

KIBALI GOLD MINE

Democratic Republic of the Congo

TENDER PACKAGE

Geotechnical Drilling for the Kibali River Hydropower Project and Quarry/Borrow-Pit Material Exploration

Item	Detail
Project	Geotechnical Drilling for the Kibali River Hydropower Project and Quarry/Borrow-Pit Material Exploration
Employer	Kibali Goldmines SA ("KGM")
Location	Haut-Uele Province, Democratic Republic of the Congo
Nature of contract	Re-measurable, unit-rate geotechnical drilling contract
Gawa HPP Site drilling scope	12 No. boreholes; approximately 290m
Moke HPP Site drilling scope	9 No. boreholes; approximately 270m
Moke Saddle Dam drilling scope	8 No. boreholes; approximately 105m
Kibali River Bridge	4 No. boreholes; approximately 60m
Quarry/borrow-pit scope	9 No. exploratory boreholes at locations instructed by the Engineer / Geotechnical Consultant
Total number of boreholes	42 No.
Tender issue date	08 September 2026
Site briefing/inspection	Not Applicable
Tender closing date	15 September 2026
Tender Awarding	13 October 2026
Anticipated commencement	20 October 2026
Required completion	20 March 2027
Document reference	PRJ-26-09-009-KGM

This document is confidential and remains the property of Kibali Goldmines SA. The project drawings issued with this Tender Package were prepared by C2D International (Pty) Ltd. The COTO Standard Specifications for Subsurface Investigations 2010 are incorporated by reference solely for the purposes of this Tender.

Table of Contents

Table of Contents.....	2
Tender Package Contents & Instructions	4
Section 1: General Information & Instructions to Tenderers	5
1.1 General Description of Works	5
1.2 General Details of the Contract.....	5
1.3 Site Facilities Available	5
1.4 Existing Services	5
1.5 Site Visit.....	5
1.6 Tender Programme	6
1.7 Evaluation Criteria	6
Section 2: Scope of Work	8
2.1 Detailed Scope.....	8
2.2 Key Technical Requirements	9
2.3 Included Services and Deliverables by KGM and the Engineer / Geotechnical Consultant	9
2.4 Resources & Personnel	10
2.5 Contractor's Responsibilities.....	11
Section 3: Site & Logistics	12
3.1 Description of Site & Site Access.....	12
3.2 Site Conditions	13
3.3 Site Access Requirements	13
Section 4: Project Management & Key Performance Indicators	15
4.1 Schedule & Milestones.....	15
4.2 Reporting Requirements	15
4.3 Change Control Procedure	16
4.4 Key Performance Indicators.....	16
Section 5: Quality & Safety	17
5.1 Quality Assurance & Quality Control.....	17
5.2 Health, Safety & Environmental Requirements	18
Section 6: Bill of Quantities	20
6.1 Pricing Summary	20
6.2 Principal Quantities	20
Section 7: Commercial Terms & Conditions of Contract.....	26
7.1 Form & Basis of Contract	26
7.2 Time for Completion	26
7.3 Payment Terms	26
7.4 Retention & Security	27
7.5 Insurance.....	27
7.6 Variations & Change Control	27
Variations shall be instructed, notified and recorded in accordance with Section 4.3 and the Employer's standard form of contract.	27

7.7 Employer-Provided Services & Obligations	27
7.8 Quality, Defects & Corrective Work	27
7.9 Suspension & Termination	27
7.10 Health, Safety, Environment & Compliance.....	28
7.11 Governing Law & Disputes	28
Section 8: Returnable Schedules & Forms of Tender	29
8.1 Form of Tender.....	29
8.2 Returnable Documentation Checklist.....	29
8.3 Returnable Safety Documentation	30
8.4 Returnable Commercial & Statutory Documentation	30
8.5 Returnable Technical Milestone / Plan	31
8.6 Returnable Bill of Quantities	31
Annexure A: COTO Standard Specifications for Subsurface Investigations, July 2010.....	33
Annexure B: Gawa HPP Geotechnical Investigation Drawing	34
Annexure C: Moke HPP Geotechnical Investigation Drawing.....	35
Annexure D: Moke Saddle Dam Geotechnical Investigation Drawing	36
Annexure E: Kibali River Bridge Investigation Requirements	37
Annexure F: Quarry/Borrow-Pit Investigation Requirements	38

Tender Package Contents & Instructions

This Tender Package contains the documents on which tenderers are invited to submit an offer for geotechnical drilling at the Gawa and Moke HPP sites and the proposed quarry/borrow-pit areas.

The following components shall be read together and are mutually explanatory:

Part	Component
Section 1	General Information and Instructions to Tenderers
Section 2	Scope of Work
Section 3	Site Conditions, Access and Logistics
Section 4	Project Management, Programme and Reporting
Section 5	Quality, Health, Safety and Environmental Requirements
Section 6 and accompanying pricing workbook	Bill of Quantities and Pricing Schedules
Section 7	Commercial Terms and Conditions
Section 8	Returnable Schedules and Form of Tender
Annexure A	Technical Specification for Geotechnical Drilling
Annexure B	Gawa HPP Geotechnical Investigation Drawing
Annexure C	Moke HPP Geotechnical Investigation Drawing
Annexure D	Moke Saddle Dam Geotechnical Investigation Drawing
Annexure E, if issued	Kibali River Bridge Geotechnical Investigation Requirements
Annexure F, if issued	Quarry/Borrow-Pit Investigation Requirements

The Works shall be undertaken in accordance with the latest project drawings and instructions issued by the Engineer / Geotechnical Consultant and, where applicable, the following principal references:

1. *Standard Specifications for Subsurface Investigations*, Committee of Transport Officials, 2010.
2. *Site Investigation Code of Practice*, First Edition, Geotechnical Division of the South African Institution of Civil Engineering, January 2010.
3. *Engineering Geological Soil and Rock Description Guidelines*, South African Institute for Engineering and Environmental Geologists, February 2026.

Tenderers shall return the completed Form of Tender, priced Bill of Quantities, returnable schedules and required safety, commercial and technical documentation. Incomplete submissions may be considered non-responsive.

Section 1: General Information & Instructions to Tenderers

1.1 General Description of Works

The Works comprise geotechnical drilling for the proposed Gawa and Moke Hydropower Projects, together with exploratory drilling for potential quarry and borrow-pit material sources within the Kibali Gold Mine area.

The scope comprises:

- Twelve (12) boreholes at Gawa HPP, totalling approximately 290m;
- Nine (9) boreholes at Moke HPP, totalling approximately 270m;
- Eight (8) boreholes at Moke Saddle Dam, totalling approximately 105m;
- Four (4) boreholes at the Kibali River Bridge, totalling approximately 60m; and
- Nine (9) quarry/borrow-pit exploration boreholes at locations and to depths instructed by the Engineer / Geotechnical Consultant.

The Works include mobilisation, drilling through soil and rock, temporary casing, core recovery, in-situ testing, core handling, drilling records, borehole closure, site reinstatement and demobilisation.

Several boreholes require difficult, very difficult or river-crossing setups. Tenderers shall allow for the safe positioning, anchoring, movement (including barge moves) and operation of drilling equipment under steep, remote and riverine conditions.

1.2 General Details of the Contract

The Contract shall be concluded on the Employer's standard form of contract, read together with the Commercial Terms in Section 7.

The Contract shall be administered on a remeasurable, unit-rate basis. Tendered rates shall remain fixed, while quantities will be remeasured based on the Works executed and certified by the Engineer / Geotechnical Consultant.

Borehole locations, depths, inclinations, setup classifications and testing quantities are provisional and may be adjusted by the Engineer / Geotechnical Consultant in response to access, geological conditions or investigation findings.

1.3 Site Facilities Available

KGM will provide the services identified in Section 2.3. Tenderers shall identify any additional facilities or assistance assumed to be provided by KGM.

1.4 Existing Services

The investigation areas are remote and largely undeveloped. It is considered highly unlikely that underground or overhead services will be encountered at the borehole positions.

Nevertheless, no borehole shall commence until its position has been approved by the Engineer / Geotechnical Consultant and clearance to drill has been received from KGM.

The Contractor shall take reasonable precautions where roads, powerlines, pipelines, mine infrastructure or other services are identified. Any infrastructure damaged through the Contractor's actions shall be repaired at the Contractor's cost.

1.5 Site Visit

No compulsory site visit will be held.

Tenderers shall review the issued drawings and site information and may submit written requests for clarification before the tender-query deadline.

By submitting a tender, the tenderer shall be deemed to have considered:

- The remote location of the Works;
- Normal, difficult, very difficult and river-crossing setups;
- Steep and riverine terrain;
- Rig movement, positioning and anchoring;
- Climatic and wet-weather conditions; and
- All reasonably foreseeable requirements not expressly identified as being provided by KGM.

1.6 Tender Programme

Milestone	Date / Time
Tender issued	08 September 2026
Compulsory site visit	Not Applicable
Tender closing date	15 September 2026
Anticipated award	13 October 2026
Site establishment / start	20 October 2026
Practical completion	20 March 2027

1.7 Evaluation Criteria

Tenders will be evaluated on a combined Safety (30%) Commercial (30%) and Technical (40%) basis. The weightings within each category are set out below. Tenders will be evaluated using the stated criteria and weightings. Any amendment to the criteria or weightings before tender closing will be issued to all Tenderers by formal addendum.

Safety - 30%

No.	Criterion	Weighting
1	Compliance of the Contractor's safety file with the KGM Contractor Safety Standard	50%
2	Valid ISO 45001 certification or equivalent safety-management system	20%
3	Qualifications and experience of proposed safety personnel	20%
4	LTIFR and TRIFR performance for the preceding three years	10%

Commercial - 30%

No.	Criterion	Weighting
1	Price competitiveness and detailed cost breakdown	80%
2	Local-content, ownership and registration compliance	10%
3	Company policies, procedures and statutory compliance	5%
4	Acceptance of the Employer's commercial and payment terms	5%

Technical - 40%

No.	Criterion	Weighting
1	Experience in comparable geotechnical drilling projects	25%
2	Proposed personnel and CVs	10%
3	Suitability and availability of drilling rigs and ancillary equipment	35%
4	Level II programme and drilling method statement	10%
5	Quality Assurance and Quality Control Plan	10%
6	Project-specific health, safety and environmental procedures	10%

Section 2: Scope of Work

2.1 Detailed Scope

The Works comprise geotechnical drilling for the proposed Gawa and Moke Hydropower Projects, together with exploratory drilling for potential quarry and borrow-pit material sources.

The drilling scope comprises:

- Gawa HPP: 12 boreholes totalling approximately 290m, comprising ten vertical and two inclined boreholes;
- Moke HPP: 9 boreholes totalling approximately 270m, comprising five vertical and four inclined boreholes;
- Moke Saddle Dam: 8 vertical boreholes totalling approximately 105m;
- Kibali River Bridge: 4 vertical boreholes totalling approximately 60m; and
- Quarry/borrow-pit exploration: 9 boreholes at locations and to depths instructed by the Engineer / Geotechnical Consultant.

The Gawa, Moke, Moke Saddle Dam and Kibali River Bridge boreholes include normal, difficult, very difficult and river-crossing setups.

The Works include:

- Establishment of the Contractor and compliance with health, safety and environmental requirements;
- Provision and establishment of two core-drilling rigs, drilling barges and ancillary equipment;
- Mobile, normal, difficult, very difficult, inclined and river-crossing drilling setups;
- Movement of drilling rigs between borehole positions;
- Rotary core drilling and temporary casing through soil, weathered material, rock and very closely fractured material;
- Inclined drilling at the locations shown on the drawings;
- Recovery of soil material and rock core;
- Use of drilling aids where approved;
- Core-orientation surveys in selected boreholes;
- Water-pressure testing, including setup, packer installation and testing;
- Supply, labelling, storage and photography of core boxes;
- Recording of drilling progress, core recovery, groundwater conditions and test results;
- Completion and marking of boreholes using standpipes and caps or concrete marker blocks, as specified;
- Reinstatement of drilling areas;
- Approved standing time, where applicable; and
- Demobilisation on completion of the Works.

The purpose of the quarry and borrow-pit drilling is to determine the overburden thickness, depth to competent rock, material type, degree of weathering and variability of potential construction-material sources.

Borehole coordinates, depths and inclinations are provisional. The Engineer / Geotechnical Consultant may adjust the location, sequence or depth of any borehole in response to access, geological conditions or investigation findings. No borehole shall be terminated, abandoned or closed without the Engineer's / Geotechnical Consultant's approval.

2.2 Key Technical Requirements

The Works shall comply with the project Technical Specifications, issued drawings, Engineer's / Geotechnical Consultant's instructions and the applicable requirements of:

- *Standard Specifications for Subsurface Investigations*, Committee of Transport Officials, 2010;
- *Site Investigation Code of Practice*, Geotechnical Division of SAICE, January 2010; and
- *Engineering Geological Soil and Rock Description Guidelines*, SAIEG, February 2026.

Unless otherwise instructed, rotary drilling shall produce a nominal 76mm diameter borehole (N-size/NWD4 or approved equivalent). Weak, weathered or fractured materials shall be drilled using a split-inner, double-tube core barrel, such as NWD4 or an approved equivalent. Conventional double-tube barrels may be used in competent rock with the Engineer's / Geotechnical Consultant's approval. Single-tube core barrels shall not be used.

Continuous core recovery shall be obtained, with drill runs generally not exceeding 1.5m. Shorter runs shall be used where required in weak, fractured or poorly recovered material. The Contractor shall adjust its equipment and drilling method to maximise recovery and minimise washing, disturbance and artificial breakage.

Inclined boreholes shall be drilled at the inclination and direction shown on the drawings. Rigs shall be suitably positioned and anchored to maintain the required alignment.

Temporary casing shall be installed where necessary to stabilise the borehole, isolate loose materials and facilitate drilling or testing. Casing shall not be left in a borehole without the Engineer's / Geotechnical Consultant's approval.

In-situ testing may include Standard Penetration Tests, water-pressure or packer tests and groundwater measurements. Tests shall be undertaken at the depths instructed by the Engineer / Geotechnical Consultant's.

Recovered core shall be placed sequentially into suitable core boxes. Drill runs, depths and core loss shall be clearly marked, and each box shall identify the project, borehole, box number and depth interval. Core boxes shall be protected and transported to the storage area designated by KGM.

The Contractor shall maintain a Daily Drilling Journal recording drilling progress, methods, casing, recovery, groundwater, testing, samples, delays and instructions. Formal geotechnical logging will be undertaken by the Engineer's appointed Geotechnical Consultant.

Completed boreholes shall be grouted, sealed, backfilled or otherwise made safe as instructed. Drilling areas shall be cleared and reinstated before demobilisation.

2.3 Included Services and Deliverables by KGM and the Engineer / Geotechnical Consultant

KGM will provide or arrange:

- Accommodation and messing;
- Local and international transportation of the Contractor's personnel;

- Transportation associated with mobilisation and demobilisation of drilling rigs and ancillary equipment;
- Transportation between the mine and investigation sites;
- Initial creation or clearing of access routes and drilling platforms and access to sites suitable for drilling barge launching;
- Fuel for the drilling rigs;
- Community liaison;
- Mine-access coordination and site security arrangements; and
- A designated core-storage area.

Tenderers shall clearly identify any additional facilities or assistance assumed to be provided by KGM.

The Engineer / Geotechnical Consultant will:

- Confirm borehole positions, depths and inclinations;
- Direct the drilling and in-situ testing programme;
- Supervise the geotechnical investigation;
- Log the recovered soil and rock core;
- Select samples for laboratory testing;
- Inspect completed boreholes and core boxes; and
- Instruct borehole termination and final completion.

2.4 Resources & Personnel

The Contractor shall provide sufficient qualified and experienced personnel to complete the Works safely and within the required programme, including:

- A project or contract manager;
- An experienced drilling supervisor;
- Competent drillers and drilling assistants;
- Suitably qualified safety personnel;
- Mechanics or maintenance personnel; and
- Specialist personnel required for inclined, difficult or river-crossing drilling.

The proposed drilling rigs shall be capable of:

- Drilling to the scheduled depths and diameter;
- Drilling vertical and inclined boreholes;
- Operating safely on steep or restricted platforms;
- Installing temporary casing;
- Achieving satisfactory core recovery;
- Undertaking the specified in-situ tests; and
- Meeting the required programme.

The current programme assumes two drilling rigs. Tenderers proposing an alternative shall demonstrate that the Works can be completed within the required period.

2.5 Contractor's Responsibilities

The Contractor shall be responsible for the following, unless expressly stated otherwise:

- Labour, supervision, drilling rigs and ancillary equipment;
- Drill rods, core barrels, casing, bits, pumps and consumables;
- Core boxes, labels, depth markers and sample containers;
- Spares, maintenance and breakdown support;
- Preparing and securing equipment for transportation;
- Providing equipment dimensions, weights and mobilisation requirements to KGM;
- Inspecting access routes and drilling platforms before use;
- Rig supports, anchors and Contractor-designed temporary works;
- Barge establishment for river crossings;
- Maintaining borehole position, depth and inclination;
- Maximising core and sample recovery;
- Core handling, labelling, storage and handover;
- Daily and weekly drilling records;
- Coordination with the Engineer's / Geotechnical Consultant's supervision, logging and testing;
- Compliance with KGM safety, environmental and security requirements;
- Control and removal of drilling-related waste;
- Borehole closure and site reinstatement; and
- Demobilisation following completion.

