# GEOLOGY / HYDROGEOLOGY REPORT

# FOR

# THE PROPOSED MM PORT FZE PROJECT ESIA

## 1.0 INTRODUCTION

The focus of this report is to undertake an in-depth assessment of the probable impacts of the proposed expansion on the hydrology and hydrogeology of the study area. This assessment encapsulates comprehensive evaluations of surface water flow, drainage patterns, and water quality in the vicinity of the project site. Moreover, meticulous evaluations of subsurface lithologic sequences, groundwater flow direction, groundwater quality, and potential groundwater migration pathways were conducted.

The ensuing findings, derived through systematic data collection, technical analyses, and comprehensive stakeholder consultation, will contribute invaluable insights into the dynamic interactions between the project and the extant hydrological conditions. With a specific emphasis on identifying potential risks and opportunities regarding water utilization, groundwater conservation, and water quality preservation, this report aims to devise mitigation measures to safeguard water resources and ensure environmental stewardship.

Aligned with the Environmental Impact Assessment Procedural Guidelines stipulated by the Federal Government of Nigeria, the purport of this project report underscores an unwavering commitment to sustainable development and responsible growth practices. The presentation of findings and recommendations will fortify informed decision-making and positively contribute to the overarching success of the proposed project.

## 1.2 Project Scope:

As part of the Environmental and Social Impact Assessment (ESIA) for the proposed project, a hydrogeological and stratigraphic assessment was conducted. The scope of this assessment includes investigations based on data obtained from the drilling of three boreholes within the project area (GW3, GW4, GW5). In addition to the data obtained from the drilling of three boreholes within the project area, water samples were collected from two existing nearby boreholes for water quality analysis (GW1, GW2). Furthermore, a third borehole located 2.0km away was designated as the control borehole, and water sample was also collected and analyzed from this location. The following components were examined for thorough understanding of groundwater resources and geological characteristics:

1. **Hydrogeological Investigation**: A evaluation of the hydrogeological conditions within the study area, based on the data obtained from the three boreholes, including groundwater flow patterns, aquifer properties, and groundwater-surface water interactions.
2. **Stratigraphic Analysis**: Examination of the soil profile and stratigraphy based on data from the three boreholes to comprehend geological formations and sediment layers that influence groundwater flow and storage characteristics.
3. **Depth to Groundwater**: Precise measurements of the depth to groundwater were recorded from the three boreholes, allowing for an understanding of the water table's level and fluctuations within the project area.
4. **Slug Test for Hydraulic Conductivity**: Conducting slug tests in the three boreholes to determine the hydraulic conductivity of aquifer formations and assess their ability to transmit groundwater.
5. **Water Quality Analysis**: Water quality analyses performed on water samples collected from the three boreholes to assess parameters such as pH, dissolved solids, heavy metals, etc.
6. **Control Borehole Water Quality Analysis**: Water sample collected and analyzed from the designated control borehole (GWC), situated 2.0km away, for assessment of groundwater quality.

7. **Groundwater Monitoring**: Development of a groundwater management and monitoring plan.
8. **Mitigation Measures and Best Practices**: Profound recommendations of appropriate mitigation measures and best practices based on assessment of groundwater resources and geological formations. These measures are crucial in ensuring responsible water management throughout the project's lifecycle.

## 1.3 Objectives of the Study

The objectives of this study are as follows.

1. Determination of subsurface lithologic units across the area.
2. Assessment of groundwater quality.
3. Determination of depth to groundwater.
4. Assessment of groundwater flow direction and pattern.
5. Determination of groundwater hydraulic properties.
6. Determination of groundwater hydrogeochemical facies

## 1.4 Location of the Study Area

The project site is located in Onne Port Complex, Onne, Eleme LGA, Rivers State. The area lies towards the North of the Bonny River.

## 1.5 Regional Geology of the Area

The formation of the present-day Niger Delta started in the early Paleocene era and resulted in the build-up of fine-grained sediments eroded and transported by River Niger and its tributaries. The subsurface geology of the Niger Delta consists of three lithostratigraphic units (Akata, Agbada and Benin Formations), which are in turn overlain by various types of quaternary deposits. The Benin Formation (2l00m thick) is made up of over 90% massive, porous, coarse sands with clay/shale inter-beds (Short and Stauble, 1967). This formation is the most prolific aquifer in the region. The Quaternary deposits (40-150m thick) generally consist of rapidly alternating sequences of sand

and silt/clay with the latter becoming increasingly more prominent seawards. The Niger Delta can be subdivided into three major inter-gradational geomorphologic units (Andersen, 1967) from land to sea (north to south), these are:

- Dry deltaic plain with rare freshwater swamps
- Extensive freshwater swamps and meander belts
- Saltwater mangrove swamps, estuaries, creeks and lagoons

The dry deltaic plain is a geographically extensive low-lying area dominated by fluvial systems, some with braided characteristics. Few meander belts occur within this deltaic plain. Raffia palms dominate flood plains while palm trees are most common in the inter-fluvial settings. Extensive lateritic soil (approximately 12m in thickness) underlies this unit.

The Quaternary (neogene) and Tertiary stratigraphy of parts of the Niger Delta, (NDES 1995) is shown in Table 1.1. The sediments of the area, which are indicative of the Holocene geomorphologic units, are underlain by Benin, Agbada and Akata formations (Short and Stauble, 1967). The Benin Formation, which is the continental mega-facies of the tertiary Niger Delta, comprises about 6,000m thick successions of unconsolidated sands with thin clay and lignite interbeds. The Benin formation grade very gently downwards into the paralic delta front mega-facies, represented by the Agbada Formation. The unit consists of an interbedded sequence of sands and shales about 3,150m thick on average. All the hydrocarbon reserves of the Niger Delta accumulate in the sands of the Tertiary Niger Delta. Consequently, it is dominated by shales of more than 1,380m thick. Sands constitute the major aquiferous layer in the Niger Delta and is dominated by sands, and gravelly sands. (Andersen, 1967).

The bulk of groundwater in the Niger Delta is contained in very thick and extensive sediments of the Benin Formation. In general, the hydrogeological data in the upland areas of the Niger Delta have very broad similarities not only on the sub surface lithology but also in the overall aquifer characteristics. The exploited aquifers in the Niger Delta including the Greater Port Harcourt are derived from the Benin Formation (The Coastal Plain Sands). Basically, the Benin Formation is unconsolidated and consists of very thick sediment over 2000meters thick. The sand sediments of Benin Formation are intercalated with layers of clay, and this has given rise to a multi layered aquifer system a common feature of the Niger Delta. The major recharge to the aquifers of the Niger Delta is from precipitation.

Table 1.1: Geological and Lithological Units of the Niger Delta

| Geologic Unit | Lithology | Age |
|---|---|---|
| Alluvium | Gravel, sand, clay silt | Quaternary |
| Freshwater back-swamp | . | |
| Meander belt | Sand, clay, some silt, and gravel | |
| Mangrove and salt Water/backswamps | Medium-fine sand, clay and some silt | |
| Active/abandoned beach ridges | Sand, clay and some silt | |
| Benin Formation (Coastal Plain Sand) | Coarse to medium sand with Subordinate silt and clay lenses | Tertiary |
| Agbada Formation | Mixture of sand, silt and shale | |
| Akata Formation | Shale, sandy in some places | |

Source: Niger Delta Environmental Survey. 1995

Based on geophysical and borehole data collected over the years the Niger Delta hydrogeological set up can be classified into (a) Impermeable/Semi permeable horizons from ground level to 10m below mean sea level. (b) A permeable/gravel sand layer up to 80 meters below sea level. (c) From 80m to 225m below sea level (masl), the formation consists of a permeable sand/gravel layer with thin impermeable/semi permeable clay/silt layers.

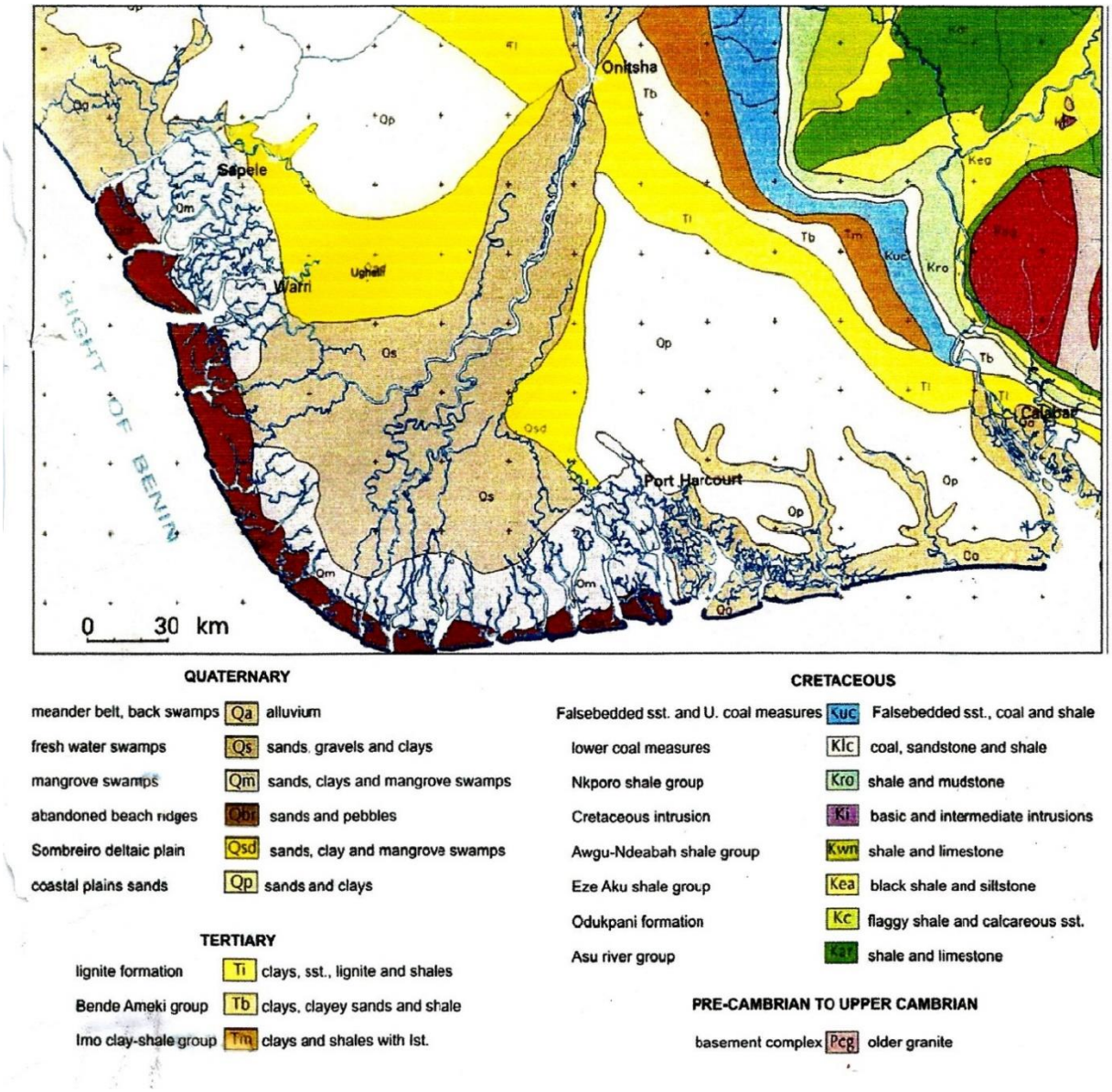



Figure 2: Geologic characteristics of the Niger Delta

## 1.6 Hydrogeological Settings of the Project Site

The Niger Delta geology is underlain by three principal formations, namely: Akata, Agbada and Benin Formations. The hydrogeology of the Niger delta is dominated by the Benin Formation, which serves not only as aquifer but also facilitates recharge of groundwater in the region. The Benin Formation serves as the groundwater reservoir in the area. The main body of groundwater in the Niger Delta is contained in the extensive sand and gravel layers which are interspersed with shale and clay layers within the formation. It is now well known that the Benin Formation (Miocene to Recent) posses' excellent water yielding properties even at great depths (Amajor, 1991).

Well cuttings from the logs of oil wells across the Niger delta, reveal that the Benin Formation is laterally extensive and extends to depths of 2000 m in places (Abam and Nwankwoala, 2020).

Etu-Efeotor and Odigi, (1983); Amajor (1989); and Etu-Efeotor and Akpokodje, (1990) studies indicate that the Benin Formation is differentiated into three main zones, namely, 1) a northern bordering zone consisting of shallow aquifers of predominantly continental deposit, 2) a transition zone of intermixing marine and continental materials and 3) a coastal zone of predominantly marine deposits.

Akpokodje et al. (1996) summarized the hydrostratigraphic units of the Benin Formation as consisting of four well defined aquifers in the upper 305 m that vary in thickness. The aquifers vary from unconfined conditions at the surface through semi-confined to confined conditions at depth. The aquifers are separated by highly discontinuous layers of shales, giving a picture of an interval that consists of a complex, non-uniform, discontinuous and heterogeneous aquifer system.

In 2014, an estimated groundwater recharge of 31.9 BCM/year was predicted by Japan International Cooperation Agency for the Niger delta region of Nigeria. This value is just below that of the Southeast region which is the highest in Nigeria. The high perennial aquifer recharge in the area is supported by the abundant rainfall, favorable geology, vast catchment area, North Southwards groundwater flow and presence of a rich network of freshwater rivers and streams in the area.

The project site is surrounded by Rivers, Swamps, and Creeks. Hence, apart from the huge contribution from rainfall to groundwater recharge, the likelihood of groundwater recharge in the area was highly influenced by these surrounding water systems.

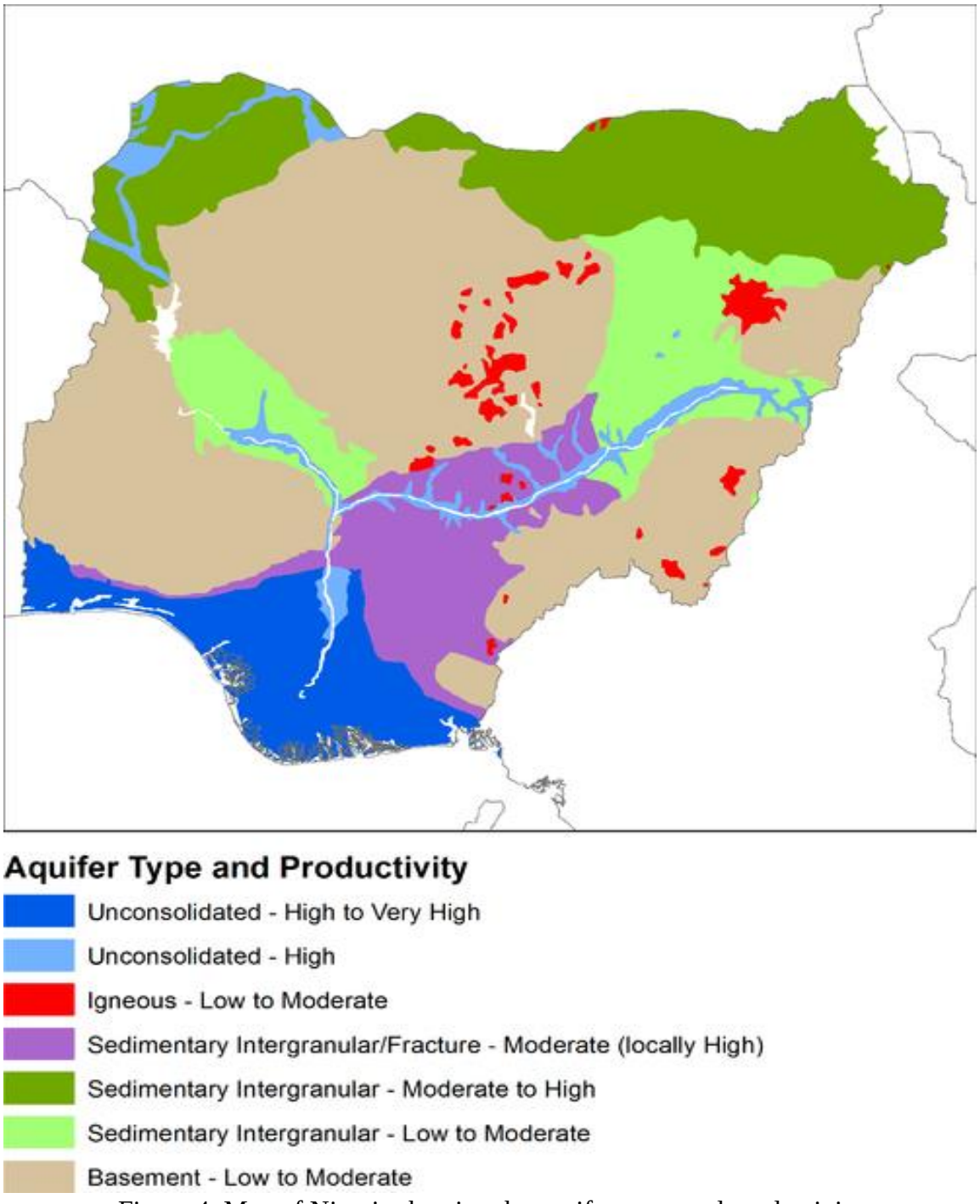



Figure 4: Map of Nigeria showing the aquifer types and productivity

## 2.0 METHODOLOGY

### 2.1 Borehole Construction

A total of three groundwater monitoring boreholes were drilled to a depth of 30.0m to access groundwater. The goal for drilling these monitoring boreholes during the ESIA study are as follows; 1) Determination of depth to groundwater, 2) Determination of baseline groundwater quality, 3) Determination of groundwater flow direction, 4) Determination of seasonal impact of groundwater table, 5) Delineation of subsurface stratigraphic lithologies, 6) Determination of hydraulic conductivity for monitoring groundwater flow movement. The following procedures will govern the installation of all monitoring wells.

#### 2.1.1 Cleaning of Equipment and Materials

A conventional boring method that consists of use of the light shell and auger motorized rig was used for the boring.

Drill rods, augers, casings, samplers, pipe wrenches, and other materials and tools were cleaned until all visible signs of grease, oil, mud, or other material were removed. Brushes were used as necessary to assist in the removal of extraneous materials or soil.

#### 2.1.3 Shell and Auger Drilling Procedures

For the construction of the 50mm diameter groundwater monitoring boreholes to a depth of 30.0m, a hand auger with a cup diameter of 101.6mm was utilized for augering the initial 1.0m. In employing the hand augering method, the drilling action is applied by manually rotating a cutting blade or auger. As drilling progresses, the auger fills with soil and is periodically lifted to the surface and emptied. The soil auger is advanced by rotating it while pressing it into the soil at the same time. Due to the sand-fill nature of the site, the auger method was discontinued, and the shell and auger method adopted. The auger shell aided to give the wall of the borehole stability during the augering process and to prevent backfill of loose sands. This involved mounting a tripod stand with the rope and pulley system that helps to ease the process of drilling to the target depth of 30.0m (Fig. 2.2). In stiff clayey formations, a clay cutter was added to the drilling assembly to help soften the underlying formations and allow for safe collection of disturbed soil cuttings.

### 2.1.4 Sampling of the Formation

The sampling of the soil formation was required to establish the nature of the soils at the location of the monitoring wells. Geologic samples, retrieved through percussion drilling were required to determine the strata thickness and soil types present at various depths, and to provide the information necessary to develop an accurate log for the drilled hole. All soil samples were adequately described on site before for colour, texture, composition and lithology (Fig. 2.3). All monitoring wells were properly logged, to provide a record of the lithology encountered. The soils log all follows the format established in the Unified Soil Classification System (USCS) scheme.


Figure 2.2: Drilling process using the percussion rig.


Figure 2.3 soil samples spread across various depths prior to logging

### 2.1.5 Sampling Interval and Type

During augering, soils within the borehole were sampled at regular intervals (1.0m interval) and at every change in lithology. The soil samples were examined for logging of the hole.

### 2.1.6 Well Construction Materials

All materials utilized or incorporated into the construction of ground water monitoring wells were new, of sound condition, and free of hazardous or toxic chemical constituents which may leach into the ground water. All paint, coatings, or inks were removed prior to installation.

### 2.1.7 Well Screens

Well screens were continuously slotted PVC plastic well screen. Well screen was designed on site based on aquifer conditions. The bottom of each screened sections was designed to accept a threaded bottom plug, which plug were designed to withstand all installation and well development pressures without becoming dislodged or damaged.

### 2.1.8 Riser Pipe

Riser pipes consisted of PVC plastic pipe meeting ASTM D1785, with flush-joint threads. Riser pipes were furnished in appropriate lengths, with all riser pipes having a minimum length of 5 feet and a maximum length of 20 feet. Diameter of risers utilized was 50mm.

### 2.1.9 Graded Filter (Gravel) Pack

Gravel pack was the material placed in the annular space around the well screen. The pack was uniformly graded gravel, comprised of hard, durable particles which have been washed and screened. The sizing of the gravels was determined by the soil type that was encountered in the aquiferous zone. The particle size of the pack were 4 times the D15 size (15 percent of the soil is finer than this dimension) of the soil in the monitored zone and were no more than 4 times the D85 size (85 percent of the soil is finer than this dimension) of the soil in the monitored zone. The gravel pack were cleaned and free from foreign particles.


Figure 2.4: Installation of 2-inches casing pipes in GW3 Borehole

### 2.1.10 Well Installation

Prior to installation of any material in a borehole, it was verified that the borehole is stable, vertical, unobstructed, and advanced significantly within the aquiferous depth. Where the borehole tends to cave in or heave, the drill crew were advised to take the necessary steps to stabilize the borehole.

### 2.1.11 Well Component Assembly

The installation of the components of the well was as follows. All materials were cleaned. The wells screen and riser pipe were assembled by taping the male threaded portion of each component with Teflon tape, and then inserting and tightening the components by hand. The bottom plug was inserted into the bottom of the last section of the well screen. Since over 3.0m section of well screen was used, each section was joined, and hand tightened after the joints have been taped with Teflon tape. As the screen and riser pipes were assembled, the assembled sections (string) were positioned into the borehole and held in place with a slip plate and ropes, or wire cables attached to the boom of the drill rig. Once the string has been lowered to the depth of the zone to be monitored, the string was suspended in place, and the screen and riser sections positioned in the center of the borehole and vertically aligned. The riser pipe extended 1.0 meters above ground level. The final trimming of the riser to 0.50m above ground level was done after the grout was in place around the wellbore.

