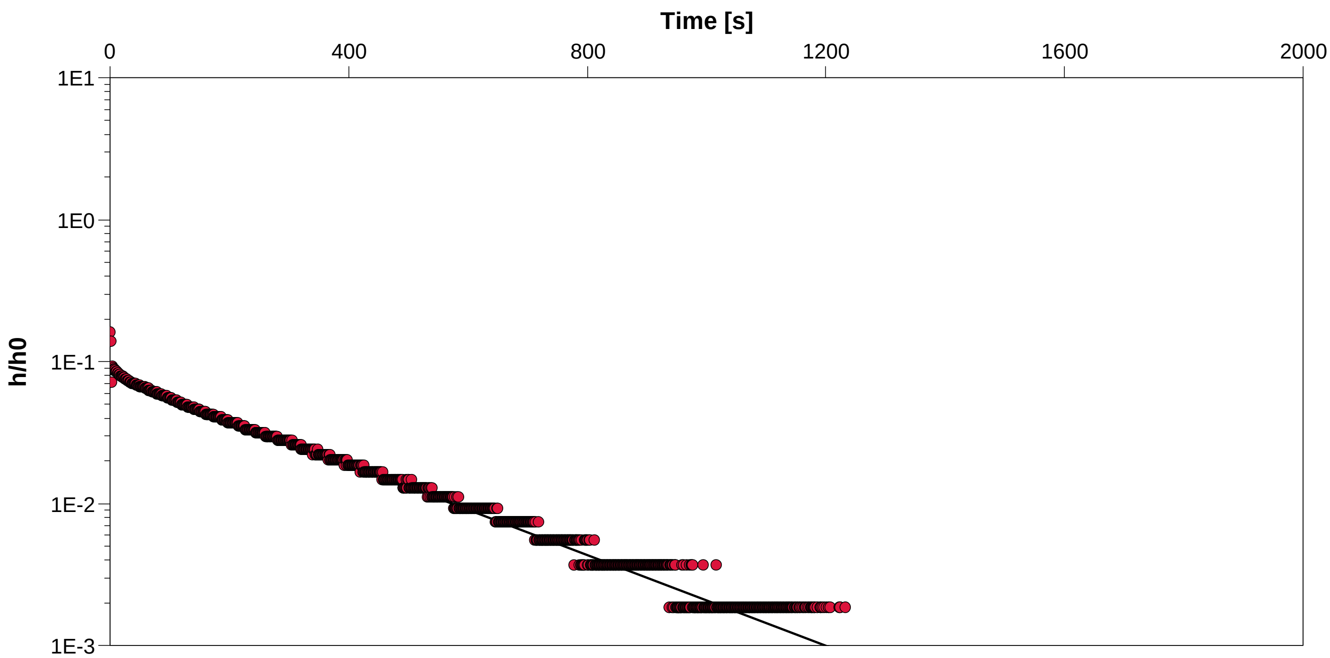



Calculation using Hvorslev

| Observation Well | Hydraulic Conductivity [m/s] | |
|---|---|---|
| MW103-20 | $2.64 \times 10^{-7}$ | |

| Slug Test Analysis Report | |
|---|---|
| | Project: Hydrogeological Assessment |
| | Number: 47477-400 |
| | Client: Tribal Partner |

| | | |
|---|---|---|
| Location: 12035 Dixie Road, Caledon | Slug Test: MW105-20 - Falling Test 1 | Test Well: MW105-20 |
| Test Conducted by: MBC | | Test Date: 11/23/2020 |
| Analysis Performed by: MBC | MW105-20 - Falling Test 1 | Analysis Date: 11/26/2020 |
| Aquifer Thickness: 2.00 m | | |

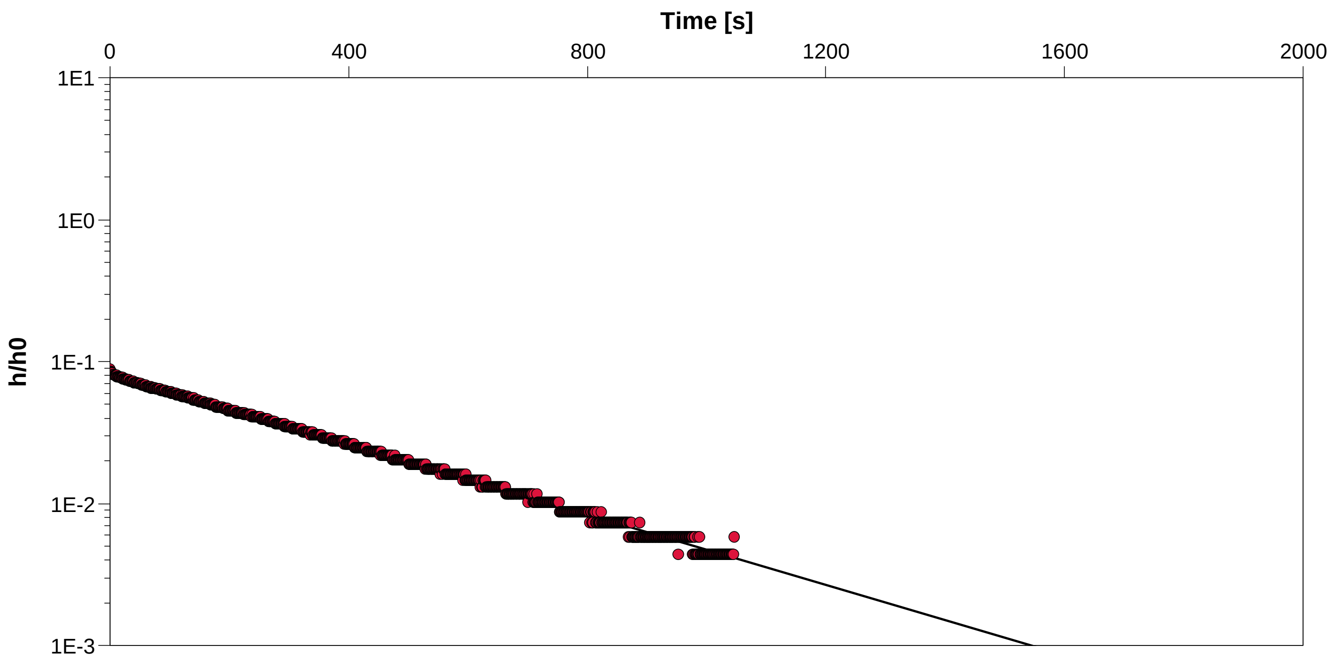



Calculation using Hvorslev

| Observation Well | Hydraulic Conductivity [m/s] | |
|---|---|---|
| MW105-20 | $2.17 \times 10^{-6}$ | |

| | |
|---|---|
| | **Slug Test Analysis Report** |
| | Project: Hydrogeological Assessment |
| | Number: 47477-400 |
| | Client: Tribal Partner |

| Location: 12035 Dixie Road, Caledon | Slug Test: MW105-20 - Rising Test 1 | Test Well: MW105-20 |
|---|---|---|
| Test Conducted by: MBC | | Test Date: 11/23/2020 |
| Analysis Performed by: MBC | MW105-20 - Rising Test 1 | Analysis Date: 11/26/2020 |
| Aquifer Thickness: 2.00 m | | |

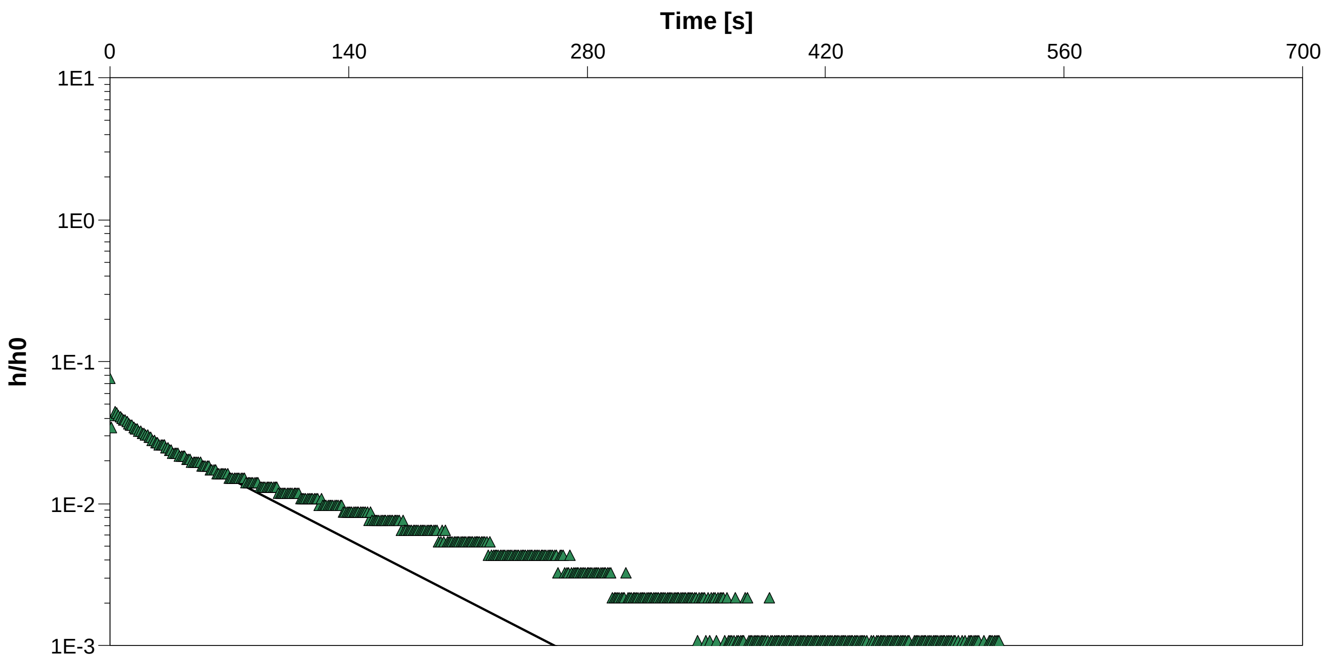



Calculation using Hvorslev

| Observation Well | Hydraulic Conductivity [m/s] | |
|---|---|---|
| MW105-20 | $1.68 \times 10^{-6}$ | |

| | |
|---|---|
| | **Slug Test Analysis Report** |
| | Project: Hydrogeological Assessment |
| | Number: 47477-400 |
| | Client: Tribal Partner |

| | | |
|---|---|---|
| Location: 12035 Dixie Road, Caledon | Slug Test: MW108-20 - Falling Test 1 | Test Well: MW108-20 |
| Test Conducted by: MBC | | Test Date: 11/23/2020 |
| Analysis Performed by: MBC | MW108-20 - Falling Test 1 | Analysis Date: 11/26/2020 |
| Aquifer Thickness: 1.80 m | | |

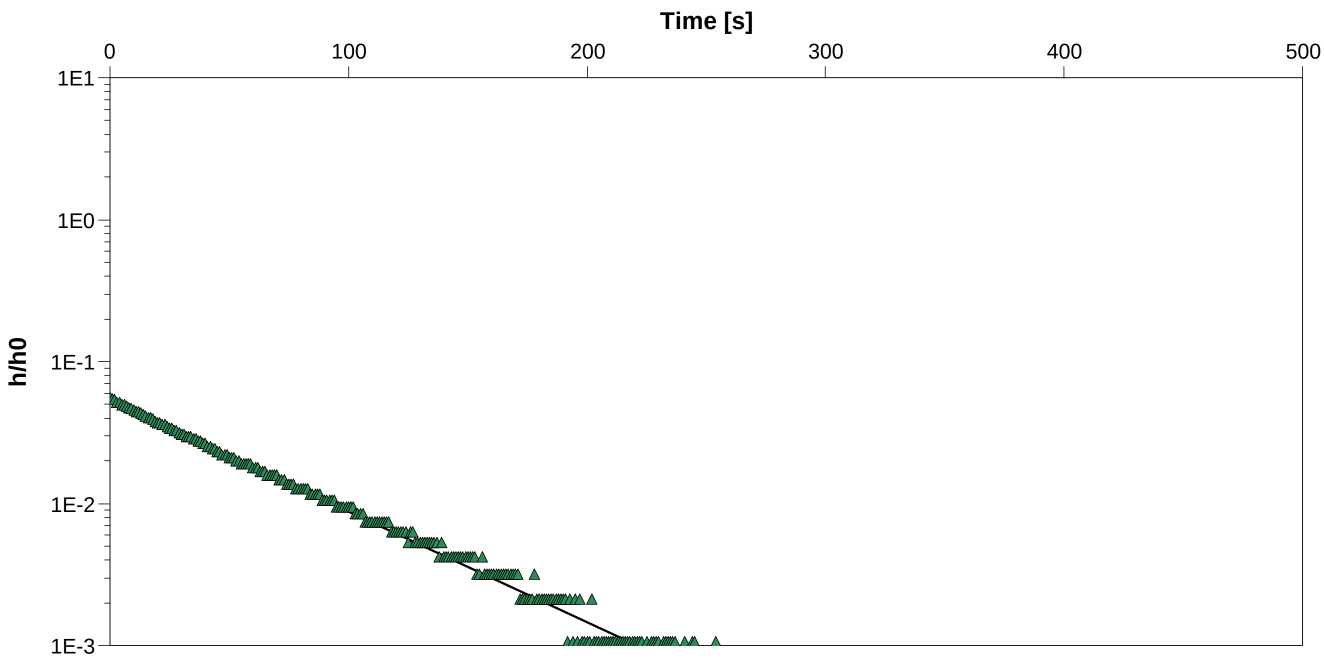



Calculation using Hvorslev

| Observation Well | Hydraulic Conductivity [m/s] | |
|---|---|---|
| MW108-20 | $8.50 \times 10^{-6}$ | |

| | |
|---|---|
| | **Slug Test Analysis Report** |
| | Project: Hydrogeological Assessment |
| | Number: 47477-400 |
| | Client: Tribal Partner |

| | | |
|---|---|---|
| Location: 12035 Dixie Road, Caledon | Slug Test: MW108-20 - Rising Test 1 | Test Well: MW108-20 |
| Test Conducted by: MBC | | Test Date: 11/23/2020 |
| Analysis Performed by: MBC | MW108-20 - Rising Test 1 | Analysis Date: 11/26/2020 |
| Aquifer Thickness: 1.80 m | | |