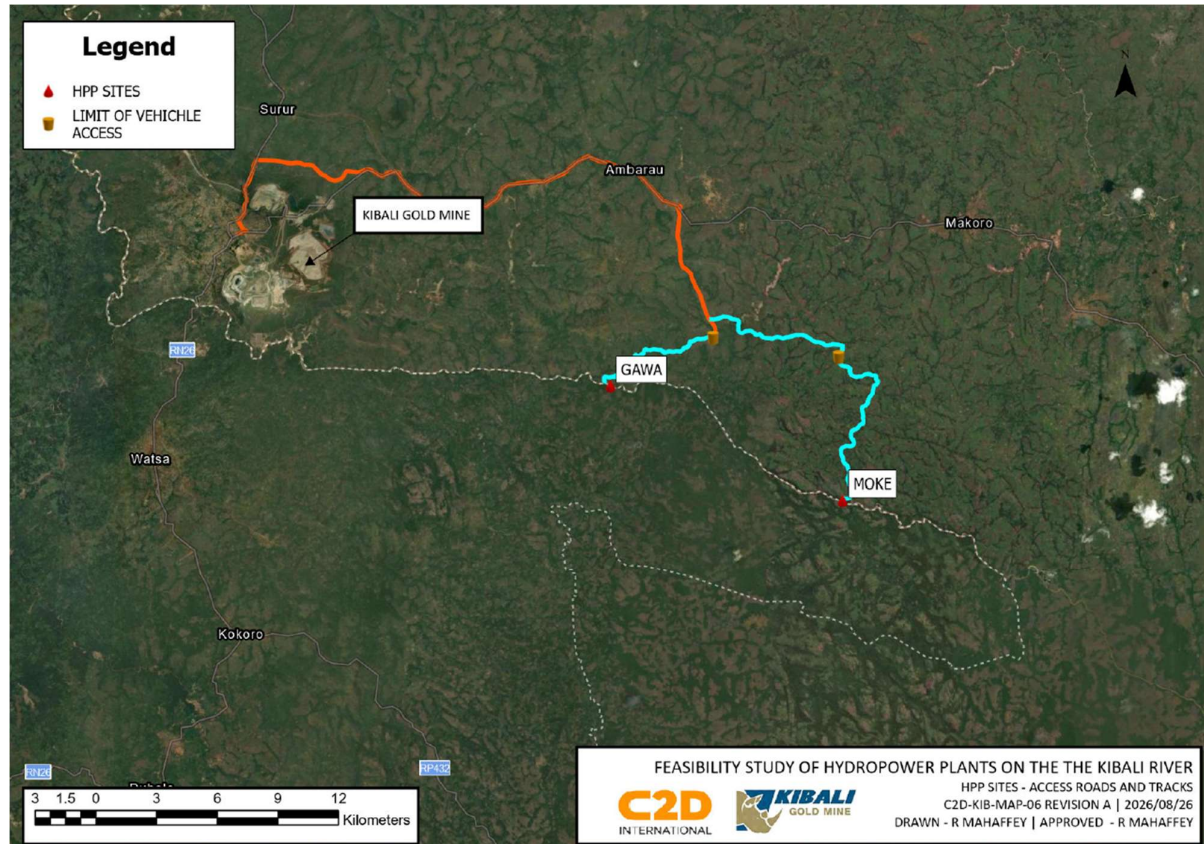
The Contractor shall not change a borehole position, depth, inclination, drilling method, core-barrel type or testing procedure without the Engineer's / Geotechnical Consultant's prior approval.

Section 3: Site & Logistics

3.1 Description of Site & Site Access

Kibali Gold Mine (“KGM”) is located in Haut-Uele Province, Watsa District, in the north-eastern Democratic Republic of the Congo.

The Gawa and Moke HPP sites are situated along the Kibali River approximately 34km and 55km from the mine respectively as illustrated below.



The quarry and borrow-pit boreholes will be located within potential material-source areas identified by KGM and the Engineer / Geotechnical Consultant.

The investigation sites are remote and characterised by steep terrain, dense vegetation and riverine conditions.

KGM will arrange the initial creation or clearing of access routes and drilling platforms where required.

Before moving equipment to a borehole, the Contractor shall confirm that:

- The access route has been released by KGM;
- The borehole position has been approved by the Engineer / Geotechnical Consultant;
- The access route and drilling platform are suitable for its equipment; and
- The required safety and security arrangements are in place.

The Contractor shall not clear vegetation, construct access routes or modify drilling platforms without prior approval.

KGM is responsible for providing and maintaining compliant access and platforms, unless additional work is necessitated by incorrect or late information from the Contractor.

3.2 Site Conditions

The region has a tropical climate with warm temperatures, high humidity and seasonal heavy rainfall. Tenderers shall allow for the effects of wet weather on access, rig stability, river levels and drilling productivity.

Conditions affecting the Works may include:

- Remote and difficult access;
- Steep, uneven or slippery terrain;
- Dense vegetation;
- Soft or saturated ground;
- Restricted drilling platforms;
- River crossings and work near flowing water;
- Variable river levels;
- Unstable soil, alluvium or weathered rock;
- Limited access for recovery and maintenance equipment; and
- Security and communication constraints.

The Contractor shall monitor weather, access and river conditions. Work shall stop where flooding, unstable ground or another condition creates an unacceptable risk.

Borehole positions may be adjusted by the Engineer / Geotechnical Consultant where access or platform conditions make the scheduled position unsafe or impractical.

The Contractor shall contain drilling fluids, cuttings, fuel, oil and waste and shall prevent their uncontrolled discharge into the Kibali River or surrounding environment.

3.3 Site Access Requirements

All personnel, vehicles and equipment shall comply with the applicable KGM access, security, health, safety and environmental requirements.

The following minimum requirements shall apply:

- All personnel shall complete the required inductions and hold valid medical fitness certificates;
- Drivers and operators shall hold valid licences and KGM permits;
- Vehicles and drilling equipment shall comply with KGM Light and Mobile Equipment requirements;
- Equipment shall be inspected and approved before use;
- Rig moves shall be supervised by a competent person;
- Rigs shall be securely positioned and anchored before drilling;
- Work near the river shall be undertaken under an approved method statement;
- Reliable communication and emergency arrangements shall be maintained; and
- KGM instructions to suspend work or evacuate an area shall be followed immediately.

KGM will arrange:

- Local and international transportation of the Contractor's personnel;

- Transportation associated with mobilisation and demobilisation of the drilling rigs and ancillary equipment;
- Transportation between the mine and the investigation sites;
- Fuel for the drilling rigs;
- Accommodation and messing; and
- Required site-security arrangements.

The Contractor shall provide KGM with personnel schedules, equipment inventories, dimensions, weights, packing lists and lifting or handling requirements sufficiently in advance.

The Contractor shall ensure that its equipment is suitably prepared and secured for transportation. Delays caused by incomplete or late information supplied by the Contractor shall remain the Contractor's responsibility.

Section 4: Project Management & Key Performance Indicators

4.1 Schedule & Milestones

The Contractor shall commence the Works on the date stated in the Notice to Proceed and complete them within the accepted Contract programme.

A Level II programme shall be submitted with the tender, showing:

- Mobilisation and establishment;
- Medicals, inductions and mine-access approvals;
- Activities allocated to each drilling rig;
- Drilling at Gawa, Moke, Moke Saddle Dam, Kibali River Bridge and the quarry/borrow-pit areas;
- Normal, difficult, very difficult and river-crossing setups;
- Rig moves and establishment between boreholes;
- In-situ testing and core handling;
- Borehole closure and site reinstatement; and
- Demobilisation.

The current planning basis assumes two drilling rigs. Tenderers proposing a different number of rigs shall demonstrate that the Works can be completed within the required period.

The Contractor shall update the programme weekly. Where delays are attributable to the Contractor, a recovery plan shall be submitted and implemented at the Contractor's cost.

The Engineer / Geotechnical Consultant may amend the drilling sequence to suit access, design requirements, geological findings or the overall project programme.

4.2 Reporting Requirements

The Contractor shall maintain a Daily Drilling Journal for each drilling rig and borehole. The journal shall record:

- Borehole number and drilling rig;
- Personnel and working hours;
- Start and finish depths;
- Drilling method and core-barrel type;
- Drill-run lengths and core recovery;
- Casing installed or removed;
- Groundwater strikes and drilling-water losses;
- In-situ tests and samples;
- Core-box numbers;
- Delays, breakdowns and standing time; and
- Instructions received from the Engineer / Geotechnical Consultant.

Daily records shall be submitted to the Engineer / Geotechnical Consultant by the start of the following working day.

A written weekly report shall be submitted every Saturday, unless otherwise agreed. It shall summarise:

- Progress against the accepted programme;
- Drilling metres and boreholes completed;
- Equipment and personnel on site;
- Safety and environmental performance;
- Delays, access constraints and breakdowns;
- Instructions and variations;
- Corrective or recovery measures; and
- A two-week look-ahead programme.

Safety, security and environmental incidents, unsafe access or drilling platforms, major equipment breakdowns, borehole instability and unexpected drilling or groundwater conditions shall be reported immediately.

4.3 Change Control Procedure

The Contractor shall notify KGM and the Engineer / Geotechnical Consultant in writing within seven days of becoming aware of any circumstance that may constitute additional or varied work or affect the Contract price or programme.

Work outside the agreed Scope of Work shall not proceed without the Engineer's / Geotechnical Consultant's written instruction, except where immediate action is required to protect persons, equipment or the environment.

Potential variations may include:

- Changes to borehole locations, depths or inclinations;
- Additional boreholes or testing;
- Additional casing or casing left in a borehole;
- Additional temporary works;
- Instructed standing time; and
- Resequencing or suspension for reasons outside the Contractor's control.
- The Contractor shall maintain a variation register and provide supporting daily records for all additional work. Failure to notify a variation within the required period may result in the associated claim being disallowed.

4.4 Key Performance Indicators

Performance will be reviewed against the Key Performance Indicators as stipulated in Schedule 3 of the Draft Contract Document included in Part B.

Section 5: Quality & Safety

5.1 Quality Assurance & Quality Control

The Contractor shall undertake all drilling, sampling, in-situ testing, core handling and borehole-completion activities in accordance with the Technical Specifications, issued drawings, Engineer's / Geotechnical Consultant's instructions and the applicable requirements of:

- *Standard Specifications for Subsurface Investigations*, Committee of Transport Officials, 2010;
- *Site Investigation Code of Practice*, Geotechnical Division of SAICE, January 2010; and
- *Engineering Geological Soil and Rock Description Guidelines*, SAIEG, February 2026.

The Contractor shall submit a project-specific Quality Assurance and Quality Control Plan with its tender. The plan shall address:

- Inspection and suitability of drilling equipment;
- Verification of borehole positions, depths, inclinations and directions;
- Drilling methods, core barrels, casing and drill-run lengths;
- Core and sample recovery;
- In-situ testing and equipment calibration;
- Core extraction, boxing, labelling, storage and transportation;
- Daily drilling records;
- Control of non-conforming work; and
- Borehole closure and site reinstatement.

The Contractor shall make all drilling rigs, core barrels, casing, testing equipment and ancillary plant available for inspection before commencement. Equipment that is unsafe, defective or unsuitable may be rejected by KGM or the Engineer / Geotechnical Consultant.

The Contractor shall use appropriate equipment and drilling techniques to maximise core recovery and minimise disturbance, washing, grinding and artificial breakage. Core recovery shall be recorded for every drill run. Where poor recovery results from unsuitable equipment, drilling technique or workmanship, the Contractor shall modify its method at its own cost.

Recovered core shall be placed sequentially into suitable core boxes. Each drill run and area of core loss shall be clearly marked. Core boxes shall be labelled with the project name, borehole number, box number and depth interval and shall be protected from disturbance, contamination and weather.

All in-situ testing shall be undertaken using approved and appropriately calibrated equipment. Tests invalidated by equipment failure or incorrect procedure shall be repeated at the Contractor's cost.

The Contractor shall maintain complete Daily Drilling Journals, core-box registers, test records, calibration certificates and borehole-completion records. These records shall be submitted progressively and handed over to the Engineer / Geotechnical Consultant on completion.

The Contractor shall immediately report non-conforming work, including incorrect borehole positions or inclinations, avoidable core loss, incorrectly labelled core, invalid testing, incomplete records or unauthorised borehole termination. Corrective work arising from matters within the Contractor's control shall be undertaken at the Contractor's cost.

5.2 Health, Safety & Environmental Requirements

The Contractor shall comply with all applicable DRC legislation, Barrick and KGM health, safety, security and environmental requirements, approved risk assessments and instructions issued by KGM or the Engineer / Geotechnical Consultant.

A project-specific Health, Safety and Environmental Plan shall be submitted with the tender. The plan shall address the principal hazards associated with:

- Mobilisation and movement of drilling rigs;
- Drilling on steep, restricted or unstable terrain;
- Difficult and very difficult drilling setups;
- River-crossing and near-river work;
- Inclined drilling;
- Rig anchoring and temporary works;
- Rod, casing and core-barrel handling;
- Lifting operations;
- Fuel, drilling-fluid and grout handling;
- Equipment maintenance and recovery;
- Adverse weather and flooding;
- Remote-area communications and evacuation; and
- Security.

All personnel shall be medically fit, appropriately trained and inducted. Operators shall hold the required licences and KGM permits. The Contractor shall provide competent supervision and suitably qualified safety personnel in accordance with KGM requirements.

Drilling rigs shall be positioned on stable platforms and securely supported and anchored before operation. Guards, emergency stops, lifting equipment, pressure lines and rod-handling systems shall be inspected regularly. Clearly marked exclusion zones shall be maintained around operating rigs.

Rig movements on steep or difficult terrain shall be supervised by a competent person and undertaken in accordance with an approved method statement. Suitable winches, anchors, recovery equipment, spotters and communication systems shall be provided.

Work within or adjacent to the river shall only proceed under an approved method statement. River levels and weather conditions shall be monitored, and work shall stop where flooding or rapidly changing conditions present a risk. Personnel exposed to a drowning risk shall wear approved flotation devices, and suitable rescue equipment shall be immediately available.

The Contractor shall comply with all KGM security controls and movement restrictions. Work at remote locations shall not proceed without the required security clearance and communication arrangements. The Contractor shall suspend work and withdraw personnel when instructed by KGM.

Fuel, oil, drilling fluids, grout and waste shall be contained and managed to prevent contamination of soil or watercourses. Spill kits shall be available at each active drilling site. Drilling return water and cuttings shall not be discharged directly into the Kibali River or another watercourse without approval.

All incidents, near misses, environmental events and security concerns shall be reported immediately. KGM, the Engineer / Geotechnical Consultant and the Contractor's authorised personnel may stop work where unsafe, insecure or environmentally unacceptable conditions exist. Work shall only resume once the necessary corrective measures have been implemented and approved.

Section 6: Bill of Quantities

The priced Bill of Quantities (“BoQ”) is issued as an accompanying Excel workbook, titled Kibali HPP – Geotech Estimate Rev 4.xlsx, which shall be completed and returned with the tender. The full itemised BoQ is also reproduced in Section 6.3 of this Tender Package; in the event of any discrepancy, the Excel workbook shall govern.

The Contract is remeasurable. Tendered rates shall remain fixed, while quantities will be based on the work actually executed and certified by the Engineer / Geotechnical Consultant. All rates shall be quoted in United States Dollars and shall exclude VAT and other separately stated taxes.

Rates shall include all labour, equipment, supervision, consumables and incidental work necessary to complete each item, except for services expressly identified as being provided by KGM.

6.1 Pricing Summary

The BoQ includes the following principal schedules:

COTO Section	Description
1	Establishment of Contractor
3	Establishment and Provision of Rigs and Equipment
5	Drilling Setups and Movement
10	Rotary Core Drilling
12	Core and Soil Material Recovery
13	Casing
14	Drilling Aids
19	Core Orientation Surveys
23	Standard Penetration Test
26	Water-Pressure Testing
31	Core Boxes
33	Core Photography
35	Borehole Marking and Completion
37	Standing Time

Tenderers shall price every applicable item and clearly identify any exclusions, qualifications or additional items.

6.2 Principal Quantities

The principal scheduled quantities are summarised below. The complete quantities and units are provided in the accompanying BoQ.