### 2.1.12 Placement of Gravel Pack

The gravel pack typically extended two feet above the uppermost row of slots in the well screen, except where relatively impermeable zones separating permeable strata of soil are thin and require that the gravel pack construction be limited to a shorter rise. The level of the gravel pack within the borehole was confirmed by sounding with a weighted tape, and appropriate notations were recorded in the well log with other well construction data. Since hollow-stem augers (shell and auger) were used, the gravel pack was placed by pouring the material into the annulus between the auger and the riser pipe. The auger was raised periodically, and an auger flight removed, to allow the gravel pack to fill the annulus between the well screen and the borehole wall. After withdrawing the temporary casing to a level approximately three feet above the top of the gravel pack, the pack was again sounded to determine whether the withdrawal of the casing disturbed the

gravel pack, and whether the pack continues to extend at least two feet above the top of the well screen.

### 2.1.13 Placement of Bentonite Seal

After the gravel pack had been placed and sounded, a bentonite pellet seal was constructed above the gravel pack. The seal was 1.0m in thickness, and the pellets were placed and sounded in the same manner as the gravel pack.

### 2.1.14 Placement of Grout

After the bentonite grout has been placed, the boreholes were grouted. Grout was prepared and then injected into the borehole via a tremie pipe. The discharge end of the tremie pipe was placed initially on the top of the bentonite seal. As the borehole was filled with the grout, the tremie pipe was raised. The grout was pumped through the tremie pipe into the borehole until the grout flows out of the borehole at the surface. After the grout has been placed, the temporary casing was removed. Additional grout was added to maintain a continuous column of grout within the borehole which is filled completely to the surface. After the grout has set (approximately 48 hours), the riser pipe was then trimmed to 0.5m above ground level. Trimming of the riser was done in a manner to prevent pipe cuttings from entering the well.

### 2.1.15 Placement of Well Protector

A steel pipe, having an inside diameter of at least 1.33 times the outside diameter of the riser pipe, was set concentrically around the riser pipe and into the plastic grout. The bottom of the well protector was submerged at least three feet into the grout and extends at least six inches above the top of the riser pipe. The well protective casing was installed so that the bottom of the casing is terminated below the frost line, to prevent heaving of the casing and riser pipe. The grout which is forced out of the borehole due to the placement of the well protector was carefully removed so as to prevent "mushrooming" of the grout, which tends to promote heaving of the well casing and the well protector during frost conditions. The well protector was maintained plumb and concentric with the riser pipe until the grout has set. Temporary braces were used to maintain the well protector in the proper position (Fig. 2.5). A locking cap was secured to the top of the well protector pipe.

### 2.1.16 Well Development

All three (3) new monitoring wells were developed, by pumping or evacuating the well casing, in order to remove trapped soil fines in the gravel pack and soil formation just outside the pack and to produce a representative sample of the water in the formation. Well development was completed 24 hours after the well construction has been completed and prior to sampling for any water quality characteristics. Well development was accomplished using a jet pump. Pump capacity is 1.09 liters per second. Well development continued until representative formation water, free of the effects of well construction, was obtained. Representative formation water was defined as water which is generally free of sediment, and has stable pH, temperature, and conductivity when measured during a period of ten minutes. Groundwater in-situ parameters (TDS, PH, EC, Temperature) were constantly monitored (every 10 minutes) until stable results were obtained. In general, well development proceeded for 3 hours for each borehole.

## 2.2 Surveying and Coordinates

The geographic reference locations for each groundwater monitoring borehole were obtained using mobile Garmin Global Positioning System (GPS) precision up to ±1.0m. The measurements were obtained by keeping the GPS on each well head and after stabilization (approx. 3 minutes depending on cloud cover) measurements were recorded. Geographic coordinates were recorded for all borehole positions on site.


Figure 2.5: Well head installation for GW3, GW4 and GW5 boreholes

### 2.3.1 Groundwater Sampling and In-Situ measurements

The borewell was flushed till stable pH and conductivity was achieved. Parameters such as pH, Electrical Conductivity, Total Dissolved Solids, Temperature and Salinity were recorded in-situ on site during sampling (Fig. 2.6). Water samples were collected in pre-cleaned plastic jars using Hanna Multimeter. Groundwater samples were analyzed in-situ three (3) times and the average values were taken to represent the characteristics of the groundwater.

Figure 2.6: Groundwater sampling and In-situ monitoring

## 2.4 Ground Water Level Measurements

The objective was to determine the piezometric surface elevation of ground water at drilled borehole locations (GW3, GW4, GW5) in order to evaluate ground water flow direction, probable direction of groundwater migration, and the effect which withdrawal wells may have on the hydrogeologic environment. Water level measurements were taken using an electric water level probe, Soil Test Model No. DR-760A. Which have accuracy of the + 0.01 feet.

## 2.5 Groundwater Flow Direction

To ascertain groundwater flow direction, knowledge of borehole point elevation and static water level depth is essential. The hydraulic head, derived from the disparity between borehole elevation and static water level, is pivotal. Hydraulic head contour mapping facilitates identification of groundwater flow paths, as water moves from higher to lower hydraulic head areas. Geological formations and human interventions like well pumping impact local flow dynamics. Repetitive static water level measurements mitigate localized pumping effects. It's crucial to recognize that groundwater flow patterns shift due to seasonal fluctuations and land use changes. Continuous monitoring of groundwater levels is thus indispensable for maintaining updated insights, aiding

effective water resource management, and making informed decisions during environmental impact assessments.

## 2.6 Field Hydraulic Conductivity Test Measurement

A critical facet of the Environmental Impact Assessment (EIA) process involves accurately determining hydraulic conductivity near groundwater monitoring boreholes. Hydraulic conductivity is pivotal for comprehending water movement and transport in subsurface formations, directly affecting aquifer water flow rate. This insight is crucial for assessing groundwater availability, vulnerability, and contamination risks. Conducting hydraulic conductivity tests is relatively simple, taking under half an hour per well. Initially, well-specific details like completion info, depth, screen location, diameter, and water column height above the screen are collected. This aids in installing the pressure transducer at the correct depth. Essential pre-test info includes well location, borehole depth, casing specifics, groundwater depth, screen attributes, aquifer thickness, pump type, discharge rate, aquifer and well type. The procedure involves: measuring static water level multiple times, setting up a jet pump assembly and generator, fitting a non-return valve to the bottom riser, placing the pump assembly at a safe depth, and installing a data logger-equipped transducer down the borehole. A loop of the transducer cable secures its position. The transducer's parameters are programmed, followed by a minute of pumping and nine minutes of recovery. Rising head data is recorded, with flow rate monitoring. Only recovery data is used for analysis due to its reliability.


Figure 2.8: Hydraulic conductivity determination using a surface pump and a data logger installed in the borehole

Table 2.1: Borehole parameters utilized for hydraulic conductivity test

| Borehole-ID | **GW3** | **GW5** | **GW4** |
|---|---|---|---|
| Borehole Depth (m) | 30 | 30 | 27 |
| Casing stickout (m) | 0.50 | 0.50 | 0.50 |
| Depth to Groundwater + Stickout (m) | 3.62 | 5.83 | 3.92 |
| Depth to Groundwater - Stickout (m) | 03.12 | 4.14 | 3.42 |
| Screen Length (m) | 6.0 | 6.0 | 6.0 |
| Radius of Screen (m) | 0.0508 | 0.0508 | 0.0508 |
| Radius of Casing (m) | 0.0508 | 0.0508 | 0.0508 |
| Radius of Borehole (m) | 0.0762 | 0.0762 | 0.0762 |
| Thickness of Aquifer (m) | 10.0 | 11.0 | 9.0 |
| Pump Used | 1.0 hp Jet Pump | 1.0 hp Jet Pump | 1.0 hp Jet Pump |
| Pumping Rate (l/s) | 1.09 | 1.09 | 1.09 |
| Type of Aquifer | Unconfined | Unconfined | Unconfined |
| Type of well penetration | Partial | Partial | Partial |
| Transducer installed depth (m) | 4.56 | 4.5 | 4.52 |
| Pumping Duration (min) | 1.00 | 1.00 | 1.00 |
| Recovery Duration (min) | 9.00 | 9.00 | 9.00 |

### 2.6.1 Data Analytical Procedures

The recovery test results (rising head) were then incorporated into the appropriate well flow equation to determine the hydraulic conductivity of the aquifer. The Hvorslev (1951) mathematical equation, Cooper-Bredehoeft-Papadopulos (1967) mathematical model and Bouwer and Rice (1976) empirical model were utilized for determination of hydraulic conductivities of the aquiferous intervals. The Hvorslev (1951) equation can be applied to both unconfined and confined aquifers, the Cooper et al., (1967) model is mainly utilized for confined aquiferous systems. Bouwer and Rice (1976) model apply to unconfined aquifers. Having more than one method to calculate the hydraulic conductivity of an aquifer is helpful. It is especially useful for cross-checking values for comparison purposes. If the results of one method differ significantly from the other, then this is helpful in detecting calculation errors.

## 3.0 RESULTS AND DISCUSSION

### 3.1 Local Stratigraphic Profile of the Area

The project site lies on the bank of the Bonny River. The geology of the site is composed of coarse-grained sands, medium to coarse grained sands, medium grained sands, medium to fine grained sands, sandy clay, silty clay, clayey sands, and organic clay. Figure 3.1 shows the lithologies encountered and correlated across the project site. The project site is a reclaimed sand-filled area. The stratigraphic unit in the area comprises of medium grained sands and medium to coarse grained sandy soils occupying between 4.50m to 7.0m below ground surface. This area is a sand-filled area, and the thickness of the sand-filled area decreases away from the shoreline. The sandy nature of these layers makes it permeable for surface water and potential contaminants to be transported into the subsurface realms. Underlying this layer is a thick layer of silty clay and organic clay which stretches to a depth between 12.0m and 14.0m. The 7.0m thick layer of clayey soils extends throughout the entire area and acts as a barrier that impedes surface infiltration from entering the subsurface realms. The thick clayey layer is underlain by a continuous layer of sandy clay which extends to a depth ranging from 17.0m in GW4 to 20.0m depth in GW3. This layer is underlain by aquiferous sands composed of medium sands, medium to coarse sands and coarse sands to a depth of 30.0m. The aquiferous thickness ranges from 9.0m to 11.0m. The similarity in the geology encountered across all three boreholes reveals the lateral continuity of stratigraphic units across the area.

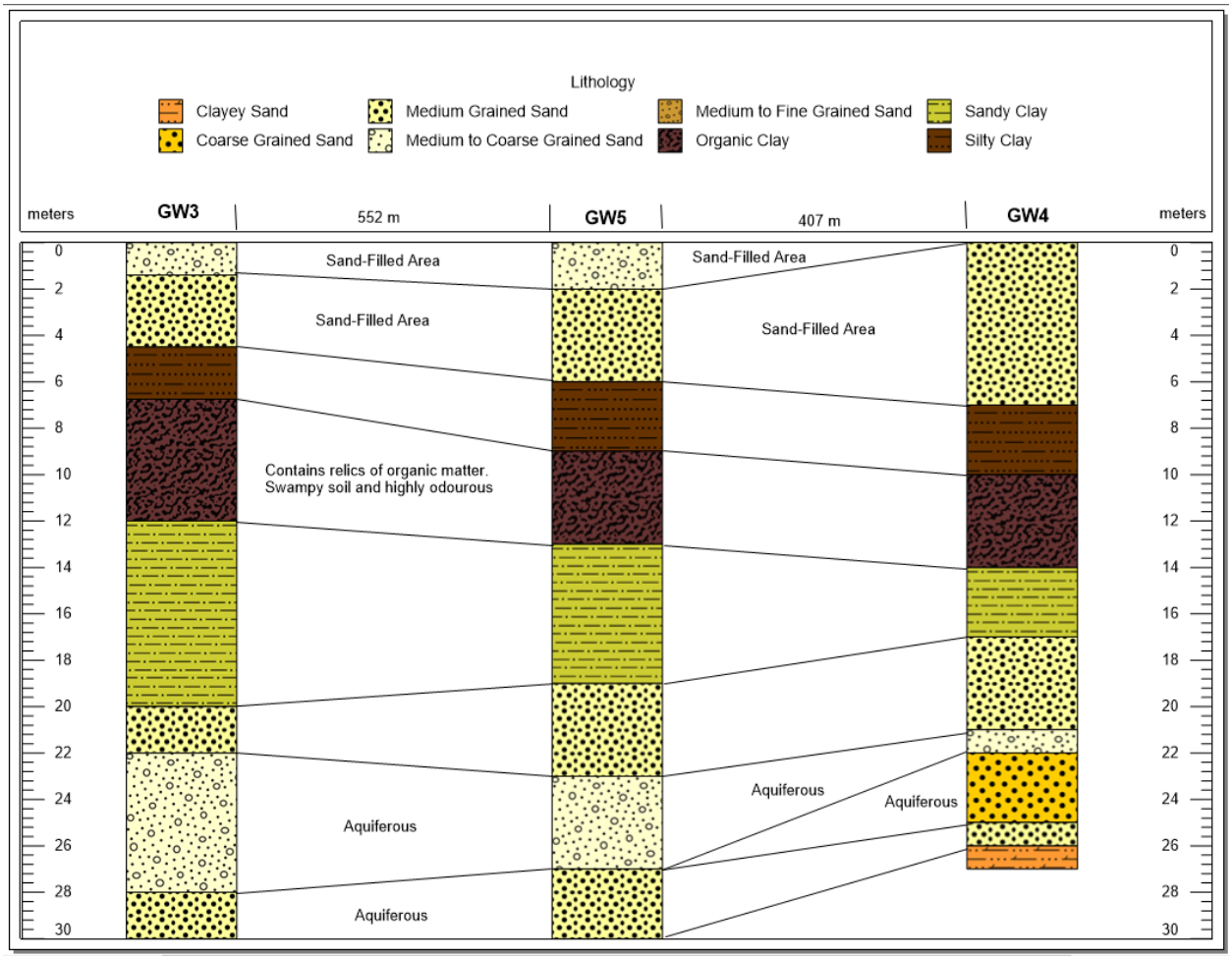



Figure 3.1: Lithologies encountered and correlated across the project site

## 3.2 Groundwater Dynamics of the Study Area

The results obtained from borehole ground elevations mapping, static water level mapping and reduced groundwater elevation determined from the difference between the ground elevation and the static water levels are presented in Table 3.1. The surface elevation across the area ranges from 4.50m to 6.50m above mean sea level. The topographic profile across the area is shallower towards the coastline (4.50m) and steeper inland away from the coastline (6.50m) (Fig. 3.2).

Static water level ranged from 3.12m to 4.14m above mean sea level (Fig. 3.3). The shallow water table makes it possible for potential contaminants from the surface to make their way into underground water resources.

Hydraulic head ranged from 1.20m to 3.40m (Fig. 3.4). Hydraulic head is higher towards the northwest and lowest towards the southern part of the study area (towards Bonny River). Groundwater flows from the northwestern part of the area towards the southeastern and southern part of the project site. Although the localized groundwater flow direction trends towards the Bonny River, over-exploitation of boreholes within the area can cause a reversal in groundwater movement within the area.

Table 3.1: Ground Elevation, static water level and reduced groundwater elevation for the study area

| ID | UTM Easting (m) | UTM Northing (m) | Ground Elevation (m) | Static Water Level (m) | Reduced Groundwater Elevation (m) |
|---|---|---|---|---|---|
| GW3 | 293715.00 | 516755.00 | 6.50 | 3.12 | 3.38 |
| GW4 | 294046.00 | 516188.00 | 4.50 | 3.42 | 1.08 |
| GW5 | 294242.00 | 516545.00 | 6.50 | 4.14 | 2.36 |


Figure 3.2: Ground surface elevation around project area

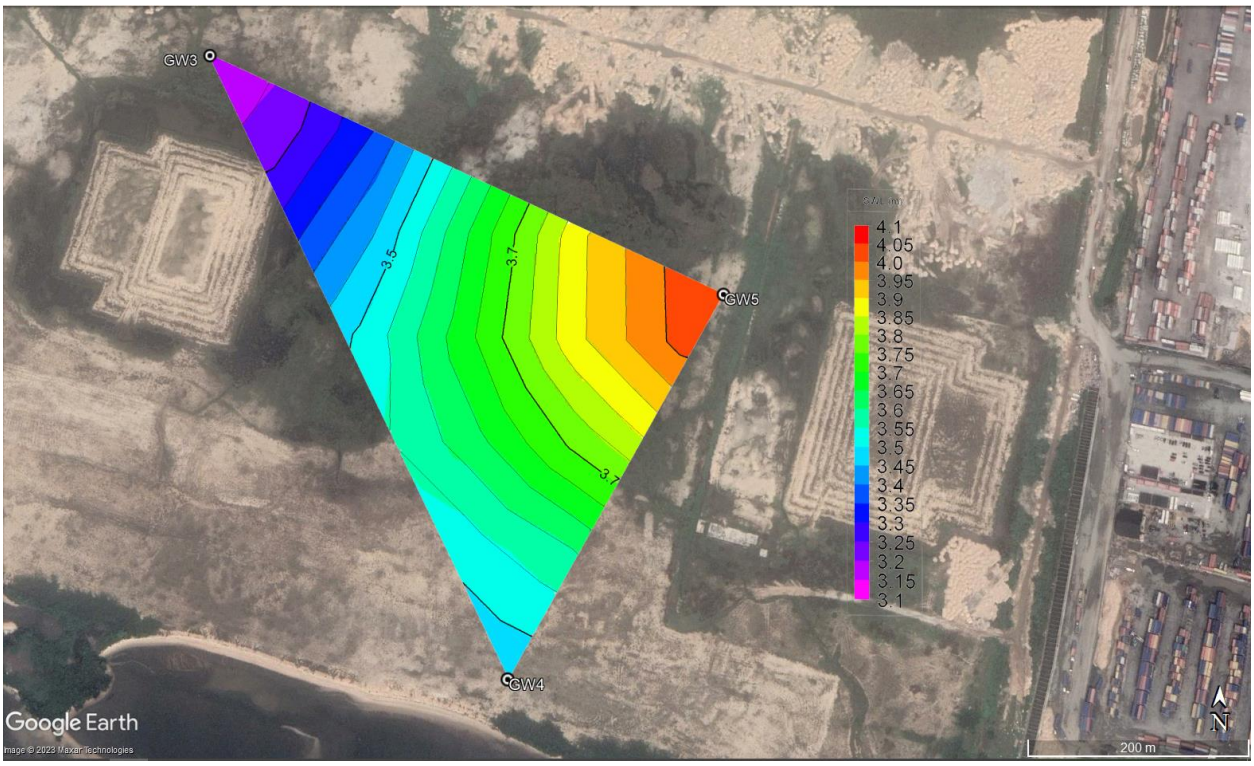



Figure 3.3: Map showing the depth to water table around project area

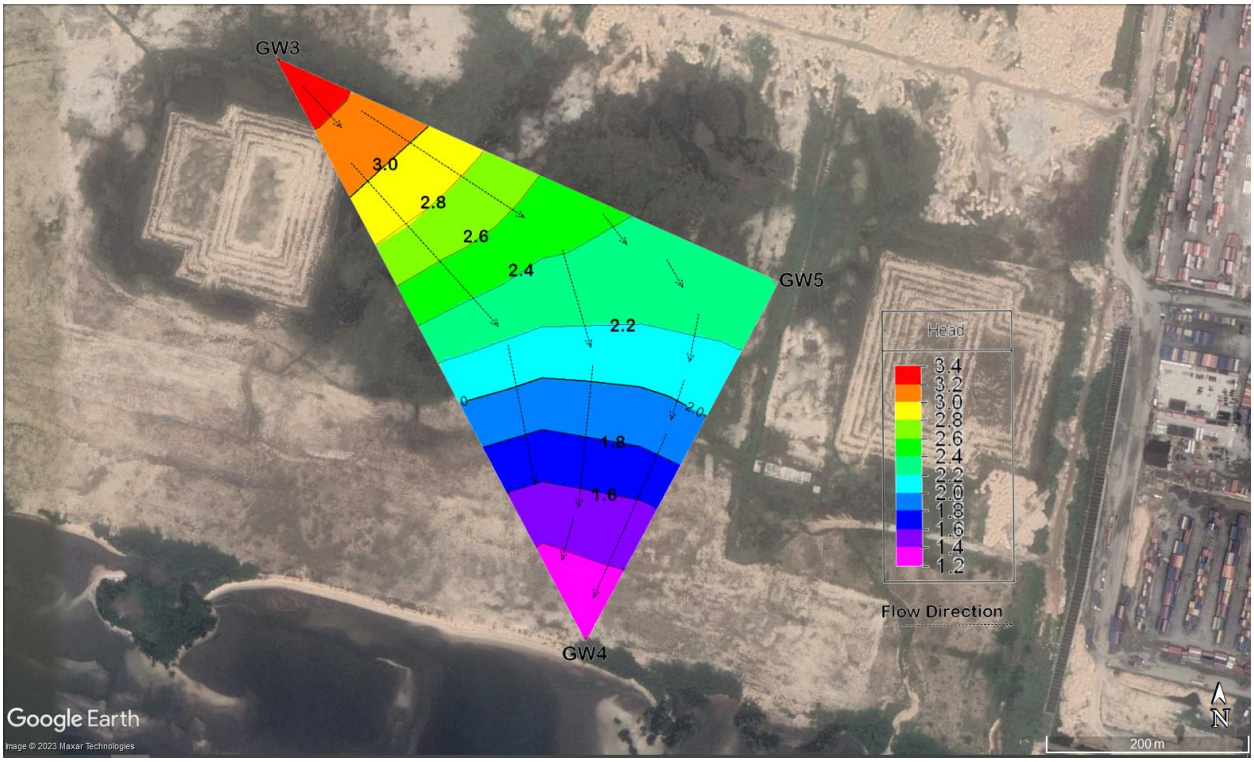



Figure 3.4: Reduced groundwater elevation map showing direction of groundwater flow around project area.

## 3.3 Hydraulic Characteristics of the Aquifer

Data obtained from hydraulic conductivity test data acquisition were modelled using mathematical empirical equations within AquiferTest software environment. The results of hydraulic conductivity are presented in Table 3.2. Three overdamped empirical models were utilized and includes; Cooper et al., (1967), Hvorslev (1951) and Bouwer and Rice (1976) empirical models. Both Cooper et al., (1967) and Hvorslev (1951) models are predominantly utilized for unconfined aquifers, whereas, Bouwer and Rice (1976) mathematical model is utilized for unconfined partially penetrating and fully penetrating aquiferous systems. Data logger results obtained from hydraulic conductivity test field investigation are presented in Appendix A. Empirical models utilized for predicting hydraulic conductivity are presented in Appendix B. Graphical plots for hydraulic conductivity analysis for GW3, GW4 and GW5 are presented in Figure 3.5, 3.6 and 3.7 respectively.