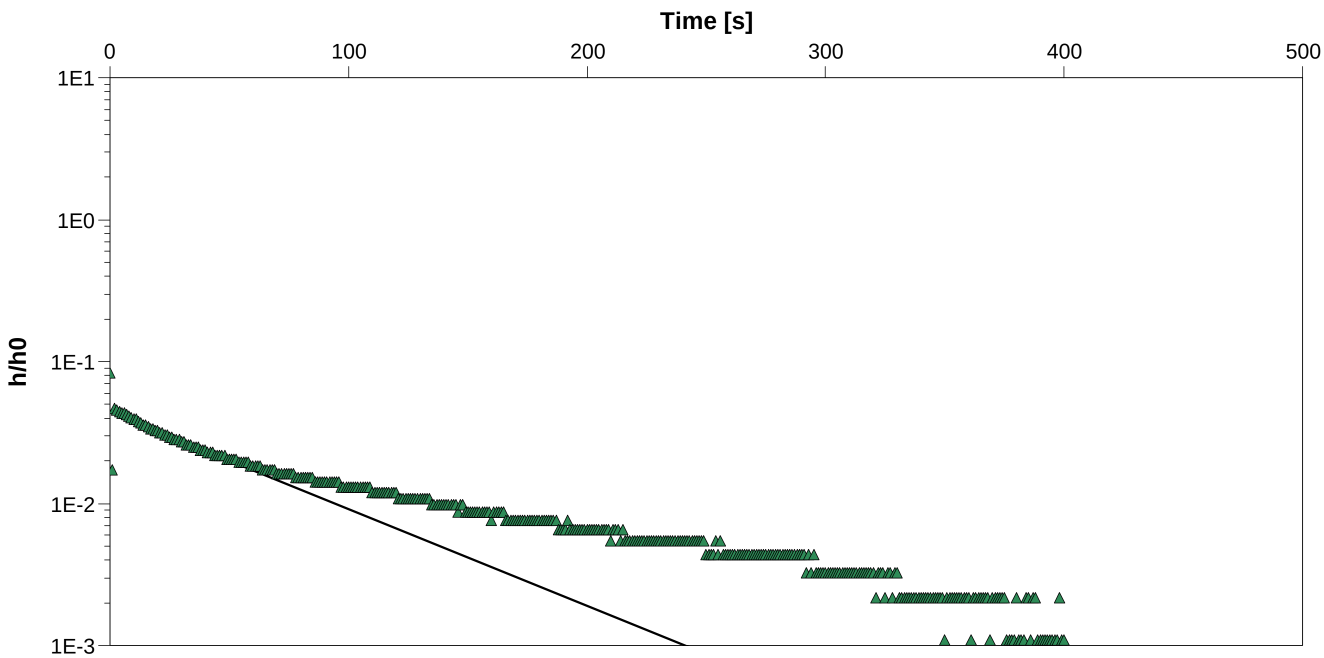



Calculation using Hvorslev

| Observation Well | Hydraulic Conductivity [m/s] | |
|---|---|---|
| MW108-20 | $1.07 \times 10^{-5}$ | |

| | |
|---|---|
| | **Slug Test Analysis Report** |
| | Project: Hydrogeological Assessment |
| | Number: 47477-400 |
| | Client: Tribal Partner |

| Location: 12035 Dixie Road, Caledon | Slug Test: MW108-20 - Falling Test 2 | Test Well: MW108-20 |
|---|---|---|
| Test Conducted by: MBC | | Test Date: 11/23/2020 |
| Analysis Performed by: MBC | MW108-20 - Falling Test 2 | Analysis Date: 11/26/2020 |
| Aquifer Thickness: 1.80 m | | |

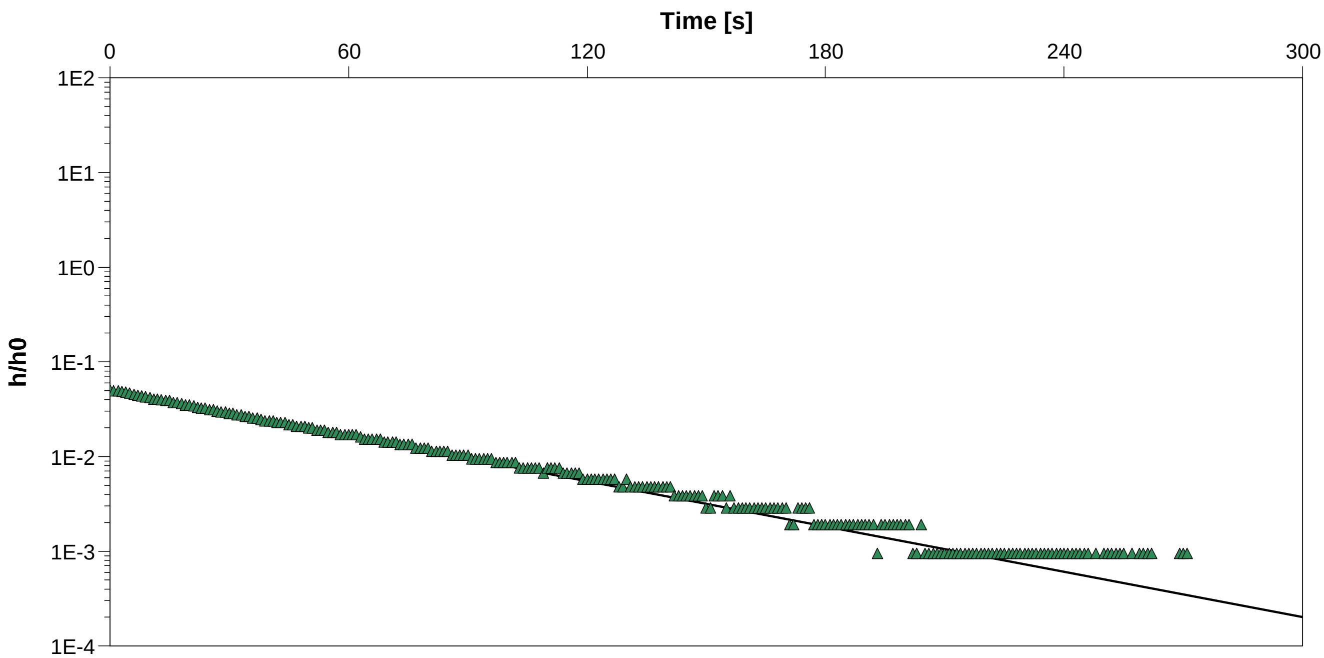



Calculation using Hvorslev

| Observation Well | Hydraulic Conductivity [m/s] | |
|---|---|---|
| MW108-20 | $9.38 \times 10^{-6}$ | |

| | |
|---|---|
| | **Slug Test Analysis Report** |
| | Project: Hydrogeological Assessment |
| | Number: 47477-400 |
| | Client: Tribal Partner |

| | | |
|---|---|---|
| Location: 12035 Dixie Road, Caledon | Slug Test: MW108-20 - Rising Test 2 | Test Well: MW108-20 |
| Test Conducted by: MBC | | Test Date: 11/23/2020 |
| Analysis Performed by: MBC | MW108-20 - Rising Test 2 | Analysis Date: 11/26/2020 |
| Aquifer Thickness: 1.80 m | | |




Calculation using Hvorslev

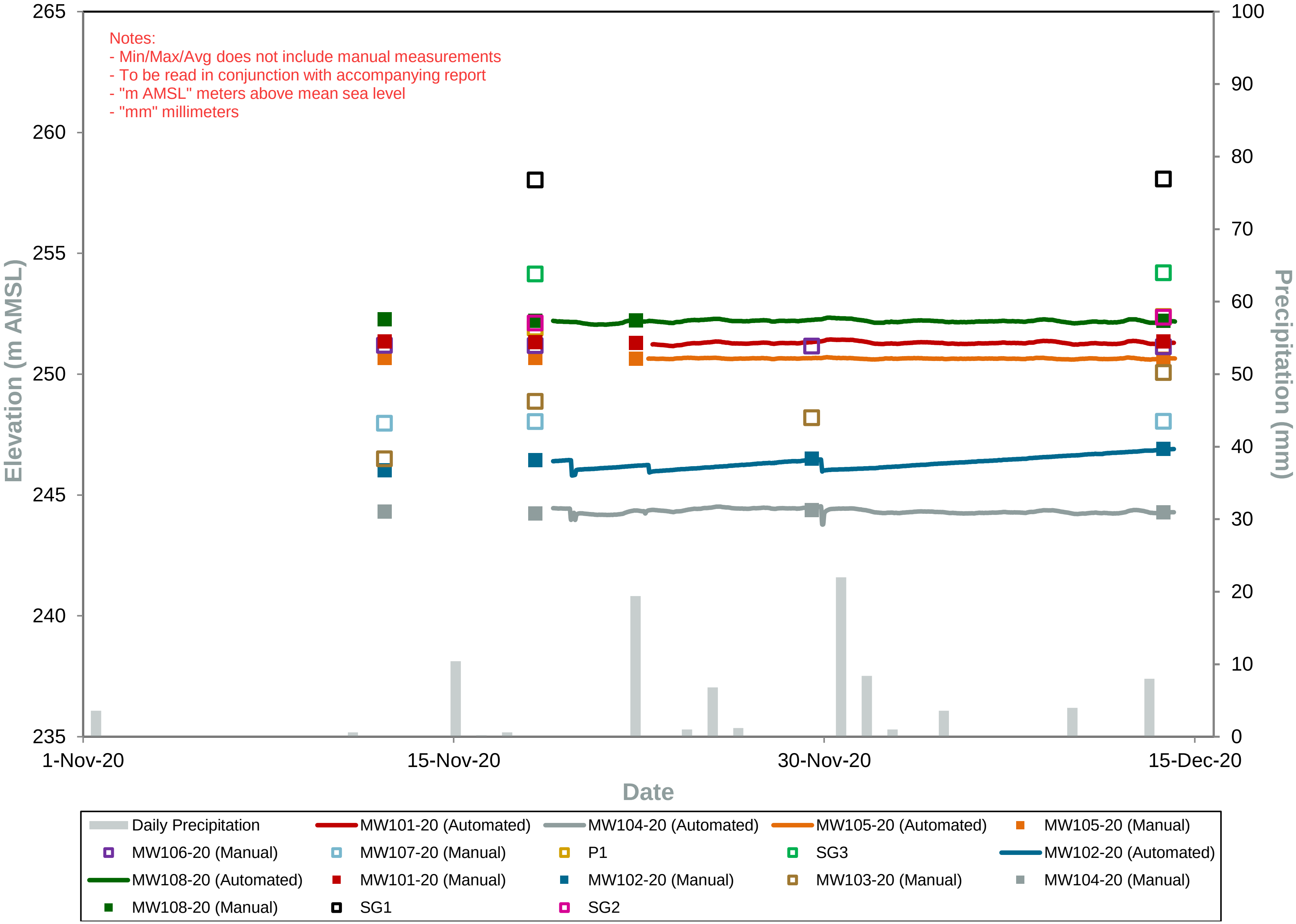
| Observation Well | Hydraulic Conductivity [m/s] | |
|---|---|---|
| MW108-20 | $1.10 \times 10^{-5}$ | |