Item	Gawa	Moke	Moke Saddle Dam	Kibali River Bridge	Quarry/Borrow Pit
Boreholes	12 No.	9 No.	8 No.	4 No.	9 No.
Scheduled drilling	290m	270m	105m	60m	135m
Inclined boreholes	2 No.	4 No.	-	-	—
Inclined drilling	80 m	150 m	-	-	—

Item	Gawa	Moke	Moke Saddle Dam	Kibali River Bridge	Quarry/Borrow Pit
River-crossing setups	2 No.	3 No.	1 No.	1 No.	–
Core-orientation surveys	2 No.	4 No.	-	-	–
Water-pressure test setups	12 No.	9 No.	8 No.	-	–
Core boxes and photographs	58 No.	54 No.	21 No.	12 No.	27 No.
Standpipes and caps	2 No.	4 No.	-	-	–
Concrete borehole markers	10 No.	5 No.	8 No.	4 No.	9 No.

Quantities are provisional and may be increased, reduced or omitted by the Engineer / Geotechnical Consultant. Rate-only items shall be priced for the valuation of instructed work or variations.

6.3 Detailed Priced Bill of Quantities

The full itemised Bill of Quantities is set out below and forms part of this Tender Package. It is reproduced from, and shall be read together with, the accompanying priced Bill of Quantities workbook (Kibali HPP – Geotech Estimate Rev 4.xlsx), which is the document to be completed and returned with the tender. “Rate Only” items are priced for the valuation of variations; quantities shown are provisional and subject to remeasurement in accordance with Section 6.2 and Section 7.1.

Note: Rate (USD) and Amount (USD) columns are to be completed by the tenderer in both this table and the accompanying Excel workbook; in the event of any discrepancy between the two, the Excel workbook shall govern.

Coto Ref	Project Ref	Description (All references refer to main COTO items)	Unit	Qty	Rate USD	Amount USD
SECTION 1	1	ESTABLISHMENT OF CONTRACTOR				
1.1	1.1	Establishment of contractor				
	1.1.1	Fixed Charges	Sum	1		
	1.1.2	Time related items	day	55		
	1.1.3	Health and Safety obligations	cal day	55		
	1.1.4	Environmental management	sum			
	1.1.5	Provision of labour (per person)	hour			
SECTION 3	2	ESTABLISHMENT AND PROVISION OF RIGS AND EQUIPMENT				
3.1	2.1	Core drilling rigs (2 No rigs)				
	2.1.1	Gawa	no.day	18.1		
	2.1.2	Moke	no.day	16.9		
	2.1.3	Moke Saddle Dam	no.day	6.6		
	2.1.4	Kibali River Bridge	no.day	3.8		
	2.1.5	Quarry/Borrow pit exploration	no.day	8.4		
3.4	2.1.6	Drilling barges	sum	1		
3.5	2.2	Establishment of other plant and equipment				
3.5.6	2.2.1	Core orientation equipment	sum	1		
3.5.7	2.2.2	Water pressure equipment	sum	1		

Coto Ref	Project Ref	Description (All references refer to main COTO items)	Unit	Qty	Rate USD	Amount USD
3.6	2.3	Any other equipment or plant, as specified and listed in Bill of Quantities				
	2.3.1	Other - contractor to specify	sum	1		
SECTION 5	3	SETTING UP				
5.1	3.1	Mobile setups				
5.1.1	3.1.1	Core drill				
	3.1.1.1	Gawa	No	12		
	3.1.1.2	Moke	No	9		
	3.1.1.3	Moke Saddle Dam	No	8		
	3.1.1.4	Kibali River Bridge	No	4		
	3.1.1.5	Quarry/Borrow pit exploration	No	9		
5.2	3.2	Skid Setups				
5.2.1	3.2.1	Normal skid setup	No			
	3.2.1.1	Gawa	No	1		
	3.2.1.2	Moke	No	1		
	3.2.1.3	Moke Saddle Dam	No	2		
	3.2.1.4	Quarry/Borrow pit exploration	No	9		
5.2.2	3.2.2	Difficult skid setup	No			
	3.2.2.1	Gawa	No	1		
	3.2.2.2	Moke	No	1		
	3.2.2.3	Moke Saddle Dam	No	5		
	3.2.2.4	Kibali River Bridge	No	4		
5.2.3	3.2.3	Very difficult skid setup				
	3.2.3.1	Gawa	No	10		
	3.2.3.2	Moke	No	7		
	3.2.3.3	Moke Saddle Dam	No	1		
5.3	3.3	Setting up on inclined holes				
	3.3.1	Extra over 5.1 or 5.2, core drill				
	3.3.1.1	Gawa	No	2		
	3.3.1.2	Moke	No	4		
5.4	3.4	Setting up in specialised circumstances				
	3.4.1	Extra over 5.1 or 5.2, core drill				
	3.4.1.1	Setups requiring river crossings				
	3.4.1.1.1	Gawa	No	2		
	3.4.1.1.2	Moke	No	3		
	3.4.1.1.3	Moke Saddle Dam	No	1		
5.5	3.5	Movement between boreholes				
	3.5.1	Extra over 5.1 or 5.2, core drill	km			
	3.5.1.1	Gawa	km	0.5		
	3.5.1.2	Moke	km	0.5		
	3.5.1.3	Moke Saddle Dam	km	0.5		
	3.5.1.4	Kibali River Bridge	km	0.5		
	3.5.1.5	Quarry/Borrow pit exploration	km	1		
SECTION 10	4	ROTARY CORE DRILLING				

Coto Ref	Project Ref	Description (All references refer to main COTO items)	Unit	Qty	Rate USD	Amount USD
10.3	4.1	In Category C materials				
	4.1.1	Gawa	m	290		
	4.1.2	Moke	m	270		
	4.1.3	Moke Saddle Dam	m	105		
	4.1.4	Kibali River Bridge	m	60		
	4.1.5	Quarry/Borrow pit exploration	m	135		
10.5	4.2	In very closely fractured material (extra over item 10.3)				
	4.2.1	Gawa	m	90		
	4.2.2	Moke	m	80		
	4.2.3	Moke Saddle Dam	m	30		
	4.2.4	Kibali River Bridge	m	18		
10.10	4.3	Extra over for drilling inclined holes in all categories				
10.10.3	4.3.1	Inclination < 30 degrees and > 0 degrees	m			
	4.3.1.1	Gawa	m	80		
	4.3.1.2	Moke LB Option 2	m	150		
SECTION 12	5	CORE AND SOIL MATERIAL RECOVERY				
12.1	5.1	Soil material recovery in all material types				
	5.1.1	Gawa	m	15		
	5.1.2	Moke	m	15		
	5.1.3	Moke Saddle Dam	m	15		
	5.1.4	Kibali River Bridge	m	10		
	5.1.5	Quarry/Borrow pit exploration	m	15		
12.4	5.2	Core recovery in Category C material				
	5.2.1	Gawa	m	290		
	5.2.2	Moke	m	270		
	5.2.3	Moke Saddle Dam	m	105		
	5.2.4	Kibali River Bridge	m	60		
	5.2.5	Quarry/Borrow pit exploration	m	135		
12.6	5.3	In very closely fractured material				
	5.3.1	Gawa	m	85		
	5.3.2	Moke	m	90		
	5.3.3	Moke Saddle Dam	m	30		
	5.3.4	Kibali River Bridge	m	15		
	5.3.5	Quarry/Borrow pit exploration	m	35		
SECTION 13	6	CASING				
13.1	6.1	Casing, which may be removed (by size)	m	R/O		
13.2	6.2	Casing in material of category B or harder (Extra over 13.1)	m	R/O		

Coto Ref	Project Ref	Description (All references refer to main COTO items)	Unit	Qty	Rate USD	Amount USD
13.3	6.3	Casing in boulders or gravel (Extra over 13.1)	m	R/O		
13.4	6.4	Casing left in the hole (Extra over 13.1) by size	m	R/O		
13.5	6.5	Casing in inclined holes (Extra over 13.1)	m	R/O		
SECTION 14	7	THE USE OF DRILLING AIDS				
14.2	7.1	Purchase price of drilling aids	P Sum			
14.3	7.2	Mark-up for handling and profit	%			
SECTION 19	8	CORE ORIENTATION SURVEYS				
19.1	8.1	Core orientation surveys				
	8.1.1	Gawa	No	2		
	8.1.2	Moke	No	4		
SECTION 23	9	STANDARD PENETRATION TEST				
23.1	9.1	Standard Penetration Test				
	9.1.1	Gawa	No	36		
	9.1.2	Moke	No	27		
	9.1.3	Moke Saddle Dam	No	24		
	9.1.4	Kibali River Bridge	No	8		
SECTION 26	10	WATER PRESSURE TESTING				
26.1	10.1	Set up at borehole				
	10.1.1	Gawa	No	12		
	10.1.2	Moke	No	9		
	10.1.3	Moke Saddle Dam	No	8		
26.2	10.2	Installation of set of packers				
	10.2.1	Gawa	No	58		
	10.2.2	Moke	No	54		
	10.2.3	Moke Saddle Dam	No	21		
26.3	10.3	Carry out pressure test				
	10.3.1	Gawa	hour	60		
	10.3.2	Moke	hour	70		
	10.3.3	Moke Saddle Dam	hour	30		
SECTION 31	11	CORE BOXES				
31.1	11.1	Core boxes				
	11.1.1	Gawa	No	58		
	11.1.2	Moke	No	54		
	11.1.3	Moke Saddle Dam	No	21		
	11.1.4	Kibali River Bridge	No	12		
	11.1.5	Quarry/Borrow pit exploration	No	27		
SECTION 33	12	CORE PHOTOGRAPHY				
33.1	12.1	Core photographs				
	12.1.1	Gawa	No	58		

Coto Ref	Project Ref	Description (All references refer to main COTO items)	Unit	Qty	Rate USD	Amount USD
	12.1.2	Moke	No	54		
	12.1.3	Moke Saddle Dam	No	21		
	12.1.4	Kibali River Bridge	No	12		
	12.1.5	Quarry/Borrow pit exploration	No	27		
SECTION 35	13	MARKING OF HOLES				
35.1	13.1	Standpipe and cap				
	13.1.1	Gawa	No	2		
	13.1.2	Moke	No	4		
35.2	13.2	Concrete block only				
	13.2.1	Gawa	No	10		
	13.2.2	Moke	No	5		
	13.2.3	Moke Saddle Dam	No	8		
	13.2.4	Kibali River Bridge	No	4		
	13.2.5	Quarry/Borrow pit exploration	No	9		
SECTION 37	14	STANDING TIME				
37.1	14.1	Standing time				
	14.1.1	Drill rig	hour			
		TOTAL (excl VAT)				

Section 7: Commercial Terms & Conditions of Contract

The Contract shall be executed on the Employer's standard form of contract. The terms below shall be read together with that standard form. Where a conflict occurs, the executed standard form shall prevail.

Tenderers shall identify all proposed qualifications or amendments in the Form of Tender. Any qualification not expressly stated in the tender submission will be deemed not to apply.

7.1 Form & Basis of Contract

Term	Provision
Contract form	Employer's standard form of contract
Pricing basis	Remeasurable, unit-rate contract based on the priced Bill of Quantities
Measurement standard	COTO Standard Specifications for Subsurface Investigations (2010), as amended by the Project Specifications
Currency	United States Dollars
Taxes	Rates shall exclude VAT and include all other applicable costs unless stated otherwise

Tendered rates shall remain fixed for the Contract period. Quantities will be remeasured based on work executed and certified by the Engineer / Geotechnical Consultant.

7.2 Time for Completion

The commencement and completion dates shall be stated in the Letter of Award or Notice to Proceed.

The Contractor shall execute the Works in accordance with the accepted Level II programme and shall provide sufficient personnel, rigs and equipment to meet the required completion date.

Extensions of time will only be considered in accordance with the Employer's standard contract and where supported by the required notices and daily records.

Term	Provision
Commencement	20 October 2026
Practical completion	20 March 2027
Programme	Approved Level II programme; progress measured weekly against it (see Section 4).
Extension of time	Granted for Employer-caused delay, variations and other events entitling relief under the standard form (standard).
Delay damages	Liquidated / delay damages for late completion as stated in the standard form and Form of Tender (rate to be inserted at award) (standard).

7.3 Payment Terms

Payment shall be based on monthly interim payment certificates for work executed and certified by the Engineer / Geotechnical Consultant.

Payment will be determined from:

- Actual remeasured quantities;
- Tendered rates in the Bill of Quantities;

- Approved lump-sum and time-related items;
- Approved variations; and
- Approved standing time, where applicable.

No payment will be made for defective work, avoidable core loss, invalid tests, unauthorised work or corrective work arising from matters within the Contractor's control.

Payment shall be made within the period stated in the Employer's standard contract following certification.

7.4 Retention & Security

Retention, performance security and any advance-payment guarantee shall be as stated in the Employer's standard contract.

Where an advance payment is agreed, it shall be supported by an acceptable guarantee and recovered from interim payment certificates.

7.5 Insurance

The Contractor shall maintain all insurance required by the Employer's standard contract and applicable DRC legislation, including:

- Public liability;
- Employer's liability or workers' compensation;
- Motor and mobile-equipment insurance;
- Insurance of the Contractor's drilling equipment; and
- Any other insurance required by KGM.

Evidence of valid cover shall be provided before mobilisation.

7.6 Variations & Change Control

Variations shall be instructed, notified and recorded in accordance with Section 4.3 and the Employer's standard form of contract.

7.7 Employer-Provided Services & Obligations

KGM will provide or arrange the services specified in Section 2.3. The Contractor shall provide the information required to coordinate those services within the agreed notice periods.

7.8 Quality, Defects & Corrective Work

All work shall comply with the Technical Specifications, approved method statements and Engineer's / Geotechnical Consultant's instructions.

The Contractor shall correct, at its own cost, defective or non-conforming work arising from unsuitable equipment, poor workmanship, incorrect procedures or failure to follow instructions.

Corrective work may include redrilling, repeating tests, replacing damaged core boxes, correcting records or reinstating disturbed areas.

7.9 Suspension & Termination

The Employer may suspend or terminate the Works in accordance with the standard contract, including for:

- Material breach;

- Unsafe or environmentally unacceptable work;
- Persistent failure to meet the programme or quality requirements;
- Use of unsuitable equipment or personnel;
- Failure to comply with security requirements; or
- Insolvency or abandonment of the Works.

The Contractor shall immediately comply with an instruction to suspend work and shall secure the boreholes, equipment and work areas.

7.10 Health, Safety, Environment & Compliance

The Contractor shall comply with all applicable DRC legislation, Barrick and KGM requirements, approved safety documentation and the provisions of Section 5.

A material breach of health, safety, environmental or security requirements may result in immediate suspension or termination.

7.11 Governing Law & Disputes

The Contract shall be governed by the law and dispute-resolution procedures stated in the Employer's standard form of contract.

Tenderers shall be deemed to have reviewed and accepted these provisions, subject to any qualification expressly recorded in the Form of Tender.

Section 8: Returnable Schedules & Forms of Tender

Tenderers shall complete and return all schedules in this Section together with the priced Bill of Quantities and the supporting safety, commercial and technical documentation.

Incomplete submissions may be considered non-responsive.

8.1 Form of Tender

To: Kibali Goldmines SA (“the Employer”)

Having examined the Tender Package for the geotechnical drilling associated with the Gawa and Moke Hydropower Project and quarry/borrow-pit material exploration, we offer to execute and complete the Works in accordance with the Tender Package for the tender sum entered below and detailed in the accompanying priced Bill of Quantities.

Item	Tenderer to complete
Tender sum (excl. VAT)	
Tender currency	
Tender validity period	
Proposed contract programme accepted	Yes / No
Employers standard contract accepted	Yes / No
Commercial Terms (Section 7) accepted	Yes / No
Qualifications or exclusions	Yes / No
Company name	
Company Registration Number	
Local content / ownership status	
Authorised signatory (name)	
Signature & date	

The tenderer confirms that it has reviewed the available site information and allowed for the remote location, access constraints and normal, difficult, very difficult and river-crossing drilling setups.

8.2 Returnable Documentation Checklist

Complete the Document Reference No. column with the tenderer’s own reference / file number for each document submitted and tick the Enclosed column.

No.	Document	Document Ref. No.	Enclosed
1	Completed Form of Tender		☐
2	Priced Bill of Quantities		☐
3	Detailed cost breakdown		☐
4	Company profile and relevant experience		☐
5	Project organisation and CVs of key personnel		☐
6	Drilling-rig and equipment schedule		☐
7	Level II programme		☐
8	Drilling method statement		☐

No.	Document	Document Ref. No.	Enclosed
9	Quality Assurance and Quality Control Plan		☐
10	Health, Safety and Environmental Plan		☐
11	Completed safety returnables		☐
12	Completed commercial and statutory returnables		☐
13	Schedule of qualifications and exclusions		☐
14	Proposed subcontractors and suppliers		☐

8.3 Returnable Safety Documentation

The tenderer shall submit the following safety documentation:

No.	Document	Document Ref. No.	Enclosed
1	KGM-compliant safety file or index		☐
2	Health and Safety Policy		☐
3	Project-specific Health, Safety and Environmental Plan		☐
4	Risk-management procedure and preliminary risk register		☐
5	Proposed drilling and rig-movement procedures		☐
6	Emergency Response Plan		☐
7	Incident-reporting and investigation procedure		☐
8	Training and competency records		☐
9	CVs and qualifications of safety personnel		☐
10	Medical and fitness-for-work procedure		☐
11	Safety-performance statistics for the previous three years		☐
12	Valid ISO 45001 certificate, if applicable		☐

8.4 Returnable Commercial & Statutory Documentation

The tenderer shall submit the following commercial and statutory documentation, enter the document reference number and ticking the Enclosed column for each item.