The results of hydraulic conductivity recorded in this study as presented in Table 3.2 shows that Hvorslev (1951) model slightly overestimates hydraulic conductivity when compared to the other models. Based on Cooper et al., (1967) empirical model, hydraulic conductivity values range from $5.08 \times 10^{-6}$ to $6.35 \times 10^{-5}$ m/sec across the site. Hydraulic conductivity obtained using Hvorslev (1951) empirical model ranged from $5.39 \times 10^{-5}$ m/sec to $9.28 \times 10^{-5}$ m/sec across the site. Results of Bouwer and Rice (1976) ranged from $2.64 \times 10^{-5}$ to $5.12 \times 10^{-5}$ m/sec. Hydraulic conductivity recorded is highest in GW4 and lowest in GW5. On average, hydraulic conductivity across the site ranged from $4.96 \times 10^{-5}$ to $6.49 \times 10^{-5}$ m/s. This result suggests groundwater movement ranges between 4.42 m/day to 5.60 m/day. Hence, any potential contaminant dissolved in groundwater will travel a lateral distance ranging from 4.42 to 5.60 meters in a single day towards the south and southeastern part of the area.

Table 3.2: Results of hydraulic conductivity obtained from analysis of in-situ hydraulic conductivity test field investigation

| Borehole ID | Hydraulic Conductivity (m/sec) | | | m/sec | m/day |
|---|---|---|---|---|---|
| | Cooper et al., (1967) | Hvorslev (1951) | Bouwer and Rice (1976) | Average | Average |
| GW3 | $5.97 \times 10^{-5}$ | $6.33 \times 10^{-5}$ | $3.06 \times 10^{-5}$ | $5.12 \times 10^{-5}$ | 4.424 |
| GW4 | $5.08 \times 10^{-6}$ | $9.28 \times 10^{-5}$ | $5.12 \times 10^{-5}$ | $6.49 \times 10^{-5}$ | 5.607 |
| GW5 | $6.35 \times 10^{-5}$ | $5.29 \times 10^{-5}$ | $2.64 \times 10^{-5}$ | $4.96 \times 10^{-5}$ | 4.285 |

Software utilized for mathematical modelling: Waterloo Hydrogeologic AquiferTest Ver. 2016.1

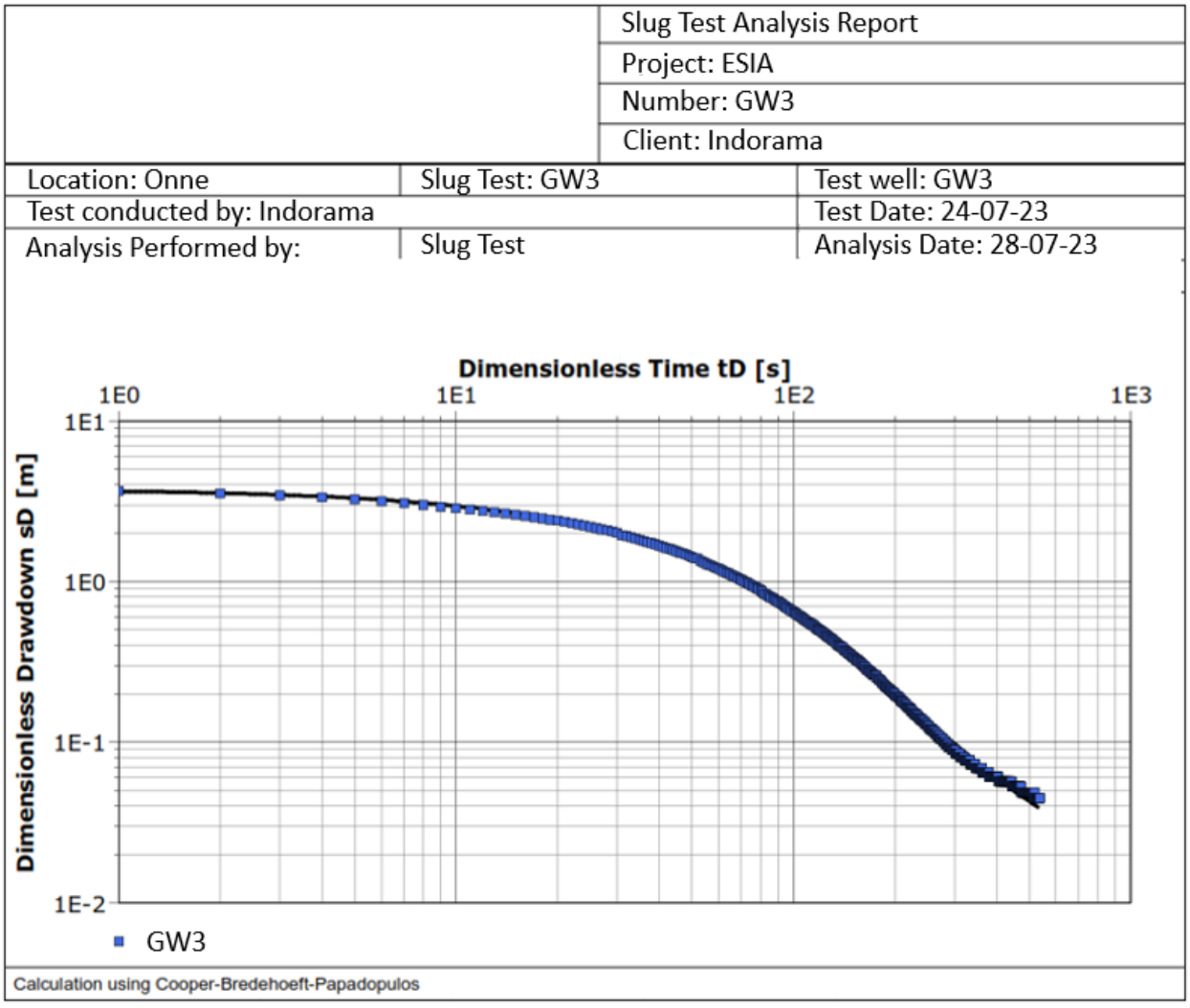



Figure 3.5: A graph of drawdown against time analysis for hydraulic conductivity determination for in-situ hydraulic conductivity test field investigation using Cooper-Bredehoeft-Papadopulos model for GW3 borehole

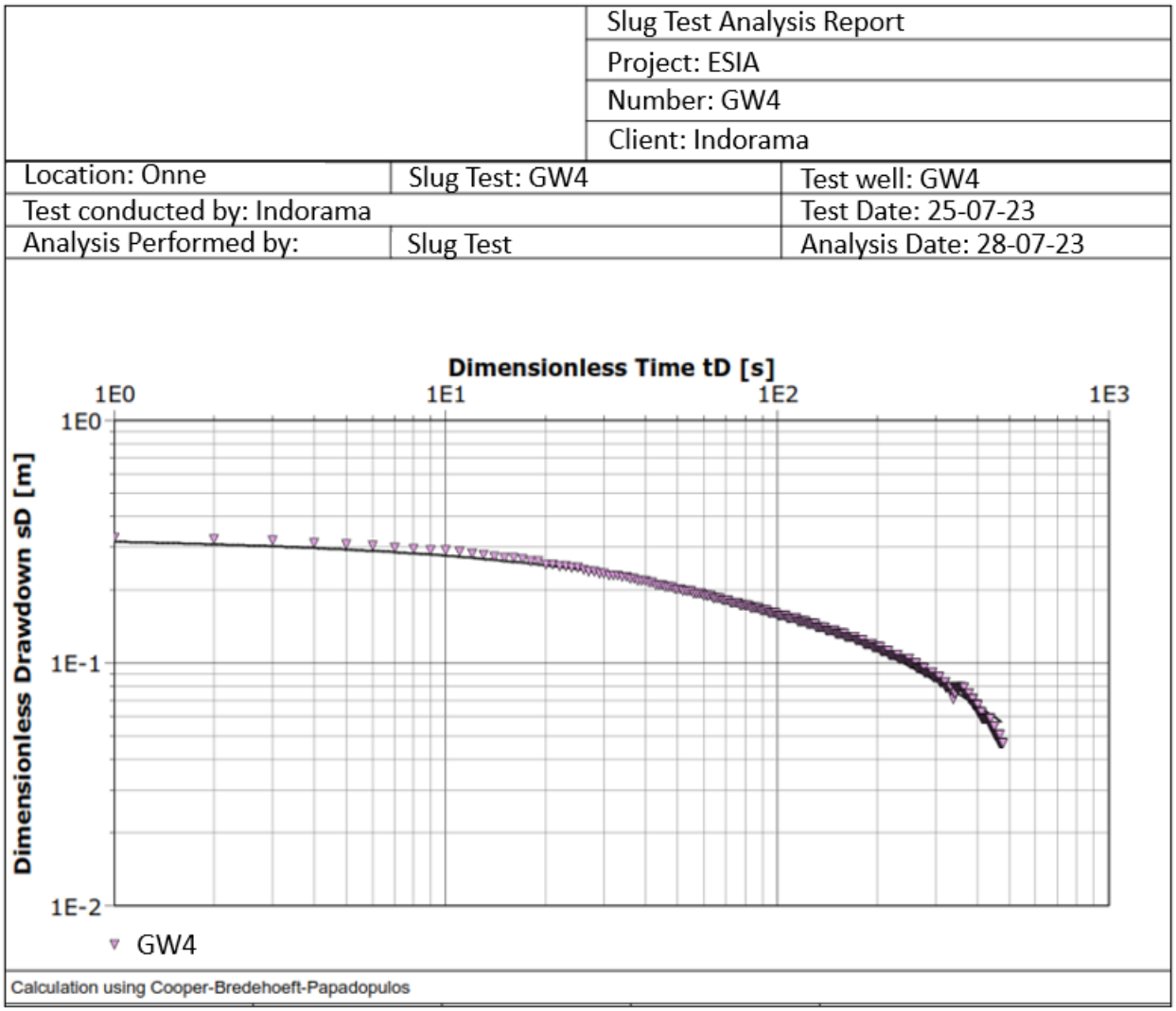
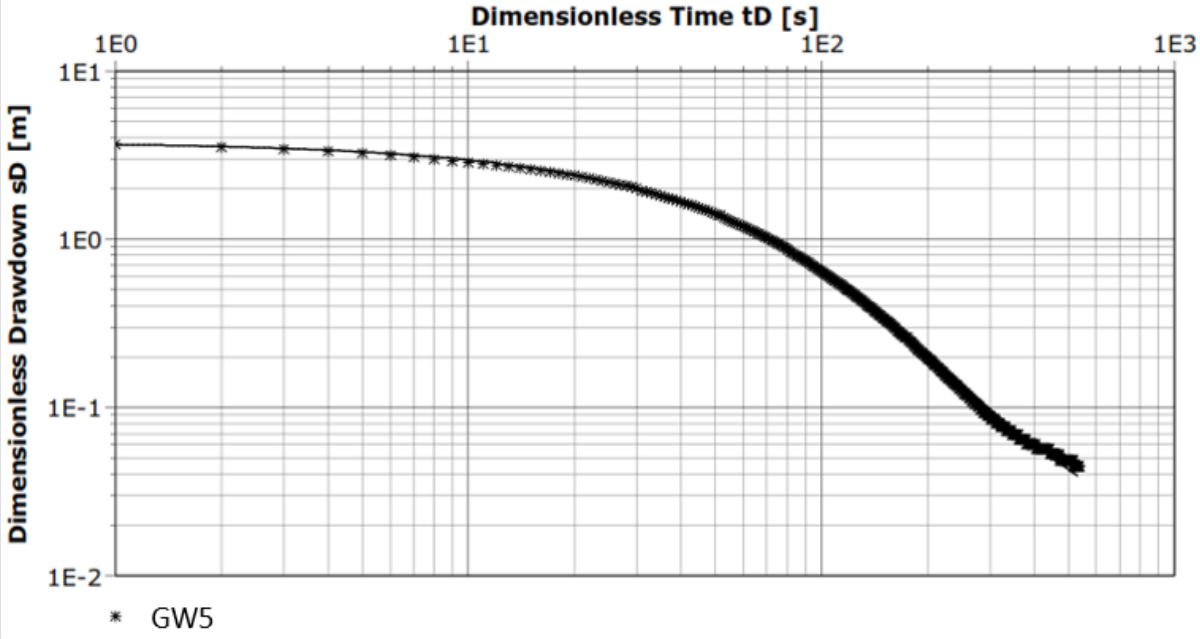



Figure 3.6: A graph of drawdown against time analysis for hydraulic conductivity determination for in-situ hydraulic conductivity test field investigation using Cooper-Bredehoeft-Papadopulos model for GW4 borehole

| | | |
|---|---|---|
| | | Slug Test Analysis Report |
| | | Project: ESIA |
| | | Number: GW5 |
| | | Client: Indorama |
| Location: Onne | Slug Test: GW5 | Test well: GW5 |
| Test conducted by: Indorama | | Test Date: 26-07-23 |
| Analysis Performed by: | Slug Test | Analysis Date: 28-07-23 |




Calculation using Cooper-Bredehoeft-Papadopulos

Figure 3.7: A graph of drawdown against time analysis for hydraulic conductivity determination for in-situ hydraulic conductivity test field investigation using Cooper-Bredehoeft-Papadopulos model for GW5 borehole

### 3.4 Groundwater Quality Indices

The results of groundwater quality analysis for four (4) groundwater samples; GW3, GW4, GW5 and GWC (control site borehole 2.0km away) obtained from boreholes within the project area are presented in Table 3.3 and Figures 3.8 to 3.14. Groundwater pH ranges between 6.90 to 7.70, indicating slightly acidic to slightly basic conditions. The pH recorded at the control site reveals acidic conditions which exceeds NSDWQ (2015) regulatory limit. Total dissolved solids and electrical conductivity ranges from 1,460 to 6,320 mg/L and between 780 to 3,480 µs/cm. These values significantly exceed those recorded at the control site and also exceeds NSDWQ regulatory limits of 1000 mg/L and 500 µs/cm respectively. The high concentrations of TDS and EC suggests the likelihood of saline intrusion into coastal freshwater aquifer systems. Salinity and chloride levels are significantly very high in all three boreholes ranging between 1,482 ppm to 10,062 ppm and between 230 to 702 mg/L. The presence of salt in groundwater was clearly obvious from the saline taste of groundwater obtained from GW4. Chloride levels exceeds NSDWQ standard of 250 mg/L in GW3 and GW4. Meanwhile, chloride (14 mg/L) and salinity levels ($3x10^{-8}$ ppm) recorded from the control site were typically very low. Phosphate and Nitrate levels are significantly very low and all within regulatory limits. Sulphate is very high in GW4 water sample close to the shoreline. Ammonia, urea and oil and grease are very low and below the instrument detectable limit of <0.01 mg/L. Apart from manganese with a concentration of 0.24 mg/L in GW4 that exceeds NSDWQ limit of 0.20 mg/L, all other heavy metals recorded at monitoring boreholes and at the control site (Silver, Cobalt, Manganese, Vanadium, Nickel, Chromium, Iron, Lead, Copper, Zinc, Mercury, Cadmium and Arsenic) were either below the detection limits or had concentrations within regulatory guidelines. The low concentration of heavy metals in groundwater samples suggest little or no anthropogenic impacts on the groundwater resources in the area. The major impact identified on groundwater quality in the area is salinity. This impact is more significant at GW4 borehole located 25m away from the coastline. Although GW3 and GW5 located inland had no saline taste, the high TDS, EC and Chloride levels recorded suggests they are most likely to be impacted from moderate to high exploitation rates.

Table 3.3: Results of groundwater quality assessment for the Wet Season (July-Aug., 2023)

| S/N | Parameter(s) | GW3 | GW4 | GW5 | GWC | NSDWQ (2015) |
|---|---|---|---|---|---|---|
| 1 | pH | 7.70 | 7.20 | 6.90 | 6.30 | 6.5 – 8.5 |
| 2 | Temperature ($^oC$) | 27.7 | 27.8 | 27.6 | 26.8 | Ambient |
| 3 | Appearance | Clear | Clear | Clear | Clear | |
| 4 | Elec. Conductivity (µs/cm) | 2580 | 6320 | 1420 | 63 | 1000 |
| 5 | TDS (mg/l) | 1420 | 3480 | 780 | 38 | 500 |
| 6 | Turbidity (NTU) | <1.0 | <1.0 | <1.0 | <1.0 | 5 |
| 7 | TSS (mg/l) | <1.0 | <1.0 | <1.0 | <1.0 | |
| 8 | Salinity (ppm) | 1,897 | 10,062 | 1,482 | $3x10^{-8}$ | |
| 9 | Total Hardness (mg/l) | 208.0 | 380.0 | 130.0 | 12.0 | 150 |
| 10 | Alkalinity (mg/l) | 20.0 | 24.0 | 16.0 | 8.0 | |
| 11 | Chloride, $Cl^-$ (mg/l) | 380.0 | 702.0 | 230.0 | 14.0 | 250 |
| 12 | Sulphate, $SO_4^{2-}$ (mg/l) | 25.0 | 100.0 | 20.0 | 2.0 | 100 |
| 13 | Nitrate, $NO_3^-$ (mg/l) | 1.28 | 1.67 | 1.13 | 0.29 | 50 |
| 14 | Phosphate, $PO_4^{3-}$ (mg/l) | 1.20 | 1.45 | 0.75 | 0.13 | |
| 15 | Cyanide (mg/l) | <0.001 | <0.001 | <0.001 | <0.001 | 0.01 |
| 16 | Ammonia (mg/l) | <0.10 | <0.10 | <0.10 | <0.10 | |
| 17 | Urea | <0.10 | <0.10 | <0.10 | <0.10 | |
| 18 | Total Nitrogen (mg/l) | 0.37 | 0.48 | 0.32 | <0.20 | |
| 19 | Oil & Grease (mg/l) | <1.00 | <1.00 | <1.00 | <1.00 | |
| 20 | DO (mg/l) | 5.20 | 4.90 | 5.10 | 5.60 | |
| 21 | $BOD_5$ (mg/l) | 2.00 | 1.60 | 1.40 | <1.00 | |
| 22 | COD (mg/l) | 3.40 | 2.50 | 2.40 | 2.00 | |
| 23 | Sodium, Na (mg/l) | 145.00 | 278.00 | 89.80 | 6.31 | 200 |
| 24 | Potassium, K (mg/l) | 52.80 | 109.70 | 31.80 | 2.56 | |
| 25 | Calcium, Ca (mg/l) | 56.80 | 108.20 | 34.60 | 3.50 | |
| 26 | Magnesium, Mg (mg/l) | 13.70 | 24.60 | 9.20 | 0.58 | 20 |
| 27 | Silver, Ag (mg/l) | <0.001 | <0.001 | <0.001 | <0.001 | |
| 28 | Cobalt, Co (mg/l) | <0.001 | <0.001 | <0.001 | <0.001 | |
| 29 | Manganese, Mn (mg/l) | 0.182 | 0.243 | 0.157 | 0.101 | 0.20 |
| 30 | Vanadium, V (mg/l) | <0.001 | <0.001 | <0.001 | <0.001 | |
| 31 | Nickel, Ni (mg/l) | <0.001 | <0.001 | <0.001 | <0.001 | 0.02 |
| 32 | Chromium, Cr (mg/l) | 0.025 | 0.038 | 0.017 | 0.016 | 0.05 |
| 33 | Iron, Fe (mg/l) | 0.246 | 0.295 | 0.119 | 0.137 | 0.3 |
| 34 | Lead, Pb (mg/l) | <0.001 | <0.001 | <0.001 | <0.001 | 0.01 |
| 35 | Copper, Cu (mg/l) | 0.084 | 0.097 | 0.065 | 0.092 | 1.0 |
| 36 | Zinc, Zn (mg/l) | 0.078 | 0.085 | 0.054 | 0.017 | 3.0 |
| 37 | Mercury, Hg (mg/l) | <0.001 | <0.001 | <0.001 | <0.001 | 0.001 |
| 38 | Cadmium, Cd (mg/l) | <0.001 | <0.001 | <0.001 | <0.001 | 0.003 |
| 39 | Arsenic, As (mg/l) | <0.001 | <0.001 | <0.001 | <0.001 | 0.01 |
| 40 | HUB (CFU/ml) x $10^2$ | 0.20 | 0.40 | 0.10 | NIL | |
| 41 | HUF (CFU/ml) x $10^2$ | NIL | NIL | NIL | NIL | |
| 42 | THB (CFU/ml) x $10^2$ | 1.40 | 1.70 | 1.10 | 1.30 | |
| 43 | THF (CFU/ml) x $10^2$ | NIL | NIL | NIL | NIL | |
| 44 | SRB (MPN/100ml) | 0.00 | 0.00 | 0.00 | 0.00 | |
| 45 | Fecal Coliform (MPN/100ml) | 10.00 | 26.00 | 18.00 | 4.00 | |

## 3.5 Groundwater Hydrogeochemistry

The hydrogeochemical analysis of groundwater provides valuable information about the processes that control the water's chemical characteristics, as well as its interaction with the surrounding geologic formations and environmental factors. Piper plot in Figure 3.8 reveals Na-Cl water type for all groundwater boreholes in the area. This suggests that all boreholes (GW3, GW4, GW5, GWC) are connected to the same aquifer with significant salinity hazards.

Stiff diagrams also reveal similarity in shape for all groundwater boreholes (Figure 3.9, 3.10, 3.11, 3.12). The stiff diagram shows predominance of sodium as the major anion and chloride as the major cation, confirming the water class is Na-Cl. This water class is highly influenced by saline water intrusion into coastal aquifers.