# Appendix E

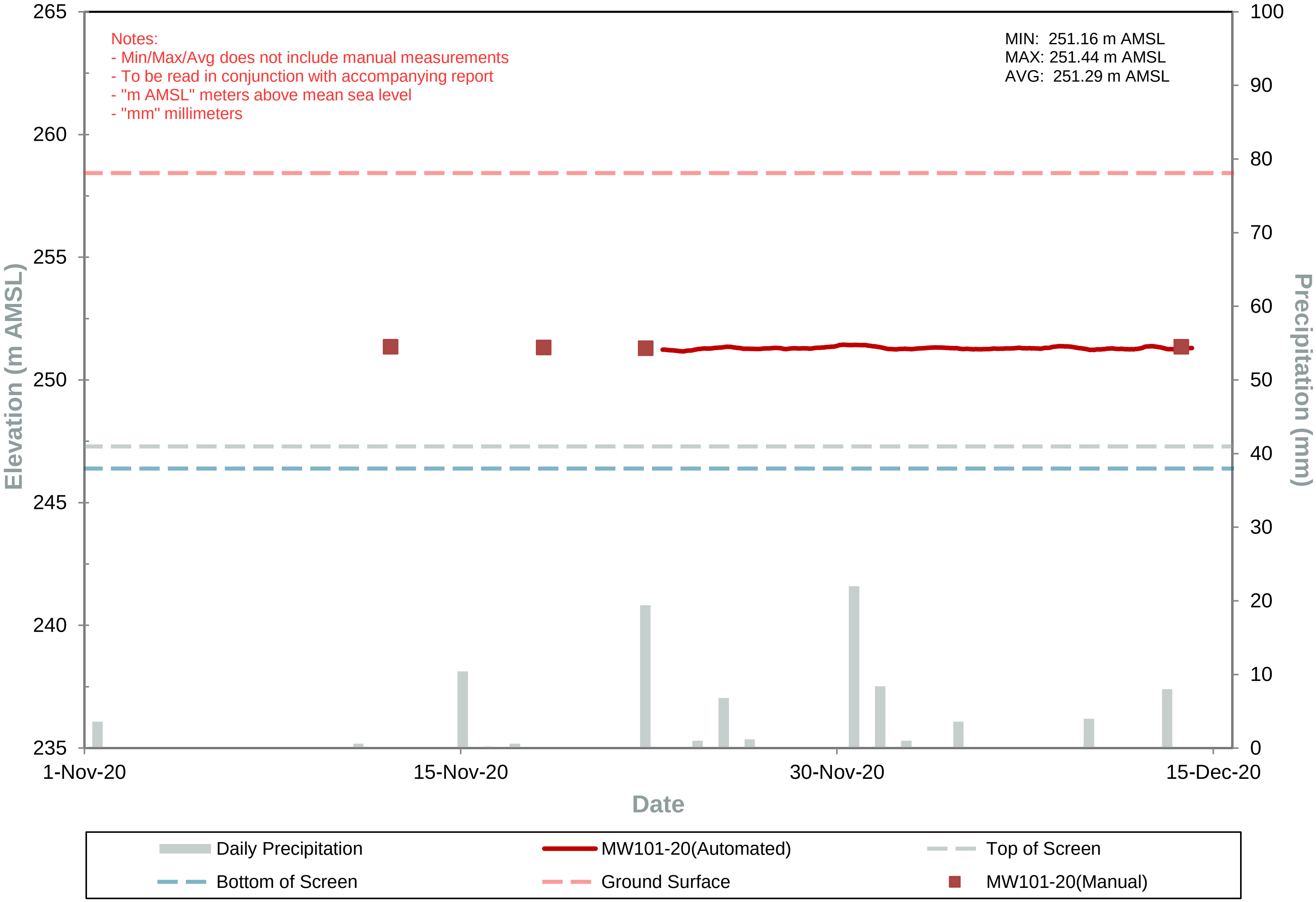
# Hydrographs

MTE

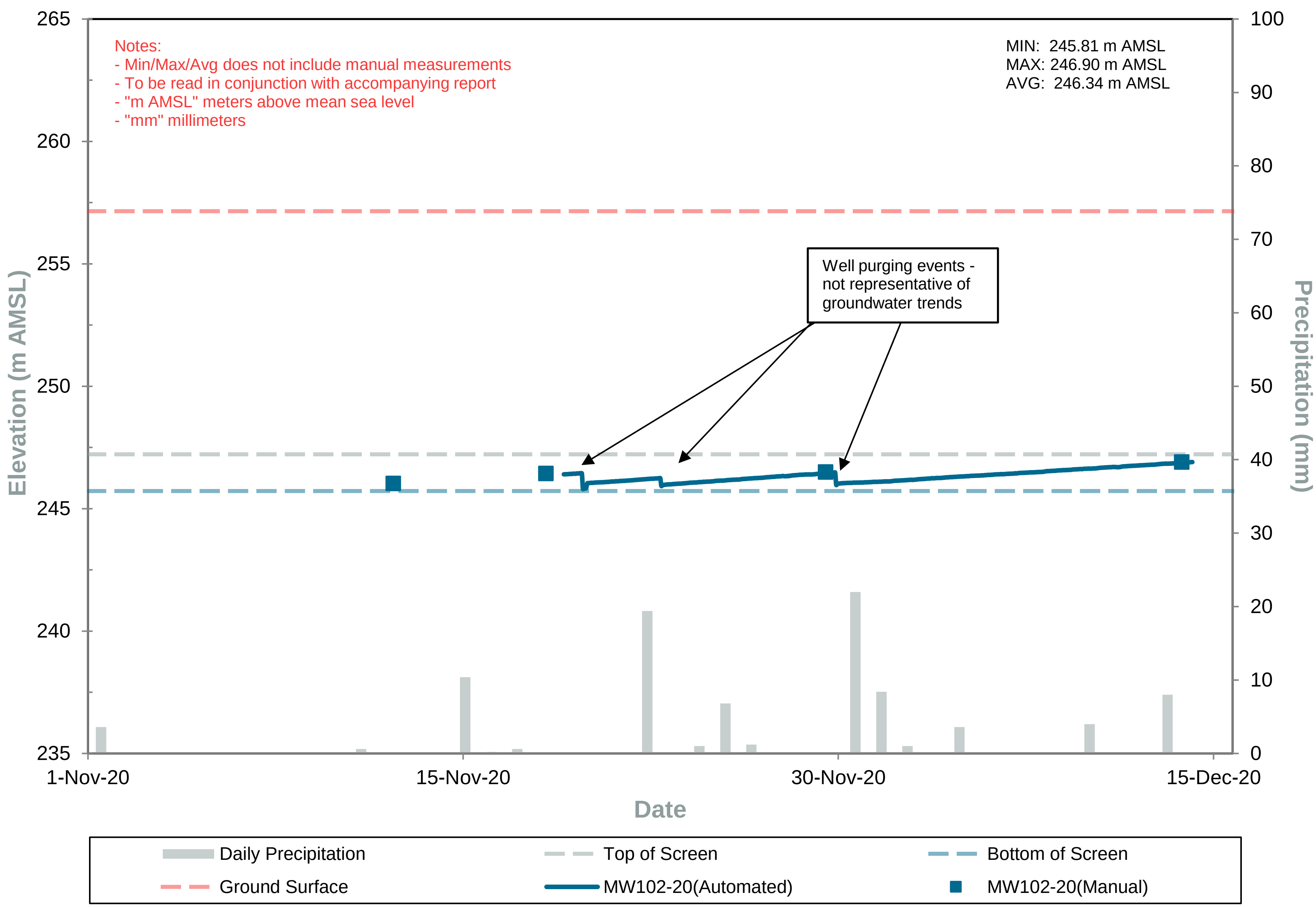
## Hydrograph 1: Groundwater Elevations



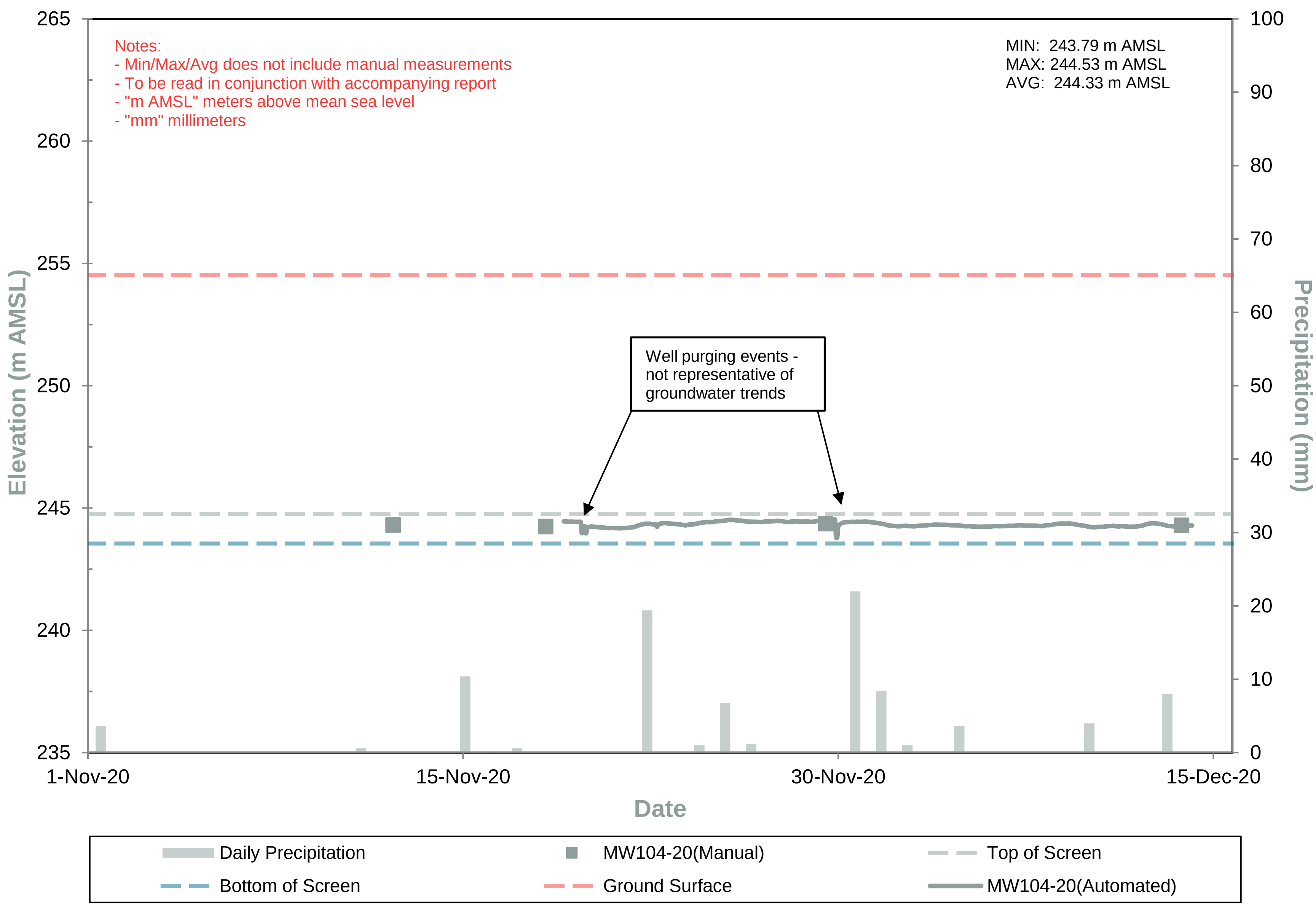
## Hydrograph 2: Groundwater Elevations - MW101-20



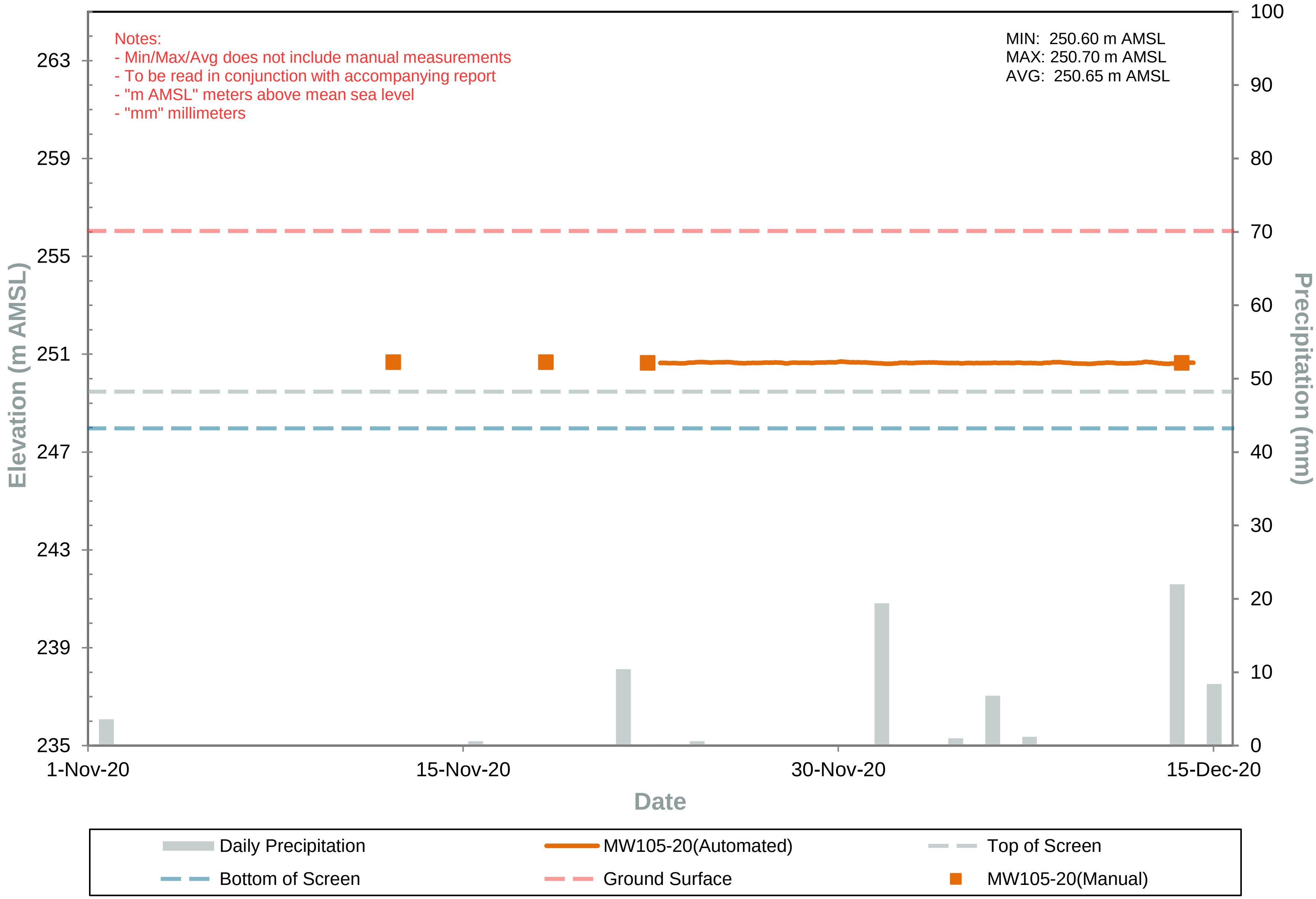
## Hydrograph 3: Groundwater Elevations - MW102-20