No.	Document	Document Ref. No.	Enclosed
1	Company registration certificate		☐
2	Company ownership information		☐
3	Registered physical and postal address		☐
4	VAT registration, if applicable		☐
5	Commercial registry certificate (RCCM), where applicable		☐
6	Tax registration and tax-clearance documentation		☐
7	ARSP, INPP, CNSS and ONEM documentation, where applicable		☐
8	Banking details		☐

No.	Document	Document Ref. No.	Enclosed
9	Proof of insurance or confirmation of insurability		☐
10	Applicable operating licences or authorisations		☐
11	Local-content compliance information		☐
12	Proposed contractual qualifications		☐

8.5 Returnable Technical Milestone / Plan

The tenderer shall complete the following schedule in accordance with its Level II programme:

No.	Milestone / Activity	Planned Start	Planned Finish
1	Safety documentation and mobilisation planning		
2	Mobilisation of personnel and equipment		
3	Inductions, equipment inspections and establishment		
4	Gawa HPP drilling		
5	Moke HPP drilling		
6	Moke Saddle Dam drilling		
7	Quarry/borrow-pit exploration drilling		
8	In-situ testing		
9	Core-box and drilling-record handover		
10	Borehole closure and site reinstatement		
11	Demobilisation		

The tenderer shall attach its detailed Level II programme and drilling method statement. The programme shall identify the proposed number of drilling rigs and the activities allocated to each rig.

8.6 Returnable Bill of Quantities

The tenderer shall price every schedule in Section 6.3 (Rate and Amount columns) and return it together with the completed accompanying Excel workbook:

Kibali HPP – Geotech Estimate Rev 4.xlsx

Rates are exclusive of VAT and stated in the tender currency. “Rate Only” items are priced for the valuation of variations; “Sum” items are lump sums entered in the Amount column.

Rates shall:

- Be stated in United States Dollars;
- Exclude VAT;
- Remain fixed for the Contract period;

- Include all costs necessary to execute the item, except for services expressly provided by KGM; and
- Be consistent with the tenderer's technical submission and proposed equipment.

The tenderer shall identify any unpriced items, assumptions, exclusions or proposed additional items. Unpriced items may be deemed to be included elsewhere in the tendered rates.

Bill of Quantities – Pricing Summary

COTO Section	Description	Amount USD
1	Establishment of Contractor	
3	Establishment and Provision of Rigs and Equipment	
5	Drilling Setups and Movement	
10	Rotary Core Drilling	
12	Core and Soil Material Recovery	
13	Casing	
14	Drilling Aids	
19	Core Orientation Surveys	
23	Standard Penetration Tests	
26	Water-Pressure Testing	
31	Core Boxes	
33	Core Photography	
35	Marking of Holes	
37	Standing Time	
	Sub-total (excl. VAT)	
	Contingencies (default 10%, to be confirmed)	
	TOTAL COST (excl. VAT)	

Annexure A: COTO Standard Specifications for Subsurface Investigations, July 2010.

The Standard Specifications for Subsurface Investigations, prepared by the Committee of Transport Officials (COTO), dated July 2010, is issued with this Tender Package.

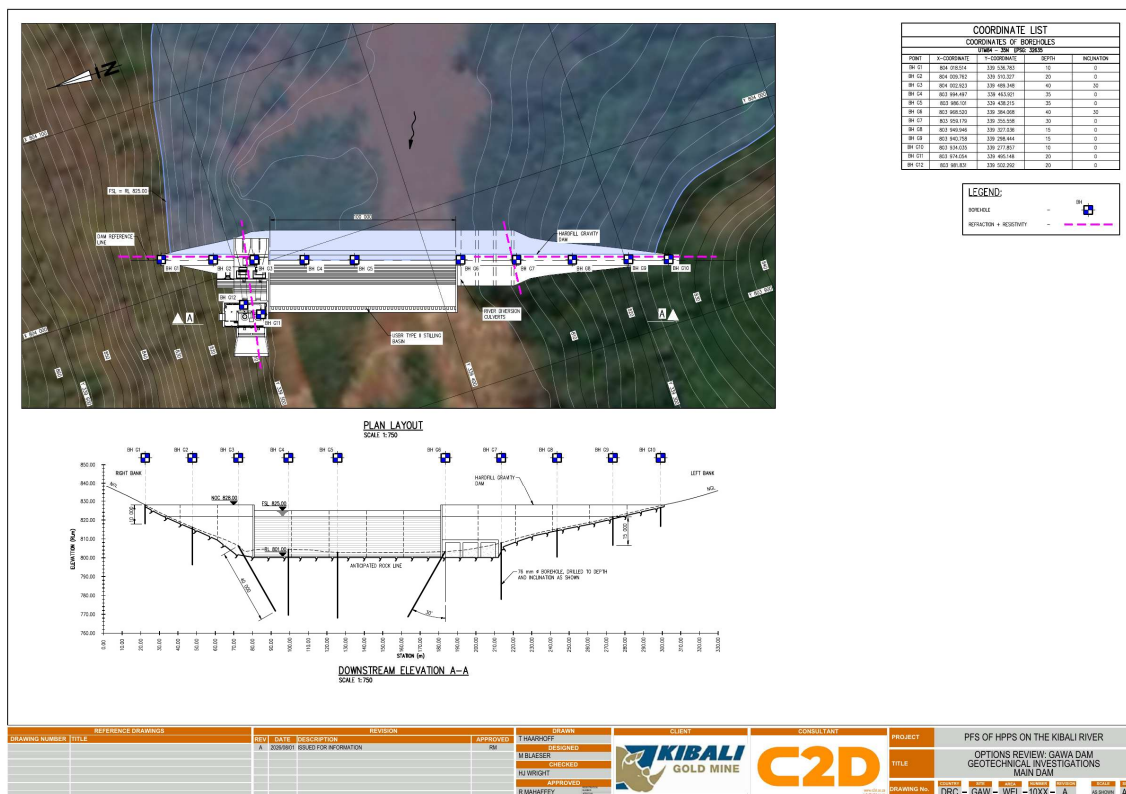
The specification establishes the general requirements for the execution, measurement and payment of subsurface investigation work, including contractor establishment, drilling setups, rotary core drilling, casing, core recovery, core orientation, water-pressure testing, core boxes, photography, borehole marking, records, health and safety, and environmental management.

The specification shall be read together with the project-specific Scope of Work, Bill of Quantities, drawings and instructions issued by the Engineer / Geotechnical Consultant. Where a conflict occurs, the Employer's standard contract shall take precedence.

Annexure B: Gawa HPP Geotechnical Investigation Drawing

The geotechnical investigation drawing for the proposed Gawa HPP main dam is issued with this Tender Package. The drawing presents the proposed dam layout, together with the locations, coordinates, scheduled depths and inclinations of the twelve geotechnical boreholes. It also identifies the proposed seismic-refraction and electrical-resistivity traverses and the anticipated drilling setup classifications.

Item	Drawing Detail
Project	PFS of HPPs on the Kibali River
Drawing title	Options Review: Gawa Dam - Geotechnical Investigations - Main Dam
Author/Consultant	C2D International (Pty) Ltd
Drawing reference	DRC-GAW-WEI-10XX
Revision	A
Date	1 August 2026
Status	Issued for Information

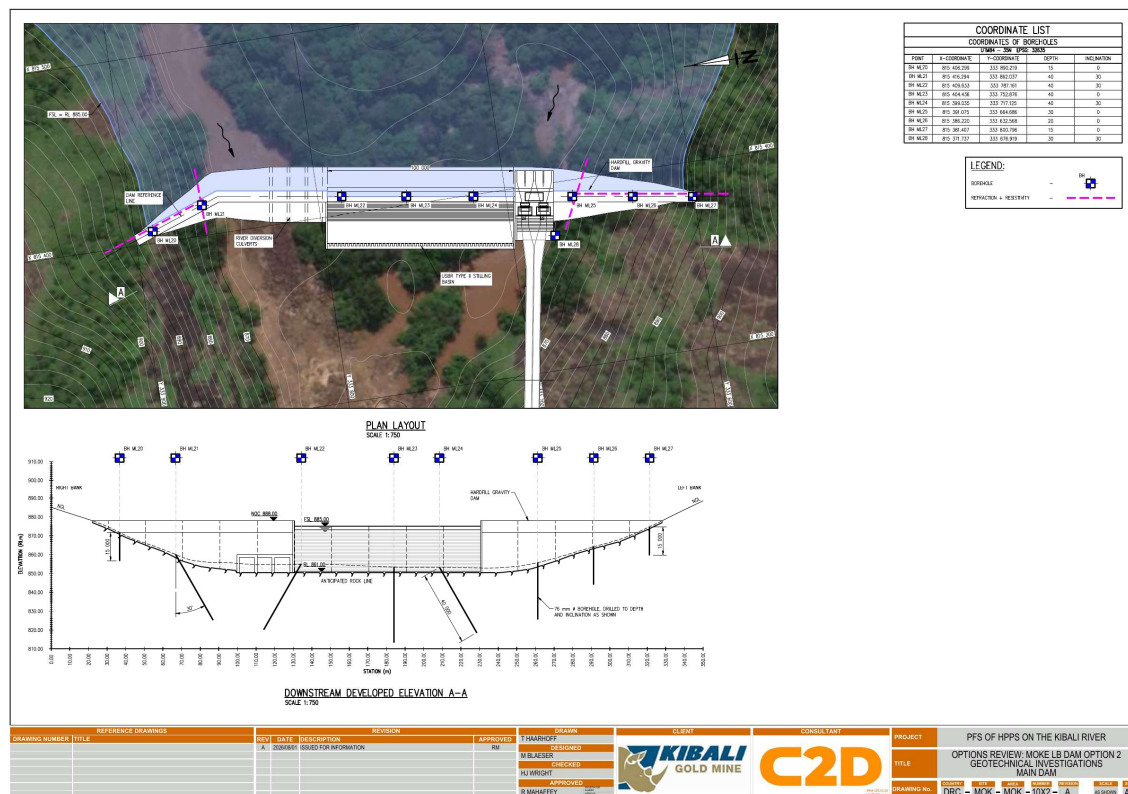


The borehole positions and depths shown on the drawing are provisional and may be amended by the Engineer / Geotechnical Consultant in response to site access, geological conditions or investigation findings.

Annexure C: Moke HPP Geotechnical Investigation Drawing

The geotechnical investigation drawing for the proposed Moke HPP main dam is issued with this Tender Package. The drawing presents the proposed dam layout, together with the locations, coordinates, scheduled depths and inclinations of the nine geotechnical boreholes. It also identifies the proposed seismic-refraction and electrical-resistivity traverses and the anticipated drilling setup classifications.

Item	Drawing Detail
Project	PFS of HPPs on the Kibali River
Drawing title	Options Review: Moke LB Dam Option 2 – Geotechnical Investigations – Main Dam
Author/Consultant	C2D International (Pty) Ltd
Drawing reference	DRC-MOK-MOK-10X2
Revision	A
Date	1 August 2026
Status	Issued for Information

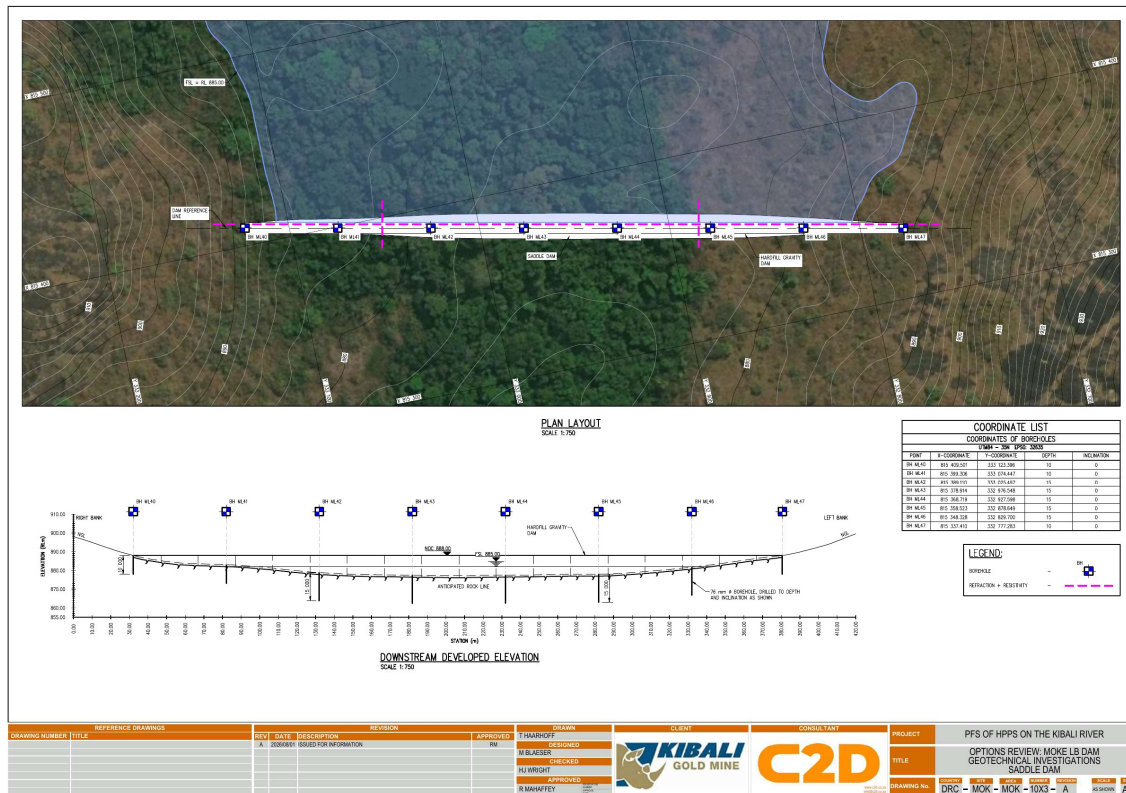


The borehole positions and depths shown on the drawing are provisional and may be amended by the Engineer / Geotechnical Consultant in response to site access, geological conditions or investigation findings.

Annexure D: Moke Saddle Dam Geotechnical Investigation Drawing

The geotechnical investigation drawing for the proposed Moke saddle dam is issued with this Tender Package. The drawing presents the proposed dam layout, together with the locations, coordinates, scheduled depths and inclinations of the eight geotechnical boreholes. It also identifies the proposed seismic-refraction and electrical-resistivity traverses and the anticipated drilling setup classifications.

Item	Drawing Detail
Project	PFS of HPPs on the Kibali River
Drawing title	Options Review: Moke LB Dam – Geotechnical Investigations – Saddle Dam
Author/Consultant	C2D International (Pty) Ltd
Drawing reference	DRC-MOK-MOK-10X3
Revision	A
Date	1 August 2026
Status	Issued for Information



The borehole positions and depths shown on the drawing are provisional and may be amended by the Engineer / Geotechnical Consultant in response to site access, geological conditions or investigation findings.

Annexure E: Kibali River Bridge Investigation Requirements

This Annexure will contain the available drawings, coordinates and investigation requirements for the proposed Kibali River Bridge.

Locations and details will be confirmed and issued to tenderers when available.

The current allowance comprises four (4) exploratory boreholes with a provisional total drilling depth of approximately 60m, equivalent to an average depth of 15m per borehole. Final borehole locations, depths, setup requirements and investigation priorities will be confirmed or instructed by the Engineer / Geotechnical Consultant.

Annexure F: Quarry/Borrow-Pit Investigation Requirements

This Annexure will contain the available drawings, coordinates and investigation requirements for the proposed quarry and borrow-pit material-source areas.

The information is currently to be confirmed and will be issued to tenderers once the preliminary material-source areas and proposed borehole positions have been identified.

The current allowance comprises nine (9) exploratory boreholes with a provisional total drilling depth of approximately 135m, equivalent to an average depth of 15m per borehole. Final borehole locations, depths, setup requirements and investigation priorities will be confirmed or instructed by the Engineer / Geotechnical Consultant.