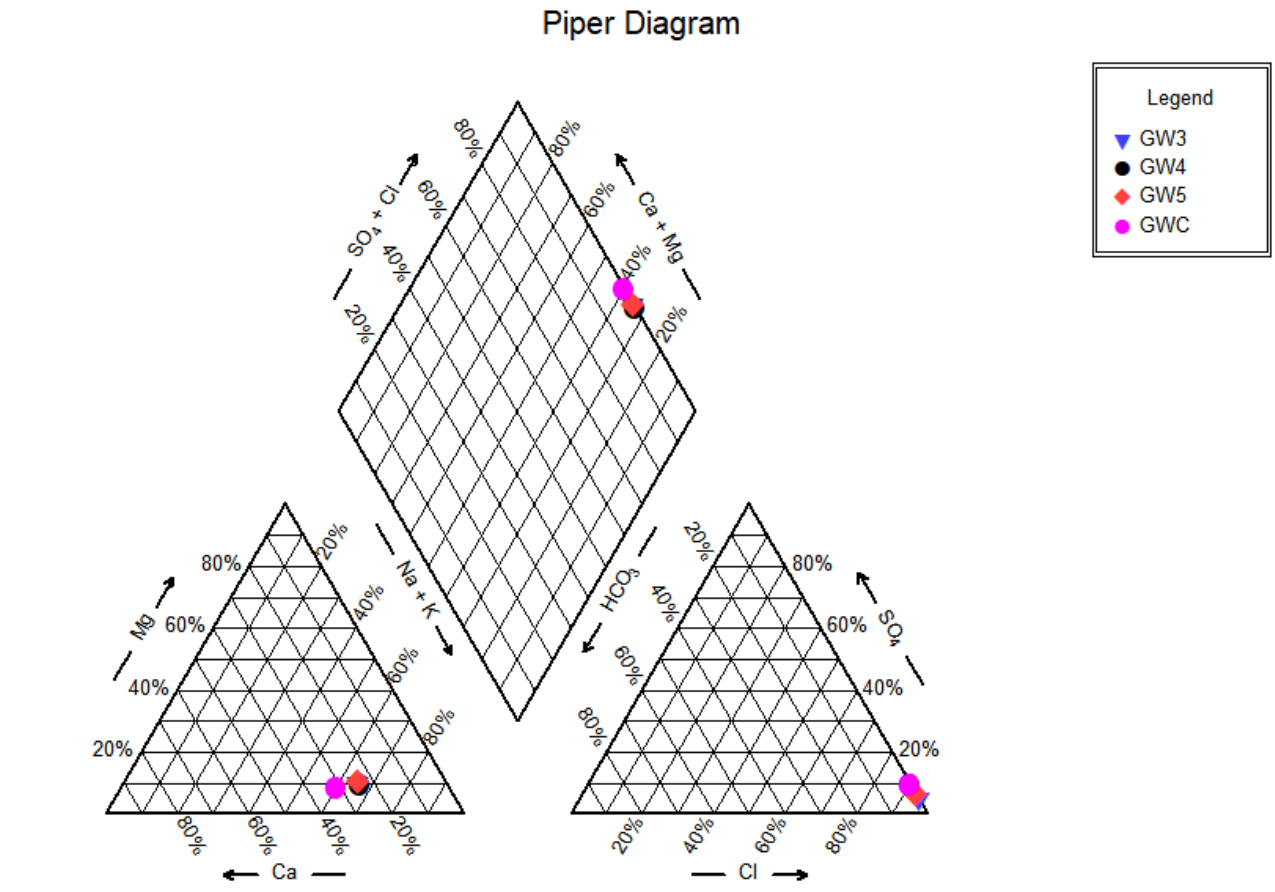



Figure 3.8: Piper diagram for groundwater samples obtained from the study area and control site

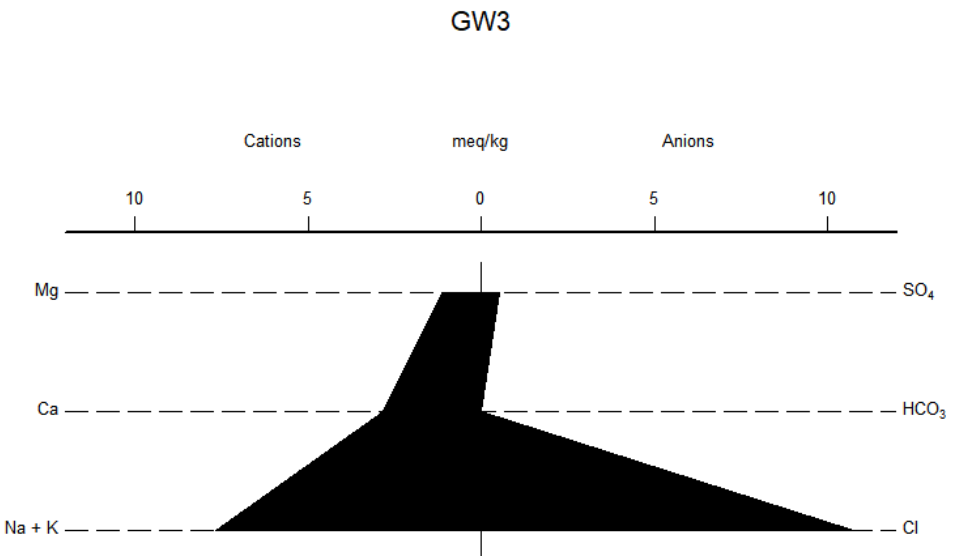



Figure 3.9: Stiff diagram for groundwater sample obtained from borehole GW3

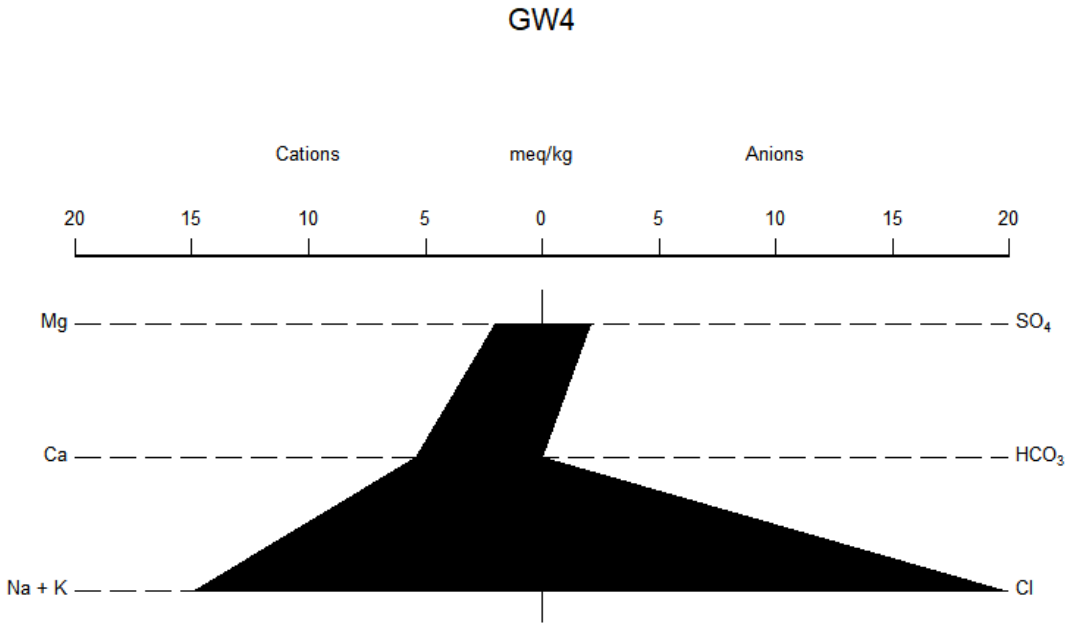



Figure 3.10: Stiff diagram for groundwater sample obtained from borehole GW4

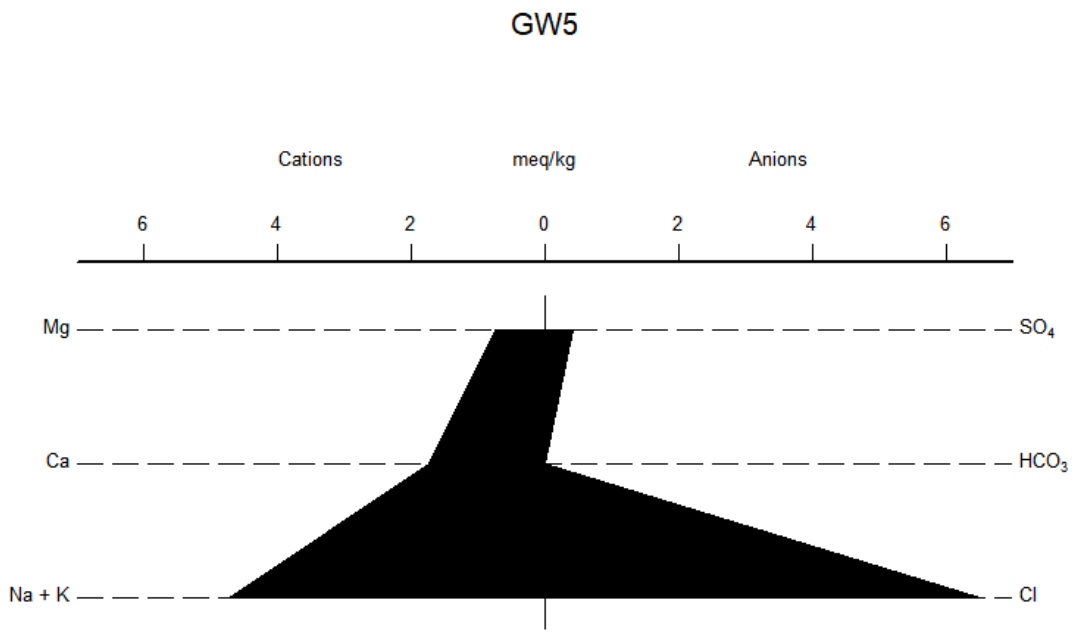



Figure 3.11: Stiff diagram for groundwater sample obtained from borehole GW5

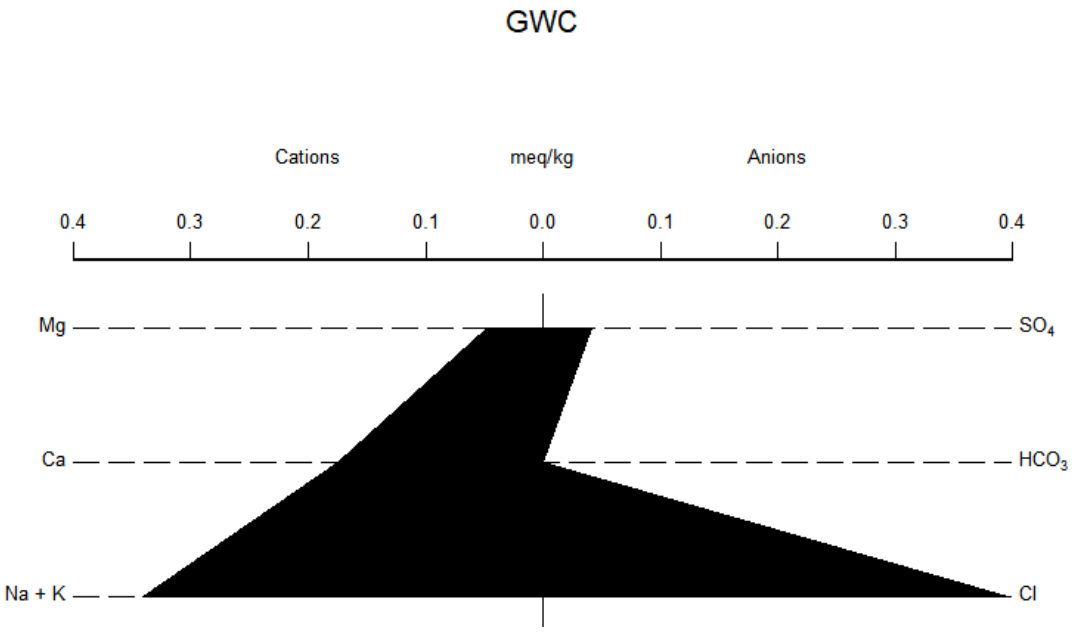



Figure 3.12: Stiff diagram for groundwater sample obtained from borehole GWC

## 4.0 CONCLUSIONS AND RECOMMENDATIONS

The project site's groundwater hydrochemistry study identifies the prevalence of Na-Cl water class, influenced by the Bonny River. High levels of dissolved solids, electrical conductivity, sodium, chloride, and salinity confirm saline water intrusion into shallow coastal systems (30.0 meters deep boreholes). Saltwater intrusion has severely compromised coastal aquifer quality. This is evident in GW4, just 25 meters from the coast, where saline taste is noticeable.

The geological composition of the area consists of an upper sandfill layer, an intermediate clayey-silty layer, and a lower aquiferous layer. The intermediate clay acts as a barrier against contaminant movement, while a thick clay layer (7.0 meters) hinders rapid rainfall recharge.

Aquifer replenishment mainly stems from saline riverine systems like Imo River and creeks. Water pH remains acceptable and lowered heavy metals content and lack of hydrocarbon contaminants in groundwater suggest minor anthropogenic influence.

Groundwater depth is shallow (<5.0 meters), flowing predominantly from northwest to south/southeast, with a migration rate of 4.42 to 5.60 meters/day. Construction of boreholes should exceed 30.0 meters and be positioned >500 meters inland to counter saline intrusion. Multiple boreholes of varying depths (30-100 meters) and spacing (>200 meters) and adequate management of abstraction rates will prevent interference and saline incursion.

Despite the localized flow direction, continuous inland borehole exploitation could trigger flow pattern reversals, necessitating careful abstraction planning. The substantial intermediate clay layer highlights limited rainfall recharge compared to lateral recharge from surrounding rivers, emphasizing the need for precaution against saline intrusion.

Hence it is recommended that routine groundwater management, including monitoring, is crucial to detect potential contaminants, particularly saline intrusion, safeguarding groundwater quality.

**APPENDIX A:** Results of Hydraulic Conductivity test conducted in-situ using a data logger

GW3 recovery data sheet from hydraulic conductivity test analysis using a data logger

| Date | Time of Day | Time (s) | Water Level (m) | Unit | Temp (°C) |
|---|---|---|---|---|---|
| 24.07.2023 | 16:56:02 | 0 | 3.9413 | m | 28.3 |
| 24.07.2023 | 16:56:03 | 1 | 3.8191 | m | 28.3 |
| 24.07.2023 | 16:56:04 | 2 | 3.7036 | m | 28.2 |
| 24.07.2023 | 16:56:05 | 3 | 3.5978 | m | 28.2 |
| 24.07.2023 | 16:56:06 | 4 | 3.5001 | m | 28.3 |
| 24.07.2023 | 16:56:07 | 5 | 3.4065 | m | 28.3 |
| 24.07.2023 | 16:56:08 | 6 | 3.3209 | m | 28.3 |
| 24.07.2023 | 16:56:09 | 7 | 3.2395 | m | 28.3 |
| 24.07.2023 | 16:56:10 | 8 | 3.1663 | m | 28.3 |
| 24.07.2023 | 16:56:11 | 9 | 3.093 | m | 28.3 |
| 24.07.2023 | 16:56:12 | 10 | 3.0321 | m | 28.3 |
| 24.07.2023 | 16:56:13 | 11 | 2.9751 | m | 28.3 |
| 24.07.2023 | 16:56:14 | 12 | 2.9222 | m | 28.3 |
| 24.07.2023 | 16:56:15 | 13 | 2.8733 | m | 28.3 |
| 24.07.2023 | 16:56:16 | 14 | 2.8285 | m | 28.3 |
| 24.07.2023 | 16:56:17 | 15 | 2.7797 | m | 28.3 |
| 24.07.2023 | 16:56:18 | 16 | 2.735 | m | 28.3 |
| 24.07.2023 | 16:56:19 | 17 | 2.6903 | m | 28.3 |
| 24.07.2023 | 16:56:20 | 18 | 2.6455 | m | 28.3 |
| 24.07.2023 | 16:56:21 | 19 | 2.6007 | m | 28.3 |
| 24.07.2023 | 16:56:22 | 20 | 2.5601 | m | 28.3 |
| 24.07.2023 | 16:56:23 | 21 | 2.5194 | m | 28.3 |
| 24.07.2023 | 16:56:24 | 22 | 2.4787 | m | 28.3 |
| 24.07.2023 | 16:56:25 | 23 | 2.438 | m | 28.3 |
| 24.07.2023 | 16:56:26 | 24 | 2.3974 | m | 28.3 |
| 24.07.2023 | 16:56:27 | 25 | 2.3608 | m | 28.3 |
| 24.07.2023 | 16:56:28 | 26 | 2.3242 | m | 28.3 |
| 24.07.2023 | 16:56:29 | 27 | 2.2876 | m | 28.3 |
| 24.07.2023 | 16:56:30 | 28 | 2.251 | m | 28.3 |
| 24.07.2023 | 16:56:31 | 29 | 2.2184 | m | 28.3 |
| 24.07.2023 | 16:56:32 | 30 | 2.186 | m | 28.3 |
| 24.07.2023 | 16:56:33 | 31 | 2.1168 | m | 28.3 |
| 24.07.2023 | 16:56:34 | 32 | 2.0843 | m | 28.3 |
| 24.07.2023 | 16:56:35 | 33 | 2.0518 | m | 28.3 |
| 24.07.2023 | 16:56:36 | 34 | 2.0233 | m | 28.3 |
| 24.07.2023 | 16:56:37 | 35 | 1.9908 | m | 28.3 |
| 24.07.2023 | 16:56:38 | 36 | 1.9613 | m | 28.2 |

| | | | | | |
|---|---|---|---|---|---|
| 24.07.2023 | 16:56:39 | 37 | 1.9287 | m | 28.2 |
| 24.07.2023 | 16:56:40 | 38 | 1.9003 | m | 28.2 |
| 24.07.2023 | 16:56:41 | 39 | 1.8719 | m | 28.2 |
| 24.07.2023 | 16:56:42 | 40 | 1.8435 | m | 28.2 |
| 24.07.2023 | 16:56:43 | 41 | 1.819 | m | 28.2 |
| 24.07.2023 | 16:56:44 | 42 | 1.7907 | m | 28.2 |
| 24.07.2023 | 16:56:45 | 43 | 1.7662 | m | 28.2 |
| 24.07.2023 | 16:56:46 | 44 | 1.7377 | m | 28.2 |
| 24.07.2023 | 16:56:47 | 45 | 1.7134 | m | 28.2 |
| 24.07.2023 | 16:56:48 | 46 | 1.689 | m | 28.2 |
| 24.07.2023 | 16:56:49 | 47 | 1.6647 | m | 28.2 |
| 24.07.2023 | 16:56:50 | 48 | 1.6403 | m | 28.2 |
| 24.07.2023 | 16:56:51 | 49 | 1.6159 | m | 28.2 |
| 24.07.2023 | 16:56:52 | 50 | 1.5915 | m | 28.2 |
| 24.07.2023 | 16:56:53 | 51 | 1.5671 | m | 28.2 |
| 24.07.2023 | 16:56:54 | 52 | 1.5671 | m | 28.2 |
| 24.07.2023 | 16:56:55 | 53 | 1.5103 | m | 28.2 |
| 24.07.2023 | 16:56:56 | 54 | 1.4859 | m | 28.2 |
| 24.07.2023 | 16:56:57 | 55 | 1.4655 | m | 28.2 |
| 24.07.2023 | 16:56:58 | 56 | 1.4453 | m | 28.2 |
| 24.07.2023 | 16:56:59 | 57 | 1.4249 | m | 28.2 |
| 24.07.2023 | 16:57:00 | 58 | 1.4047 | m | 28.2 |
| 24.07.2023 | 16:57:01 | 59 | 1.3843 | m | 28.2 |
| 24.07.2023 | 16:57:02 | 60 | 1.3681 | m | 28.2 |
| 24.07.2023 | 16:57:03 | 61 | 1.3478 | m | 28.2 |
| 24.07.2023 | 16:57:04 | 62 | 1.3315 | m | 28.2 |
| 24.07.2023 | 16:57:05 | 63 | 1.3112 | m | 28.2 |
| 24.07.2023 | 16:57:06 | 64 | 1.295 | m | 28.2 |
| 24.07.2023 | 16:57:07 | 65 | 1.2747 | m | 28.2 |
| 24.07.2023 | 16:57:08 | 66 | 1.2585 | m | 28.2 |
| 24.07.2023 | 16:57:09 | 67 | 1.2422 | m | 28.2 |
| 24.07.2023 | 16:57:10 | 68 | 1.2259 | m | 28.2 |
| 24.07.2023 | 16:57:11 | 69 | 1.2097 | m | 28.2 |
| 24.07.2023 | 16:57:12 | 70 | 1.1935 | m | 28.2 |
| 24.07.2023 | 16:57:13 | 71 | 1.1772 | m | 28.2 |
| 24.07.2023 | 16:57:14 | 72 | 1.161 | m | 28.2 |
| 24.07.2023 | 16:57:15 | 73 | 1.1488 | m | 28.2 |
| 24.07.2023 | 16:57:16 | 74 | 1.1325 | m | 28.2 |
| 24.07.2023 | 16:57:17 | 75 | 1.1204 | m | 28.2 |
| 24.07.2023 | 16:57:18 | 76 | 1.1041 | m | 28.3 |
| 24.07.2023 | 16:57:19 | 77 | 1.0919 | m | 28.3 |
| 24.07.2023 | 16:57:20 | 78 | 1.0757 | m | 28.3 |
| 24.07.2023 | 16:57:21 | 79 | 1.0635 | m | 28.3 |

| | | | | | |
|---|---|---|---|---|---|
| 24.07.2023 | 16:57:22 | 80 | 1.0513 | m | 28.3 |
| 24.07.2023 | 16:57:23 | 81 | 1.0351 | m | 28.3 |
| 24.07.2023 | 16:57:24 | 82 | 1.0107 | m | 28.3 |
| 24.07.2023 | 16:57:25 | 83 | 0.9985 | m | 28.3 |
| 24.07.2023 | 16:57:26 | 84 | 0.9864 | m | 28.3 |
| 24.07.2023 | 16:57:27 | 85 | 0.9742 | m | 28.3 |
| 24.07.2023 | 16:57:28 | 86 | 0.966 | m | 28.3 |
| 24.07.2023 | 16:57:29 | 87 | 0.9538 | m | 28.3 |
| 24.07.2023 | 16:57:30 | 88 | 0.9417 | m | 28.3 |
| 24.07.2023 | 16:57:31 | 89 | 0.9295 | m | 28.3 |
| 24.07.2023 | 16:57:32 | 90 | 0.9214 | m | 28.3 |
| 24.07.2023 | 16:57:33 | 91 | 0.9086 | m | 28.2 |
| 24.07.2023 | 16:57:34 | 92 | 0.9005 | m | 28.2 |
| 24.07.2023 | 16:57:35 | 93 | 0.8883 | m | 28.2 |
| 24.07.2023 | 16:57:36 | 94 | 0.8761 | m | 28.2 |
| 24.07.2023 | 16:57:37 | 95 | 0.864 | m | 28.2 |
| 24.07.2023 | 16:57:38 | 96 | 0.8558 | m | 28.2 |
| 24.07.2023 | 16:57:39 | 97 | 0.8436 | m | 28.2 |
| 24.07.2023 | 16:57:40 | 98 | 0.8355 | m | 28.2 |
| 24.07.2023 | 16:57:41 | 99 | 0.8274 | m | 28.2 |
| 24.07.2023 | 16:57:42 | 100 | 0.8193 | m | 28.2 |
| 24.07.2023 | 16:57:43 | 101 | 0.8071 | m | 28.2 |
| 24.07.2023 | 16:57:44 | 102 | 0.799 | m | 28.2 |
| 24.07.2023 | 16:57:45 | 103 | 0.7909 | m | 28.2 |
| 24.07.2023 | 16:57:46 | 104 | 0.7828 | m | 28.2 |
| 24.07.2023 | 16:57:47 | 105 | 0.7746 | m | 28.2 |
| 24.07.2023 | 16:57:48 | 106 | 0.7665 | m | 28.2 |
| 24.07.2023 | 16:57:49 | 107 | 0.7585 | m | 28.2 |
| 24.07.2023 | 16:57:50 | 108 | 0.7503 | m | 28.2 |
| 24.07.2023 | 16:57:51 | 109 | 0.7422 | m | 28.2 |
| 24.07.2023 | 16:57:52 | 110 | 0.734 | m | 28.2 |
| 24.07.2023 | 16:57:53 | 111 | 0.7259 | m | 28.2 |
| 24.07.2023 | 16:57:54 | 112 | 0.7179 | m | 28.2 |
| 24.07.2023 | 16:57:55 | 113 | 0.7097 | m | 28.2 |
| 24.07.2023 | 16:57:56 | 114 | 0.7097 | m | 28.2 |
| 24.07.2023 | 16:57:57 | 115 | 0.6975 | m | 28.2 |
| 24.07.2023 | 16:57:58 | 116 | 0.6894 | m | 28.2 |
| 24.07.2023 | 16:57:59 | 117 | 0.6813 | m | 28.2 |
| 24.07.2023 | 16:58:00 | 118 | 0.6773 | m | 28.2 |
| 24.07.2023 | 16:58:01 | 119 | 0.6691 | m | 28.2 |
| 24.07.2023 | 16:58:02 | 120 | 0.665 | m | 28.2 |
| 24.07.2023 | 16:58:03 | 121 | 0.661 | m | 28.2 |
| 24.07.2023 | 16:58:04 | 122 | 0.6529 | m | 28.2 |