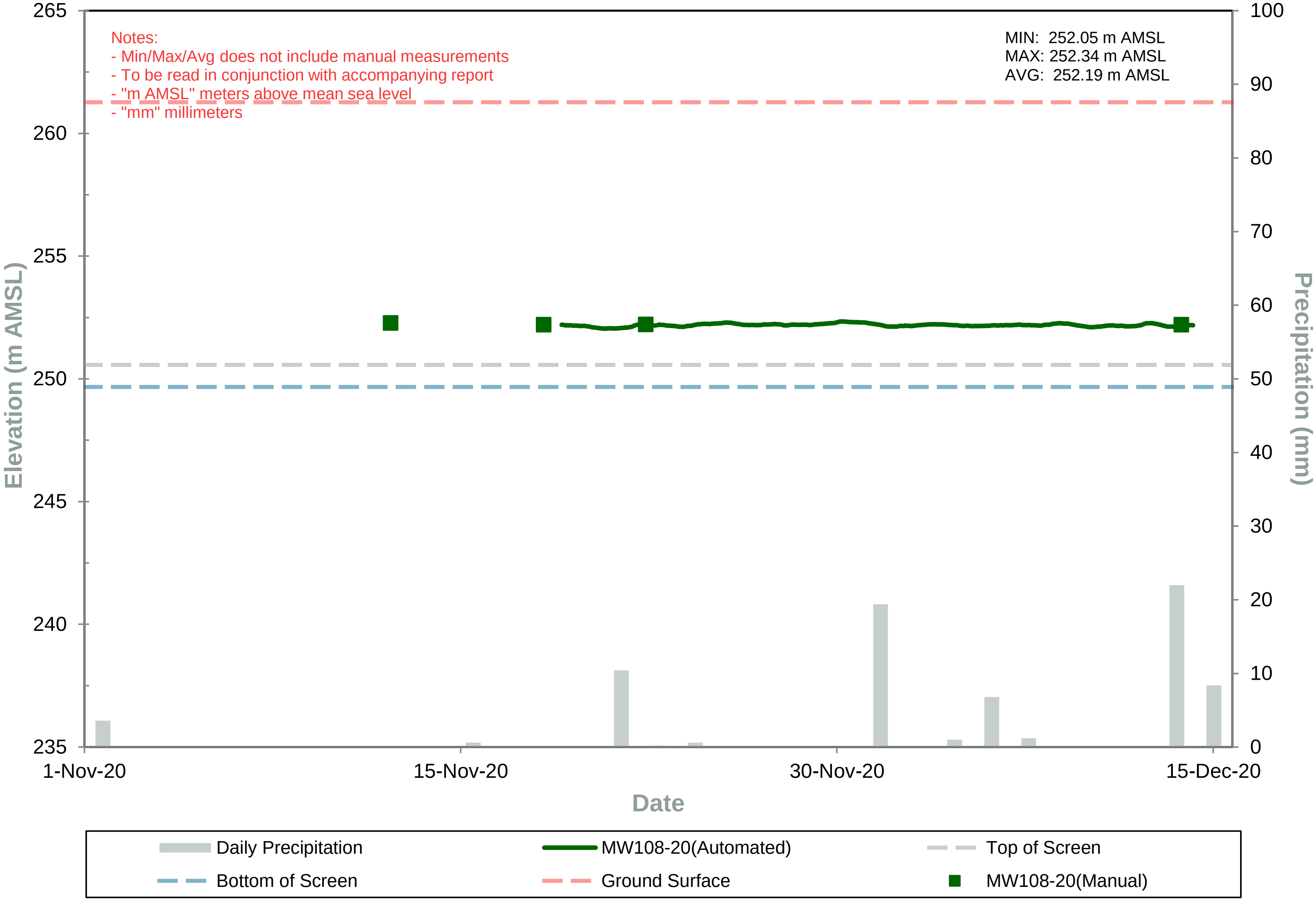
# Hydrograph 4: Groundwater Elevations - MW104-20



## Hydrograph 5: Groundwater Elevations - MW105-20



## Hydrograph 6: Groundwater Elevations - MW108-20



# Appendix F

# Certificate of Analysis

Your Project #: 47477-400
Your C.O.C. #: 802795-01-01

**Attention: John McNeil**

MTE Consultants Inc
520 Bingemans Centre Dr
Kitchener, ON
CANADA N2B 3X9

**Report Date: 2020/12/01**
Report #: R6431491
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**BV LABS JOB #: C0V1545**
**Received: 2020/11/23, 17:34**

Sample Matrix: Water
# Samples Received: 3

| Analyses | Quantity | Date Extracted | Date Analyzed | Laboratory Method | Analytical Method |
|---|---|---|---|---|---|
| Alkalinity | 3 | N/A | 2020/11/26 | CAM SOP-00448 | SM 23 2320 B m |
| Carbonate, Bicarbonate and Hydroxide | 3 | N/A | 2020/11/27 | CAM SOP-00102 | APHA 4500-CO2 D |
| Chloride by Automated Colourimetry | 3 | N/A | 2020/11/27 | CAM SOP-00463 | SM 23 4500-Cl E m |
| Conductivity | 3 | N/A | 2020/11/26 | CAM SOP-00414 | SM 23 2510 m |
| Dissolved Organic Carbon (DOC) (1) | 3 | N/A | 2020/11/26 | CAM SOP-00446 | SM 23 5310 B m |
| Hardness (calculated as CaCO3) | 2 | N/A | 2020/11/27 | CAM SOP 00102/00408/00447 | SM 2340 B |
| Hardness (calculated as CaCO3) | 1 | N/A | 2020/11/30 | CAM SOP 00102/00408/00447 | SM 2340 B |
| Lab Filtered Metals by ICPMS | 1 | 2020/11/25 | 2020/11/26 | CAM SOP-00447 | EPA 6020B m |
| Dissolved Metals by ICPMS | 1 | N/A | 2020/11/25 | CAM SOP-00447 | EPA 6020B m |
| Dissolved Metals by ICPMS | 1 | N/A | 2020/11/30 | CAM SOP-00447 | EPA 6020B m |
| Ion Balance (% Difference) | 2 | N/A | 2020/11/27 | | |
| Ion Balance (% Difference) | 1 | N/A | 2020/11/30 | | |
| Anion and Cation Sum | 2 | N/A | 2020/11/27 | | |
| Anion and Cation Sum | 1 | N/A | 2020/11/30 | | |
| Total Ammonia-N | 3 | N/A | 2020/11/26 | CAM SOP-00441 | USGS I-2522-90 m |
| Nitrate (NO3) and Nitrite (NO2) in Water (2) | 3 | N/A | 2020/11/26 | CAM SOP-00440 | SM 23 4500-NO3I/NO2B |
| pH | 3 | 2020/11/25 | 2020/11/26 | CAM SOP-00413 | SM 4500H+ B m |
| Orthophosphate | 3 | N/A | 2020/11/26 | CAM SOP-00461 | EPA 365.1 m |
| Sat. pH and Langelier Index (@ 20C) | 2 | N/A | 2020/11/27 | | Auto Calc |
| Sat. pH and Langelier Index (@ 20C) | 1 | N/A | 2020/11/30 | | Auto Calc |
| Sat. pH and Langelier Index (@ 4C) | 2 | N/A | 2020/11/27 | | Auto Calc |
| Sat. pH and Langelier Index (@ 4C) | 1 | N/A | 2020/11/30 | | Auto Calc |
| Sulphate by Automated Colourimetry | 3 | N/A | 2020/11/27 | CAM SOP-00464 | EPA 375.4 m |
| Total Dissolved Solids (TDS calc) | 2 | N/A | 2020/11/27 | | Auto Calc |
| Total Dissolved Solids (TDS calc) | 1 | N/A | 2020/11/30 | | Auto Calc |

**Remarks:**

Bureau Veritas Laboratories are accredited to ISO/IEC 17025 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by BV Labs are based upon recognized Provincial, Federal or US method compendia such as CCME, MELCC, EPA, APHA.



Bureau Veritas Laboratories 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvlabs.com

Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

Your Project #: 47477-400
Your C.O.C. #: 802795-01-01


**Attention: John McNeil**

MTE Consultants Inc
520 Bingemans Centre Dr
Kitchener, ON
CANADA N2B 3X9


**Report Date: 2020/12/01**
Report #: R6431491
Version: 1 - Final

# CERTIFICATE OF ANALYSIS

**BV LABS JOB #: C0V1545**
**Received: 2020/11/23, 17:34**

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in BV Labs profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and BV Labs in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported; unless indicated otherwise, associated sample data are not blank corrected. Where applicable, unless otherwise noted, Measurement Uncertainty has not been accounted for when stating conformity to the referenced standard.

BV Labs liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. BV Labs has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by BV Labs, unless otherwise agreed in writing. BV Labs is not responsible for the accuracy or any data impacts, that result from the information provided by the customer or their agent.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested. When sampling is not conducted by BV Labs, results relate to the supplied samples tested.
This Certificate shall not be reproduced except in full, without the written approval of the laboratory.
Reference Method suffix “m” indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.
(1) Dissolved Organic Carbon (DOC) present in the sample should be considered as non-purgeable DOC.
(2) Values for calculated parameters may not appear to add up due to rounding of raw data and significant figures.

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Ronklin Gracian, Project Manager
Email: Ronklin.Gracian@bvlabs.com
Phone# (905)817-5752
====================================================================
BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

## RCAP - COMPREHENSIVE (WATER)

| BV Labs ID | | | OFV696 | | | OFV696 | | | OFV697 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | | 2020/11/20 14:10 | | | 2020/11/20 14:10 | | | 2020/11/20 14:40 | | |
| COC Number | | | 802795-01-01 | | | 802795-01-01 | | | 802795-01-01 | | |
| | **UNITS** | **Criteria** | **MW101-20** | **RDL** | **QC Batch** | **MW101-20 Lab-Dup** | **RDL** | **QC Batch** | **MW105-20** | **RDL** | **QC Batch** |
| **Calculated Parameters** | | | | | | | | | | | |
| Anion Sum | me/L | - | 13.4 | N/A | 7074369 | | | | 23.1 | N/A | 7074369 |
| Bicarb. Alkalinity (calc. as CaCO3) | mg/L | - | 280 | 1.0 | 7073132 | | | | 470 | 1.0 | 7073132 |
| Calculated TDS | mg/L | - | 740 | 1.0 | 7074372 | | | | 1300 | 1.0 | 7074372 |
| Carb. Alkalinity (calc. as CaCO3) | mg/L | - | 1.7 | 1.0 | 7073132 | | | | 2.0 | 1.0 | 7073132 |
| Cation Sum | me/L | - | 13.8 | N/A | 7074369 | | | | 25.5 | N/A | 7074369 |
| Hardness (CaCO3) | mg/L | - | 610 | 1.0 | 7073133 | | | | 900 | 1.0 | 7073133 |
| Ion Balance (% Difference) | % | - | 1.17 | N/A | 7073134 | | | | 4.88 | N/A | 7073134 |
| Langelier Index (@ 20C) | N/A | - | 0.946 | | 7074370 | | | | 1.13 | | 7074370 |
| Langelier Index (@ 4C) | N/A | - | 0.699 | | 7074371 | | | | 0.885 | | 7074371 |
| Saturation pH (@ 20C) | N/A | - | 6.87 | | 7074370 | | | | 6.52 | | 7074370 |
| Saturation pH (@ 4C) | N/A | - | 7.12 | | 7074371 | | | | 6.76 | | 7074371 |
| **Inorganics** | | | | | | | | | | | |
| Total Ammonia-N | mg/L | - | 0.16 | 0.050 | 7077629 | | | | 0.12 | 0.050 | 7077629 |
| Conductivity | umho/cm | - | 1400 | 1.0 | 7076464 | | | | 2200 | 1.0 | 7076464 |
| Dissolved Organic Carbon | mg/L | - | 2.2 | 0.40 | 7075937 | 2.2 | 0.40 | 7075937 | 4.4 | 0.40 | 7075937 |
| Orthophosphate (P) | mg/L | - | <0.010 | 0.010 | 7075392 | | | | <0.010 | 0.010 | 7075392 |
| pH | pH | 6.5:8.5 | 7.82 | | 7076476 | | | | 7.65 | | 7076476 |
| Dissolved Sulphate (SO4) | mg/L | - | 88 | 1.0 | 7075391 | | | | 160 | 1.0 | 7075391 |
| Alkalinity (Total as CaCO3) | mg/L | - | 280 | 1.0 | 7076462 | | | | 470 | 1.0 | 7076462 |
| Dissolved Chloride (Cl-) | ug/L | - | 210000 | 2000 | 7075384 | | | | 360000 | 4000 | 7075384 |
| Nitrite (N) | mg/L | - | <0.010 | 0.010 | 7075565 | | | | 0.101 | 0.010 | 7075565 |
| Nitrate (N) | mg/L | - | <0.10 | 0.10 | 7075565 | | | | 2.02 | 0.10 | 7075565 |
| Nitrate + Nitrite (N) | mg/L | - | <0.10 | 0.10 | 7075565 | | | | 2.12 | 0.10 | 7075565 |
| **Metals** | | | | | | | | | | | |
| Dissolved Aluminum (Al) | ug/L | - | 56 | 4.9 | 7075570 | | | | <4.9 | 4.9 | 7075570 |
| Dissolved Antimony (Sb) | ug/L | 20 | <0.50 | 0.50 | 7075570 | | | | <0.50 | 0.50 | 7075570 |
| Dissolved Arsenic (As) | ug/L | 100 | 2.6 | 1.0 | 7075570 | | | | <1.0 | 1.0 | 7075570 |
| Dissolved Barium (Ba) | ug/L | - | 200 | 2.0 | 7075570 | | | | 150 | 2.0 | 7075570 |