— End of Tender Package —

PART B

DRAFT CONTRACT

(Kibali Goldmines SA – Geotechnical Drilling Contract, Rotary Core)



Agreement No. XXXX

entered between

Kibali Goldmines SA

and

[INSERT NAME OF CONTRACTOR]

**GEOTECHNICAL DRILLING CONTRACT
(ROTARY CORE)**

Contents

Table of Contents

Form of Agreement.....	43
Signing Page	44
Contract Specifics	45
Specific Conditions	47
Standard Terms and Conditions	48
1 Definitions	48
2 Interpretation	53
3 Supply of Drilling Services.....	54
4 Health and Safety	55
5 Conditions as to Quality.....	56
6 Contractor's Obligations.....	56
7 Key Performance Indicators (KPIs).....	57
8 Representatives	57
9 Personnel.....	58
10 Plant and Equipment.....	58
11 Invoicing And Payment	58
12 Variations	60
13 Defects	60
14 Termination	61
15 Suspension	62
16 Insurance	62
17 Liability and Indemnity	63
18 Intellectual Property.....	64
19 Confidential Information and Publicity	64
20 Taxes	66
21 Assignment and Subcontracting.....	66
22 Dispute Resolution	67
23 Notices and Manner of Delivery	68
24 Inconsistency between Parts of this Contract	68
25 Corruption and Trade Controls	69
26 Audit and Retention of Documents	71

27	Representations and Warranties	72
28	General.....	72
	Schedules	74
	Schedule 1 Drilling Services	75
	Schedule 2 Contract Pricing.....	81
	Schedule 3 Key Performance Indicators.....	83
	Schedule 4 Insurance Requirements.....	86
	Schedule 5 IP Requirements	89
	Schedule 6 Responsibility Matrix	90

Form of Agreement

THIS AGREEMENT is dated

(the **Execution Date**).

BETWEEN

- (1) **Kibali Goldmines SA**, a company incorporated in the Democratic Republic of Congo and having its registered office address at 4239 Avenue Tombal Baye, 3ème Étage de l'Immeuble Le Prestige, Commune de la Gombe, Ville de Kinshasa, Democratic Republic of Congo, with registration number CD/KIN/RCCM/14-B-3832, together with its legal successors in title (the “**Company**”); and
- (2) **XXXXXXXXXXXXXX**, a company incorporated in (Country) and having its registered address at (insert Address), with registration number [COMPANY REGISTRATION NUMBER], together with its legal successors in title (the “**Contractor**”),

each a **Party** and together the **Parties**.

WHEREAS

- A. The Company requires the Drilling Services as set out in Schedule 1.
- B. The Contractor carries on the business of performing services such as the Drilling Services.
- C. This Contract sets out the terms and conditions upon which the Company and the Contractor will perform their respective obligations in the relation to the Drilling Services and the performance of the Drilling Services (and the rectification of any Defects therein).

THE PARTIES HAVE AGREED AS FOLLOWS

1. DEFINITIONS

In the Contract, unless the context otherwise requires, capitalised terms have the meaning given in the Conditions.

2. PRIORITY OF DOCUMENTS

- 2.1 The following documents are deemed to form and shall be read and construed as part of the Contract:

- (a) this Form of Agreement;
- (b) Contract Specifics;
- (c) Specific Conditions;
- (d) Standard Terms and Conditions;
- (e) the Schedules to the Conditions:

Schedule 1 (Drilling Services)

Schedule 2 (Contract Pricing)

Schedule 3 (Key Performance Indicators)

Schedule 4 (Insurance Requirements)

Schedule 5 (IP Requirements)

Schedule 6 (Responsibility Matrix)

Signing Page

Executed as an Agreement

Company

Signed for and on behalf of:

Kibali Gold Mine (Registration No.
CD/KIN/RCCM/14-B-3832)

in the presence of

sign here ►

sign here ►

Witness

Witness

Title

Print name

Print name

Contractor

Signed by

Contractor name
(Registration No. XXXX):

in the presence of

sign here ►

sign here ►

Witness

Witness

Title

Print name

Print name

Contract Specifics

Description	Clause No.	Details
Company	1	Kibali Goldmines SA, a company incorporated in the Democratic Republic of Congo and having its registered office address at 4239 Avenue Tombal Baye, 3ème Étage de l'Immeuble Le Prestige, Commune de la Gombe, Ville de Kinshasa, Democratic Republic of Congo, with registration number CD/KIN/RCCM/14-B-3832, together with its legal successors in title (the “ Company ”)
Company's Representative	1	[Insert name, title] Address: [] Telephone [] Email: []
Completion Date(s)	1	20 March 2027 (anticipated Practical Completion per the accepted Level II programme; to be confirmed in the Letter of Award / Notice to Proceed).
Contract Price	1	As set out in Schedule 2
Contractor's Representative	1	[Insert name, title] Address: [] Telephone [] Email: []
Country		Democratic Republic of Congo
Currency	1	USD
Defects Correction Period	1	[KGM to confirm - e.g. 3 months] from the date on which the Drilling Services are last performed.
End Date	1	The earlier of: (a) the date on which Completion occurs; and (b) the date this Contract is terminated under clause 14
Governing Law	1	The laws of England & Wales
Import Taxes and Duties		Payable by the Contractor and included in the Contract Price
Insurance Requirements	1	As set out in Schedule 4

Description	Clause No.	Details
Invoicing Date	11.3	10 (ten) Days before the end of each month (or other period specified in the Contract Specifics)
IP Requirements		As set out in Clause 18 of Standard Terms and Conditions
Drilling Services/Scope of Work	1	In consideration of the payments to be made by the Company to the Contractor in accordance with this Contract, the Contractor will perform the required Drilling Services as described in Schedule 1 and any services which are necessary or incidental to those so described to be performed in accordance with the Contract.
Site	1	Kibali Gold Mine, Democratic Republic of Congo
Start Date	1	12 October 2026 (anticipated Site establishment/start date; to be confirmed in the Letter of Award / Notice to Proceed).
Plant and Equipment	10	As set out in Schedule 1
Contractor's Liability	17.3(a)	Two times the value of the Contract Price
Address for Notices	23	As set out in Contract Specifics
Date of this Contract		[The date on which the last Party signs this Contract]

Specific Conditions

The following Country Specific Conditions apply in addition to the Standard Terms and Conditions.

1. COUNTRY SPECIFIC CONDITIONS

The Contractor shall comply with all applicable laws, regulations and statutory requirements of the Democratic Republic of the Congo, including those relating to employment, immigration, work permits, taxation, customs and temporary importation, occupational health and safety, environmental protection, security and local-content requirements. KGM will provide reasonable assistance with mine-access approvals, security coordination, personnel travel and the importation and transportation arrangements expressly allocated to KGM under the Contract. The Contractor shall remain responsible for providing all information and documentation required for these processes within the prescribed timeframes. Any delay or additional cost arising from inaccurate, incomplete or late information supplied by the Contractor shall be for the Contractor's account, while delays arising solely from KGM-controlled approvals, security restrictions, access arrangements or customs processes shall be managed in accordance with the variation, standing-time and extension-of-time provisions of the Contract.

2. SPECIFIC CONDITIONS

The Drilling Services shall be undertaken in accordance with the project-specific Scope of Work, accepted Bill of Quantities, issued drawings, Technical Specifications, responsibility matrix and written instructions of KGM and the Engineer/Geotechnical Consultant. The Engineer/Geotechnical Consultant is authorised to direct the technical execution of the investigation, including confirming or adjusting borehole positions, depths, inclinations, drilling methods, testing requirements and termination depths. Any instruction that may affect the Contract Price or Completion Date shall be notified to the Company's Representative and confirmed in writing in accordance with the Contract's variation procedure. KGM shall provide or arrange the access routes, drilling platforms, transportation, accommodation, messing, fuel, security and other services expressly allocated to it under the Contract. The Contractor shall be responsible for confirming its equipment and platform requirements sufficiently in advance and for the safe operation, positioning, anchoring and movement of its drilling equipment. Where compliance with applicable law, mandatory KGM/Barrick safety requirements and the technical requirements of the Contract cannot simultaneously be achieved, work shall be suspended and the matter referred to the Company's Representative for written direction before work resumes.

3. PRIORITY

To the extent of inconsistency between these Country Specific Conditions, the Specific Conditions and the Standard Terms and Conditions contained in this Contract, then for the purposes of interpretation of this Contract the order of priority shall be:

1. the Country Specific Conditions;
2. the Specific Conditions;
3. the Standard Terms and Conditions.

Standard Terms and Conditions

1 Definitions

In addition to the definitions found elsewhere in this Agreement (including in the Contract Specifics and the Schedules), the following definitions shall apply, unless the context requires otherwise:

Anti-Corruption Laws means all applicable laws, regulations, and policies relating to the prevention of bribery, corruption, and money laundering to which the Parties and their Related Entities are subject, including but not limited to the *Foreign Public Officials Act (Canada)*, the *U.S. Foreign Corrupt Practices Act (FCPA)*, the *DRC Anti-Corruption Framework* (including Law No. 04/016 of 19 July 2004 on the fight against money laundering and terrorist financing, the Penal Code of the Democratic Republic of Congo – Articles 147 to 149 on the bribery of public officials, and related anti-corruption provisions), together with any applicable regulations of the *Cellule Nationale des Renseignements Financiers (CENAREF)*, and international instruments to which the Democratic Republic of Congo is a party, such as the *United Nations Convention Against Corruption (UNCAC)* and the *African Union Convention on Preventing and Combating Corruption*.

Anti-Corruption Policies means the ethics and anti-bribery policies of Barrick Mining Corporation, which are available on the public website of Barrick Mining Corporation or otherwise notified to the Contractor, in each case as updated, amended, supplemented or replaced them from time to time.

Agreement means the written agreement between the Parties, formed by the contract documents listed in the Form of Agreement.

Authority means any national, state, provincial, regional, territorial, local or municipal government, ministry, governmental department, commission, board, bureau, agency, instrumentality, executive, legislative, judicial or administrative body, in each case with jurisdiction.

Applicable Laws means any law applicable to the performance of Services, including any municipal, provincial, state, or federal laws, treaties, protocols, statutes, orders, decrees, regulations, rules, licenses, permits, consents, and approvals of any public authority, as the same may be amended from time to time, including without limitation any laws or regulations applicable to the Site.

Authorized Representative of the Company shall mean the person listed in the Form of the Agreement.

Barrick Mining Corporation means the company of that name incorporated under the laws of British Columbia, Canada and having its registered office at 323 Alexander Street, Vancouver, BC V6A 1C4, Canada.

Barrick Group Company means Barrick Mining Corporation and/or any of its Related Entities.

Barrick Policies and Procedures includes any policy, procedure, publication or guideline of Barrick Mining Corporation (as amended from time to time).

Business Day means a day that is not a Saturday, Sunday, a public holiday, or a bank holiday in the place concerned when the relevant act is or may be done.

Calendar Time 24 – hour day, 7 days a week.

Claim means any dispute or difference between the Parties arising in connection with this Contract or Drilling Services at Law or in equity.

Company means the Party named as such in the Form of Agreement or its lawful successor.

Company's Representative is the person named as such in the Contract Specifics or any replacement thereof notified to the Contractor.

Completion means the completed performance of all Drilling Services, in each case in accordance with the Contract.

Completion Date(s) means the date(s) for Completion specified in the Form of Agreement.

Confidential Information has the meaning given to this term in clause 19.1.

Consequential Loss means loss of production, loss of profit or anticipated profit, loss of opportunities or any special, exemplary or punitive damages.

Contract means this agreement and includes (in the order of precedence) the Contract Specifics, the Specific Conditions, these Standard Terms and Conditions, any purchase order, and all other schedules, attachments and annexures.

Contract Price means the aggregate of the amounts payable to the Contractor in respect of the Drilling Services, calculated in accordance with Schedule 2 including all Taxes (save for applicable VAT) and any additions and deductions, which may be allowed in accordance with this Contract.

Contract Specifics means the schedule of contract information with that name forming part of this Contract.

Contractor means the Party named as such in the Form of Agreement or its lawful successor:

Direct Costs means all verifiable, direct, out-of-pocket costs incurred by Contractor in performing the Drilling Services using the most favourable (i.e., favourable to the Company) published labour rates and equipment and materials costs as are charged by Contractor to their respective preferred customers at the time in its performance of the Drilling Services, but excluding:

- (a) fees and expenses of Contractor's legal counsel, and any travel expenses (including transportation, lodging and food) incurred by any of Contractor's legal counsel in conjunction with the Drilling Services;
- (b) any mark-up for overhead or profit;

- (c) any taxes, duties, levies or other impositions applicable to Contractor and for which Contractor has responsibility under this Agreement;
- (d) any costs incurred or paid by Contractors to cure Defects;
- (e) any costs incurred to participate in a Dispute resolution process pursuant to Clause 22;
- (f) any costs of bonding, insurance or any deductible required by an insurance policy; and
- (g) any costs incurred to cure any default by Contractor of a duty or obligation under this Agreement.

Defect or Defective means any aspect of the Drilling Services not in accordance with this Contract, or any damage, deficiency, fault or inadequacy in design, performance, workmanship, quality or makeup of the Drilling Services, and **Defective** shall be construed accordingly.

Defects Correction Period means the period stated as such in the Form of Agreement.

Dispute has the meaning given to this term in clause 22.1.

Drill Hole Target drill hole target parameters will be established for each specific scope by the Company's representative.

Drill Rig Availability drill rig availability hours mean the actual time the equipment was available to operate.

Drilling Services means the services specified as such in Form of Agreement and Schedule 1 (including any part thereof).

End Date has the meaning as listed in the Form of Agreement.

Effective Date has the meaning as listed in the Form of Agreement.

Good Industry Practice means using the standards, practices, methods and procedures, complying with Laws and exercising the degree of skill, care, diligence, prudence and foresight which would be expected from a properly skilled and competent international market leading contractor in the mining sector experienced in providing services (as the case may be) of a similar type, nature and complexity to the Drilling Services.

Government Official Includes:

- (a) an officer or employee of any governmental, semi-governmental or judicial entity or authority, independent or otherwise, including any provincial government, local-level government, any statutory or public body established under a law, any state-owned or state-controlled entity or corporation, or any instrumentality of any government;
- (b) any person acting in an official capacity on behalf of any of the foregoing;
 - i. an officer, employee or official of a political party;
 - ii. a candidate for political office; or
 - iii. an official or employee of a public international organization.

Governing Law means the governing law specified in the Form of Agreement.

Insolvency Event	means, in respect of either Party, any of the following events whereby a Party: (a) becomes insolvent; (b) enters into official management or a scheme of arrangement with creditors or any class or group of creditors; (c) has a receiver and/or manager appointed to it or any asset or undertaking; (d) has an administrator, provisional liquidator or liquidator appointed; (e) has any secured or other creditors take possession, or appoint an agent to take possession, of any asset; (f) is affected by any other form of procedure relating to insolvency, reorganisation, or dissolution in any jurisdiction; or (g) is affected by any similar or equivalent events having force of Law which applies to the Party.
Intellectual Property (or IP)	means any subject matter, whether tangible or intangible, that attracts, or is susceptible to protection by, Intellectual Property Rights.
Intellectual Property Rights (or IP Rights)	means all copyright and analogous rights (including moral rights), all rights in relation to inventions (including patent rights), registered and unregistered trademarks (including service marks), registered designs, confidential information (including trade secrets), know-how, circuit layouts and all other rights throughout the world resulting from intellectual activity in the industrial, scientific, or artistic fields. These rights include: (a) all rights in all applications to register these rights; and (b) all renewals and extensions of these rights.
Invoice	means an invoice submitted by the Contractor in accordance with clause 11 or a recipient created tax invoice generated by the Company which meets all the requirements of a valid invoice for VAT purposes in the Country.
Monthly Reporting	KPIs will be assessed on a quarterly basis during the Contractor quarterly review meetings. However, measurements are to be taken and reported by the Contractor monthly at Site level and sent to the Company's Representative.
KPIs	means the Key Performance Indicators set out in the Drilling Plan in <u>Schedule 3</u> (if any).
Law	means: (a) the present or future requirements of any statute, directive, regulation, code, order, rule, subordinate legislation or other document enforceable under any statute, regulation, rule or subordinate legislation, common law or equity; (b) the lawful requirements, directions or instructions of any Governmental Agency; and (c) the listing rules and procedures of any applicable stock exchange.
OFAC	means the U.S Department of Treasury, Office of Foreign Assets Control.
OHS & E	means occupational health, safety and environment.
Observed Invoices	means any invoices with errors, discrepancies or missing information that does not allow the Company to process payment, including but not limited to: (a) Rates that differ from those in the Agreement (b) Amounts that do not match the drilling reports (c) Invoices sent to the incorrect Company representative.

Operational Delay Time means the actual time the equipment was not in condition to operate, including but not limited to:

- (a) Unscheduled maintenance
- (b) Scheduled overrun due to PM periods
- (c) Scheduled maintenance activity on the equipment outside of standard PM intervals
- (d) Lack of personnel to operate the rig.

Party or Parties means the Company or the Contractor, and Parties means both.

Performance Baseline the performance baselines will be agreed between the Company's Representative and the Contractor.

Personnel means directors, employees, agents, contractors and subcontractors but a reference to the Company's Personnel excludes the Contractor and the Subcontractors.

Plant and Equipment means plant, equipment, tools, appliances or other property and items required for the performance of the Contractor's obligations under the Agreement.

Related Entity means, in relation to a Party or other entity, a body corporate which is a controlling company, or a controlled company, or a controlled company of a controlling company, of that Party or other entity. For the purposes of this definition, "control" means possession, directly or indirectly, of the power to direct or cause direction of management and policies through ownership of voting securities, contract, voting trust or otherwise.