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| 24.07.2023 | 16:58:05 | 123 | 0.6489 | m | 28.2 |
| 24.07.2023 | 16:58:06 | 124 | 0.6407 | m | 28.2 |
| 24.07.2023 | 16:58:07 | 125 | 0.6367 | m | 28.2 |
| 24.07.2023 | 16:58:08 | 126 | 0.6285 | m | 28.2 |
| 24.07.2023 | 16:58:09 | 127 | 0.6244 | m | 28.2 |
| 24.07.2023 | 16:58:10 | 128 | 0.6204 | m | 28.2 |
| 24.07.2023 | 16:58:11 | 129 | 0.6123 | m | 28.2 |
| 24.07.2023 | 16:58:12 | 130 | 0.6083 | m | 28.2 |
| 24.07.2023 | 16:58:13 | 131 | 0.6042 | m | 28.2 |
| 24.07.2023 | 16:58:14 | 132 | 0.5961 | m | 28.2 |
| 24.07.2023 | 16:58:15 | 133 | 0.592 | m | 28.2 |
| 24.07.2023 | 16:58:16 | 134 | 0.5839 | m | 28.2 |
| 24.07.2023 | 16:58:17 | 135 | 0.5758 | m | 28.2 |
| 24.07.2023 | 16:58:18 | 136 | 0.5717 | m | 28.2 |
| 24.07.2023 | 16:58:19 | 137 | 0.5677 | m | 28.2 |
| 24.07.2023 | 16:58:20 | 138 | 0.5636 | m | 28.2 |
| 24.07.2023 | 16:58:21 | 139 | 0.5595 | m | 28.2 |
| 24.07.2023 | 16:58:22 | 140 | 0.5555 | m | 28.2 |
| 24.07.2023 | 16:58:23 | 141 | 0.5474 | m | 28.2 |
| 24.07.2023 | 16:58:24 | 142 | 0.5433 | m | 28.2 |
| 24.07.2023 | 16:58:25 | 143 | 0.5393 | m | 28.2 |
| 24.07.2023 | 16:58:26 | 144 | 0.5352 | m | 28.2 |
| 24.07.2023 | 16:58:27 | 145 | 0.5311 | m | 28.2 |
| 24.07.2023 | 16:58:28 | 146 | 0.5271 | m | 28.2 |
| 24.07.2023 | 16:58:29 | 147 | 0.523 | m | 28.2 |
| 24.07.2023 | 16:58:30 | 148 | 0.5189 | m | 28.2 |
| 24.07.2023 | 16:58:31 | 149 | 0.515 | m | 28.2 |
| 24.07.2023 | 16:58:32 | 150 | 0.5109 | m | 28.2 |
| 24.07.2023 | 16:58:33 | 151 | 0.5068 | m | 28.2 |
| 24.07.2023 | 16:58:34 | 152 | 0.5027 | m | 28.2 |
| 24.07.2023 | 16:58:35 | 153 | 0.4987 | m | 28.2 |
| 24.07.2023 | 16:58:36 | 154 | 0.4946 | m | 28.2 |
| 24.07.2023 | 16:58:37 | 155 | 0.4946 | m | 28.2 |
| 24.07.2023 | 16:58:38 | 156 | 0.4905 | m | 28.2 |
| 24.07.2023 | 16:58:39 | 157 | 0.4865 | m | 28.2 |
| 24.07.2023 | 16:58:40 | 158 | 0.4825 | m | 28.2 |
| 24.07.2023 | 16:58:41 | 159 | 0.4784 | m | 28.2 |
| 24.07.2023 | 16:58:42 | 160 | 0.4744 | m | 28.2 |
| 24.07.2023 | 16:58:43 | 161 | 0.4703 | m | 28.2 |
| 24.07.2023 | 16:58:44 | 162 | 0.4662 | m | 28.2 |
| 24.07.2023 | 16:58:45 | 163 | 0.4662 | m | 28.2 |
| 24.07.2023 | 16:58:46 | 164 | 0.4581 | m | 28.2 |
| 24.07.2023 | 16:58:47 | 165 | 0.454 | m | 28.2 |

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| 24.07.2023 | 16:58:48 | 166 | 0.454 | m | 28.2 |
| 24.07.2023 | 16:58:49 | 167 | 0.45 | m | 28.2 |
| 24.07.2023 | 16:58:50 | 168 | 0.446 | m | 28.2 |
| 24.07.2023 | 16:58:51 | 169 | 0.4419 | m | 28.2 |
| 24.07.2023 | 16:58:52 | 170 | 0.4419 | m | 28.2 |
| 24.07.2023 | 16:58:53 | 171 | 0.4378 | m | 28.2 |
| 24.07.2023 | 16:58:54 | 172 | 0.4338 | m | 28.2 |
| 24.07.2023 | 16:58:55 | 173 | 0.4338 | m | 28.2 |
| 24.07.2023 | 16:58:56 | 174 | 0.4297 | m | 28.2 |
| 24.07.2023 | 16:58:57 | 175 | 0.4297 | m | 28.2 |
| 24.07.2023 | 16:58:58 | 176 | 0.4297 | m | 28.2 |
| 24.07.2023 | 16:58:59 | 177 | 0.4215 | m | 28.2 |
| 24.07.2023 | 16:59:00 | 178 | 0.4215 | m | 28.2 |
| 24.07.2023 | 16:59:01 | 179 | 0.4175 | m | 28.2 |
| 24.07.2023 | 16:59:02 | 180 | 0.4135 | m | 28.2 |
| 24.07.2023 | 16:59:03 | 181 | 0.4135 | m | 28.2 |
| 24.07.2023 | 16:59:04 | 182 | 0.4094 | m | 28.2 |
| 24.07.2023 | 16:59:05 | 183 | 0.4054 | m | 28.2 |
| 24.07.2023 | 16:59:06 | 184 | 0.4013 | m | 28.2 |
| 24.07.2023 | 16:59:07 | 185 | 0.4013 | m | 28.2 |
| 24.07.2023 | 16:59:08 | 186 | 0.3972 | m | 28.2 |
| 24.07.2023 | 16:59:09 | 187 | 0.3932 | m | 28.2 |
| 24.07.2023 | 16:59:10 | 188 | 0.3932 | m | 28.2 |
| 24.07.2023 | 16:59:11 | 189 | 0.3891 | m | 28.2 |
| 24.07.2023 | 16:59:12 | 190 | 0.3891 | m | 28.2 |
| 24.07.2023 | 16:59:13 | 191 | 0.385 | m | 28.2 |
| 24.07.2023 | 16:59:14 | 192 | 0.385 | m | 28.2 |
| 24.07.2023 | 16:59:15 | 193 | 0.381 | m | 28.2 |
| 24.07.2023 | 16:59:16 | 194 | 0.381 | m | 28.2 |
| 24.07.2023 | 16:59:17 | 195 | 0.377 | m | 28.2 |
| 24.07.2023 | 16:59:18 | 196 | 0.377 | m | 28.2 |
| 24.07.2023 | 16:59:19 | 197 | 0.3729 | m | 28.2 |
| 24.07.2023 | 16:59:20 | 198 | 0.3729 | m | 28.2 |
| 24.07.2023 | 16:59:21 | 199 | 0.3688 | m | 28.2 |
| 24.07.2023 | 16:59:22 | 200 | 0.3688 | m | 28.2 |
| 24.07.2023 | 16:59:23 | 201 | 0.3648 | m | 28.2 |
| 24.07.2023 | 16:59:24 | 202 | 0.3648 | m | 28.2 |
| 24.07.2023 | 16:59:25 | 203 | 0.3648 | m | 28.2 |
| 24.07.2023 | 16:59:26 | 204 | 0.3607 | m | 28.2 |
| 24.07.2023 | 16:59:27 | 205 | 0.3607 | m | 28.2 |
| 24.07.2023 | 16:59:28 | 206 | 0.3566 | m | 28.2 |
| 24.07.2023 | 16:59:29 | 207 | 0.3566 | m | 28.2 |
| 24.07.2023 | 16:59:30 | 208 | 0.3527 | m | 28.2 |

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| 24.07.2023 | 16:59:31 | 209 | 0.3527 | m | 28.2 |
| 24.07.2023 | 16:59:32 | 210 | 0.3486 | m | 28.2 |
| 24.07.2023 | 16:59:33 | 211 | 0.3486 | m | 28.2 |
| 24.07.2023 | 16:59:34 | 212 | 0.3486 | m | 28.2 |
| 24.07.2023 | 16:59:35 | 213 | 0.3445 | m | 28.2 |
| 24.07.2023 | 16:59:36 | 214 | 0.3445 | m | 28.2 |
| 24.07.2023 | 16:59:37 | 215 | 0.3404 | m | 28.2 |
| 24.07.2023 | 16:59:38 | 216 | 0.3404 | m | 28.2 |
| 24.07.2023 | 16:59:39 | 217 | 0.3364 | m | 28.2 |
| 24.07.2023 | 16:59:40 | 218 | 0.3364 | m | 28.2 |
| 24.07.2023 | 16:59:41 | 219 | 0.3364 | m | 28.2 |
| 24.07.2023 | 16:59:42 | 220 | 0.3323 | m | 28.2 |
| 24.07.2023 | 16:59:43 | 221 | 0.3323 | m | 28.2 |
| 24.07.2023 | 16:59:44 | 222 | 0.3323 | m | 28.2 |
| 24.07.2023 | 16:59:45 | 223 | 0.3282 | m | 28.2 |
| 24.07.2023 | 16:59:46 | 224 | 0.3282 | m | 28.2 |
| 24.07.2023 | 16:59:47 | 225 | 0.3242 | m | 28.2 |
| 24.07.2023 | 16:59:48 | 226 | 0.3242 | m | 28.2 |
| 24.07.2023 | 16:59:49 | 227 | 0.3242 | m | 28.2 |
| 24.07.2023 | 16:59:50 | 228 | 0.3202 | m | 28.2 |
| 24.07.2023 | 16:59:51 | 229 | 0.3202 | m | 28.2 |
| 24.07.2023 | 16:59:52 | 230 | 0.3202 | m | 28.2 |
| 24.07.2023 | 16:59:53 | 231 | 0.3202 | m | 28.2 |
| 24.07.2023 | 16:59:54 | 232 | 0.3161 | m | 28.2 |
| 24.07.2023 | 16:59:55 | 233 | 0.3161 | m | 28.2 |
| 24.07.2023 | 16:59:56 | 234 | 0.3161 | m | 28.2 |
| 24.07.2023 | 16:59:57 | 235 | 0.3121 | m | 28.2 |
| 24.07.2023 | 16:59:58 | 236 | 0.3121 | m | 28.2 |
| 24.07.2023 | 16:59:59 | 237 | 0.3121 | m | 28.2 |
| 24.07.2023 | 17:00:00 | 238 | 0.308 | m | 28.2 |
| 24.07.2023 | 17:00:01 | 239 | 0.308 | m | 28.2 |
| 24.07.2023 | 17:00:02 | 240 | 0.308 | m | 28.2 |
| 24.07.2023 | 17:00:03 | 241 | 0.308 | m | 28.2 |
| 24.07.2023 | 17:00:04 | 242 | 0.3039 | m | 28.2 |
| 24.07.2023 | 17:00:05 | 243 | 0.3039 | m | 28.2 |
| 24.07.2023 | 17:00:06 | 244 | 0.3039 | m | 28.2 |
| 24.07.2023 | 17:00:07 | 245 | 0.3039 | m | 28.2 |
| 24.07.2023 | 17:00:08 | 246 | 0.2998 | m | 28.2 |
| 24.07.2023 | 17:00:09 | 247 | 0.2998 | m | 28.2 |
| 24.07.2023 | 17:00:10 | 248 | 0.2998 | m | 28.2 |
| 24.07.2023 | 17:00:11 | 249 | 0.2998 | m | 28.2 |
| 24.07.2023 | 17:00:12 | 250 | 0.2958 | m | 28.2 |
| 24.07.2023 | 17:00:13 | 251 | 0.2958 | m | 28.2 |

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| 24.07.2023 | 17:00:14 | 252 | 0.2958 | m | 28.2 |
| 24.07.2023 | 17:00:15 | 253 | 0.2917 | m | 28.2 |
| 24.07.2023 | 17:00:16 | 254 | 0.2917 | m | 28.2 |
| 24.07.2023 | 17:00:17 | 255 | 0.2917 | m | 28.2 |
| 24.07.2023 | 17:00:18 | 256 | 0.2917 | m | 28.2 |
| 24.07.2023 | 17:00:19 | 257 | 0.2917 | m | 28.2 |
| 24.07.2023 | 17:00:20 | 258 | 0.2877 | m | 28.2 |
| 24.07.2023 | 17:00:21 | 259 | 0.2877 | m | 28.2 |
| 24.07.2023 | 17:00:22 | 260 | 0.2877 | m | 28.2 |
| 24.07.2023 | 17:00:23 | 261 | 0.2877 | m | 28.2 |
| 24.07.2023 | 17:00:24 | 262 | 0.2837 | m | 28.2 |
| 24.07.2023 | 17:00:25 | 263 | 0.2837 | m | 28.2 |
| 24.07.2023 | 17:00:26 | 264 | 0.2837 | m | 28.2 |
| 24.07.2023 | 17:00:27 | 265 | 0.2837 | m | 28.2 |
| 24.07.2023 | 17:00:28 | 266 | 0.2837 | m | 28.2 |
| 24.07.2023 | 17:00:29 | 267 | 0.2796 | m | 28.2 |
| 24.07.2023 | 17:00:30 | 268 | 0.2796 | m | 28.2 |
| 24.07.2023 | 17:00:31 | 269 | 0.2796 | m | 28.2 |
| 24.07.2023 | 17:00:32 | 270 | 0.2796 | m | 28.2 |
| 24.07.2023 | 17:00:33 | 271 | 0.2755 | m | 28.2 |
| 24.07.2023 | 17:00:34 | 272 | 0.2755 | m | 28.2 |
| 24.07.2023 | 17:00:35 | 273 | 0.2755 | m | 28.2 |
| 24.07.2023 | 17:00:36 | 274 | 0.2755 | m | 28.2 |
| 24.07.2023 | 17:00:37 | 275 | 0.2755 | m | 28.2 |
| 24.07.2023 | 17:00:38 | 276 | 0.2755 | m | 28.2 |
| 24.07.2023 | 17:00:39 | 277 | 0.2715 | m | 28.2 |
| 24.07.2023 | 17:00:40 | 278 | 0.2715 | m | 28.2 |
| 24.07.2023 | 17:00:41 | 279 | 0.2715 | m | 28.2 |
| 24.07.2023 | 17:00:42 | 280 | 0.2715 | m | 28.2 |
| 24.07.2023 | 17:00:43 | 281 | 0.2715 | m | 28.2 |
| 24.07.2023 | 17:00:44 | 282 | 0.2674 | m | 28.2 |
| 24.07.2023 | 17:00:45 | 283 | 0.2674 | m | 28.2 |
| 24.07.2023 | 17:00:46 | 284 | 0.2674 | m | 28.2 |
| 24.07.2023 | 17:00:47 | 285 | 0.2674 | m | 28.2 |
| 24.07.2023 | 17:00:48 | 286 | 0.2674 | m | 28.2 |
| 24.07.2023 | 17:00:49 | 287 | 0.2674 | m | 28.2 |
| 24.07.2023 | 17:00:50 | 288 | 0.2633 | m | 28.2 |
| 24.07.2023 | 17:00:51 | 289 | 0.2633 | m | 28.2 |
| 24.07.2023 | 17:00:52 | 290 | 0.2633 | m | 28.2 |
| 24.07.2023 | 17:00:53 | 291 | 0.2633 | m | 28.2 |
| 24.07.2023 | 17:00:54 | 292 | 0.2633 | m | 28.2 |
| 24.07.2023 | 17:00:55 | 293 | 0.2633 | m | 28.2 |
| 24.07.2023 | 17:00:56 | 294 | 0.2633 | m | 28.2 |

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| 24.07.2023 | 17:00:57 | 295 | 0.2592 | m | 28.2 |
| 24.07.2023 | 17:00:58 | 296 | 0.2592 | m | 28.2 |
| 24.07.2023 | 17:00:59 | 297 | 0.2592 | m | 28.2 |
| 24.07.2023 | 17:01:00 | 298 | 0.2592 | m | 28.2 |
| 24.07.2023 | 17:01:01 | 299 | 0.2592 | m | 28.2 |
| 24.07.2023 | 17:01:02 | 300 | 0.2592 | m | 28.2 |
| 24.07.2023 | 17:01:03 | 301 | 0.2592 | m | 28.2 |
| 24.07.2023 | 17:01:04 | 302 | 0.2553 | m | 28.2 |
| 24.07.2023 | 17:01:05 | 303 | 0.2553 | m | 28.2 |
| 24.07.2023 | 17:01:06 | 304 | 0.2553 | m | 28.2 |
| 24.07.2023 | 17:01:07 | 305 | 0.2553 | m | 28.2 |
| 24.07.2023 | 17:01:08 | 306 | 0.2553 | m | 28.2 |
| 24.07.2023 | 17:01:09 | 307 | 0.2553 | m | 28.2 |
| 24.07.2023 | 17:01:10 | 308 | 0.2553 | m | 28.2 |
| 24.07.2023 | 17:01:11 | 309 | 0.2553 | m | 28.2 |
| 24.07.2023 | 17:01:12 | 310 | 0.2553 | m | 28.2 |
| 24.07.2023 | 17:01:13 | 311 | 0.2553 | m | 28.2 |
| 24.07.2023 | 17:01:14 | 312 | 0.2512 | m | 28.2 |
| 24.07.2023 | 17:01:15 | 313 | 0.2512 | m | 28.2 |
| 24.07.2023 | 17:01:16 | 314 | 0.2512 | m | 28.2 |
| 24.07.2023 | 17:01:17 | 315 | 0.2512 | m | 28.2 |
| 24.07.2023 | 17:01:18 | 316 | 0.2512 | m | 28.2 |
| 24.07.2023 | 17:01:19 | 317 | 0.2512 | m | 28.2 |
| 24.07.2023 | 17:01:20 | 318 | 0.2512 | m | 28.2 |
| 24.07.2023 | 17:01:21 | 319 | 0.2512 | m | 28.2 |
| 24.07.2023 | 17:01:22 | 320 | 0.2512 | m | 28.2 |
| 24.07.2023 | 17:01:23 | 321 | 0.2512 | m | 28.2 |
| 24.07.2023 | 17:01:24 | 322 | 0.2471 | m | 28.2 |
| 24.07.2023 | 17:01:25 | 323 | 0.2471 | m | 28.2 |
| 24.07.2023 | 17:01:26 | 324 | 0.2471 | m | 28.2 |
| 24.07.2023 | 17:01:27 | 325 | 0.2471 | m | 28.2 |
| 24.07.2023 | 17:01:28 | 326 | 0.2471 | m | 28.2 |
| 24.07.2023 | 17:01:29 | 327 | 0.2471 | m | 28.2 |
| 24.07.2023 | 17:01:30 | 328 | 0.2471 | m | 28.2 |
| 24.07.2023 | 17:01:31 | 329 | 0.2471 | m | 28.2 |
| 24.07.2023 | 17:01:32 | 330 | 0.2471 | m | 28.2 |
| 24.07.2023 | 17:01:33 | 331 | 0.2471 | m | 28.2 |
| 24.07.2023 | 17:01:34 | 332 | 0.2471 | m | 28.2 |
| 24.07.2023 | 17:01:35 | 333 | 0.2471 | m | 28.2 |
| 24.07.2023 | 17:01:36 | 334 | 0.2431 | m | 28.2 |
| 24.07.2023 | 17:01:37 | 335 | 0.2431 | m | 28.2 |
| 24.07.2023 | 17:01:38 | 336 | 0.2431 | m | 28.2 |
| 24.07.2023 | 17:01:39 | 337 | 0.2431 | m | 28.2 |