| | |
|---|---|
| No Fill | No Exceedance |
| Grey | Exceeds 1 criteria policy/level |
| Black | Exceeds both criteria/levels |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999
N/A = Not Applicable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Microbiology testing is conducted at 6660 Campobello Rd. Chemistry testing is conducted at 6740 Campobello Rd.

BV Labs Job #: C0V1545
Report Date: 2020/12/01

MTE Consultants Inc
Client Project #: 47477-400
Sampler Initials: MC

## RCAP - COMPREHENSIVE (WATER)

| BV Labs ID | | | OFV696 | | | OFV696 | | | OFV697 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Sampling Date | | | 2020/11/20 14:10 | | | 2020/11/20 14:10 | | | 2020/11/20 14:40 | | |
| COC Number | | | 802795-01-01 | | | 802795-01-01 | | | 802795-01-01 | | |
| | **UNITS** | **Criteria** | **MW101-20** | **RDL** | **QC Batch** | **MW101-20 Lab-Dup** | **RDL** | **QC Batch** | **MW105-20** | **RDL** | **QC Batch** |
| Dissolved Beryllium (Be) | ug/L | 11 | <0.40 | 0.40 | 7075570 | | | | <0.40 | 0.40 | 7075570 |
| Dissolved Boron (B) | ug/L | 200 | 25 | 10 | 7075570 | | | | 160 | 10 | 7075570 |
| Dissolved Cadmium (Cd) | ug/L | 0.2 | <0.090 | 0.090 | 7075570 | | | | <0.090 | 0.090 | 7075570 |
| Dissolved Calcium (Ca) | ug/L | - | 160000 | 200 | 7075570 | | | | 250000 | 200 | 7075570 |
| Dissolved Chromium (Cr) | ug/L | - | <5.0 | 5.0 | 7075570 | | | | <5.0 | 5.0 | 7075570 |
| Dissolved Cobalt (Co) | ug/L | 0.9 | 0.63 | 0.50 | 7075570 | | | | **2.1** | 0.50 | 7075570 |
| Dissolved Copper (Cu) | ug/L | 5 | <0.90 | 0.90 | 7075570 | | | | 2.2 | 0.90 | 7075570 |
| Dissolved Iron (Fe) | ug/L | 300 | **1700** | 100 | 7075570 | | | | <100 | 100 | 7075570 |
| Dissolved Lead (Pb) | ug/L | 5 | <0.50 | 0.50 | 7075570 | | | | <0.50 | 0.50 | 7075570 |
| Dissolved Magnesium (Mg) | ug/L | - | 52000 | 50 | 7075570 | | | | 67000 | 50 | 7075570 |
| Dissolved Manganese (Mn) | ug/L | - | 110 | 2.0 | 7075570 | | | | 1600 | 2.0 | 7075570 |
| Dissolved Molybdenum (Mo) | ug/L | 40 | 2.6 | 0.50 | 7075570 | | | | 3.1 | 0.50 | 7075570 |
| Dissolved Nickel (Ni) | ug/L | 25 | 1.6 | 1.0 | 7075570 | | | | 4.6 | 1.0 | 7075570 |
| Dissolved Phosphorus (P) | ug/L | - | <100 | 100 | 7075570 | | | | <100 | 100 | 7075570 |
| Dissolved Potassium (K) | ug/L | - | 3900 | 200 | 7075570 | | | | 5600 | 200 | 7075570 |
| Dissolved Selenium (Se) | ug/L | 100 | <2.0 | 2.0 | 7075570 | | | | <2.0 | 2.0 | 7075570 |
| Dissolved Silicon (Si) | ug/L | - | 9800 | 50 | 7075570 | | | | 7900 | 50 | 7075570 |
| Dissolved Silver (Ag) | ug/L | 0.1 | <0.090 | 0.090 | 7075570 | | | | <0.090 | 0.090 | 7075570 |
| Dissolved Sodium (Na) | ug/L | - | 34000 | 100 | 7075570 | | | | 170000 | 100 | 7075570 |
| Dissolved Strontium (Sr) | ug/L | - | 380 | 1.0 | 7075570 | | | | 590 | 1.0 | 7075570 |
| Dissolved Thallium (Tl) | ug/L | 0.3 | <0.050 | 0.050 | 7075570 | | | | 0.055 | 0.050 | 7075570 |
| Dissolved Titanium (Ti) | ug/L | - | <5.0 | 5.0 | 7075570 | | | | <5.0 | 5.0 | 7075570 |
| Dissolved Uranium (U) | ug/L | 5 | 0.44 | 0.10 | 7075570 | | | | **5.3** | 0.10 | 7075570 |
| Dissolved Vanadium (V) | ug/L | 6 | <0.50 | 0.50 | 7075570 | | | | <0.50 | 0.50 | 7075570 |
| Dissolved Zinc (Zn) | ug/L | 30 | <5.0 | 5.0 | 7075570 | | | | <5.0 | 5.0 | 7075570 |

| | |
|---|---|
| No Fill | No Exceedance |
| Grey | Exceeds 1 criteria policy/level |
| Black | Exceeds both criteria/levels |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999

## RCAP - COMPREHENSIVE (LAB FILTERED)

| BV Labs ID | | | OFV695 | | | OFV695 | | |
|---|---|---|---|---|---|---|---|---|
| Sampling Date | | | 2020/11/20 11:00 | | | 2020/11/20 11:00 | | |
| COC Number | | | 802795-01-01 | | | 802795-01-01 | | |
| | **UNITS** | **Criteria** | **SG2** | **RDL** | **QC Batch** | **SG2 Lab-Dup** | **RDL** | **QC Batch** |
| **Calculated Parameters** | | | | | | | | |
| Anion Sum | me/L | - | 8.83 | N/A | 7074369 | | | |
| Bicarb. Alkalinity (calc. as CaCO3) | mg/L | - | 270 | 1.0 | 7073132 | | | |
| Calculated TDS | mg/L | - | 480 | 1.0 | 7074372 | | | |
| Carb. Alkalinity (calc. as CaCO3) | mg/L | - | 3.6 | 1.0 | 7073132 | | | |
| Cation Sum | me/L | - | 9.08 | N/A | 7074369 | | | |
| Hardness (CaCO3) | mg/L | - | 370 | 1.0 | 7073133 | | | |
| Ion Balance (% Difference) | % | - | 1.38 | N/A | 7073134 | | | |
| Langelier Index (@ 20C) | N/A | - | 1.17 | | 7074370 | | | |
| Langelier Index (@ 4C) | N/A | - | 0.921 | | 7074371 | | | |
| Saturation pH (@ 20C) | N/A | - | 6.98 | | 7074370 | | | |
| Saturation pH (@ 4C) | N/A | - | 7.23 | | 7074371 | | | |
| **Inorganics** | | | | | | | | |
| Total Ammonia-N | mg/L | - | 0.068 | 0.050 | 7077629 | <0.050 | 0.050 | 7077629 |
| Conductivity | umho/cm | - | 840 | 1.0 | 7076464 | 850 | 1.0 | 7076464 |
| Dissolved Organic Carbon | mg/L | - | 5.4 | 0.40 | 7075937 | | | |
| Orthophosphate (P) | mg/L | - | 0.035 | 0.010 | 7075392 | | | |
| pH | pH | 6.5:8.5 | 8.15 | | 7076476 | 8.22 | | 7076476 |
| Dissolved Sulphate (SO4) | mg/L | - | 42 | 1.0 | 7075391 | | | |
| Alkalinity (Total as CaCO3) | mg/L | - | 280 | 1.0 | 7076462 | 280 | 1.0 | 7076462 |
| Dissolved Chloride (Cl-) | ug/L | - | 85000 | 1000 | 7075384 | | | |
| Nitrite (N) | mg/L | - | <0.010 | 0.010 | 7075565 | | | |
| Nitrate (N) | mg/L | - | 0.29 | 0.10 | 7075565 | | | |
| Nitrate + Nitrite (N) | mg/L | - | 0.29 | 0.10 | 7075565 | | | |
| **Metals** | | | | | | | | |
| Dissolved Aluminum (Al) | ug/L | - | <4.9 | 4.9 | 7076206 | | | |
| Dissolved Antimony (Sb) | ug/L | 20 | <0.50 | 0.50 | 7076206 | | | |
| Dissolved Arsenic (As) | ug/L | 100 | <1.0 | 1.0 | 7076206 | | | |
| Dissolved Barium (Ba) | ug/L | - | 54 | 2.0 | 7076206 | | | |

| | |
|---|---|
| No Fill | No Exceedance |
| Grey | Exceeds 1 criteria policy/level |
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RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999
N/A = Not Applicable

BV Labs Job #: C0V1545
Report Date: 2020/12/01

MTE Consultants Inc
Client Project #: 47477-400
Sampler Initials: MC

## RCAP - COMPREHENSIVE (LAB FILTERED)

| BV Labs ID | | | OFV695 | | | OFV695 | | |
|---|---|---|---|---|---|---|---|---|
| Sampling Date | | | 2020/11/20 11:00 | | | 2020/11/20 11:00 | | |
| COC Number | | | 802795-01-01 | | | 802795-01-01 | | |
| | **UNITS** | **Criteria** | **SG2** | **RDL** | **QC Batch** | **SG2 Lab-Dup** | **RDL** | **QC Batch** |
| Dissolved Beryllium (Be) | ug/L | 11 | <0.40 | 0.40 | 7076206 | | | |
| Dissolved Boron (B) | ug/L | 200 | 22 | 10 | 7076206 | | | |
| Dissolved Cadmium (Cd) | ug/L | 0.2 | <0.090 | 0.090 | 7076206 | | | |
| Dissolved Calcium (Ca) | ug/L | - | 110000 | 200 | 7076206 | | | |
| Dissolved Chromium (Cr) | ug/L | - | <5.0 | 5.0 | 7076206 | | | |
| Dissolved Cobalt (Co) | ug/L | 0.9 | <0.50 | 0.50 | 7076206 | | | |
| Dissolved Copper (Cu) | ug/L | 5 | <0.90 | 0.90 | 7076206 | | | |
| Dissolved Iron (Fe) | ug/L | 300 | <100 | 100 | 7076206 | | | |
| Dissolved Lead (Pb) | ug/L | 5 | <0.50 | 0.50 | 7076206 | | | |
| Dissolved Magnesium (Mg) | ug/L | - | 22000 | 50 | 7076206 | | | |
| Dissolved Manganese (Mn) | ug/L | - | 14 | 2.0 | 7076206 | | | |
| Dissolved Molybdenum (Mo) | ug/L | 40 | <0.50 | 0.50 | 7076206 | | | |
| Dissolved Nickel (Ni) | ug/L | 25 | <1.0 | 1.0 | 7076206 | | | |
| Dissolved Phosphorus (P) | ug/L | - | <100 | 100 | 7076206 | | | |
| Dissolved Potassium (K) | ug/L | - | 3500 | 200 | 7076206 | | | |
| Dissolved Selenium (Se) | ug/L | 100 | <2.0 | 2.0 | 7076206 | | | |
| Dissolved Silicon (Si) | ug/L | - | 5100 | 50 | 7076206 | | | |
| Dissolved Silver (Ag) | ug/L | 0.1 | <0.090 | 0.090 | 7076206 | | | |
| Dissolved Sodium (Na) | ug/L | - | 39000 | 100 | 7076206 | | | |
| Dissolved Strontium (Sr) | ug/L | - | 270 | 1.0 | 7076206 | | | |
| Dissolved Thallium (Tl) | ug/L | 0.3 | <0.050 | 0.050 | 7076206 | | | |
| Dissolved Titanium (Ti) | ug/L | - | <5.0 | 5.0 | 7076206 | | | |
| Dissolved Uranium (U) | ug/L | 5 | 0.70 | 0.10 | 7076206 | | | |
| Dissolved Vanadium (V) | ug/L | 6 | <0.50 | 0.50 | 7076206 | | | |
| Dissolved Zinc (Zn) | ug/L | 30 | <5.0 | 5.0 | 7076206 | | | |

| | |
|---|---|
| No Fill | No Exceedance |
| Grey | Exceeds 1 criteria policy/level |
| Black | Exceeds both criteria/levels |