Representative means the Company's Representative or the Contractor's Representative, as the context may require.

Sanctioned Person means:

- (a) a person or entity with whom United States persons or entities are restricted from doing business under the regulations of OFAC (including those persons and entities named on the OFAC Specially Designated and Blocked Persons List and the Sectoral Sanctions Identifications List);
- (b) a person or entity designated in any of the Republic of Zambia, European Union, United Kingdom, Canada or any other applicable jurisdiction (including the jurisdiction of incorporation of the Contractor) or under other applicable sanctions regime including, but not limited to the EU consolidated list of persons, groups and entities subject to EU financial sanctions, Specially Designated Nationals and Blocked Persons list maintained by OFAC, the Consolidated Canadian Autonomous Sanctions List, or HM Treasury's Consolidated List of Financial Sanctions Targets;
- (c) a person or entity placed on the World Bank blacklist (being the list of firms and individual's ineligible to be awarded a World Bank financed contract, published by the World Bank at www.worldbank.org/debar);
- (d) a person or entity placed on the United Nations Security Council Consolidated List, as any such list may be updated from time to time; and/or
- (e) a person or entity owned or controlled by, or acting on behalf of, or at the direction of, any of the foregoing,

as any such list may be updated from time to time.

Site means the place described as such in the Form of Agreement as the place for the performance of the Drilling Services by the Contractor.

Site Standards and Procedures	means the standards, specifications, policies, procedures and matters as applicable to the supply of Drilling Services on the Site and any updates, amendments, supplements, replacements thereto or any other guidelines, rules or requirements, notified to the Contractor in writing from time to time.
Specific Conditions	means the conditions of that name which form part of this Contract.
Specifications	means the specifications for the Services described on <u>Schedule 1</u> .
Standard Terms and Conditions	means the Standard Terms and Conditions set out in this Contract.
Start Date	has the meaning as listed in the Contract Specifics.
Subcontractor	means any person engaged by the Contractor to perform any part of its obligations under this Contract and includes consultants, subcontractors, suppliers and other contractors.
Tax or Taxes	means all present and future taxes, fees, levies, duties, imposts, assessment, royalties, tariffs, fees and charges imposed or assessed in respect of this Contract by all Authorities including income tax, payroll tax, statutory pension or superannuation contributions and workers' compensation payments and contributions, sales tax, customs duty, excise, and stamp duty as well as interest penalties and additions thereto.
VAT	means value-added tax, goods & services tax or any tax analogous thereto, but excludes any statutory late payment interest or penalties.

2 Interpretation

In this Agreement except to the extent that the content otherwise requires:

- (a) a reference to a 'day', 'month', 'quarter' or 'year' is a reference to a calendar day, calendar month, a calendar quarter, or a calendar year;
- (b) headings and bold type are for convenience only and do not affect the interpretation of this Agreement;
- (c) no rule of construction or provision of this Agreement applies to the disadvantage of a Party on the basis that the Party was responsible for the preparation of this Agreement or any part of it;
- (d) a reference to 'use' in the context of a licence of Intellectual Property from one party to the other is a reference to 'use, copy, adapt, modify, exercise, test, install, operate, maintain, manage, support and repair' within the scope of the licence which is granted;
- (e) a monetary amount referred to in this Agreement is a reference to the Currency;
- (f) specifying anything in this Agreement after the words 'include', 'including', 'for example' or similar expressions does not limit what else is included; and

- (g) where any number of days is prescribed in this Agreement, it shall be reckoned exclusive of the first day and inclusive of the last day.

3 Supply of Drilling Services

- 3.1 This Contract shall come into full force and effect on the date of this Contract and end on the End Date, unless terminated earlier in accordance with the provisions of this Contract.
- 3.2 The Contractor shall perform the Drilling Services in accordance with this Contract, Good Industry Practices and the Company's instructions.
- 3.3 The Contractor shall:
 - (a) perform the Drilling Services with due expedition and without delay.
 - (b) perform the Drilling Services from the Start Date and complete performance of the Drilling Services not later than the Completion Date(s).
 - (c) provide the Contractor's documents specified in this Agreement, and all Contractor's Personnel, consumables and other things and services, whether of a temporary or permanent nature, required in and for the design, execution, completion and remedying of defects in the performance of the Drilling Services.
 - (d) be responsible for the adequacy, stability, and safety of all Site operations and of all methods of work in performing the Drilling Services.
 - (e) perform the Drilling Services in accordance with the relevant mining legislation, the Company's establishment convention (if applicable), and any drilling, and health and safety standards and regulations commonly utilised in country of performance.
 - (f) ensure that the Drilling Services are fit for their purpose and shall not be entitled to any addition to the Contract Price or to an extension to any timing or deadlines set out in the Scope of Work to the extent that any aspect of the Drilling Services is inaccurate, incomplete or is not fit for its intended purpose as a result of a failure by the Contractor to comply with the requirements of this Clause 3.
 - (g) ensure that the availability of the Contractor's Equipment to perform the Drilling Services (according to the industry standards accepted by the Company and advised to the Contractor) is 90% or more in any 3-month period. Where that availability is not achieved, the Contractor will use its best endeavours to utilise all additional drill rigs as are available to it together with such other plant or equipment as is practical to perform the Drilling Services in accordance with the Drill Plan.
 - (h) unless otherwise stated in this Contract, daily drilling progress reports shall be prepared by the Contractor and submitted to the Company on the following day. Each progress report shall be signed by the Company within 48 hours of the Company being satisfied with the progress report's contents. Each report shall include an assessment of progress against the Drilling Plan together with proposals to recover any slippage in planned progress.
- 3.4 The Parties acknowledge and agree that the appointment of the Contractor is non-exclusive, and the Company may, as it sees fit, contract with other third parties for the provision services that are either comparable or unrelated to the Drilling Services. The Contractor shall

- cooperate with such third parties and coordinate its activities with those of such third parties, as reasonably required by the Company.
- 3.5 The Contractor acknowledges and agrees that time is of the essence for the performance of the Drilling Services.
- 3.6 If the Contractor encounters events or circumstances, which have resulted in, or might reasonably be expected to result in completion of the Drilling Services later than the Completion Date(s), the Contractor shall immediately notify the Company thereof and the reason(s) and extent of the delay. The Company may then, by written notice to the Contractor, amend the Completion Date(s) as it considers appropriate, acting reasonably. The Contractor shall not be entitled to any increase in the Contract Price or any damages, costs, or expenses in connection with such amendment of the Completion Date(s).
- 3.7 All fossils, coins, articles of value or antiquity, and structures and other remains or items of geological or archaeological interest found on the Site shall be placed under the care and authority of the Company. The Contractor shall take reasonable precautions to prevent Contractor's Personnel or other persons from removing or damaging any of these findings.
- 3.8 The Contractor shall set out the position of the Drilling Services in the areas as designated by the Company and otherwise in accordance with Schedule 1 (*Drilling Services*) using Good Industry Practice. The Contractor shall be fully and solely responsible for the correct positioning of all parts of the Drilling Services and shall rectify any error in the positions, levels, dimension or alignment of the Drilling Services.

4 Health and Safety

- 4.1 The Contractor and the Company acknowledge that the health and safety of all persons affected by the performance of the Contract is at all times the paramount consideration in the undertaking and completion of the Drilling Services.
- 4.2 The Contractor shall ensure that:
- (a) the performance of Drilling Services complies at all times with all applicable Laws, including all Laws relating to OHS&E.
 - (b) the performance of Drilling Services complies at all times with this Contract, Barrick Policies and Procedures, Site Standards and Procedures notified by the Company or Company's Representative and Good Industry Practice.
- 4.3 The Contractor and its employees and/or agents must at all times, when present at Site, comply with the Site Standards and Procedures and not cause, permit or tolerate an unsafe act, circumstance or condition over which the Contractor has control, at the Site, and must, at its cost, comply with directions from the Company to modify or stop any activity that the Company considers or ought to reasonably consider as unsafe.
- 4.4 If any Contractor's Personnel damage property while at the Site, the Contractor must promptly, at the Company's absolute discretion, either make good, or reimburse the Company for the cost of making good, the damage and pay any compensation that the Law requires the Contractor to pay.
- 4.5 Without prejudice to the foregoing provisions of this clause 4, the Contractor shall clearly label any hazardous goods as such and comply with, and implement the requirements of, any applicable Laws and any Barrick Policies and Procedures notified by the Company or Company's Representative in relation to the packaging, labelling or delivery of hazardous goods.

5 Conditions as to Quality

5.1 The Contractor must ensure that:

- (a) the Drilling Services match the description and specifications of the Drilling Services in this Contract and comply with any standards specified in this Contract therefor;
- (b) the Drilling Services are performed by appropriately qualified, experienced and trained Contractor's Personnel, comply with the standards specified in this Contract, and are fit for the purposes set out in, or which a skilled and experienced contractor in the position of the Contractor would reasonably infer from, this Contract; and
- (c) it and its Personnel shall exercise the level of care and skill usually exercised in accordance with Good Industry Practice in the performance of its obligations under this Contract.

6 Contractor's Obligations

6.1 The Contractor must, in performing the Drilling Services and performing its obligations under this Contract:

- (a) comply with all reasonable instructions from the Company;
- (b) not interfere with the Company's activities or the activities of any other person at the Site and immediately vacate the Site when requested to by the Company;
- (c) be aware of and comply with, and ensure that the Contractor's Personnel are aware of and comply with, all applicable Laws, Site Standards and Procedures;
- (d) ensure that the Contractor's Personnel entering the Company's premises perform the Services in a safe manner and are properly qualified for, and skilled in, the performance of their tasks;
- (e) obtain, at the Contractor's expense, any necessary licences, permits, qualifications, registrations and other statutory requirements necessary for the performance of its obligations under this Contract;
- (f) provide all information and assistance as the Company reasonably requires in connection with any statutory or internal health and safety investigation in connection with this Contract or the Drilling Services;
- (g) ensure that all its Personnel meet the requirements applicable in the Country to enter the Site (including necessary vaccination);
- (h) leave the Company's premises secure, clean, orderly and fit for immediate use, having regard to the condition of the Company's premises immediately prior to the performance of Drilling Services; and
- (i) comply with all applicable Greenhouse Gas Emissions (GHG) reporting regulations applicable to Contractor's performance hereunder. The Contractor acknowledges that the Company may be required to report certain actions with respect to GHG emissions attributable to the Company's operations and the Contractor agrees to promptly provide information reasonably requested by the Company to comply with its reporting obligations.

7 Key Performance Indicators (KPIs)

- 7.1 The Contractor must perform the Drilling Services under this Contract to achieve the KPIs.
- 7.2 If the Contractor fails to achieve a KPI during each period specified in Schedule 3, the Contract Price payable will be adjusted as set out in Schedule 2.
- 7.3 If the Contractor fails to meet any of the agreed KPIs, the following steps shall be taken:
- (a) Notification: the Company shall notify the Contractor in writing of the KPI non-compliance, providing specific details of the areas where performance is lacking.
 - (b) Remediation Plan: Within 7 days of receiving the notification, the Contractor must submit a remediation plan to the Company, outlining the steps that will be taken to achieve compliance with the KPIs. This plan must include:
 - i. A detailed action plan
 - ii. Specific timelines for achieving compliance
 - iii. Responsible personnel for each action item
- 7.4 If the Contractor fails to meet the KPIs and does not rectify the situation within 30 days of submitting the remediation plan, the Company may require the Contractor to take specific corrective actions, at the Contractor's expense to remedy the non-compliance.
- 7.5 If the Contractor fails to meet KPIs after remediation efforts, the Company reserves the right to terminate the contract for cause. In such an event:
- (a) The Company shall provide written notice of termination to the Contractor;
 - (b) The Contractor shall be compensated for all works satisfactorily completed up to date of termination, minus any deductions incurred for KPI non-compliance;
 - (c) The Company may seek alternative contractors to complete the remaining work, and the original Contractor will be held liable for any additional costs incurred.

8 Representatives

- 8.1 Each Party will appoint a Representative who will be authorised to act on behalf of the Party that appointed the Representative in relation to this Contract. Without limiting the Company's rights, the Company's Representative may exercise all of the Company's rights and functions under this Contract (including giving directions), other than the right to terminate this Contract or amend the terms of the Contract.
- 8.2 The Company and the Contractor acknowledge and agree that they will not make any claim or pursue any legal action against a Representative whether in contract, tort (including negligence), equity, statute or otherwise, save that nothing in this clause 8.2 releases the Company or the Contractor from any liability arising out of the conduct of its Representative that the Company or the Contractor would otherwise have to the other.
- 8.3 Either Party may replace their Representative by written notice to the other Party at any time.
- 8.4 Where this Contract requires the Contractor to indemnify the Company, the Contractor shall also be required to indemnify the Company's Representative on the same terms.

9 Personnel

- 9.1 The Contractor must, at the Contractor's cost:
- (a) engage and provide the services of all personnel who are required to perform the Contractor's obligations under this Contract;
 - (b) where the Contractor's Personnel are required to access the Site, manage and supervise the Contractor's Personnel working at the Site and procure their compliance with the Site Standards and Procedures;
 - (c) promptly provide the Company with all information the Company requires regarding the Contractor's Personnel; and
 - (d) ensure that all Contractor's Personnel who are engaged in performing the Contractor's obligations under this Contract have completed the appropriate training and competency assessments in order to work on the Site and have met and complied with the Company's requirements for access to the Site.
- 9.2 The Contractor shall at all times remain responsible for the behaviour of the Contractor's Personnel.
- 9.3 The Company may require the removal from the Site of any Contractor's Personnel who, in the Company's reasonable opinion, may be unsuitable or have breached the Site Standards and Procedures.

10 Plant and Equipment

- 10.1 Unless this Contract provides otherwise, the Contractor must supply all Plant and Equipment, at the Contractor's expense.
- 10.2 Any Plant and Equipment supplied by the Company shall only be used for the purposes of fulfilling the Contractor's obligations under this Contract.
- 10.3 The Contractor must compensate the Company for any loss or damage to the Company's premises or property (including any Company supplied plant and equipment) resulting from any acts or omissions of the Contractor or the Contractor's Personnel.

11 Invoicing And Payment

- 11.1 In consideration of the due and proper performance of this Contract by the Contractor, the Company will pay to the Contractor the Contract Price.
- 11.2 Unless this Contract expressly provides otherwise, the Contract Price is:
- (a) inclusive of all charges, including insurance, premiums and costs, leave entitlements, freight, packaging, packing and delivery costs and Taxes (other than VAT);
 - (b) inclusive of the cost of any miscellaneous services of a kind which are commonly provided with services of the same or a similar nature to the Drilling Services; and
 - (c) not subject to rise and fall, escalation or review.
 - (d) The tendered rates shall remain fixed in United States Dollars for the planned Contract period. However, where the performance of the Drilling Services is suspended,

delayed or extended materially beyond the original Completion Date due to circumstances not attributable to the Contractor, the Contractor shall be entitled to submit a substantiated request for an equitable adjustment to the applicable rates and Contract Price. Any adjustment shall be subject to review and written approval by the Company in accordance with the variation provisions of this Contract.

- 11.3 No later than each Invoicing Date, the Contractor must provide to the Company an invoice which must comply with clause 11.4.
- 11.4 A Contractor Invoice must:
- (a) be provided using an electronic invoicing system if directed to by the Company;
 - (b) refer to a purchase order number (if any) and this Contract, including the line item numbers on the purchase order (if any);
 - (c) include a detailed description of the performed Drilling Services, including the period of Drilling Services in respect of which the Invoice relates and the relevant details;
 - (d) include a Company name, Company registration number, registered tax number and VAT number;
 - (e) detail the Contract Price relating to the relevant Drilling Services, broken down to reflect the Contract Price components as set out in Schedule 2 (*Contract Pricing*); and
 - (f) set out the amount of any applicable VAT.
- 11.5 The provision of an Invoice that complies with the requirements of clause 11.4 is a precondition to the Contractor's right to payment for the Drilling Services which are the subject of a Contractor Invoice.
- 11.6 If any Invoice does not contain the information required by clause 11.4, the Company may return it to the Contractor, in which case the Contractor must submit a replacement compliant Invoice.
- 11.7 If the Company requests, the Contractor must provide the Company with all relevant records to calculate and verify the amount set out in any Invoice, failing which the Invoice may be rejected.
- 11.8 Subject to clause 11.9 and clause 11.10, the Company must pay all Invoices in the payment run that occurs immediately following the expiry of thirty (30) days after:
- (a) the date on which the relevant Invoice is generated (in the case of a recipient created tax invoice); or
 - (b) the date on which the relevant Invoice is received from the Contractor (in all other cases).
- 11.9 If the Company disputes any Invoice:
- (a) to the extent permitted by Law, the Company may withhold payment of the disputed part of the relevant Invoice pending resolution of the dispute;
 - (b) if the resolution of the dispute determines that the Company must pay an amount to the Contractor, the Company must pay that amount upon resolution of the dispute.
- 11.10 The Company may, set off, withhold, or deduct any payment due to the Contractor under this Contract by any amount which the Contractor must pay the Company, including costs, charges, damages and expenses and any debts owed by the Contractor to the Company in relation to or in connection with this Contract or the Drilling Services. This does not limit the Company's right to recover those amounts in other ways.