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|---|---|---|---|---|---|
| 24.07.2023 | 17:01:40 | 338 | 0.2431 | m | 28.2 |
| 24.07.2023 | 17:01:41 | 339 | 0.2431 | m | 28.2 |
| 24.07.2023 | 17:01:42 | 340 | 0.2431 | m | 28.2 |
| 24.07.2023 | 17:01:43 | 341 | 0.2431 | m | 28.2 |
| 24.07.2023 | 17:01:44 | 342 | 0.2431 | m | 28.2 |
| 24.07.2023 | 17:01:45 | 343 | 0.2431 | m | 28.2 |
| 24.07.2023 | 17:01:46 | 344 | 0.2431 | m | 28.2 |
| 24.07.2023 | 17:01:47 | 345 | 0.2431 | m | 28.2 |
| 24.07.2023 | 17:01:48 | 346 | 0.2431 | m | 28.2 |
| 24.07.2023 | 17:01:49 | 347 | 0.239 | m | 28.2 |
| 24.07.2023 | 17:01:50 | 348 | 0.239 | m | 28.2 |
| 24.07.2023 | 17:01:51 | 349 | 0.239 | m | 28.2 |
| 24.07.2023 | 17:01:52 | 350 | 0.239 | m | 28.2 |
| 24.07.2023 | 17:01:53 | 351 | 0.239 | m | 28.2 |
| 24.07.2023 | 17:01:54 | 352 | 0.239 | m | 28.2 |
| 24.07.2023 | 17:01:55 | 353 | 0.239 | m | 28.2 |
| 24.07.2023 | 17:01:56 | 354 | 0.239 | m | 28.2 |
| 24.07.2023 | 17:01:57 | 355 | 0.239 | m | 28.2 |
| 24.07.2023 | 17:01:58 | 356 | 0.239 | m | 28.2 |
| 24.07.2023 | 17:01:59 | 357 | 0.239 | m | 28.2 |
| 24.07.2023 | 17:02:00 | 358 | 0.239 | m | 28.2 |
| 24.07.2023 | 17:02:01 | 359 | 0.239 | m | 28.2 |
| 24.07.2023 | 17:02:02 | 360 | 0.239 | m | 28.2 |
| 24.07.2023 | 17:02:03 | 361 | 0.239 | m | 28.2 |
| 24.07.2023 | 17:02:04 | 362 | 0.239 | m | 28.2 |
| 24.07.2023 | 17:02:05 | 363 | 0.2349 | m | 28.2 |
| 24.07.2023 | 17:02:06 | 364 | 0.2349 | m | 28.2 |
| 24.07.2023 | 17:02:07 | 365 | 0.2349 | m | 28.2 |
| 24.07.2023 | 17:02:08 | 366 | 0.2349 | m | 28.2 |
| 24.07.2023 | 17:02:09 | 367 | 0.2349 | m | 28.2 |
| 24.07.2023 | 17:02:10 | 368 | 0.2349 | m | 28.2 |
| 24.07.2023 | 17:02:11 | 369 | 0.2349 | m | 28.2 |
| 24.07.2023 | 17:02:12 | 370 | 0.2349 | m | 28.2 |
| 24.07.2023 | 17:02:13 | 371 | 0.2349 | m | 28.2 |
| 24.07.2023 | 17:02:14 | 372 | 0.2349 | m | 28.2 |
| 24.07.2023 | 17:02:15 | 373 | 0.2349 | m | 28.2 |
| 24.07.2023 | 17:02:16 | 374 | 0.2349 | m | 28.2 |
| 24.07.2023 | 17:02:17 | 375 | 0.2349 | m | 28.2 |
| 24.07.2023 | 17:02:18 | 376 | 0.2349 | m | 28.2 |
| 24.07.2023 | 17:02:19 | 377 | 0.2349 | m | 28.2 |
| 24.07.2023 | 17:02:20 | 378 | 0.2349 | m | 28.2 |
| 24.07.2023 | 17:02:21 | 379 | 0.2349 | m | 28.2 |
| 24.07.2023 | 17:02:22 | 380 | 0.2349 | m | 28.2 |

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|---|---|---|---|---|---|
| 24.07.2023 | 17:02:23 | 381 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:24 | 382 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:25 | 383 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:26 | 384 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:27 | 385 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:28 | 386 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:29 | 387 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:30 | 388 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:31 | 389 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:32 | 390 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:33 | 391 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:34 | 392 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:35 | 393 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:36 | 394 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:37 | 395 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:38 | 396 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:39 | 397 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:40 | 398 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:41 | 399 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:42 | 400 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:43 | 401 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:44 | 402 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:45 | 403 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:46 | 404 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:47 | 405 | 0.2309 | m | 28.2 |
| 24.07.2023 | 17:02:48 | 406 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:02:49 | 407 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:02:50 | 408 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:02:51 | 409 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:02:52 | 410 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:02:53 | 411 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:02:54 | 412 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:02:55 | 413 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:02:56 | 414 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:02:57 | 415 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:02:58 | 416 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:02:59 | 417 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:00 | 418 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:01 | 419 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:02 | 420 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:03 | 421 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:04 | 422 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:05 | 423 | 0.2269 | m | 28.2 |

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|---|---|---|---|---|---|
| 24.07.2023 | 17:03:06 | 424 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:07 | 425 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:08 | 426 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:09 | 427 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:10 | 428 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:11 | 429 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:12 | 430 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:13 | 431 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:14 | 432 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:15 | 433 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:16 | 434 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:17 | 435 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:18 | 436 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:19 | 437 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:20 | 438 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:21 | 439 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:22 | 440 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:23 | 441 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:24 | 442 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:25 | 443 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:26 | 444 | 0.2269 | m | 28.2 |
| 24.07.2023 | 17:03:27 | 445 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:28 | 446 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:29 | 447 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:30 | 448 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:31 | 449 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:32 | 450 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:33 | 451 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:34 | 452 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:35 | 453 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:36 | 454 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:37 | 455 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:38 | 456 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:39 | 457 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:40 | 458 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:41 | 459 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:42 | 460 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:43 | 461 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:44 | 462 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:45 | 463 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:46 | 464 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:47 | 465 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:48 | 466 | 0.2228 | m | 28.2 |

| | | | | | |
|---|---|---|---|---|---|
| 24.07.2023 | 17:03:49 | 467 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:50 | 468 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:51 | 469 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:52 | 470 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:53 | 471 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:54 | 472 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:55 | 473 | 0.2228 | m | 28.2 |
| 24.07.2023 | 17:03:56 | 474 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:03:57 | 475 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:03:58 | 476 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:03:59 | 477 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:00 | 478 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:01 | 479 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:02 | 480 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:03 | 481 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:04 | 482 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:05 | 483 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:06 | 484 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:07 | 485 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:08 | 486 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:09 | 487 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:10 | 488 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:11 | 489 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:12 | 490 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:13 | 491 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:14 | 492 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:15 | 493 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:16 | 494 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:17 | 495 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:18 | 496 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:19 | 497 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:20 | 498 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:21 | 499 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:22 | 500 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:23 | 501 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:24 | 502 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:25 | 503 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:26 | 504 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:27 | 505 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:28 | 506 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:29 | 507 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:30 | 508 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:31 | 509 | 0.2187 | m | 28.2 |

| | | | | | |
|---|---|---|---|---|---|
| 24.07.2023 | 17:04:32 | 510 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:33 | 511 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:34 | 512 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:35 | 513 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:36 | 514 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:37 | 515 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:38 | 516 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:39 | 517 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:40 | 518 | 0.2187 | m | 28.2 |
| 24.07.2023 | 17:04:41 | 519 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:42 | 520 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:43 | 521 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:44 | 522 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:45 | 523 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:46 | 524 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:47 | 525 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:48 | 526 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:49 | 527 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:50 | 528 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:51 | 529 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:52 | 530 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:53 | 531 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:54 | 532 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:55 | 533 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:56 | 534 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:57 | 535 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:58 | 536 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:04:59 | 537 | 0.2147 | m | 28.2 |
| 24.07.2023 | 17:05:00 | 538 | 0.2147 | m | 28.2 |

GW4 recovery data sheet from hydraulic conductivity test analysis using a data logger

| Date | Time of Day | Time (s) | Water Level (m) | Unit | Temp (°C) |
|---|---|---|---|---|---|
| 25.07.2023 | 17:51:00 | 0 | 3.4765 | m | 29.4 |
| 25.07.2023 | 17:51:01 | 1 | 3.35 | m | 29.4 |
| 25.07.2023 | 17:51:02 | 2 | 3.2114 | m | 29.4 |
| 25.07.2023 | 17:51:03 | 3 | 3.085 | m | 29.4 |
| 25.07.2023 | 17:51:04 | 4 | 2.9707 | m | 29.4 |
| 25.07.2023 | 17:51:05 | 5 | 2.8688 | m | 29.4 |
| 25.07.2023 | 17:51:06 | 6 | 2.771 | m | 29.4 |
| 25.07.2023 | 17:51:07 | 7 | 2.6853 | m | 29.4 |
| 25.07.2023 | 17:51:08 | 8 | 2.6038 | m | 29.4 |
| 25.07.2023 | 17:51:09 | 9 | 2.5345 | m | 29.4 |
| 25.07.2023 | 17:51:10 | 10 | 2.4733 | m | 29.4 |
| 25.07.2023 | 17:51:11 | 11 | 2.4163 | m | 29.5 |
| 25.07.2023 | 17:51:12 | 12 | 2.3674 | m | 29.5 |
| 25.07.2023 | 17:51:13 | 13 | 2.3266 | m | 29.5 |
| 25.07.2023 | 17:51:14 | 14 | 2.29 | m | 29.5 |
| 25.07.2023 | 17:51:15 | 15 | 2.2493 | m | 29.5 |
| 25.07.2023 | 17:51:16 | 16 | 2.2125 | m | 29.5 |
| 25.07.2023 | 17:51:17 | 17 | 2.18 | m | 29.5 |
| 25.07.2023 | 17:51:18 | 18 | 2.1432 | m | 29.5 |
| 25.07.2023 | 17:51:19 | 19 | 2.1107 | m | 29.5 |
| 25.07.2023 | 17:51:20 | 20 | 2.0781 | m | 29.5 |
| 25.07.2023 | 17:51:21 | 21 | 2.0495 | m | 29.5 |
| 25.07.2023 | 17:51:22 | 22 | 2.0251 | m | 29.5 |
| 25.07.2023 | 17:51:23 | 23 | 1.9966 | m | 29.5 |
| 25.07.2023 | 17:51:24 | 24 | 1.9722 | m | 29.5 |
| 25.07.2023 | 17:51:25 | 25 | 1.9273 | m | 29.5 |
| 25.07.2023 | 17:51:26 | 26 | 1.9029 | m | 29.5 |
| 25.07.2023 | 17:51:27 | 27 | 1.8825 | m | 29.5 |
| 25.07.2023 | 17:51:28 | 28 | 1.8622 | m | 29.5 |
| 25.07.2023 | 17:51:29 | 29 | 1.8418 | m | 29.5 |
| 25.07.2023 | 17:51:30 | 30 | 1.8214 | m | 29.5 |
| 25.07.2023 | 17:51:31 | 31 | 1.8051 | m | 29.5 |
| 25.07.2023 | 17:51:32 | 32 | 1.7848 | m | 29.5 |
| 25.07.2023 | 17:51:33 | 33 | 1.7685 | m | 29.5 |
| 25.07.2023 | 17:51:34 | 34 | 1.7522 | m | 29.5 |
| 25.07.2023 | 17:51:35 | 35 | 1.7359 | m | 29.5 |
| 25.07.2023 | 17:51:36 | 36 | 1.7237 | m | 29.5 |
| 25.07.2023 | 17:51:37 | 37 | 1.7074 | m | 29.5 |

| | | | | | |
|---|---|---|---|---|---|
| 25.07.2023 | 17:51:38 | 38 | 1.6952 | m | 29.5 |
| 25.07.2023 | 17:51:39 | 39 | 1.683 | m | 29.5 |
| 25.07.2023 | 17:51:40 | 40 | 1.6707 | m | 29.5 |
| 25.07.2023 | 17:51:41 | 41 | 1.6585 | m | 29.5 |
| 25.07.2023 | 17:51:42 | 42 | 1.6503 | m | 29.5 |
| 25.07.2023 | 17:51:43 | 43 | 1.6381 | m | 29.5 |
| 25.07.2023 | 17:51:44 | 44 | 1.6259 | m | 29.5 |
| 25.07.2023 | 17:51:45 | 45 | 1.6178 | m | 29.5 |
| 25.07.2023 | 17:51:46 | 46 | 1.6096 | m | 29.5 |
| 25.07.2023 | 17:51:47 | 47 | 1.5974 | m | 29.5 |
| 25.07.2023 | 17:51:48 | 48 | 1.5893 | m | 29.5 |
| 25.07.2023 | 17:51:49 | 49 | 1.5811 | m | 29.5 |
| 25.07.2023 | 17:51:50 | 50 | 1.573 | m | 29.5 |
| 25.07.2023 | 17:51:51 | 51 | 1.5567 | m | 29.5 |
| 25.07.2023 | 17:51:52 | 52 | 1.5486 | m | 29.5 |
| 25.07.2023 | 17:51:53 | 53 | 1.5404 | m | 29.5 |
| 25.07.2023 | 17:51:54 | 54 | 1.5364 | m | 29.5 |
| 25.07.2023 | 17:51:55 | 55 | 1.5282 | m | 29.5 |
| 25.07.2023 | 17:51:56 | 56 | 1.5201 | m | 29.5 |
| 25.07.2023 | 17:51:57 | 57 | 1.516 | m | 29.5 |
| 25.07.2023 | 17:51:58 | 58 | 1.5079 | m | 29.5 |
| 25.07.2023 | 17:51:59 | 59 | 1.5038 | m | 29.5 |
| 25.07.2023 | 17:52:00 | 60 | 1.4997 | m | 29.5 |
| 25.07.2023 | 17:52:01 | 61 | 1.4916 | m | 29.5 |
| 25.07.2023 | 17:52:02 | 62 | 1.4875 | m | 29.5 |
| 25.07.2023 | 17:52:03 | 63 | 1.4835 | m | 29.5 |
| 25.07.2023 | 17:52:04 | 64 | 1.4793 | m | 29.5 |
| 25.07.2023 | 17:52:05 | 65 | 1.4711 | m | 29.5 |
| 25.07.2023 | 17:52:06 | 66 | 1.4671 | m | 29.5 |
| 25.07.2023 | 17:52:07 | 67 | 1.463 | m | 29.5 |
| 25.07.2023 | 17:52:08 | 68 | 1.4589 | m | 29.5 |
| 25.07.2023 | 17:52:09 | 69 | 1.4549 | m | 29.5 |
| 25.07.2023 | 17:52:10 | 70 | 1.4508 | m | 29.5 |
| 25.07.2023 | 17:52:11 | 71 | 1.4508 | m | 29.5 |
| 25.07.2023 | 17:52:12 | 72 | 1.4467 | m | 29.5 |
| 25.07.2023 | 17:52:13 | 73 | 1.4427 | m | 29.5 |
| 25.07.2023 | 17:52:14 | 74 | 1.4386 | m | 29.5 |
| 25.07.2023 | 17:52:15 | 75 | 1.4345 | m | 29.5 |
| 25.07.2023 | 17:52:16 | 76 | 1.4304 | m | 29.5 |
| 25.07.2023 | 17:52:17 | 77 | 1.4304 | m | 29.5 |
| 25.07.2023 | 17:52:18 | 78 | 1.4264 | m | 29.5 |
| 25.07.2023 | 17:52:19 | 79 | 1.4223 | m | 29.5 |
| 25.07.2023 | 17:52:20 | 80 | 1.4223 | m | 29.5 |

| | | | | | |
|---|---|---|---|---|---|
| 25.07.2023 | 17:52:21 | 81 | 1.4142 | m | 29.5 |
| 25.07.2023 | 17:52:22 | 82 | 1.4142 | m | 29.5 |
| 25.07.2023 | 17:52:23 | 83 | 1.4101 | m | 29.5 |
| 25.07.2023 | 17:52:24 | 84 | 1.4101 | m | 29.5 |
| 25.07.2023 | 17:52:25 | 85 | 1.406 | m | 29.5 |
| 25.07.2023 | 17:52:26 | 86 | 1.406 | m | 29.5 |
| 25.07.2023 | 17:52:27 | 87 | 1.402 | m | 29.5 |
| 25.07.2023 | 17:52:28 | 88 | 1.3979 | m | 29.5 |
| 25.07.2023 | 17:52:29 | 89 | 1.3979 | m | 29.5 |
| 25.07.2023 | 17:52:30 | 90 | 1.3938 | m | 29.5 |
| 25.07.2023 | 17:52:31 | 91 | 1.3938 | m | 29.5 |
| 25.07.2023 | 17:52:32 | 92 | 1.3897 | m | 29.5 |
| 25.07.2023 | 17:52:33 | 93 | 1.3897 | m | 29.5 |
| 25.07.2023 | 17:52:34 | 94 | 1.3897 | m | 29.5 |
| 25.07.2023 | 17:52:35 | 95 | 1.3857 | m | 29.5 |
| 25.07.2023 | 17:52:36 | 96 | 1.3857 | m | 29.5 |
| 25.07.2023 | 17:52:37 | 97 | 1.3816 | m | 29.5 |
| 25.07.2023 | 17:52:38 | 98 | 1.3816 | m | 29.5 |
| 25.07.2023 | 17:52:39 | 99 | 1.3775 | m | 29.5 |
| 25.07.2023 | 17:52:40 | 100 | 1.3775 | m | 29.5 |
| 25.07.2023 | 17:52:41 | 101 | 1.3775 | m | 29.5 |
| 25.07.2023 | 17:52:42 | 102 | 1.3735 | m | 29.5 |
| 25.07.2023 | 17:52:43 | 103 | 1.3735 | m | 29.5 |
| 25.07.2023 | 17:52:44 | 104 | 1.3694 | m | 29.5 |
| 25.07.2023 | 17:52:45 | 105 | 1.3694 | m | 29.5 |
| 25.07.2023 | 17:52:46 | 106 | 1.3694 | m | 29.5 |
| 25.07.2023 | 17:52:47 | 107 | 1.3653 | m | 29.5 |
| 25.07.2023 | 17:52:48 | 108 | 1.3653 | m | 29.5 |
| 25.07.2023 | 17:52:49 | 109 | 1.3653 | m | 29.5 |
| 25.07.2023 | 17:52:50 | 110 | 1.3613 | m | 29.5 |
| 25.07.2023 | 17:52:51 | 111 | 1.3613 | m | 29.5 |
| 25.07.2023 | 17:52:52 | 112 | 1.3613 | m | 29.5 |
| 25.07.2023 | 17:52:53 | 113 | 1.3572 | m | 29.5 |
| 25.07.2023 | 17:52:54 | 114 | 1.3572 | m | 29.5 |
| 25.07.2023 | 17:52:55 | 115 | 1.3572 | m | 29.5 |
| 25.07.2023 | 17:52:56 | 116 | 1.3572 | m | 29.5 |
| 25.07.2023 | 17:52:57 | 117 | 1.3531 | m | 29.5 |
| 25.07.2023 | 17:52:58 | 118 | 1.3531 | m | 29.5 |
| 25.07.2023 | 17:52:59 | 119 | 1.3531 | m | 29.5 |
| 25.07.2023 | 17:53:00 | 120 | 1.3531 | m | 29.5 |
| 25.07.2023 | 17:53:01 | 121 | 1.349 | m | 29.5 |
| 25.07.2023 | 17:53:02 | 122 | 1.349 | m | 29.5 |
| 25.07.2023 | 17:53:03 | 123 | 1.349 | m | 29.5 |

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| 25.07.2023 | 17:55:12 | 252 | 1.2798 | m | 29.5 |

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| 25.07.2023 | 17:55:55 | 295 | 1.2636 | m | 29.5 |

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| 25.07.2023 | 17:57:21 | 381 | 1.2432 | m | 29.5 |

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| 25.07.2023 | 17:57:38 | 398 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:57:39 | 399 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:57:40 | 400 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:57:41 | 401 | 1.231 | m | 29.5 |
| 25.07.2023 | 17:57:42 | 402 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:57:43 | 403 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:57:44 | 404 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:57:45 | 405 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:57:46 | 406 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:57:47 | 407 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:57:48 | 408 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:57:49 | 409 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:57:50 | 410 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:57:51 | 411 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:57:52 | 412 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:57:53 | 413 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:57:54 | 414 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:57:55 | 415 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:57:56 | 416 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:57:57 | 417 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:57:58 | 418 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:57:59 | 419 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:58:00 | 420 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:58:01 | 421 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:58:02 | 422 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:58:03 | 423 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:58:04 | 424 | 1.2391 | m | 29.5 |

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|---|---|---|---|---|---|
| 25.07.2023 | 17:58:05 | 425 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:58:06 | 426 | 1.2391 | m | 29.5 |
| 25.07.2023 | 17:58:07 | 427 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:58:08 | 428 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:58:09 | 429 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:58:10 | 430 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:58:11 | 431 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:58:12 | 432 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:58:13 | 433 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:58:14 | 434 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:58:15 | 435 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:58:16 | 436 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:58:17 | 437 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:58:18 | 438 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:58:19 | 439 | 1.2351 | m | 29.5 |
| 25.07.2023 | 17:58:20 | 440 | 1.231 | m | 29.5 |
| 25.07.2023 | 17:58:21 | 441 | 1.231 | m | 29.5 |
| 25.07.2023 | 17:58:22 | 442 | 1.231 | m | 29.5 |
| 25.07.2023 | 17:58:23 | 443 | 1.231 | m | 29.5 |
| 25.07.2023 | 17:58:24 | 444 | 1.231 | m | 29.5 |
| 25.07.2023 | 17:58:25 | 445 | 1.231 | m | 29.5 |
| 25.07.2023 | 17:58:26 | 446 | 1.231 | m | 29.5 |
| 25.07.2023 | 17:58:27 | 447 | 1.231 | m | 29.5 |
| 25.07.2023 | 17:58:28 | 448 | 1.231 | m | 29.5 |
| 25.07.2023 | 17:58:29 | 449 | 1.231 | m | 29.5 |
| 25.07.2023 | 17:58:30 | 450 | 1.231 | m | 29.5 |
| 25.07.2023 | 17:58:31 | 451 | 1.2269 | m | 29.5 |
| 25.07.2023 | 17:58:32 | 452 | 1.2269 | m | 29.5 |
| 25.07.2023 | 17:58:33 | 453 | 1.2269 | m | 29.5 |
| 25.07.2023 | 17:58:34 | 454 | 1.2269 | m | 29.5 |
| 25.07.2023 | 17:58:35 | 455 | 1.2269 | m | 29.5 |
| 25.07.2023 | 17:58:36 | 456 | 1.2269 | m | 29.5 |
| 25.07.2023 | 17:58:37 | 457 | 1.2269 | m | 29.5 |
| 25.07.2023 | 17:58:38 | 458 | 1.2269 | m | 29.5 |
| 25.07.2023 | 17:58:39 | 459 | 1.2269 | m | 29.5 |
| 25.07.2023 | 17:58:40 | 460 | 1.2269 | m | 29.5 |
| 25.07.2023 | 17:58:41 | 461 | 1.2269 | m | 29.5 |
| 25.07.2023 | 17:58:42 | 462 | 1.2269 | m | 29.5 |
| 25.07.2023 | 17:58:43 | 463 | 1.2269 | m | 29.5 |
| 25.07.2023 | 17:58:44 | 464 | 1.2229 | m | 29.5 |
| 25.07.2023 | 17:58:45 | 465 | 1.2229 | m | 29.5 |
| 25.07.2023 | 17:58:46 | 466 | 1.2229 | m | 29.5 |
| 25.07.2023 | 17:58:47 | 467 | 1.2229 | m | 29.5 |