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: Ontario Provincial Water Quality Objectives
Ref. to MOEE Water Management document dated Feb.1999

## TEST SUMMARY

**BV Labs ID:** OFV695
**Sample ID:** SG2
**Matrix:** Water

**Collected:** 2020/11/20
**Shipped:**
**Received:** 2020/11/23

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Alkalinity | AT | 7076462 | N/A | 2020/11/26 | Surinder Rai |
| Carbonate, Bicarbonate and Hydroxide | CALC | 7073132 | N/A | 2020/11/27 | Automated Statchk |
| Chloride by Automated Colourimetry | KONE | 7075384 | N/A | 2020/11/27 | Deonarine Ramnarine |
| Conductivity | AT | 7076464 | N/A | 2020/11/26 | Surinder Rai |
| Dissolved Organic Carbon (DOC) | TOCV/NDIR | 7075937 | N/A | 2020/11/26 | Nimarta Singh |
| Hardness (calculated as CaCO3) | | 7073133 | N/A | 2020/11/27 | Automated Statchk |
| Lab Filtered Metals by ICPMS | ICP/MS | 7076206 | 2020/11/25 | 2020/11/26 | Arefa Dabhad |
| Ion Balance (% Difference) | CALC | 7073134 | N/A | 2020/11/27 | Automated Statchk |
| Anion and Cation Sum | CALC | 7074369 | N/A | 2020/11/27 | Automated Statchk |
| Total Ammonia-N | LACH/NH4 | 7077629 | N/A | 2020/11/26 | Amanpreet Sappal |
| Nitrate (NO3) and Nitrite (NO2) in Water | LACH | 7075565 | N/A | 2020/11/26 | Chandra Nandlal |
| pH | AT | 7076476 | 2020/11/25 | 2020/11/26 | Surinder Rai |
| Orthophosphate | KONE | 7075392 | N/A | 2020/11/26 | Alina Dobreanu |
| Sat. pH and Langelier Index (@ 20C) | CALC | 7074370 | N/A | 2020/11/27 | Automated Statchk |
| Sat. pH and Langelier Index (@ 4C) | CALC | 7074371 | N/A | 2020/11/27 | Automated Statchk |
| Sulphate by Automated Colourimetry | KONE | 7075391 | N/A | 2020/11/27 | Deonarine Ramnarine |
| Total Dissolved Solids (TDS calc) | CALC | 7074372 | N/A | 2020/11/27 | Automated Statchk |

**BV Labs ID:** OFV695 Dup
**Sample ID:** SG2
**Matrix:** Water

**Collected:** 2020/11/20
**Shipped:**
**Received:** 2020/11/23

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Alkalinity | AT | 7076462 | N/A | 2020/11/26 | Surinder Rai |
| Conductivity | AT | 7076464 | N/A | 2020/11/26 | Surinder Rai |
| Total Ammonia-N | LACH/NH4 | 7077629 | N/A | 2020/11/26 | Amanpreet Sappal |
| pH | AT | 7076476 | 2020/11/25 | 2020/11/26 | Surinder Rai |

**BV Labs ID:** OFV696
**Sample ID:** MW101-20
**Matrix:** Water

**Collected:** 2020/11/20
**Shipped:**
**Received:** 2020/11/23

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Alkalinity | AT | 7076462 | N/A | 2020/11/26 | Surinder Rai |
| Carbonate, Bicarbonate and Hydroxide | CALC | 7073132 | N/A | 2020/11/27 | Automated Statchk |
| Chloride by Automated Colourimetry | KONE | 7075384 | N/A | 2020/11/27 | Deonarine Ramnarine |
| Conductivity | AT | 7076464 | N/A | 2020/11/26 | Surinder Rai |
| Dissolved Organic Carbon (DOC) | TOCV/NDIR | 7075937 | N/A | 2020/11/26 | Nimarta Singh |
| Hardness (calculated as CaCO3) | | 7073133 | N/A | 2020/11/30 | Automated Statchk |
| Dissolved Metals by ICPMS | ICP/MS | 7075570 | N/A | 2020/11/30 | Azita Fazaeli |
| Ion Balance (% Difference) | CALC | 7073134 | N/A | 2020/11/30 | Automated Statchk |
| Anion and Cation Sum | CALC | 7074369 | N/A | 2020/11/30 | Automated Statchk |
| Total Ammonia-N | LACH/NH4 | 7077629 | N/A | 2020/11/26 | Amanpreet Sappal |
| Nitrate (NO3) and Nitrite (NO2) in Water | LACH | 7075565 | N/A | 2020/11/26 | Chandra Nandlal |
| pH | AT | 7076476 | 2020/11/25 | 2020/11/26 | Surinder Rai |



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BV Labs Job #: C0V1545
Report Date: 2020/12/01

MTE Consultants Inc
Client Project #: 47477-400
Sampler Initials: MC

## TEST SUMMARY

**BV Labs ID:** OFV696
**Sample ID:** MW101-20
**Matrix:** Water

**Collected:** 2020/11/20
**Shipped:**
**Received:** 2020/11/23

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Orthophosphate | KONE | 7075392 | N/A | 2020/11/26 | Alina Dobreanu |
| Sat. pH and Langelier Index (@ 20C) | CALC | 7074370 | N/A | 2020/11/30 | Automated Statchk |
| Sat. pH and Langelier Index (@ 4C) | CALC | 7074371 | N/A | 2020/11/30 | Automated Statchk |
| Sulphate by Automated Colourimetry | KONE | 7075391 | N/A | 2020/11/27 | Deonarine Ramnarine |
| Total Dissolved Solids (TDS calc) | CALC | 7074372 | N/A | 2020/11/30 | Automated Statchk |

**BV Labs ID:** OFV696 Dup
**Sample ID:** MW101-20
**Matrix:** Water

**Collected:** 2020/11/20
**Shipped:**
**Received:** 2020/11/23

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Dissolved Organic Carbon (DOC) | TOCV/NDIR | 7075937 | N/A | 2020/11/26 | Nimarta Singh |

**BV Labs ID:** OFV697
**Sample ID:** MW105-20
**Matrix:** Water

**Collected:** 2020/11/20
**Shipped:**
**Received:** 2020/11/23

| Test Description | Instrumentation | Batch | Extracted | Date Analyzed | Analyst |
|---|---|---|---|---|---|
| Alkalinity | AT | 7076462 | N/A | 2020/11/26 | Surinder Rai |
| Carbonate, Bicarbonate and Hydroxide | CALC | 7073132 | N/A | 2020/11/27 | Automated Statchk |
| Chloride by Automated Colourimetry | KONE | 7075384 | N/A | 2020/11/27 | Deonarine Ramnarine |
| Conductivity | AT | 7076464 | N/A | 2020/11/26 | Surinder Rai |
| Dissolved Organic Carbon (DOC) | TOCV/NDIR | 7075937 | N/A | 2020/11/26 | Nimarta Singh |
| Hardness (calculated as CaCO3) | | 7073133 | N/A | 2020/11/27 | Automated Statchk |
| Dissolved Metals by ICPMS | ICP/MS | 7075570 | N/A | 2020/11/25 | Azita Fazaeli |
| Ion Balance (% Difference) | CALC | 7073134 | N/A | 2020/11/27 | Automated Statchk |
| Anion and Cation Sum | CALC | 7074369 | N/A | 2020/11/27 | Automated Statchk |
| Total Ammonia-N | LACH/NH4 | 7077629 | N/A | 2020/11/26 | Amanpreet Sappal |
| Nitrate (NO3) and Nitrite (NO2) in Water | LACH | 7075565 | N/A | 2020/11/26 | Chandra Nandlal |
| pH | AT | 7076476 | 2020/11/25 | 2020/11/26 | Surinder Rai |
| Orthophosphate | KONE | 7075392 | N/A | 2020/11/26 | Alina Dobreanu |
| Sat. pH and Langelier Index (@ 20C) | CALC | 7074370 | N/A | 2020/11/27 | Automated Statchk |
| Sat. pH and Langelier Index (@ 4C) | CALC | 7074371 | N/A | 2020/11/27 | Automated Statchk |
| Sulphate by Automated Colourimetry | KONE | 7075391 | N/A | 2020/11/27 | Deonarine Ramnarine |
| Total Dissolved Solids (TDS calc) | CALC | 7074372 | N/A | 2020/11/27 | Automated Statchk |



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## GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

| | |
|---|---|
| Package 1 | 2.3°C |

**Results relate only to the items tested.**



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# QUALITY ASSURANCE REPORT



| | | | Matrix Spike | | SPIKED BLANK | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| 7075384 | Dissolved Chloride (Cl-) | 2020/11/27 | NC | 80 - 120 | 101 | 80 - 120 | <1000 | ug/L | 1.3 | 20 |
| 7075391 | Dissolved Sulphate (SO4) | 2020/11/27 | NC | 75 - 125 | 104 | 80 - 120 | <1.0 | mg/L | 1.2 | 20 |
| 7075392 | Orthophosphate (P) | 2020/11/26 | 102 | 75 - 125 | 100 | 80 - 120 | <0.010 | mg/L | NC | 25 |
| 7075565 | Nitrate (N) | 2020/11/26 | 96 | 80 - 120 | 97 | 80 - 120 | <0.10 | mg/L | 0.085 | 20 |
| 7075565 | Nitrite (N) | 2020/11/26 | 105 | 80 - 120 | 105 | 80 - 120 | <0.010 | mg/L | NC | 20 |
| 7075570 | Dissolved Aluminum (Al) | 2020/11/25 | 102 | 80 - 120 | 103 | 80 - 120 | <4.9 | ug/L | | |
| 7075570 | Dissolved Antimony (Sb) | 2020/11/25 | 104 | 80 - 120 | 101 | 80 - 120 | <0.50 | ug/L | NC | 20 |
| 7075570 | Dissolved Arsenic (As) | 2020/11/25 | 98 | 80 - 120 | 98 | 80 - 120 | <1.0 | ug/L | 0.93 | 20 |
| 7075570 | Dissolved Barium (Ba) | 2020/11/25 | 99 | 80 - 120 | 96 | 80 - 120 | <2.0 | ug/L | 4.3 | 20 |
| 7075570 | Dissolved Beryllium (Be) | 2020/11/25 | 96 | 80 - 120 | 99 | 80 - 120 | <0.40 | ug/L | NC | 20 |
| 7075570 | Dissolved Boron (B) | 2020/11/25 | 102 | 80 - 120 | 99 | 80 - 120 | <10 | ug/L | 2.7 | 20 |
| 7075570 | Dissolved Cadmium (Cd) | 2020/11/25 | 98 | 80 - 120 | 100 | 80 - 120 | <0.090 | ug/L | NC | 20 |
| 7075570 | Dissolved Calcium (Ca) | 2020/11/25 | NC | 80 - 120 | 100 | 80 - 120 | <200 | ug/L | | |
| 7075570 | Dissolved Chromium (Cr) | 2020/11/25 | 95 | 80 - 120 | 99 | 80 - 120 | <5.0 | ug/L | NC | 20 |
| 7075570 | Dissolved Cobalt (Co) | 2020/11/25 | 93 | 80 - 120 | 99 | 80 - 120 | <0.50 | ug/L | NC | 20 |
| 7075570 | Dissolved Copper (Cu) | 2020/11/25 | 96 | 80 - 120 | 99 | 80 - 120 | <0.90 | ug/L | 5.5 | 20 |
| 7075570 | Dissolved Iron (Fe) | 2020/11/25 | 96 | 80 - 120 | 98 | 80 - 120 | <100 | ug/L | | |
| 7075570 | Dissolved Lead (Pb) | 2020/11/25 | 91 | 80 - 120 | 96 | 80 - 120 | <0.50 | ug/L | NC | 20 |
| 7075570 | Dissolved Magnesium (Mg) | 2020/11/25 | NC | 80 - 120 | 99 | 80 - 120 | <50 | ug/L | | |
| 7075570 | Dissolved Manganese (Mn) | 2020/11/25 | 96 | 80 - 120 | 99 | 80 - 120 | <2.0 | ug/L | | |
| 7075570 | Dissolved Molybdenum (Mo) | 2020/11/25 | 102 | 80 - 120 | 100 | 80 - 120 | <0.50 | ug/L | 0.26 | 20 |
| 7075570 | Dissolved Nickel (Ni) | 2020/11/25 | 91 | 80 - 120 | 98 | 80 - 120 | <1.0 | ug/L | NC | 20 |
| 7075570 | Dissolved Phosphorus (P) | 2020/11/25 | 106 | 80 - 120 | 110 | 80 - 120 | <100 | ug/L | | |
| 7075570 | Dissolved Potassium (K) | 2020/11/25 | 99 | 80 - 120 | 100 | 80 - 120 | <200 | ug/L | | |
| 7075570 | Dissolved Selenium (Se) | 2020/11/25 | 97 | 80 - 120 | 101 | 80 - 120 | <2.0 | ug/L | NC | 20 |
| 7075570 | Dissolved Silicon (Si) | 2020/11/25 | 104 | 80 - 120 | 98 | 80 - 120 | <50 | ug/L | | |
| 7075570 | Dissolved Silver (Ag) | 2020/11/25 | 66 (1) | 80 - 120 | 98 | 80 - 120 | <0.090 | ug/L | NC | 20 |
| 7075570 | Dissolved Sodium (Na) | 2020/11/25 | NC | 80 - 120 | 100 | 80 - 120 | <100 | ug/L | 0.51 | 20 |
| 7075570 | Dissolved Strontium (Sr) | 2020/11/25 | 97 | 80 - 120 | 98 | 80 - 120 | <1.0 | ug/L | | |
| 7075570 | Dissolved Thallium (Tl) | 2020/11/25 | 92 | 80 - 120 | 97 | 80 - 120 | <0.050 | ug/L | NC | 20 |
| 7075570 | Dissolved Titanium (Ti) | 2020/11/25 | 104 | 80 - 120 | 95 | 80 - 120 | <5.0 | ug/L | | |