- 11.11 Any money payable under this Contract is to be paid by electronic funds transfer to the Contractor's nominated bank account or by such other means as the Parties agree.
- 11.12 A payment made pursuant to this Contract will not be taken or construed as proof or admission that the Drilling Services performed, or any part of the Drilling Services performed, were to the satisfaction of the Company but will only be taken to be payment on account.

12 Variations

- 12.1 Variations to the Drilling Services may be initiated by the Company at any time prior to the End Date, in either case by an instruction for the Contractor to submit a proposal. the Contractor shall respond in writing as soon as practicable, either by giving reasons why he cannot comply (if this is the case) or by submitting:
- (a) a description of the proposed work or services to be performed and a programme for its execution or performance;
 - (b) the Contractor's proposal for any necessary modifications to the Drilling Plan; and
 - (c) the Contractor's proposal for evaluation of the variation (including the Contractor's proposals regarding adjustment of the Contract Price (if any) but subject in all circumstances to the terms of Schedule 1 (*Drilling Services*) that require certain variations to be at the Contractor's sole cost).
 - (d) The Company shall, as soon as practicable after receiving such proposal respond with approval, disapproval or comments. The Contractor shall not delay any other aspect of the Drilling Services (not being subject to the variation) whilst awaiting a response.
 - (e) Each instruction to execute a variation shall be issued by the Company to the Contractor, who shall acknowledge receipt.
 - (f) The Contractor shall not make any alteration and/or modification of the Drilling Services or Drilling Plan unless and until the Company instructs or approves a variation.

13 Defects

- 13.1 If the Contractor becomes aware of any Defect in the Drilling Services, it must promptly notify the Company of the Defect in writing.
- 13.2 The Contractor must rectify all Defects in the Drilling Services or re-perform any Defective Drilling Service at its cost until the end of the Defects Correction Period in the time and manner specified by the Company (and if no time or manner is specified, then within a reasonable time and manner). If the Contractor fails to comply with this clause, the Company may rectify, or re-perform (or engage others to rectify, replace or re-perform) the Defective Drilling Services and the costs so incurred by the Company may be deducted, set off or withheld from payment to be made to the Contractor under this Contract or otherwise recovered as a debt due from the Contractor to the Company and/or treat the failure as a material breach of the Contract.
- 13.3 Notwithstanding clause 13.2, if, in the Company's view, a Defect creates a circumstance or condition that is unsafe, hazardous or a posing threat (or potential threat) to safety of persons or property, health or the environment, and which requires prompt rectification, then the Company is not obliged to give the Contractor an opportunity to make good the Defect before the Company rectifies, or engages others to rectify, the Defect at the Contractor's risk and cost.

Where the Contractor has rectified a Defect under this clause 13, the rectified Drilling Services will be subject to a Defects Correction Period commencing on the date the Contractor rectified the Defect.

- 13.4 The rights and obligations under this clause 13 shall continue after the End Date.

14 Termination

- 14.1 The Company may, in its absolute discretion and for any reason whatsoever, and without being obliged to give any reasons, end this Contract at any time by giving a 60 (sixty) days' written notice to the Contractor.
- 14.2 The Company may immediately terminate this Contract by notice in writing to the Contractor if:
- (a) the Contractor commits a material breach of this Contract and either:
 - i. *the Company, acting reasonably, does not believe the material breach of this Contract is capable of remedy; or*
 - i. *the Company has provided a notice of breach, and the Contractor fails to remedy that breach within the time specified in the notice of breach; or*
 - (b) an Insolvency Event in respect of the Contractor occurs; or
 - (c) the Contractor suspends or ceases to carry on all or a substantial part of its business, or purports to do so; or
 - (d) the Contractor's financial position deteriorates to such an extent that in the terminating party's opinion the other party's capability to adequately fulfil its obligations under the Contract has been placed in jeopardy; or
 - (e) the Contractor incurs liabilities equal to or in excess of any of the limits specified in the Contract Specifics; or
 - (f) there is any breach of clause 25; or
 - (g) the Contractor or any Related Entity is or becomes or is considered by the Company likely to become a Sanctioned Person; or
 - (h) the Contractor fails to meet the agreed KPIs in Schedule 3 (*Key Performance Indicators*) after remediation efforts. In such an event:
 - ii. *The Contractor shall be compensated for all works satisfactorily completed up to date of termination, minus any penalties incurred for KPI non-compliance.*
 - iii. *The Company may seek alternative contractors to complete the remaining work, and the original Contractor will be held liable for any additional costs incurred.*
- 14.3 The Contractor may terminate this Contract by giving a 60 (sixty) days' written notice to the Company:
- (a) if the Company fails to make a payment due to the Contractor under the Contract and in respect of which there is no bona fide dispute as to the Company's liability to make the payment and the Contractor has provided a notice of default and the Company fails to remedy the non-payment within sixty (60) Business Days of the notice; or
 - (b) if an Insolvency Event in respect of the Company occurs.
- 14.4 If the Company terminates this Contract under clause 14.1 or clause 14.2 or the Contractor terminates this Contract under clause 14.3, the Company may engage other persons to perform the Drilling Services; and must, as the Contractor's sole and exclusive remedy in respect of the Company terminating this Contract:

(a) in respect of any Drilling Services, subject to clause 11, pay the Contractor:

- i. *for the Drilling Services performed prior to the date of termination for which payment has not been made; and*
- ii. *the relevant portion of the Contract Price allocated for demobilisation (and if not so allocated, demobilisation costs reasonably and properly incurred by the Contractor);*

14.5 If the Company terminates this Contract pursuant to clause 14.2, then the Company is entitled to recover from the Contractor any costs, losses, damages and liabilities incurred or suffered by it or its Related Entities as a result of, or arising out of, or in any way in connection with, the termination or any preceding breach (including any extra costs incurred in procuring the Drilling Services from other suppliers).

14.6 Despite anything to the contrary in this Contract, if the Company terminates this Contract for a breach by the Contractor of clause 25 (other than clause 25.2(b)), the Company will have no obligation to make any payments, or otherwise provide compensation to the Contractor, unless the Company has received all government authorisations required to do so.

14.7 Except as set out in this clause 14, the Contractor will not be entitled to make, and the Company will not be liable for, any further Claim, including for any loss caused by the termination of the Contract.

15 Suspension

15.1 The Company may at any time and for any reason give a written direction to the Contractor to suspend all or any part of the performance of the Drilling Services, and if the Contractor receives a direction from the Company under this clause 15, the Contractor must immediately suspend the provision of the Drilling Services.

15.2 The Company may at any time give a written direction to the Contractor to resume the provision of the Drilling Services and if the Contractor receives such a direction, the Contractor must immediately resume the provision of the Drilling Services.

15.3 If the Company gives a direction to suspend for any reason other than breach of this Contract by the Contractor or any act or omission by the Contractor or the Contractor's Personnel not authorised by this Contract, the Contractor is entitled to payment of its reasonable and verifiable costs incurred directly as a result of complying with the direction under clause 15.1.

15.4 Except to the extent provided in clause 15.3, the Contractor is not entitled to make, and the Company is not liable for, any Claim for or in connection with a direction given pursuant to clause 15.1.

16 Insurance

16.1 From the Start Date until the end of the last Defects Correction Period (longer periods are applicable for Professional Indemnity Insurance), the Contractor must procure and maintain the insurances required by the applicable Laws and/or such insurances as the Company may require the Contractor to obtain in accordance with Insurance Requirements (if applicable) and such other insurances as are customarily engaged on a prudent basis to cover the business and assets of the Contractor.

16.2 The Contractor must ensure that its Subcontractors are insured as required by this clause 16, as appropriate, as if they were the Contractor.

- 16.3 The Contractor must, on or prior to the Start Date and otherwise when requested by the Company, provide to the Company certificates of currency and renewal certificates or other evidence of compliance with this clause 16 reasonably required by the Company. Despite anything to the contrary in this Contract, the Company:
- (a) has the right to refuse the Contractor (and any of the Contractor's Personnel) entry to the Company's premises; and
 - (b) is not obliged to pay, and may withhold payment of any amount owed by it to the Contractor without any interest accruing under this Contract,
- unless and until the Company has been so satisfied. Nothing in this clause 16.3 will fix the Company with notice of the contents of any policy and will not be raised as a defence to any claim by the Company against the Contractor.
- 16.4 The insurance policies under this Contract are primary, and not secondary to the indemnities referred to in this Contract. The effecting of any or all insurances as required by this Contract shall not in any way limit the liabilities or obligations of the Contractor to the Company under any other provision of this Contract.
- 16.5 If any event occurs which may give rise to a claim involving the Company under any policy of insurance to be taken out by the Contractor under this Contract, the Contractor shall:
- (a) notify the Company within 14 (fourteen) days of that event; and
 - (b) ensure that the Company is kept fully informed of any subsequent actions and developments concerning the relevant claim.

17 Liability and Indemnity

- 17.1 The Contractor must indemnify, and keep indemnified, the Company and its Related Entities on demand from and against all costs, losses, claims, proceedings, demands and actions of any nature, whether actual or threatened, made against the Company or its Related Entities arising out of or in connection with:
- (a) any breach of this Contract or applicable Law by the Contractor;
 - (b) any gross negligence, negligence, wilful misconduct or unlawful act or omission of the Contractor or Contractor's Personnel, or of any other person for whose acts or omissions the Contractor is liable;
 - (c) any claim that the Drilling Services or the Company's use or enjoyment of the Drilling Services infringes or allegedly infringes the Intellectual Property Rights of any person; or
 - (d) any Taxes, fines, penalties and associated liabilities paid, suffered or incurred by the Company after a request or demand to do so from any Authority in the Country, which the Contractor disputes, omits or otherwise refuses to pay in violation of applicable Laws,
- except to the extent caused, or contributed to, by gross negligence or wilful misconduct of the Company or the Company's Personnel.
- 17.2 Except as set out in clause 17.4, neither Party will be liable to the other Party for any Consequential Loss suffered or incurred by the other Party in connection with this Contract.
- 17.3 Except as set out in clause 17.4:
- (a) the Contractor's liability to the Company arising out of or in connection with this Contract is limited to the amount set out in the Contract Specifics; and

- (b) the Company's liability to the Contractor arising out of or in connection with this Contract is limited to an amount equal to the Contract Price.

17.4 Nothing in clause 17.2 or clause 17.3 excludes or limits:

- (a) a Party's liability:
- i. for a deliberate breach of this Contract or any wilful misconduct; or*
 - ii. in respect of fraud or fraudulent misrepresentation; or*
 - iii. in respect of liquidated damages (if any), reduction of the Contract Price under Schedule 2 (if any) or under any provision in this Contract where a debt or other payment is expressly recoverable; or*
 - iv. for the death of, or personal injury sustained by, an individual to the extent such death or personal injury was caused by the negligence or wilful misconduct of that Party or that Party's officers, employees or agents; or*
 - v. for any matter which cannot be excluded or limited by operation of applicable Law;*
- (b) the Contractor's liability:
- i. to indemnify the Company under clause 17.1(c) and (d);*
 - ii. to indemnify the Company pursuant to clause 17.1 in respect of damage to the property of a third party;*
 - iii. to indemnify the Company pursuant to clause 17.1 for breach of clause 25 by the Contractor;*
 - iv. to the extent that the Contractor is required by this Contract to procure and maintain insurance in respect of that liability;*
 - v. to the extent that the Contractor recovers any amount for which it is liable under this Contract from a Subcontractor or third party; or*
 - vi. to rectify any Defect.*

- 17.5 The rights and obligations under this clause 17 continue after the End Date and extends to include any claims by the Contractor's Personnel and third parties whether or not specifically stated in clause 17.

18 Intellectual Property

- 18.1 Any and all Intellectual Property (present or future) created or coming into existence as a result of, for the purpose of, or in connection with the performance of this Contract (including all Intellectual Property developed by the Contractor or a Subcontractor in performing this Contract, any Intellectual Property created or developed jointly by the Parties in the course of or for the purposes of performance of this Contract, (the Project IP)) vests with the Company from the moment of its creation or coming into existence, and the Contractor hereby assigns all rights, title and interest in and to the Project IP to the Company (including, but not limited to, any Project IP created prior to, on or after the date of the Contract).
- 18.2 All the IP Rights to the Contractor's Intellectual Property (whether owned by the Contractor or licensed to the Contractor by a third party), which is in existence at the date of this Contract or comes into existence after the date of this Contract otherwise than in connection with this Contract remains vested in the Contractor and the Contractor grants to the Company a worldwide, non-exclusive, perpetual, royalty-free, irrevocable, transferable licence (with the right to assign and sub-license such Contractor's IP) to use the Contractor's IP.

19 Confidential Information and Publicity

- 19.1 The Contractor must, and must ensure that the Contractor's Personnel:

- (a) keep the Confidential Information in such a way as to ensure that it remains confidential and is not disclosed without the Company's prior written approval and not take any photographs of any part of the Company's operations and/or Sites;
- (b) not advertise or make any public announcement or issue any media release regarding this Contract or the transactions contemplated herein without the Company's prior written approval;
- (c) use Confidential Information only as necessary for the purposes of fulfilling its obligations under this Contract; and
- (d) subject to clause 19.2, only disclose the Confidential Information to Related Entities or Contractor's Personnel who need the information to enable the Contractor to fulfil its obligations under this Contract or otherwise with the Company's prior written approval.

For the purposes of this clause 19, "Confidential Information" means:

- (a) the terms of this Contract;
- (b) all information (in any form) relating to the Company or its Related Entities made available to the Contractor at any time in connection with this Contract; and
- (c) any information that concerns the business, operations, finances, plans, Personnel or customers of the Company or its Related Entities, which is disclosed to or acquired by the Contractor (including any information that is derived from such information),

but does not include information which:

- (d) is or becomes public knowledge other than by a breach of this Contract; or
- (a) has been independently developed by the Contractor without breach of this Contract or acquired by the Contractor from a source which was not subject to a duty of confidentiality to the Company or its Related Entities (but only if, to the Contractor's knowledge, the source is not prohibited from disclosing such Confidential Information to the Contractor).

19.2 Subject to clause 19.3, the Contractor's obligation not to disclose Confidential Information without the Company's prior written approval does not apply to disclosures to the extent that they are:

- (e) required by Law (including disclosure to any stock exchange or to any Authority);
- (a) by order of any court or tribunal; or
- (b) made to its legal advisers, accountants or auditors that are subject to a confidentiality agreement on terms not less stringent than this clause 19.

19.3 Before making any disclosure pursuant to clause 19.2(e), the Contractor must:

- (f) give the Company details of the reasons for the disclosure and a copy of the information the Contractor proposes to disclose;
- (a) where reasonably possible, provide the Company with sufficient notice to enable the Company to seek a protective order or other remedy; and
- (b) provide the Company with all assistance and co-operation which the Company considers necessary to prevent or limit that disclosure including by making such amendments to the terms of the disclosure, as may be requested by the Company.

- 19.4 The Contractor must, within 10 (ten) Business Days (or any other period agreed in writing by the Parties) after a direction by the Company to do so, return or destroy all Confidential Information in the Contractor's possession, power or control.
- 19.5 Notwithstanding the provisions of clause 19.4, the Contractor, its Related Entities and their respective legal, accounting and financial advisers may retain any Confidential Information which is required to be retained by Law or for the purposes of compliance with any relevant professional standards or insurance policies or where reasonably necessary to support any advice given to the Contractor or a Related Entity and for such period as required by Law.
- 19.6 Any Confidential Information retained under clause 19.5 will remain subject to the provisions of this clause 19 until it is destroyed.
- 19.7 The Contractor must inform the Company immediately if it becomes aware or suspects that there has been a breach of its obligations under this clause 19.
- 19.8 The rights and obligations under this clause 19 shall survive termination of this Contract and continue for 5 (five) years after the End Date.

20 Taxes

- 20.1 The Contractor must pay all Taxes to the relevant Authority. If the Contractor pays any Taxes on behalf of the Company, the Contractor must provide the Company with documentary evidence of the payment of those Taxes.
- 20.2 Where the Company believes it is required by Law to withhold or deduct any amounts with respect to or which relate to any Tax from any payment due to the Contractor, the Company shall be entitled to withhold or deduct such amounts.
- 20.3 Where a relevant Authority requires the Company to pay to it a withholding amount that exceeds the amount that was withheld or deducted under clause 20.2, the Company may provide the Contractor with proof from the relevant Authority that payment is required, request the Contractor to pay and the Contractor must pay the excess amount to the Company.
- 20.4 Whenever the Company withholds or deducts that amount from any payment due to the Contractor, the Company must give the Contractor a written notice of such amount withheld.
- 20.5 If any goods are to be imported into the Country:
- (a) the Contractor must supply all documentation and do all that is reasonably necessary to assist the Company to obtain a tariff, customs, excise or importation concession, or any concession analogous thereto, in respect of those Goods; and
 - (b) the Company will be entitled to the sole and full benefit of any tariff customs, excise or importation concession, or any concession analogous thereto, granted in respect of those Goods.