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|---|---|---|---|---|---|
| 25.07.2023 | 17:58:48 | 468 | 1.2229 | m | 29.5 |
| 25.07.2023 | 17:58:49 | 469 | 1.2229 | m | 29.5 |
| 25.07.2023 | 17:58:50 | 470 | 1.2229 | m | 29.5 |
| 25.07.2023 | 17:58:51 | 471 | 1.2229 | m | 29.5 |
| 25.07.2023 | 17:58:52 | 472 | 1.2229 | m | 29.5 |
| 25.07.2023 | 17:58:53 | 473 | 1.2229 | m | 29.5 |
| 25.07.2023 | 17:58:54 | 474 | 1.2229 | m | 29.5 |
| 25.07.2023 | 17:58:55 | 475 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:58:56 | 476 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:58:57 | 477 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:58:58 | 478 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:58:59 | 479 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:00 | 480 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:01 | 481 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:02 | 482 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:03 | 483 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:04 | 484 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:05 | 485 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:06 | 486 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:07 | 487 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:08 | 488 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:09 | 489 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:10 | 490 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:11 | 491 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:12 | 492 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:13 | 493 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:14 | 494 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:15 | 495 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:16 | 496 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:17 | 497 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:18 | 498 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:19 | 499 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:20 | 500 | 1.2188 | m | 29.5 |
| 25.07.2023 | 17:59:21 | 501 | 1.2147 | m | 29.5 |
| 25.07.2023 | 17:59:22 | 502 | 1.2147 | m | 29.5 |
| 25.07.2023 | 17:59:23 | 503 | 1.2147 | m | 29.5 |
| 25.07.2023 | 17:59:24 | 504 | 1.2147 | m | 29.5 |
| 25.07.2023 | 17:59:25 | 505 | 1.2147 | m | 29.5 |
| 25.07.2023 | 17:59:26 | 506 | 1.2147 | m | 29.5 |
| 25.07.2023 | 17:59:27 | 507 | 1.2147 | m | 29.5 |
| 25.07.2023 | 17:59:28 | 508 | 1.2147 | m | 29.5 |
| 25.07.2023 | 17:59:29 | 509 | 1.2147 | m | 29.5 |
| 25.07.2023 | 17:59:30 | 510 | 1.2147 | m | 29.5 |

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|---|---|---|---|---|---|
| 25.07.2023 | 17:59:31 | 511 | 1.2147 | m | 29.5 |
| 25.07.2023 | 17:59:32 | 512 | 1.2147 | m | 29.5 |
| 25.07.2023 | 17:59:33 | 513 | 1.2147 | m | 29.5 |
| 25.07.2023 | 17:59:34 | 514 | 1.2107 | m | 29.5 |
| 25.07.2023 | 17:59:35 | 515 | 1.2107 | m | 29.5 |
| 25.07.2023 | 17:59:36 | 516 | 1.2107 | m | 29.5 |
| 25.07.2023 | 17:59:37 | 517 | 1.2107 | m | 29.5 |
| 25.07.2023 | 17:59:38 | 518 | 1.2107 | m | 29.5 |
| 25.07.2023 | 17:59:39 | 519 | 1.2107 | m | 29.5 |
| 25.07.2023 | 17:59:40 | 520 | 1.2107 | m | 29.5 |
| 25.07.2023 | 17:59:41 | 521 | 1.2107 | m | 29.5 |
| 25.07.2023 | 17:59:42 | 522 | 1.2107 | m | 29.5 |
| 25.07.2023 | 17:59:43 | 523 | 1.2107 | m | 29.5 |
| 25.07.2023 | 17:59:44 | 524 | 1.2107 | m | 29.5 |
| 25.07.2023 | 17:59:45 | 525 | 1.2107 | m | 29.5 |
| 25.07.2023 | 17:59:46 | 526 | 1.2107 | m | 29.5 |
| 25.07.2023 | 17:59:47 | 527 | 1.2107 | m | 29.5 |
| 25.07.2023 | 17:59:48 | 528 | 1.2107 | m | 29.5 |
| 25.07.2023 | 17:59:49 | 529 | 1.2066 | m | 29.5 |
| 25.07.2023 | 17:59:50 | 530 | 1.2107 | m | 29.5 |
| 25.07.2023 | 17:59:51 | 531 | 1.2066 | m | 29.5 |
| 25.07.2023 | 17:59:52 | 532 | 1.2066 | m | 29.5 |
| 25.07.2023 | 17:59:53 | 533 | 1.2066 | m | 29.5 |
| 25.07.2023 | 17:59:54 | 534 | 1.2066 | m | 29.5 |
| 25.07.2023 | 17:59:55 | 535 | 1.2066 | m | 29.5 |
| 25.07.2023 | 17:59:56 | 536 | 1.2066 | m | 29.5 |
| 25.07.2023 | 17:59:57 | 537 | 1.2066 | m | 29.5 |
| 25.07.2023 | 17:59:58 | 538 | 1.2066 | m | 29.5 |

GW5 recovery data sheet from hydraulic conductivity test analysis using a data logger

| Date | Time of Day | Time (s) | Water Level (m) | Unit | Temp (°C) |
|---|---|---|---|---|---|
| 26.07.2023 | 8:51:01 | 0 | 4.5584 | m | 28.5 |
| 26.07.2023 | 8:51:02 | 1 | 4.5313 | m | 28.5 |
| 26.07.2023 | 8:51:03 | 2 | 4.4091 | m | 28.5 |
| 26.07.2023 | 8:51:04 | 3 | 4.2936 | m | 28.5 |
| 26.07.2023 | 8:51:05 | 4 | 4.1878 | m | 28.5 |
| 26.07.2023 | 8:51:06 | 5 | 4.0901 | m | 28.5 |
| 26.07.2023 | 8:51:07 | 6 | 3.9965 | m | 28.5 |
| 26.07.2023 | 8:51:08 | 7 | 3.9109 | m | 28.5 |
| 26.07.2023 | 8:51:09 | 8 | 3.8295 | m | 28.5 |
| 26.07.2023 | 8:51:10 | 9 | 3.7563 | m | 28.5 |
| 26.07.2023 | 8:51:11 | 10 | 3.683 | m | 28.5 |
| 26.07.2023 | 8:51:12 | 11 | 3.6221 | m | 28.5 |
| 26.07.2023 | 8:51:13 | 12 | 3.5651 | m | 28.5 |
| 26.07.2023 | 8:51:14 | 13 | 3.5122 | m | 28.5 |
| 26.07.2023 | 8:51:15 | 14 | 3.4633 | m | 28.5 |
| 26.07.2023 | 8:51:16 | 15 | 3.4185 | m | 28.5 |
| 26.07.2023 | 8:51:17 | 16 | 3.3697 | m | 28.5 |
| 26.07.2023 | 8:51:18 | 17 | 3.325 | m | 28.5 |
| 26.07.2023 | 8:51:19 | 18 | 3.2803 | m | 28.5 |
| 26.07.2023 | 8:51:20 | 19 | 3.2355 | m | 28.5 |
| 26.07.2023 | 8:51:21 | 20 | 3.1907 | m | 28.5 |
| 26.07.2023 | 8:51:22 | 21 | 3.1501 | m | 28.5 |
| 26.07.2023 | 8:51:23 | 22 | 3.1094 | m | 28.5 |
| 26.07.2023 | 8:51:24 | 23 | 3.0687 | m | 28.5 |
| 26.07.2023 | 8:51:25 | 24 | 3.028 | m | 28.5 |
| 26.07.2023 | 8:51:26 | 25 | 2.9874 | m | 28.5 |
| 26.07.2023 | 8:51:27 | 26 | 2.9508 | m | 28.5 |
| 26.07.2023 | 8:51:28 | 27 | 2.9142 | m | 28.5 |
| 26.07.2023 | 8:51:29 | 28 | 2.8776 | m | 28.5 |
| 26.07.2023 | 8:51:30 | 29 | 2.841 | m | 28.5 |
| 26.07.2023 | 8:51:31 | 30 | 2.8084 | m | 28.5 |
| 26.07.2023 | 8:51:32 | 31 | 2.776 | m | 28.5 |
| 26.07.2023 | 8:51:33 | 32 | 2.7068 | m | 28.5 |
| 26.07.2023 | 8:51:34 | 33 | 2.6743 | m | 28.5 |
| 26.07.2023 | 8:51:35 | 34 | 2.6418 | m | 28.5 |
| 26.07.2023 | 8:51:36 | 35 | 2.6133 | m | 28.5 |
| 26.07.2023 | 8:51:37 | 36 | 2.5808 | m | 28.5 |
| 26.07.2023 | 8:51:38 | 37 | 2.5513 | m | 28.5 |

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|---|---|---|---|---|---|
| 26.07.2023 | 8:51:39 | 38 | 2.5187 | m | 28.5 |
| 26.07.2023 | 8:51:40 | 39 | 2.4903 | m | 28.5 |
| 26.07.2023 | 8:51:41 | 40 | 2.4619 | m | 28.5 |
| 26.07.2023 | 8:51:42 | 41 | 2.4335 | m | 28.5 |
| 26.07.2023 | 8:51:43 | 42 | 2.409 | m | 28.5 |
| 26.07.2023 | 8:51:44 | 43 | 2.3807 | m | 28.5 |
| 26.07.2023 | 8:51:45 | 44 | 2.3562 | m | 28.5 |
| 26.07.2023 | 8:51:46 | 45 | 2.3277 | m | 28.5 |
| 26.07.2023 | 8:51:47 | 46 | 2.3034 | m | 28.5 |
| 26.07.2023 | 8:51:48 | 47 | 2.279 | m | 28.5 |
| 26.07.2023 | 8:51:49 | 48 | 2.2547 | m | 28.5 |
| 26.07.2023 | 8:51:50 | 49 | 2.2303 | m | 28.5 |
| 26.07.2023 | 8:51:51 | 50 | 2.2059 | m | 28.5 |
| 26.07.2023 | 8:51:52 | 51 | 2.1815 | m | 28.5 |
| 26.07.2023 | 8:51:53 | 52 | 2.1571 | m | 28.5 |
| 26.07.2023 | 8:51:54 | 53 | 2.1571 | m | 28.5 |
| 26.07.2023 | 8:51:55 | 54 | 2.1003 | m | 28.5 |
| 26.07.2023 | 8:51:56 | 55 | 2.0759 | m | 28.5 |
| 26.07.2023 | 8:51:57 | 56 | 2.0555 | m | 28.5 |
| 26.07.2023 | 8:51:58 | 57 | 2.0353 | m | 28.5 |
| 26.07.2023 | 8:51:59 | 58 | 2.0149 | m | 28.5 |
| 26.07.2023 | 8:52:00 | 59 | 1.9947 | m | 28.5 |
| 26.07.2023 | 8:52:01 | 60 | 1.9743 | m | 28.5 |
| 26.07.2023 | 8:52:02 | 61 | 1.9581 | m | 28.5 |
| 26.07.2023 | 8:52:03 | 62 | 1.9378 | m | 28.5 |
| 26.07.2023 | 8:52:04 | 63 | 1.9215 | m | 28.5 |
| 26.07.2023 | 8:52:05 | 64 | 1.9012 | m | 28.5 |
| 26.07.2023 | 8:52:06 | 65 | 1.885 | m | 28.5 |
| 26.07.2023 | 8:52:07 | 66 | 1.8647 | m | 28.5 |
| 26.07.2023 | 8:52:08 | 67 | 1.8485 | m | 28.5 |
| 26.07.2023 | 8:52:09 | 68 | 1.8322 | m | 28.5 |
| 26.07.2023 | 8:52:10 | 69 | 1.8159 | m | 28.5 |
| 26.07.2023 | 8:52:11 | 70 | 1.7997 | m | 28.5 |
| 26.07.2023 | 8:52:12 | 71 | 1.7835 | m | 28.5 |
| 26.07.2023 | 8:52:13 | 72 | 1.7672 | m | 28.5 |
| 26.07.2023 | 8:52:14 | 73 | 1.751 | m | 28.5 |
| 26.07.2023 | 8:52:15 | 74 | 1.7388 | m | 28.5 |
| 26.07.2023 | 8:52:16 | 75 | 1.7225 | m | 28.5 |
| 26.07.2023 | 8:52:17 | 76 | 1.7104 | m | 28.5 |
| 26.07.2023 | 8:52:18 | 77 | 1.6941 | m | 28.5 |
| 26.07.2023 | 8:52:19 | 78 | 1.6819 | m | 28.5 |
| 26.07.2023 | 8:52:20 | 79 | 1.6657 | m | 28.5 |
| 26.07.2023 | 8:52:21 | 80 | 1.6535 | m | 28.5 |

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|---|---|---|---|---|---|
| 26.07.2023 | 8:52:22 | 81 | 1.6413 | m | 28.5 |
| 26.07.2023 | 8:52:23 | 82 | 1.6251 | m | 28.5 |
| 26.07.2023 | 8:52:24 | 83 | 1.6007 | m | 28.5 |
| 26.07.2023 | 8:52:25 | 84 | 1.5885 | m | 28.5 |
| 26.07.2023 | 8:52:26 | 85 | 1.5764 | m | 28.5 |
| 26.07.2023 | 8:52:27 | 86 | 1.5642 | m | 28.5 |
| 26.07.2023 | 8:52:28 | 87 | 1.556 | m | 28.5 |
| 26.07.2023 | 8:52:29 | 88 | 1.5438 | m | 28.5 |
| 26.07.2023 | 8:52:30 | 89 | 1.5317 | m | 28.5 |
| 26.07.2023 | 8:52:31 | 90 | 1.5195 | m | 28.5 |
| 26.07.2023 | 8:52:32 | 91 | 1.5114 | m | 28.5 |
| 26.07.2023 | 8:52:33 | 92 | 1.4986 | m | 28.5 |
| 26.07.2023 | 8:52:34 | 93 | 1.4905 | m | 28.5 |
| 26.07.2023 | 8:52:35 | 94 | 1.4783 | m | 28.5 |
| 26.07.2023 | 8:52:36 | 95 | 1.4661 | m | 28.5 |
| 26.07.2023 | 8:52:37 | 96 | 1.454 | m | 28.5 |
| 26.07.2023 | 8:52:38 | 97 | 1.4458 | m | 28.5 |
| 26.07.2023 | 8:52:39 | 98 | 1.4336 | m | 28.5 |
| 26.07.2023 | 8:52:40 | 99 | 1.4255 | m | 28.5 |
| 26.07.2023 | 8:52:41 | 100 | 1.4174 | m | 28.5 |
| 26.07.2023 | 8:52:42 | 101 | 1.4093 | m | 28.5 |
| 26.07.2023 | 8:52:43 | 102 | 1.3971 | m | 28.5 |
| 26.07.2023 | 8:52:44 | 103 | 1.389 | m | 28.5 |
| 26.07.2023 | 8:52:45 | 104 | 1.3809 | m | 28.5 |
| 26.07.2023 | 8:52:46 | 105 | 1.3728 | m | 28.5 |
| 26.07.2023 | 8:52:47 | 106 | 1.3646 | m | 28.5 |
| 26.07.2023 | 8:52:48 | 107 | 1.3565 | m | 28.5 |
| 26.07.2023 | 8:52:49 | 108 | 1.3485 | m | 28.5 |
| 26.07.2023 | 8:52:50 | 109 | 1.3403 | m | 28.5 |
| 26.07.2023 | 8:52:51 | 110 | 1.3322 | m | 28.5 |
| 26.07.2023 | 8:52:52 | 111 | 1.324 | m | 28.5 |
| 26.07.2023 | 8:52:53 | 112 | 1.3159 | m | 28.5 |
| 26.07.2023 | 8:52:54 | 113 | 1.3079 | m | 28.5 |
| 26.07.2023 | 8:52:55 | 114 | 1.2997 | m | 28.5 |
| 26.07.2023 | 8:52:56 | 115 | 1.2997 | m | 28.5 |
| 26.07.2023 | 8:52:57 | 116 | 1.2875 | m | 28.5 |
| 26.07.2023 | 8:52:58 | 117 | 1.2794 | m | 28.5 |
| 26.07.2023 | 8:52:59 | 118 | 1.2713 | m | 28.5 |
| 26.07.2023 | 8:53:00 | 119 | 1.2673 | m | 28.5 |
| 26.07.2023 | 8:53:01 | 120 | 1.2591 | m | 28.5 |
| 26.07.2023 | 8:53:02 | 121 | 1.255 | m | 28.5 |
| 26.07.2023 | 8:53:03 | 122 | 1.251 | m | 28.5 |
| 26.07.2023 | 8:53:04 | 123 | 1.2429 | m | 28.5 |

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|---|---|---|---|---|---|
| 26.07.2023 | 8:53:05 | 124 | 1.2389 | m | 28.5 |
| 26.07.2023 | 8:53:06 | 125 | 1.2307 | m | 28.5 |
| 26.07.2023 | 8:53:07 | 126 | 1.2267 | m | 28.5 |
| 26.07.2023 | 8:53:08 | 127 | 1.2185 | m | 28.5 |
| 26.07.2023 | 8:53:09 | 128 | 1.2144 | m | 28.5 |
| 26.07.2023 | 8:53:10 | 129 | 1.2104 | m | 28.5 |
| 26.07.2023 | 8:53:11 | 130 | 1.2023 | m | 28.5 |
| 26.07.2023 | 8:53:12 | 131 | 1.1983 | m | 28.5 |
| 26.07.2023 | 8:53:13 | 132 | 1.1942 | m | 28.5 |
| 26.07.2023 | 8:53:14 | 133 | 1.1861 | m | 28.5 |
| 26.07.2023 | 8:53:15 | 134 | 1.182 | m | 28.5 |
| 26.07.2023 | 8:53:16 | 135 | 1.1739 | m | 28.5 |
| 26.07.2023 | 8:53:17 | 136 | 1.1658 | m | 28.5 |
| 26.07.2023 | 8:53:18 | 137 | 1.1617 | m | 28.5 |
| 26.07.2023 | 8:53:19 | 138 | 1.1577 | m | 28.5 |
| 26.07.2023 | 8:53:20 | 139 | 1.1536 | m | 28.5 |
| 26.07.2023 | 8:53:21 | 140 | 1.1495 | m | 28.5 |
| 26.07.2023 | 8:53:22 | 141 | 1.1455 | m | 28.5 |
| 26.07.2023 | 8:53:23 | 142 | 1.1374 | m | 28.5 |
| 26.07.2023 | 8:53:24 | 143 | 1.1333 | m | 28.5 |
| 26.07.2023 | 8:53:25 | 144 | 1.1293 | m | 28.5 |
| 26.07.2023 | 8:53:26 | 145 | 1.1252 | m | 28.5 |
| 26.07.2023 | 8:53:27 | 146 | 1.1211 | m | 28.5 |
| 26.07.2023 | 8:53:28 | 147 | 1.1171 | m | 28.5 |
| 26.07.2023 | 8:53:29 | 148 | 1.113 | m | 28.5 |
| 26.07.2023 | 8:53:30 | 149 | 1.1089 | m | 28.5 |
| 26.07.2023 | 8:53:31 | 150 | 1.105 | m | 28.5 |
| 26.07.2023 | 8:53:32 | 151 | 1.1009 | m | 28.5 |
| 26.07.2023 | 8:53:33 | 152 | 1.0968 | m | 28.5 |
| 26.07.2023 | 8:53:34 | 153 | 1.0927 | m | 28.5 |
| 26.07.2023 | 8:53:35 | 154 | 1.0887 | m | 28.5 |
| 26.07.2023 | 8:53:36 | 155 | 1.0846 | m | 28.5 |
| 26.07.2023 | 8:53:37 | 156 | 1.0846 | m | 28.5 |
| 26.07.2023 | 8:53:38 | 157 | 1.0805 | m | 28.5 |
| 26.07.2023 | 8:53:39 | 158 | 1.0765 | m | 28.5 |
| 26.07.2023 | 8:53:40 | 159 | 1.0725 | m | 28.5 |
| 26.07.2023 | 8:53:41 | 160 | 1.0684 | m | 28.5 |
| 26.07.2023 | 8:53:42 | 161 | 1.0644 | m | 28.5 |
| 26.07.2023 | 8:53:43 | 162 | 1.0603 | m | 28.5 |
| 26.07.2023 | 8:53:44 | 163 | 1.0562 | m | 28.5 |
| 26.07.2023 | 8:53:45 | 164 | 1.0562 | m | 28.5 |
| 26.07.2023 | 8:53:46 | 165 | 1.0481 | m | 28.5 |
| 26.07.2023 | 8:53:47 | 166 | 1.044 | m | 28.5 |

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| 26.07.2023 | 8:53:49 | 168 | 1.04 | m | 28.5 |
| 26.07.2023 | 8:53:50 | 169 | 1.036 | m | 28.5 |
| 26.07.2023 | 8:53:51 | 170 | 1.0319 | m | 28.5 |
| 26.07.2023 | 8:53:52 | 171 | 1.0319 | m | 28.5 |
| 26.07.2023 | 8:53:53 | 172 | 1.0278 | m | 28.5 |
| 26.07.2023 | 8:53:54 | 173 | 1.0238 | m | 28.5 |
| 26.07.2023 | 8:53:55 | 174 | 1.0238 | m | 28.5 |
| 26.07.2023 | 8:53:56 | 175 | 1.0197 | m | 28.5 |
| 26.07.2023 | 8:53:57 | 176 | 1.0197 | m | 28.5 |
| 26.07.2023 | 8:53:58 | 177 | 1.0197 | m | 28.5 |
| 26.07.2023 | 8:53:59 | 178 | 1.0115 | m | 28.5 |
| 26.07.2023 | 8:54:00 | 179 | 1.0115 | m | 28.5 |
| 26.07.2023 | 8:54:01 | 180 | 1.0075 | m | 28.5 |
| 26.07.2023 | 8:54:02 | 181 | 1.0035 | m | 28.5 |
| 26.07.2023 | 8:54:03 | 182 | 1.0035 | m | 28.5 |
| 26.07.2023 | 8:54:04 | 183 | 0.9994 | m | 28.5 |
| 26.07.2023 | 8:54:05 | 184 | 0.9954 | m | 28.5 |
| 26.07.2023 | 8:54:06 | 185 | 0.9913 | m | 28.5 |
| 26.07.2023 | 8:54:07 | 186 | 0.9913 | m | 28.5 |
| 26.07.2023 | 8:54:08 | 187 | 0.9872 | m | 28.5 |
| 26.07.2023 | 8:54:09 | 188 | 0.9832 | m | 28.5 |
| 26.07.2023 | 8:54:10 | 189 | 0.9832 | m | 28.5 |
| 26.07.2023 | 8:54:11 | 190 | 0.9791 | m | 28.5 |
| 26.07.2023 | 8:54:12 | 191 | 0.9791 | m | 28.5 |
| 26.07.2023 | 8:54:13 | 192 | 0.975 | m | 28.5 |
| 26.07.2023 | 8:54:14 | 193 | 0.975 | m | 28.5 |
| 26.07.2023 | 8:54:15 | 194 | 0.971 | m | 28.5 |
| 26.07.2023 | 8:54:16 | 195 | 0.971 | m | 28.5 |
| 26.07.2023 | 8:54:17 | 196 | 0.967 | m | 28.5 |
| 26.07.2023 | 8:54:18 | 197 | 0.967 | m | 28.5 |
| 26.07.2023 | 8:54:19 | 198 | 0.9629 | m | 28.5 |
| 26.07.2023 | 8:54:20 | 199 | 0.9629 | m | 28.5 |
| 26.07.2023 | 8:54:21 | 200 | 0.9588 | m | 28.5 |
| 26.07.2023 | 8:54:22 | 201 | 0.9588 | m | 28.5 |
| 26.07.2023 | 8:54:23 | 202 | 0.9548 | m | 28.5 |
| 26.07.2023 | 8:54:24 | 203 | 0.9548 | m | 28.5 |
| 26.07.2023 | 8:54:25 | 204 | 0.9548 | m | 28.5 |
| 26.07.2023 | 8:54:26 | 205 | 0.9507 | m | 28.5 |
| 26.07.2023 | 8:54:27 | 206 | 0.9507 | m | 28.5 |
| 26.07.2023 | 8:54:28 | 207 | 0.9466 | m | 28.5 |
| 26.07.2023 | 8:54:29 | 208 | 0.9466 | m | 28.5 |
| 26.07.2023 | 8:54:30 | 209 | 0.9427 | m | 28.5 |