| | | | Matrix Spike | | SPIKED BLANK | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| 7075570 | Dissolved Uranium (U) | 2020/11/25 | 100 | 80 - 120 | 100 | 80 - 120 | <0.10 | ug/L | NC | 20 |
| 7075570 | Dissolved Vanadium (V) | 2020/11/25 | 98 | 80 - 120 | 99 | 80 - 120 | <0.50 | ug/L | NC | 20 |
| 7075570 | Dissolved Zinc (Zn) | 2020/11/25 | 92 | 80 - 120 | 100 | 80 - 120 | <5.0 | ug/L | NC | 20 |
| 7075937 | Dissolved Organic Carbon | 2020/11/26 | 97 | 80 - 120 | 97 | 80 - 120 | <0.40 | mg/L | 0.28 | 20 |
| 7076206 | Dissolved Aluminum (Al) | 2020/11/26 | 96 | 80 - 120 | 99 | 80 - 120 | <4.9 | ug/L | NC | 20 |
| 7076206 | Dissolved Antimony (Sb) | 2020/11/26 | 101 | 80 - 120 | 102 | 80 - 120 | <0.50 | ug/L | NC | 20 |
| 7076206 | Dissolved Arsenic (As) | 2020/11/26 | 95 | 80 - 120 | 98 | 80 - 120 | <1.0 | ug/L | 2.2 | 20 |
| 7076206 | Dissolved Barium (Ba) | 2020/11/26 | 96 | 80 - 120 | 100 | 80 - 120 | <2.0 | ug/L | 2.5 | 20 |
| 7076206 | Dissolved Beryllium (Be) | 2020/11/26 | 93 | 80 - 120 | 95 | 80 - 120 | <0.40 | ug/L | NC | 20 |
| 7076206 | Dissolved Boron (B) | 2020/11/26 | 89 | 80 - 120 | 92 | 80 - 120 | <10 | ug/L | 1.6 | 20 |
| 7076206 | Dissolved Cadmium (Cd) | 2020/11/26 | 97 | 80 - 120 | 99 | 80 - 120 | <0.090 | ug/L | NC | 20 |
| 7076206 | Dissolved Calcium (Ca) | 2020/11/26 | NC | 80 - 120 | 98 | 80 - 120 | <200 | ug/L | 1.3 | 20 |
| 7076206 | Dissolved Chromium (Cr) | 2020/11/26 | 90 | 80 - 120 | 93 | 80 - 120 | <5.0 | ug/L | NC | 20 |
| 7076206 | Dissolved Cobalt (Co) | 2020/11/26 | 91 | 80 - 120 | 96 | 80 - 120 | <0.50 | ug/L | NC | 20 |
| 7076206 | Dissolved Copper (Cu) | 2020/11/26 | 91 | 80 - 120 | 94 | 80 - 120 | <0.90 | ug/L | NC | 20 |
| 7076206 | Dissolved Iron (Fe) | 2020/11/26 | 94 | 80 - 120 | 96 | 80 - 120 | <100 | ug/L | NC | 20 |
| 7076206 | Dissolved Lead (Pb) | 2020/11/26 | 94 | 80 - 120 | 97 | 80 - 120 | <0.50 | ug/L | NC | 20 |
| 7076206 | Dissolved Magnesium (Mg) | 2020/11/26 | 92 | 80 - 120 | 100 | 80 - 120 | <50 | ug/L | 1.6 | 20 |
| 7076206 | Dissolved Manganese (Mn) | 2020/11/26 | 93 | 80 - 120 | 95 | 80 - 120 | <2.0 | ug/L | NC | 20 |
| 7076206 | Dissolved Molybdenum (Mo) | 2020/11/26 | 94 | 80 - 120 | 95 | 80 - 120 | <0.50 | ug/L | 0.60 | 20 |
| 7076206 | Dissolved Nickel (Ni) | 2020/11/26 | 89 | 80 - 120 | 93 | 80 - 120 | <1.0 | ug/L | NC | 20 |
| 7076206 | Dissolved Phosphorus (P) | 2020/11/26 | 97 | 80 - 120 | 107 | 80 - 120 | <100 | ug/L | NC | 20 |
| 7076206 | Dissolved Potassium (K) | 2020/11/26 | 100 | 80 - 120 | 102 | 80 - 120 | <200 | ug/L | 1.4 | 20 |
| 7076206 | Dissolved Selenium (Se) | 2020/11/26 | 94 | 80 - 120 | 96 | 80 - 120 | <2.0 | ug/L | NC | 20 |
| 7076206 | Dissolved Silicon (Si) | 2020/11/26 | 98 | 80 - 120 | 98 | 80 - 120 | <50 | ug/L | 0.49 | 20 |
| 7076206 | Dissolved Silver (Ag) | 2020/11/26 | 93 | 80 - 120 | 96 | 80 - 120 | <0.090 | ug/L | NC | 20 |
| 7076206 | Dissolved Sodium (Na) | 2020/11/26 | 92 | 80 - 120 | 98 | 80 - 120 | <100 | ug/L | 1.4 | 20 |
| 7076206 | Dissolved Strontium (Sr) | 2020/11/26 | 94 | 80 - 120 | 98 | 80 - 120 | <1.0 | ug/L | 2.6 | 20 |
| 7076206 | Dissolved Thallium (Tl) | 2020/11/26 | 92 | 80 - 120 | 98 | 80 - 120 | <0.050 | ug/L | NC | 20 |
| 7076206 | Dissolved Titanium (Ti) | 2020/11/26 | 94 | 80 - 120 | 96 | 80 - 120 | <5.0 | ug/L | NC | 20 |
| 7076206 | Dissolved Uranium (U) | 2020/11/26 | 93 | 80 - 120 | 97 | 80 - 120 | <0.10 | ug/L | 2.0 | 20 |

## QUALITY ASSURANCE REPORT(CONT'D)



| | | | Matrix Spike | | SPIKED BLANK | | Method Blank | | RPD | |
|---|---|---|---|---|---|---|---|---|---|---|
| QC Batch | Parameter | Date | % Recovery | QC Limits | % Recovery | QC Limits | Value | UNITS | Value (%) | QC Limits |
| 7076206 | Dissolved Vanadium (V) | 2020/11/26 | 91 | 80 - 120 | 94 | 80 - 120 | <0.50 | ug/L | NC | 20 |
| 7076206 | Dissolved Zinc (Zn) | 2020/11/26 | 93 | 80 - 120 | 95 | 80 - 120 | <5.0 | ug/L | NC | 20 |
| 7076462 | Alkalinity (Total as CaCO3) | 2020/11/26 | | | 96 | 85 - 115 | <1.0 | mg/L | 0.38 | 20 |
| 7076464 | Conductivity | 2020/11/26 | | | 101 | 85 - 115 | <1.0 | umho/cm | 0.36 | 25 |
| 7076476 | pH | 2020/11/26 | | | 101 | 98 - 103 | | | 0.80 | N/A |
| 7077629 | Total Ammonia-N | 2020/11/26 | 98 | 75 - 125 | 100 | 80 - 120 | <0.050 | mg/L | NC | 20 |

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

(1) Recovery or RPD for this parameter is outside control limits. The overall quality control for this analysis meets acceptability criteria.

# VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).

Brad Newman, B.Sc., C.Chem., Scientific Service Specialist

CHARTERED
Eva Pranjic
CHEMIST

Ewa Pranjic, M.Sc., C.Chem, Scientific Specialist

BV Labs has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per ISO/IEC 17025, signing the reports.
For Service Group specific validation please refer to the Validation Signature Page.

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109 & 110, 4023 Meadowbrook Drive, London, Ontario Canada N6L 1E7 Tel:(519) 652-9444 Toll-free:800-563-6266 Fax:(519) 652-8189 www.bvlabs.com

# CHAIN OF CUSTODY RECORD

Page 1 of 1

| INVOICE TO: | | REPORT TO: | | PROJECT INFORMATION: | | Laboratory Use Only: | |
|---|---|---|---|---|---|---|---|
| Company Name: | #6868 MTE Consultants Inc | Company Name: | MTE Consultants | Quotation #: | B90004 | BV Labs Job #: | Bottle Order #: |
| Attention: | Mackenzie Costello | Attention: | John McNeil | P.O. #: | | | 802795 |
| Address: | 520 Bingemans Centre Dr<br>Kitchener ON N2B 3X9 | Address: | 123 St. George St, London, ON | Project: | 47477-400. | COC #: | Project Manager: |
| Tel: | (226) 234-4146 Fax: (519) 743-6513 | Tel: | (519) 204-6510 Fax: | Project Name: | | C#802795-01-01 | Ronklin Gracian |
| Email: | MCostello@mte85.com | Email: | jmcneil@mte85.com mcostello@mte85.com | Site #: / Sampled By: | Mackenzie Costello | | |

MOE REGULATED DRINKING WATER OR WATER INTENDED FOR HUMAN CONSUMPTION MUST BE SUBMITTED ON THE BV LABS DRINKING WATER CHAIN OF CUSTODY

**Regulation 153 (2011):** ☐ Table 1 ☐ Res/Park ☐ Medium/Fine ☐ Table 2 ☐ Ind/Comm ☐ Coarse ☐ Table 3 ☐ Agri/Other ☐ For RSC ☐ Table ___

**Other Regulations:** ☐ CCME ☐ Sanitary Sewer Bylaw ☐ Reg 558 ☐ Storm Sewer Bylaw ☐ MISA Municipality ___ ☒ PWQO ☐ Reg 406 Table ___ ☐ Other * Please lower DL

**Special Instructions:**

*Include Criteria on Certificate of Analysis (Y/N)?* Y

ANALYSIS REQUESTED (PLEASE BE SPECIFIC): Field Filtered (please circle): (Metals) / Hg / Cr VI; RCAp - Comprehensive

**Turnaround Time (TAT) Required:** Please provide advance notice for rush projects

**Regular (Standard) TAT:** ☒
*(will be applied if Rush TAT is not specified):*
*Standard TAT = 5-7 Working days for most tests.*
*Please note: Standard TAT for certain tests such as BOD and Dioxins/Furans are > 5 days - contact your Project Manager for details.*

**Job Specific Rush TAT (if applies to entire submission)**
Date Required: ___ Time Required: ___
Rush Confirmation Number: ___ (call lab for #)

| | Sample Barcode Label | Sample (Location) Identification | Date Sampled | Time Sampled | Matrix | Field Filtered / Metals | RCAp - Comprehensive | # of Bottles | Comments |
|---|---|---|---|---|---|---|---|---|---|
| 1 | | SG2 | 20/11/20 | 11:00 | GW | No | X | 4 | Please field filter at lab |
| 2 | | MW101-20 | ↓ | 14:10 | GW | Yes | X | 4. | |
| 3 | | MW105-20 | ↓ | 14:40 | GW | Yes | X | 4 | |
| 4 | | | | | | | | | Please lower detection limit |
| 5 | | | | | | | | | for PWQO when |
| 6 | | | | | | | | | required |
| 7 | | | | | | | | | |
| 8 | | | | | | | | | |
| 9 | | | | | | | | | |
| 10 | | | | | | | | | |

23-Nov-20 17:34
Ronklin Gracian
C0V1545
URB ENV-1365

| * RELINQUISHED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | RECEIVED BY: (Signature/Print) | Date: (YY/MM/DD) | Time | # jars used and not submitted | Time Sensitive | Laboratory Use Only |
|---|---|---|---|---|---|---|---|---|
| Mackenzie Costello | 20/11/23 | 165 | [signature] | 2020/11/23 | 17:34 | | | Temperature (°C) on Recei 2/3/2; Custody Seal Present Yes ✓; Intact ✓ |

* UNLESS OTHERWISE AGREED TO IN WRITING, WORK SUBMITTED ON THIS CHAIN OF CUSTODY IS SUBJECT TO BV LABS' STANDARD TERMS AND CONDITIONS. SIGNING OF THIS CHAIN OF CUSTODY DOCUMENT IS ACKNOWLEDGMENT AND ACCEPTANCE OF OUR TERMS WHICH ARE AVAILABLE FOR VIEWING AT WWW.BVLABS.COM/TERMS-AND-CONDITIONS.

* IT IS THE RESPONSIBILITY OF THE RELINQUISHER TO ENSURE THE ACCURACY OF THE CHAIN OF CUSTODY RECORD. AN INCOMPLETE CHAIN OF CUSTODY MAY RESULT IN ANALYTICAL TAT DELAYS.

** SAMPLE CONTAINER, PRESERVATION, HOLD TIME AND PACKAGE INFORMATION CAN BE VIEWED AT WWW.BVLABS.COM/RESOURCES/CHAIN-OF-CUSTODY-FORMS.

SAMPLES MUST BE KEPT COOL ( < 10° C ) FROM TIME OF SAMPLING UNTIL DELIVERY TO BV LABS

White: BV Labs Yellow: Client

## Exceedance Summary Table – Prov. Water Quality Obj.

### Result Exceedances

| Sample ID | BV Labs ID | Parameter | Criteria | Result | DL | UNITS |
|---|---|---|---|---|---|---|
| MW101-20 | OFV696-03 | Dissolved Iron (Fe) | 300 | 1700 | 100 | ug/L |
| MW105-20 | OFV697-03 | Dissolved Cobalt (Co) | 0.9 | 2.1 | 0.50 | ug/L |
| MW105-20 | OFV697-03 | Dissolved Uranium (U) | 5 | 5.3 | 0.10 | ug/L |

The exceedance summary table is for information purposes only and should not be considered a comprehensive listing or statement of conformance to applicable regulatory guidelines.


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# Appendix G

# Water Balance

Appendix G: Site Water Balance

**Pre-Development**

| Parameter | Units | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Catchment | 0.58 | 2100 | | | 2200 | | | 2300 | | 3100 | | 3200 |
| Area | ha | 3.42 | | | 14.90 | | | 0.76 | | 26.36 | | 19.04 |
| Average Annual Precipitation | mm | 786 | | | 786 | | | 786 | | 786 | | 786 |
| % Impervious | % | 17.0% | | | 0.0% | | | 11.8% | | 25.2% | | 1.3% |
| Surface/Ground Cover | - | Impervious | Urban Lawn/Crop | Pasture and Shrubs | Urban Lawn/Crop | Wooded | Pasture and Shrubs | Impervious | Urban Lawn | Impervious | Urban Lawn/Crop | Crop |
| Simplified Soil Description (Native) | - | - | Glacial Till | Glacial Till | Glacial Till | Glacial Till | Glacial Till | - | Glacial Till | - | Glacial Till | Glacial Till |
| Hydrologic Soil Group | - | - | CD | CD | CD | CD | CD | - | CD | - | CD | CD |
| Area | ha | 0.58 | 2.04 | 0.80 | 11.42 | 0.76 | 2.72 | 0.09 | 0.67 | 6.64 | 19.72 | 19.04 |
| | $m^2$ | 5,814 | 20,386 | 8,000 | 114,200 | 7,600 | 27,200 | 900 | 6,700 | 66,427 | 197,173 | 190,400 |
| Precipitation, P | m/year | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 |
| Evapotranspiration, ET | m/year | 0.050 | 0.444 | 0.457 | 0.444 | 0.460 | 0.457 | 0.050 | 0.444 | 0.050 | 0.444 | 0.444 |
| Water Surplus, WS | m/year | 0.736 | 0.342 | 0.329 | 0.342 | 0.326 | 0.329 | 0.736 | 0.342 | 0.736 | 0.342 | 0.342 |
| Ground Cover Factor | - | - | 0.10 | 0.15 | 0.10 | 0.20 | 0.15 | - | 0.10 | - | 0.10 | 0.10 |
| Soils Factor | - | - | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | - | 0.20 | - | 0.20 | 0.20 |
| Topography Factor | - | - | 0.20 | 0.10 | 0.20 | 0.10 | 0.10 | - | 0.20 | - | 0.20 | 0.20 |
| Infiltration Factor (sum) | - | 0.00 | 0.50 | 0.45 | 0.50 | 0.50 | 0.45 | 0.00 | 0.50 | 0.00 | 0.50 | 0.50 |
| Infiltration, I | m/year | 0.000 | 0.171 | 0.148 | 0.171 | 0.163 | 0.148 | 0.000 | 0.171 | 0.000 | 0.171 | 0.171 |
| Runoff, RO | m/year | 0.736 | 0.171 | 0.181 | 0.171 | 0.163 | 0.181 | 0.736 | 0.171 | 0.736 | 0.171 | 0.171 |
| **Annual Volumes** | | | | | | | | | | | | |
| Precipitation, P | $m^3$/year | 4,570 | 16,023 | 6,288 | 89,761 | 5,974 | 21,379 | 707 | 5,266 | 52,212 | 154,978 | 149,654 |
| Evapotranspiration, ET | $m^3$/year | 291 | 9,052 | 3,652 | 50,706 | 3,495 | 12,418 | 45 | 2,975 | 3,321 | 87,546 | 84,539 |
| Infiltration, I | $m^3$/year | 0 | 3,486 | 1,186 | 19,528 | 1,239 | 4,032 | 0 | 1,146 | 0 | 33,716 | 32,558 |
| Runoff, RO | $m^3$/year | 4,279 | 3,486 | 1,450 | 19,528 | 1,239 | 4,929 | 662 | 1,146 | 48,890 | 33,716 | 32,558 |
| **Catchment Totals** | | | | | | | | | | | | |
| Precipitation, P | $m^3$/year | 26,881 | | | 117,114 | | | 5,974 | | 207,190 | | 149,654 |
| Evapotranspiration, ET | $m^3$/year | 12,995 | | | 66,619 | | | 3,020 | | 90,867 | | 84,539 |
| Infiltration, I | $m^3$/year | 4,672 | | | 24,800 | | | 1,146 | | 33,716 | | 32,558 |
| Runoff, RO | $m^3$/year | 9,215 | | | 25,696 | | | 1,808 | | 82,606 | | 32,558 |
| **Site Totals** | | | | | | | | | | | | |
| Precipitation, P | $m^3$/year | 506,813 | | | | | | | | | | |
| Evapotranspiration, ET | $m^3$/year | 258,039 | | | | | | | | | | |
| Infiltration, I | $m^3$/year | 96,891 | | | | | | | | | | |
| Runoff, RO | $m^3$/year | 151,882 | | | | | | | | | | |

**Post-Development (Unmitigated)**

| Parameter | Units | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Catchment | 0.58 | 2100 | | 2200 | 2300 | 2400 | | 3100 | | 3200 | | 3300 | | 3400 | | 3500 | 4100 | |
| Area | ha | 3.11 | | 5.60 | 2.00 | 0.76 | | 25.24 | | 7.11 | | 9.32 | | 4.34 | | 3.52 | 3.48 | |
| Average Annual Precipitation | mm | 786 | | 786 | 786 | 786 | | 786 | | 786 | | 786 | | 786 | | 786 | 786 | |
| % Impervious | % | 18.7% | | 0.0% | 0.0% | 11.8% | | 85.9% | | 88.3% | | 78.8% | | 77.6% | | 100.0% | 66.3% | |
| Surface/Ground Cover | - | Impervious | Urban Lawn | Urban Lawn/Crop | Urban Lawn/Crop | Impervious | Urban Lawn | Impervious | Urban Lawn | Impervious | Urban Lawn | Impervious | Urban Lawn | Lined SWP Pond | Urban Lawn | Impervious | Wooded | Pasture and Shrubs |
| Simplified Soil Description (Native) | - | - | Glacial Till | Glacial Till | Glacial Till | - | Glacial Till | - | Glacial Till | - | Glacial Till | - | Glacial Till | - | Glacial Till | - | Glacial Till | Glacial Till |
| Hydrologic Soil Group | - | - | CD | CD | CD | - | CD | - | CD | - | CD | - | CD | - | CD | - | CD | CD |
| Area | ha | 0.58 | 2.53 | 5.60 | 2.00 | 0.09 | 0.67 | 21.68 | 3.56 | 6.28 | 0.83 | 7.34 | 1.98 | 4.12 | 0.22 | 3.52 | 0.76 | 2.72 |
| | $m^2$ | 5,816 | 25,284 | 56,000 | 20,000 | 900 | 6,700 | 216,812 | 35,588 | 62,781 | 8,319 | 73,442 | 19,758 | 41,200 | 2,200 | 35,200 | 7,600 | 27,200 |
| Precipitation, P | m/year | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 | 0.786 |
| Evapotranspiration, ET | m/year | 0.050 | 0.444 | 0.444 | 0.444 | 0.050 | 0.444 | 0.050 | 0.444 | 0.050 | 0.444 | 0.050 | 0.444 | 0.510 | 0.444 | 0.050 | 0.460 | 0.457 |
| Water Surplus, WS | m/year | 0.736 | 0.342 | 0.342 | 0.342 | 0.736 | 0.342 | 0.736 | 0.342 | 0.736 | 0.342 | 0.736 | 0.342 | 0.276 | 0.342 | 0.736 | 0.326 | 0.329 |
| Ground Cover Factor | - | - | 0.10 | 0.10 | 0.10 | - | 0.10 | - | 0.10 | - | 0.10 | - | 0.10 | - | 0.10 | - | 0.20 | 0.15 |
| Soils Factor | - | - | 0.20 | 0.20 | 0.20 | - | 0.20 | - | 0.20 | - | 0.20 | - | 0.20 | - | 0.20 | - | 0.20 | 0.20 |
| Topography Factor | - | - | 0.20 | 0.20 | 0.10 | - | 0.30 | - | 0.30 | - | 0.30 | - | 0.30 | - | 0.10 | - | 0.10 | 0.10 |
| Infiltration Factor (sum) | - | 0.00 | 0.50 | 0.50 | 0.40 | 0.00 | 0.60 | 0.00 | 0.60 | 0.00 | 0.60 | 0.00 | 0.60 | 0.00 | 0.40 | 0.00 | 0.50 | 0.45 |
| Infiltration, I | m/year | 0.000 | 0.171 | 0.171 | 0.137 | 0.000 | 0.205 | 0.000 | 0.205 | 0.000 | 0.205 | 0.000 | 0.205 | 0.000 | 0.137 | 0.000 | 0.163 | 0.148 |
| Runoff, RO | m/year | 0.736 | 0.171 | 0.171 | 0.205 | 0.736 | 0.137 | 0.736 | 0.137 | 0.736 | 0.137 | 0.736 | 0.137 | 0.276 | 0.205 | 0.736 | 0.163 | 0.181 |
| **Annual Volumes** | | | | | | | | | | | | | | | | | | |
| Precipitation, P | $m^3$/year | 4,571 | 19,873 | 44,016 | 15,720 | 707 | 5,266 | 170,414 | 27,972 | 49,346 | 6,538 | 57,725 | 15,530 | 32,383 | 1,729 | 27,667 | 5,974 | 21,379 |
| Evapotranspiration, ET | $m^3$/year | 291 | 11,226 | 24,864 | 8,880 | 45 | 2,975 | 10,841 | 15,801 | 3,139 | 3,694 | 3,672 | 8,773 | 21,012 | 977 | 1,760 | 3,495 | 12,418 |
| Infiltration, I | $m^3$/year | 0 | 4,324 | 9,576 | 2,736 | 0 | 1,375 | 0 | 7,303 | 0 | 1,707 | 0 | 4,054 | 0 | 301 | 0 | 1,239 | 4,032 |
| Runoff, RO | $m^3$/year | 4,280 | 4,324 | 9,576 | 4,104 | 662 | 917 | 159,573 | 4,868 | 46,207 | 1,138 | 54,053 | 2,703 | 11,371 | 451 | 25,907 | 1,239 | 4,929 |
| **Catchment Totals** | | | | | | | | | | | | | | | | | | |
| Precipitation, P | $m^3$/year | 24,445 | | 44,016 | 15,720 | 5,974 | | 198,386 | | 55,885 | | 73,255 | | 34,112 | | 27,667 | 27,353 | |
| Evapotranspiration, ET | $m^3$/year | 11,517 | | 24,864 | 8,880 | 3,020 | | 26,642 | | 6,833 | | 12,445 | | 21,989 | | 1,760 | 15,913 | |
| Infiltration, I | $m^3$/year | 4,324 | | 9,576 | 2,736 | 1,375 | | 7,303 | | 1,707 | | 4,054 | | 301 | | 0 | 5,272 | |
| Runoff, RO | $m^3$/year | 8,604 | | 9,576 | 4,104 | 1,579 | | 164,442 | | 47,345 | | 56,756 | | 11,823 | | 25,907 | 6,168 | |
| **Site Totals** | | | | | | | | | | | | | | | | | | |
| Precipitation, P | $m^3$/year | 506,813 | | | | | | | | | | | | | | | | |
| Evapotranspiration, ET | $m^3$/year | 133,863 | | | | | | | | | | | | | | | | |
| Infiltration, I | $m^3$/year | 36,647 | | | | | | | | | | | | | | | | |
| Runoff, RO | $m^3$/year | 336,303 | | | | | | | | | | | | | | | | |