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| 26.07.2023 | 8:54:32 | 211 | 0.9386 | m | 28.5 |
| 26.07.2023 | 8:54:33 | 212 | 0.9386 | m | 28.5 |
| 26.07.2023 | 8:54:34 | 213 | 0.9386 | m | 28.5 |
| 26.07.2023 | 8:54:35 | 214 | 0.9345 | m | 28.5 |
| 26.07.2023 | 8:54:36 | 215 | 0.9345 | m | 28.5 |
| 26.07.2023 | 8:54:37 | 216 | 0.9304 | m | 28.5 |
| 26.07.2023 | 8:54:38 | 217 | 0.9304 | m | 28.5 |
| 26.07.2023 | 8:54:39 | 218 | 0.9264 | m | 28.5 |
| 26.07.2023 | 8:54:40 | 219 | 0.9264 | m | 28.5 |
| 26.07.2023 | 8:54:41 | 220 | 0.9264 | m | 28.5 |
| 26.07.2023 | 8:54:42 | 221 | 0.9223 | m | 28.5 |
| 26.07.2023 | 8:54:43 | 222 | 0.9223 | m | 28.5 |
| 26.07.2023 | 8:54:44 | 223 | 0.9223 | m | 28.5 |
| 26.07.2023 | 8:54:45 | 224 | 0.9182 | m | 28.5 |
| 26.07.2023 | 8:54:46 | 225 | 0.9182 | m | 28.5 |
| 26.07.2023 | 8:54:47 | 226 | 0.9142 | m | 28.5 |
| 26.07.2023 | 8:54:48 | 227 | 0.9142 | m | 28.5 |
| 26.07.2023 | 8:54:49 | 228 | 0.9142 | m | 28.5 |
| 26.07.2023 | 8:54:50 | 229 | 0.9102 | m | 28.5 |
| 26.07.2023 | 8:54:51 | 230 | 0.9102 | m | 28.5 |
| 26.07.2023 | 8:54:52 | 231 | 0.9102 | m | 28.5 |
| 26.07.2023 | 8:54:53 | 232 | 0.9102 | m | 28.5 |
| 26.07.2023 | 8:54:54 | 233 | 0.9061 | m | 28.5 |
| 26.07.2023 | 8:54:55 | 234 | 0.9061 | m | 28.5 |
| 26.07.2023 | 8:54:56 | 235 | 0.9061 | m | 28.5 |
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| 26.07.2023 | 8:54:58 | 237 | 0.9021 | m | 28.5 |
| 26.07.2023 | 8:54:59 | 238 | 0.9021 | m | 28.5 |
| 26.07.2023 | 8:55:00 | 239 | 0.898 | m | 28.5 |
| 26.07.2023 | 8:55:01 | 240 | 0.898 | m | 28.5 |
| 26.07.2023 | 8:55:02 | 241 | 0.898 | m | 28.5 |
| 26.07.2023 | 8:55:03 | 242 | 0.898 | m | 28.5 |
| 26.07.2023 | 8:55:04 | 243 | 0.8939 | m | 28.5 |
| 26.07.2023 | 8:55:05 | 244 | 0.8939 | m | 28.5 |
| 26.07.2023 | 8:55:06 | 245 | 0.8939 | m | 28.5 |
| 26.07.2023 | 8:55:07 | 246 | 0.8939 | m | 28.5 |
| 26.07.2023 | 8:55:08 | 247 | 0.8898 | m | 28.5 |
| 26.07.2023 | 8:55:09 | 248 | 0.8898 | m | 28.5 |
| 26.07.2023 | 8:55:10 | 249 | 0.8898 | m | 28.5 |
| 26.07.2023 | 8:55:11 | 250 | 0.8898 | m | 28.5 |
| 26.07.2023 | 8:55:12 | 251 | 0.8858 | m | 28.5 |
| 26.07.2023 | 8:55:13 | 252 | 0.8858 | m | 28.5 |

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| 26.07.2023 | 8:55:14 | 253 | 0.8858 | m | 28.5 |
| 26.07.2023 | 8:55:15 | 254 | 0.8817 | m | 28.5 |
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| 26.07.2023 | 8:55:17 | 256 | 0.8817 | m | 28.5 |
| 26.07.2023 | 8:55:18 | 257 | 0.8817 | m | 28.5 |
| 26.07.2023 | 8:55:19 | 258 | 0.8817 | m | 28.5 |
| 26.07.2023 | 8:55:20 | 259 | 0.8777 | m | 28.5 |
| 26.07.2023 | 8:55:21 | 260 | 0.8777 | m | 28.5 |
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| 26.07.2023 | 8:55:23 | 262 | 0.8777 | m | 28.5 |
| 26.07.2023 | 8:55:24 | 263 | 0.8737 | m | 28.5 |
| 26.07.2023 | 8:55:25 | 264 | 0.8737 | m | 28.5 |
| 26.07.2023 | 8:55:26 | 265 | 0.8737 | m | 28.5 |
| 26.07.2023 | 8:55:27 | 266 | 0.8737 | m | 28.5 |
| 26.07.2023 | 8:55:28 | 267 | 0.8737 | m | 28.5 |
| 26.07.2023 | 8:55:29 | 268 | 0.8696 | m | 28.5 |
| 26.07.2023 | 8:55:30 | 269 | 0.8696 | m | 28.5 |
| 26.07.2023 | 8:55:31 | 270 | 0.8696 | m | 28.5 |
| 26.07.2023 | 8:55:32 | 271 | 0.8696 | m | 28.5 |
| 26.07.2023 | 8:55:33 | 272 | 0.8655 | m | 28.5 |
| 26.07.2023 | 8:55:34 | 273 | 0.8655 | m | 28.5 |
| 26.07.2023 | 8:55:35 | 274 | 0.8655 | m | 28.5 |
| 26.07.2023 | 8:55:36 | 275 | 0.8655 | m | 28.5 |
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| 26.07.2023 | 8:55:38 | 277 | 0.8655 | m | 28.5 |
| 26.07.2023 | 8:55:39 | 278 | 0.8615 | m | 28.5 |
| 26.07.2023 | 8:55:40 | 279 | 0.8615 | m | 28.5 |
| 26.07.2023 | 8:55:41 | 280 | 0.8615 | m | 28.5 |
| 26.07.2023 | 8:55:42 | 281 | 0.8615 | m | 28.5 |
| 26.07.2023 | 8:55:43 | 282 | 0.8615 | m | 28.5 |
| 26.07.2023 | 8:55:44 | 283 | 0.8574 | m | 28.5 |
| 26.07.2023 | 8:55:45 | 284 | 0.8574 | m | 28.5 |
| 26.07.2023 | 8:55:46 | 285 | 0.8574 | m | 28.5 |
| 26.07.2023 | 8:55:47 | 286 | 0.8574 | m | 28.5 |
| 26.07.2023 | 8:55:48 | 287 | 0.8574 | m | 28.5 |
| 26.07.2023 | 8:55:49 | 288 | 0.8574 | m | 28.5 |
| 26.07.2023 | 8:55:50 | 289 | 0.8533 | m | 28.5 |
| 26.07.2023 | 8:55:51 | 290 | 0.8533 | m | 28.5 |
| 26.07.2023 | 8:55:52 | 291 | 0.8533 | m | 28.5 |
| 26.07.2023 | 8:55:53 | 292 | 0.8533 | m | 28.5 |
| 26.07.2023 | 8:55:54 | 293 | 0.8533 | m | 28.5 |
| 26.07.2023 | 8:55:55 | 294 | 0.8533 | m | 28.5 |
| 26.07.2023 | 8:55:56 | 295 | 0.8533 | m | 28.5 |

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| 26.07.2023 | 8:55:57 | 296 | 0.8492 | m | 28.5 |
| 26.07.2023 | 8:55:58 | 297 | 0.8492 | m | 28.5 |
| 26.07.2023 | 8:55:59 | 298 | 0.8492 | m | 28.5 |
| 26.07.2023 | 8:56:00 | 299 | 0.8492 | m | 28.5 |
| 26.07.2023 | 8:56:01 | 300 | 0.8492 | m | 28.5 |
| 26.07.2023 | 8:56:02 | 301 | 0.8492 | m | 28.5 |
| 26.07.2023 | 8:56:03 | 302 | 0.8492 | m | 28.5 |
| 26.07.2023 | 8:56:04 | 303 | 0.8453 | m | 28.5 |
| 26.07.2023 | 8:56:05 | 304 | 0.8453 | m | 28.5 |
| 26.07.2023 | 8:56:06 | 305 | 0.8453 | m | 28.5 |
| 26.07.2023 | 8:56:07 | 306 | 0.8453 | m | 28.5 |
| 26.07.2023 | 8:56:08 | 307 | 0.8453 | m | 28.5 |
| 26.07.2023 | 8:56:09 | 308 | 0.8453 | m | 28.5 |
| 26.07.2023 | 8:56:10 | 309 | 0.8453 | m | 28.5 |
| 26.07.2023 | 8:56:11 | 310 | 0.8453 | m | 28.5 |
| 26.07.2023 | 8:56:12 | 311 | 0.8453 | m | 28.5 |
| 26.07.2023 | 8:56:13 | 312 | 0.8453 | m | 28.5 |
| 26.07.2023 | 8:56:14 | 313 | 0.8412 | m | 28.5 |
| 26.07.2023 | 8:56:15 | 314 | 0.8412 | m | 28.5 |
| 26.07.2023 | 8:56:16 | 315 | 0.8412 | m | 28.5 |
| 26.07.2023 | 8:56:17 | 316 | 0.8412 | m | 28.5 |
| 26.07.2023 | 8:56:18 | 317 | 0.8412 | m | 28.5 |
| 26.07.2023 | 8:56:19 | 318 | 0.8412 | m | 28.5 |
| 26.07.2023 | 8:56:20 | 319 | 0.8412 | m | 28.5 |
| 26.07.2023 | 8:56:21 | 320 | 0.8412 | m | 28.5 |
| 26.07.2023 | 8:56:22 | 321 | 0.8412 | m | 28.5 |
| 26.07.2023 | 8:56:23 | 322 | 0.8412 | m | 28.5 |
| 26.07.2023 | 8:56:24 | 323 | 0.8371 | m | 28.5 |
| 26.07.2023 | 8:56:25 | 324 | 0.8371 | m | 28.5 |
| 26.07.2023 | 8:56:26 | 325 | 0.8371 | m | 28.5 |
| 26.07.2023 | 8:56:27 | 326 | 0.8371 | m | 28.5 |
| 26.07.2023 | 8:56:28 | 327 | 0.8371 | m | 28.5 |
| 26.07.2023 | 8:56:29 | 328 | 0.8371 | m | 28.5 |
| 26.07.2023 | 8:56:30 | 329 | 0.8371 | m | 28.5 |
| 26.07.2023 | 8:56:31 | 330 | 0.8371 | m | 28.5 |
| 26.07.2023 | 8:56:32 | 331 | 0.8371 | m | 28.5 |
| 26.07.2023 | 8:56:33 | 332 | 0.8371 | m | 28.5 |
| 26.07.2023 | 8:56:34 | 333 | 0.8371 | m | 28.5 |
| 26.07.2023 | 8:56:35 | 334 | 0.8371 | m | 28.5 |
| 26.07.2023 | 8:56:36 | 335 | 0.8331 | m | 28.5 |
| 26.07.2023 | 8:56:37 | 336 | 0.8331 | m | 28.5 |
| 26.07.2023 | 8:56:38 | 337 | 0.8331 | m | 28.5 |
| 26.07.2023 | 8:56:39 | 338 | 0.8331 | m | 28.5 |

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| 26.07.2023 | 8:56:40 | 339 | 0.8331 | m | 28.6 |
| 26.07.2023 | 8:56:41 | 340 | 0.8331 | m | 28.6 |
| 26.07.2023 | 8:56:42 | 341 | 0.8331 | m | 28.6 |
| 26.07.2023 | 8:56:43 | 342 | 0.8331 | m | 28.6 |
| 26.07.2023 | 8:56:44 | 343 | 0.8331 | m | 28.6 |
| 26.07.2023 | 8:56:45 | 344 | 0.8331 | m | 28.6 |
| 26.07.2023 | 8:56:46 | 345 | 0.8331 | m | 28.6 |
| 26.07.2023 | 8:56:47 | 346 | 0.8331 | m | 28.6 |
| 26.07.2023 | 8:56:48 | 347 | 0.8331 | m | 28.6 |
| 26.07.2023 | 8:56:49 | 348 | 0.829 | m | 28.6 |
| 26.07.2023 | 8:56:50 | 349 | 0.829 | m | 28.6 |
| 26.07.2023 | 8:56:51 | 350 | 0.829 | m | 28.6 |
| 26.07.2023 | 8:56:52 | 351 | 0.829 | m | 28.6 |
| 26.07.2023 | 8:56:53 | 352 | 0.829 | m | 28.6 |
| 26.07.2023 | 8:56:54 | 353 | 0.829 | m | 28.6 |
| 26.07.2023 | 8:56:55 | 354 | 0.829 | m | 28.6 |
| 26.07.2023 | 8:56:56 | 355 | 0.829 | m | 28.6 |
| 26.07.2023 | 8:56:57 | 356 | 0.829 | m | 28.6 |
| 26.07.2023 | 8:56:58 | 357 | 0.829 | m | 28.6 |
| 26.07.2023 | 8:56:59 | 358 | 0.829 | m | 28.6 |
| 26.07.2023 | 8:57:00 | 359 | 0.829 | m | 28.6 |
| 26.07.2023 | 8:57:01 | 360 | 0.829 | m | 28.6 |
| 26.07.2023 | 8:57:02 | 361 | 0.829 | m | 28.6 |
| 26.07.2023 | 8:57:03 | 362 | 0.829 | m | 28.6 |
| 26.07.2023 | 8:57:04 | 363 | 0.829 | m | 28.6 |
| 26.07.2023 | 8:57:05 | 364 | 0.8249 | m | 28.6 |
| 26.07.2023 | 8:57:06 | 365 | 0.8249 | m | 28.6 |
| 26.07.2023 | 8:57:07 | 366 | 0.8249 | m | 28.6 |
| 26.07.2023 | 8:57:08 | 367 | 0.8249 | m | 28.6 |
| 26.07.2023 | 8:57:09 | 368 | 0.8249 | m | 28.6 |
| 26.07.2023 | 8:57:10 | 369 | 0.8249 | m | 28.6 |
| 26.07.2023 | 8:57:11 | 370 | 0.8249 | m | 28.6 |
| 26.07.2023 | 8:57:12 | 371 | 0.8249 | m | 28.6 |
| 26.07.2023 | 8:57:13 | 372 | 0.8249 | m | 28.6 |
| 26.07.2023 | 8:57:14 | 373 | 0.8249 | m | 28.6 |
| 26.07.2023 | 8:57:15 | 374 | 0.8249 | m | 28.6 |
| 26.07.2023 | 8:57:16 | 375 | 0.8249 | m | 28.6 |
| 26.07.2023 | 8:57:17 | 376 | 0.8249 | m | 28.6 |
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| 26.07.2023 | 8:57:20 | 379 | 0.8249 | m | 28.6 |
| 26.07.2023 | 8:57:21 | 380 | 0.8249 | m | 28.6 |
| 26.07.2023 | 8:57:22 | 381 | 0.8249 | m | 28.6 |

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| 26.07.2023 | 8:57:23 | 382 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:24 | 383 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:25 | 384 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:26 | 385 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:27 | 386 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:28 | 387 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:29 | 388 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:30 | 389 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:31 | 390 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:32 | 391 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:33 | 392 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:34 | 393 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:35 | 394 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:36 | 395 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:37 | 396 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:38 | 397 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:39 | 398 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:40 | 399 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:41 | 400 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:42 | 401 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:43 | 402 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:44 | 403 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:45 | 404 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:46 | 405 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:47 | 406 | 0.8209 | m | 28.6 |
| 26.07.2023 | 8:57:48 | 407 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:57:49 | 408 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:57:50 | 409 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:57:51 | 410 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:57:52 | 411 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:57:53 | 412 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:57:54 | 413 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:57:55 | 414 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:57:56 | 415 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:57:57 | 416 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:57:58 | 417 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:57:59 | 418 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:00 | 419 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:01 | 420 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:02 | 421 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:03 | 422 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:04 | 423 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:05 | 424 | 0.8169 | m | 28.6 |

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|---|---|---|---|---|---|
| 26.07.2023 | 8:58:06 | 425 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:07 | 426 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:08 | 427 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:09 | 428 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:10 | 429 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:11 | 430 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:12 | 431 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:13 | 432 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:14 | 433 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:15 | 434 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:16 | 435 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:17 | 436 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:18 | 437 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:19 | 438 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:20 | 439 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:21 | 440 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:22 | 441 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:23 | 442 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:24 | 443 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:25 | 444 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:26 | 445 | 0.8169 | m | 28.6 |
| 26.07.2023 | 8:58:27 | 446 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:28 | 447 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:29 | 448 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:30 | 449 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:31 | 450 | 0.8128 | m | 28.6 |
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| 26.07.2023 | 8:58:33 | 452 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:34 | 453 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:35 | 454 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:36 | 455 | 0.8128 | m | 28.6 |
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| 26.07.2023 | 8:58:38 | 457 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:39 | 458 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:40 | 459 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:41 | 460 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:42 | 461 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:43 | 462 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:44 | 463 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:45 | 464 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:46 | 465 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:47 | 466 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:48 | 467 | 0.8128 | m | 28.6 |

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|---|---|---|---|---|---|
| 26.07.2023 | 8:58:49 | 468 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:50 | 469 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:51 | 470 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:52 | 471 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:53 | 472 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:54 | 473 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:55 | 474 | 0.8128 | m | 28.6 |
| 26.07.2023 | 8:58:56 | 475 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:58:57 | 476 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:58:58 | 477 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:58:59 | 478 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:00 | 479 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:01 | 480 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:02 | 481 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:03 | 482 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:04 | 483 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:05 | 484 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:06 | 485 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:07 | 486 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:08 | 487 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:09 | 488 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:10 | 489 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:11 | 490 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:12 | 491 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:13 | 492 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:14 | 493 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:15 | 494 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:16 | 495 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:17 | 496 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:18 | 497 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:19 | 498 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:20 | 499 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:21 | 500 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:22 | 501 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:23 | 502 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:24 | 503 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:25 | 504 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:26 | 505 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:27 | 506 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:28 | 507 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:29 | 508 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:30 | 509 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:31 | 510 | 0.8087 | m | 28.6 |

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|---|---|---|---|---|---|
| 26.07.2023 | 8:59:32 | 511 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:33 | 512 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:34 | 513 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:35 | 514 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:36 | 515 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:37 | 516 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:38 | 517 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:39 | 518 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:40 | 519 | 0.8087 | m | 28.6 |
| 26.07.2023 | 8:59:41 | 520 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:42 | 521 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:43 | 522 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:44 | 523 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:45 | 524 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:46 | 525 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:47 | 526 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:48 | 527 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:49 | 528 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:50 | 529 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:51 | 530 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:52 | 531 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:53 | 532 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:54 | 533 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:55 | 534 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:56 | 535 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:57 | 536 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:58 | 537 | 0.8047 | m | 28.6 |
| 26.07.2023 | 8:59:59 | 538 | 0.8047 | m | 28.6 |
| 26.07.2023 | 9:00:00 | 539 | 0.8047 | m | 28.6 |

# APPENDIX B

## MATHEMATICAL MODEL UTILIZED FOR ESTIMATING HYDRAULIC CONDUCTIVITY

### Model 1: Overdamped Cooper-Bredehoeft-Papadopulos (1967)

The Cooper-Bredehoeft-Papadopulos (1967) slug test applies to the instantaneous injection or withdrawal of a volume of water from a large diameter well cased in a confined aquifer. If water is injected into the well, then the initial head is above the equilibrium level and the solution method predicts the buildup. On the other hand, if water is withdrawn from the well casing, then the initial head is below the equilibrium level and the method calculates the drawdown. The drawdown or buildup *s* is given by the following equation:

$$\overline{H} = \frac{H_0 r_w S K_0(rq)}{Tq(r_w q K_0(r_w q) + 2\alpha K_1(r_w q))} \quad (1)$$

$$q = \sqrt{pS/T} \quad (2)$$

$$\alpha = \frac{r_w^2 S}{r_c^2} \quad (3)$$

Where:

- H is displacement in the well at time t [L]
- $H_0$ is initial displacement at t=0 [L]
- $K_i$ is modified Bessel function of second kind, order i
- p is the Laplace transform variable
- r is radial distance [L]
- $r_c$ is casing radius [L]
- $r_w$ is well radius [L]
- S is storativity [dimensionless]
- t is elapsed time since initiation of test [T]
- T is transmissivity [$L^2/T$]

**Model 2: Overdamped Hvorslev (1951)**

Hydraulic conductivity was calculated based on Hvorslev (1951) empirical model as follows;

$$k = \frac{A}{F(t_2 - t_1)} log_e \frac{H_1}{H_2} \quad (4)$$

where **k** is the permeability of soil (in cm/sec);

**F** is the intake factor

**$H_1$** is the variable head (in cm) measured at time **$t_1$** (in sec) after commencement of test;

**$H_2$** is the variable head (in cm) measurement at time **$t_2$** (in sec) after commencement of test;

**A** is the cross-sectional area of borehole casing or standpipe ($\frac{\pi}{4}D^2$).

**Model 3: Overdamped Bouwer and Rice (1976):**

$$K = \frac{r_c^2 \ln(R_e / R)}{2L_e} \frac{1}{t} \ln\left(\frac{H_0}{H_t}\right)$$

$$\ln(R_e / R) = \left[\frac{1.1}{\ln(L_w / R)} + \frac{A + B\ln[(h - L_w)/R]}{L_e / R}\right]^{-1}$$

K – hydraulic conductivity
rc – radius of the well casing
R – radius of the gravel envelope
Re – effective radius over which hear is disipated
Le – length of screen over which water can enter
H0 – drawdown at time 0
Ht – drawdown at time t
t – time
Lw – distance from water table to the bottom of the bore hole
A,B – constants on figure 5.25

Valid for Lw<h (the saturated thickness of the aquifer)