21 Assignment and Subcontracting

- 21.1 The Contractor cannot assign, transfer, charge or otherwise dispose of any of its rights, interests or obligations in respect of this Contract without the prior written consent of the Company, which consent must not be unreasonably withheld.
- 21.2 The Company may assign its rights or delegate any obligation in respect of this Contract or novate the Contract to a Related Entity or a person financially capable of meeting its

obligations, and the Contractor irrevocably consents to such assignment, delegation or novation. If required by the Company, the Contractor must enter into any document reasonably required to give effect to the assignment, delegation or novation.

- 21.3 The Contractor must obtain the approval of the Company before appointing any Subcontractor to perform any part of its obligations under this Contract. The Contractor is liable to the Company for the acts, omissions and/or defaults of any Subcontractor as if they were acts, omissions or defaults of the Contractor.

22 Dispute Resolution

- 22.1 Where any dispute, controversy or claim arising out of or in relation to this Contract arises, a Party may give a notice of dispute to the other Party (the Dispute). Within twenty (20) Business Days of the notice (or any other period agreed in writing between the Parties), the Representatives (or their nominees) must confer to attempt to resolve the Dispute.
- 22.2 Notwithstanding the foregoing, any Dispute that has not been amicably resolved pursuant to clause 22.1 within sixty (60) Business Days shall finally be resolved by arbitration in accordance with the Rules of Arbitration of the International Chamber of Commerce current at the date of reference (the ICC Rules) as amended herein:
- 22.3 pursuant to which the dispute shall be finally resolved on the basis that:
- (a) there shall be one arbitrator;
 - (b) the Parties shall endeavour to agree on the nomination of the sole arbitrator but failing agreement between them within a period of fourteen (14) days after receipt of the claimant's request for arbitration, the arbitrator shall be appointed by the Court of Arbitration of the International Chamber of Commerce under the ICC Rules;
 - (c) the seat of the arbitration shall be London, England, save that the Parties expressly agree that leave to appeal under section 69(1) of the Arbitration Act 1996 or an application for the determination of a preliminary point of law under section 45 of the Arbitration Act 1996 may not be sought with respect to any question of law arising out of an award or in the course of the proceedings;
 - (d) the language of the arbitration shall be English;
 - (e) the Emergency Arbitrator Provisions of the ICC Rules shall not apply; and
 - (f) notwithstanding the governing law clause, the arbitration and the agreement to arbitrate shall be governed by the law of England & Wales.
- 22.4 The Parties agree to be bound by any decision, award or ruling of the arbitral tribunal under this clause 22 and shall be final and binding on the Parties, and the Parties undertake to carry out any award without delay. Judgment upon the award may be entered by any court having jurisdiction over the award or relevant party or its assets.
- 22.5 Except as the tribunal or a competent judicial authority may determine, pending the resolution of any Dispute, both Parties must continue to perform their obligations under this Contract, except in the case of a disputed Invoice under clause 11.9, in which case the Company is not required to pay the amount disputed.

23 Notices and Manner of Delivery

- 23.1 Unless otherwise specified in this Contract any notice, approval, consent or other communication in relation to this Contract must be in writing, in the English language and delivered by the Permitted Method to the attention of the relevant Representative to the address for notices for the relevant Representative, out in the Contract Specifics.
- 23.2 A notice submitted in accordance with clause 23.1 is effective at the time stated in clause 23.5, and if this is after 5pm in the place of receipt, will be considered to be received on the next Business Day.
- 23.3 This clause does not prevent normal, day-to-day communications between the Parties taking place by email.
- 23.4 A notice given pursuant to clauses 14 and 22 may not be sent electronically by email or as an attachment to an email.
- 23.5 The Permitted Method means any of the methods set out in the first column below, the second column setting out the date on which a notice given by such Permitted Method shall be deemed to be given provided the notice is properly addressed and sent in full to the Notified Address:

(1) Permitted Method	(2) Date on which notice deemed given
Personal delivery	When left at the address for the relevant Representative on a Business Day, or, if not a Business Day or after 5pm, on the next Business Day
First class pre-paid post	Two Business Days after posting
Registered or International registered or prepaid airmail	Seven Business Days after posting
E-mail	At the time shown in the delivery confirmation report generated by the sender's email system; or if the sender's email system does not generate a delivery confirmation report, within 12 hours of the time the email is sent, unless the sender receives a return email notification that the email was not delivered, undeliverable or similar, at the time which is within 12 hours from the time the email was sent

24 Inconsistency between Parts of this Contract

- 24.1 To the extent of any inconsistency between the several parts of this Contract, the order of precedence set out in clause 2.1 of the Form of Agreement will apply.

25 Corruption and Trade Controls

25.1 Anti-corruption and anti-fraud

- (a) Notwithstanding any other provision of this Contract, the Contractor shall at all times:
- i. comply with all applicable Anti-Corruption Laws;*
 - ii. comply with the Anti-Corruption Policies;*
 - iii. maintain in place throughout the duration of this Contract its own policies and procedures to ensure compliance with the Anti-Corruption Laws, the Anti-Corruption Policies and will enforce them where appropriate;*
 - iv. immediately report to the Company any request or demand for any undue financial or other advantage of any kind received by the Contractor in connection with the performance of this Contract;*
 - v. immediately notify the Company in writing if a Government Official becomes an officer or employee of the Contractor or acquires a direct or indirect interest in the Contractor;*
 - vi. not, either directly or indirectly, pay any commission or fees or grant any rebates or other remuneration or gratuity to any employee, agent, or officer of the Company or any of its Related Entities;*
 - vii. immediately notify the Company if any person solicits improper payments or other things of value from the Contractor in connection with Contractor's work on behalf of the Company and its Related Entities; and*
 - viii. ensure that no monies paid to it by the Company under this Contract shall be used by the Contractor for bribery or similar illegal activity.*
- (b) The Contractor warrants and represents that in relation to this Contract:
- i. none of the officers, directors, or employees, shareholders (registered or beneficial), or individuals with a direct or indirect financial interest in the Contractor are Government Officials. The Contractor shall notify the Company promptly in writing if a Government Official acquires an ownership or beneficial interest in the Contractor or become an officer or director of the Contractor.*
 - ii. it has not, and will not, promise, offer, give or authorize the giving of any payments or the provision of other things of value to any individual or entity to obtain business, to retain business, to receive an improper advantage, or to receive favoured treatment. These prohibitions apply even if payments of this kind are commonplace and accepted as a way of doing business in a given part of the world.*
 - iii. it has not received, agreed or attempted to receive the proceeds of or profits from a crime or agreed to assist any person to retain the benefits of a crime;*
 - iv. it will perform appropriate anti-corruption-related due diligence on any Subcontractor engaged to perform this Contract and inform any such Subcontractor of the Company's anti-corruption-related policies in advance of the Subcontractor performing services or receiving funds provided to the Contractor pursuant to this Contract.*
- (c) The foregoing representation and warranties shall be continuing in effect throughout the term of this Contract, and the Contractor shall immediately notify the Company in writing if any aspect of such representations and warranties ceases to be complete and accurate.
- (d) In performance of the services in connection with this Contract, Contractor shall not use any Subcontractors or third parties without the prior written consent of the Company. Contractor shall require that any Subcontractors used in connection with this Contract agree to the terms contained in this clause.

- (e) Contractor and any Subcontractor the Contractor uses in connection with this Contract shall provide such periodic certificates of compliance with this clause as may from time-to-time be reasonably requested in writing by the Company.
- (f) Upon request from the Company, the Contractor shall make its books and records available for review so that the Company may confirm compliance with terms of this Contract.
- (g) Contractor's failure to abide by this clause 25 shall be deemed a material breach of this Contract, and:
 - i. the Company shall have no further obligation to pay the Contractor;*
 - ii. the Contractor shall immediately repay the Company the amount of funds or value paid by Contractor to a third party in breach of this clause;*
 - iii. the Contractor shall hold harmless and indemnify on demand the Company for any losses, liabilities, costs, expenses (including attorneys' fees and court costs), penalties and sanctions related to or arising out of Contractor's breach of this clause; and*
 - iv. the Company shall be entitled to immediately suspend or terminate this Contract pursuant to clause 14 of this Contract.*

25.2 Sanctions

- (a) The Contractor shall ensure that:
 - i. it complies with the export control and sanctions laws of the United States, European Union, Canada, and other applicable government authorities, including without limitation the Export Administration Regulations;*
 - ii. it will not infringe any embargo imposed by the European Union, United Kingdom, Canada, the United States, the United Nations or any other applicable jurisdiction (including the jurisdiction of incorporation of the Contractor), also considering the limitations of domestic business and prohibitions of by-passing;*
 - iii. in relation to goods, works or services provided by, or supplied to a third party by the Contractor, these are not intended for use in connection with armaments, nuclear technology or weapons, if such use is subject to prohibition or authorisation which has not been obtained; and*
 - iv. it complies with the regulations applicable to Sanctioned Persons concerning the trading with entities, persons and organisations listed therein*
- (b) The Contractor and any Subcontractor the Contractor uses in connection with this Contract shall provide periodic certificates of compliance with this clause as may from time-to-time be reasonably requested in writing by the Company.
- (c) The Contractor represents and warrants that it is not a Sanctioned Person and to the best of its knowledge, it is not likely to become a Sanctioned Person for the duration of this Contract. The foregoing shall be continuing in effect throughout the term of this Contract, and the Contractor shall immediately notify the Company in writing if any aspect of such warranty ceases to be complete and accurate.
- (d) Nothing in this Contract requires any Party to take any action, or refrain from taking any action, where doing so would be prohibited by, or subject to, penalty under any applicable national and international export control laws and regulations (including trade sanctions).
- (e) The Contractor's failure to abide by this clause, or the Contractor exposing the Company to the risk of penalties under any applicable export control and sanctions laws, shall be deemed a material breach of this Contract, and:
 - i. the Company shall have no further obligation to pay the Contractor, including for any amounts that may be owed by the Company to the Contractor prior to the date the Contractor became a Sanctioned Person;*

- ii. *the Contractor shall immediately repay the Company the amount of funds or value paid by the Contractor to a third party in breach of this clause;*
 - iii. *the Contractor shall hold harmless and indemnify on demand the Company for any losses, liabilities, costs, expenses (including attorneys' fees and court costs), penalties and sanctions related to or arising out of Contractor's breach of this clause; and*
 - iv. *the Company shall be entitled to immediately suspend or terminate this Contract pursuant to clause 14 of this Contract.*
- (f) If required to conduct export control checks, the Contractor, upon request by the Company but subject to the Company complying with all reasonable requirements as to confidentiality, shall promptly provide the Company with all information pertaining to the source of particular goods, works and services provided by the Contractor as part of the Drilling Services, as well as any applicable export control restrictions.
- (g) Nothing in this Contract requires any Party to take any action, or refrain from taking any action, where doing so would be prohibited by or subject to penalty under any applicable national and international export control Laws and regulations (including trade sanctions).

26 Audit and Retention of Documents

- 26.1 During the performance of Drilling Services, and for a period ending five years after the end of the last Defects Correction Period, the Company, or a third party appointed by the Company, may from time to time conduct an audit of:
- (a) all invoiced charges made by the Contractor to the Company;
 - (b) the Contractor's compliance with any applicable Law;
 - (c) the Contractor's adherence to its obligations under clause 25; or
 - (d) any other provision of this Contract under which the Contractor has obligations, the performance of which is capable of being verified by audit.
- 26.2 The Contractor shall provide the Company with all reasonable access during the performance of Drilling Services (including the taking of copies) to all Contractor's Personnel, books, records, systems, monthly reports on payments made to the Subcontractors, a going concern statement from the Contractor's auditors, procedures and correspondence relating to this Contract, to audit and verify for any reasonable purpose including monitoring efficiency, verifying price and determining best practice in relation to the performance of Drilling Services. Should the Company reasonably require to have the Contractor's financial statements be inspected by its auditors, such auditors shall be subject to the same confidentiality obligations as set out in this Contract.
- 26.3 Without limiting any other rights and remedies available to the Company, if any deficiencies are identified by an audit undertaken under clause 26.2, the Contractor shall, at its cost and expense, take prompt corrective action and notify the Company of such action including repayment of any sums (with finance charges) as may be appropriate to the Company.
- 26.4 The Contractor shall maintain and retain for a period of the later of two years after the end of the last Defects Correction Period or the completion of any audit initiated by the Company under clause 26.2 after the end of the last Defects Correction Period, clear, full and proper records of all Drilling Services provided including all details and data used in the creation of Invoices.
- 26.5 This clause survives the termination or expiry of this Contract.

27 Representations and Warranties

- 27.1 Without limiting any other term of this Contract, the Contractor represents and warrants to the Company that each of the statements made in clause 27.3 is correct as at the execution date of this Contract and shall remain so until the End Date. The Contractor acknowledges that a breach of any such warranties may (in the Company's sole discretion) be regarded as constituting a material breach for the purpose of clause 14.2.
- 27.2 This clause 27 survives the termination or expiry of this Contract.
- 27.3 The Contractor represents and warrants to the Company that:
- (a) it is a legal entity, duly incorporated and validly existing under the Laws of its jurisdiction of incorporation;
 - (b) for the duration of this Contract, it will remain incorporated in its jurisdiction of incorporation as at the date of this Contract;
 - (c) it has full corporate power to enter into, and perform, this Contract, and neither the execution of this Contract nor the performance of the Drilling Services results shall result, in a breach of:
 - i. *the terms of, or constitute a default under, any agreement, undertaking or instrument; or*
 - ii. *any order, rule, writ, regulation, injunction or decree of any court or Authority or Law applicable to the Contractor by which the Contractor may be bound;*
 - (d) it is, and the Contractor's Personnel (including any additional or replacement Contractor's Personnel) are, suitably equipped, organised, qualified, financed, trained and experienced to perform all of its/their obligations under this Contract, and shall exercise the level of care and skill usually exercised in accordance with Good Industry Practice in the performance of Drilling Services;
 - (e) this Contract has been validly executed by the Contractor, and constitutes valid and binding obligations of the Contractor enforceable according to its terms;
 - (f) neither the performance of Drilling Services infringes or shall infringe on the Intellectual Property Rights of any third party; and
 - (g) all information provided to the Company in connection with the Company's due diligence review questionnaire is complete, true and accurate in all material respects as at the date provided and not misleading in any material respect and there is no information not disclosed which renders any information given to the Company incomplete, inaccurate or misleading.
 - (h) the Contractor has complied with the instructions given to it in the tender process with respect to the provision of information and so far, as reasonable has provided information which would be relevant to the Company's decision to retain the Contractor to carry out the Drilling Services and to perform its other obligations under this Agreement.

28 General

- 28.1 This Contract will be governed by, construed and take effect in accordance with the Governing Law.

- 28.2 The Parties agree that the United Nations Convention on Contracts for the International Sale of Goods does not apply in any respect to this Contract.
- 28.3 The Parties do not intend any term of this Contract to be enforceable by any person who is not a Party to this Contract, other than any Barrick Group Company or the Company's Representative to the extent referred to in this Contract. Notwithstanding the foregoing, the Parties may, by agreement, rescind or vary this Contract without the consent of any third party to whom the right of enforcement of any of its terms has been expressly provided.
- 28.4 To the fullest extent permitted by Law, in relation to the subject matter of this Contract, this Contract constitutes the entire agreement between the Parties and supersedes any prior written or other agreement between the Parties relating to the subject matter of this Contract. Each Party acknowledges that in entering into this Contract, it is not relying on any representation, warranty or other statement relating to the subject matter of this Contract, which is not set out in this Contract, provided that nothing herein shall affect a Party's rights in the case of fraud.
- 28.5 Nothing contained in this Contract is to be construed as constituting a joint venture, agency or partnership or employment relationship between the Contractor (or its Personnel) and the Company.
- 28.6 An amendment to any term of this Contract or a waiver of any right arising under or in connection with this Contract, must be in writing and signed by the authorised representatives of both Parties.
- 28.7 This Contract may be executed in any number of counterparts, and this has the same effect as if the signatures on the counterparts were on a single copy of the Contract. All counterparts, taken together, constitute one instrument. A Party may execute this Contract by signing any counterpart.

Schedules

Table of contents

Schedule 1 Drilling Services.....75

Schedule 2 Contract Pricing.....81

Schedule 3 Key Performance Indicators.....83

Schedule 4 Insurance Requirements86

Schedule 5 IP Requirements.....89

Schedule 6 Responsibility Matrix90

Schedule 1

Drilling Services

Scope of Work	Services Description
	Type of Drilling: The Works comprise geotechnical rotary core drilling (nominal 76mm diameter or N-size/NWD4 or approved equivalent) for the Kibali River Hydropower Project geotechnical investigations at the Gawa and Moke sites, the Moke Saddle Dam, the Kibali River Bridge, and the associated quarry/borrow-pit material-source areas, together with any further geotechnical drilling instructed within the KGM lease area. Purpose / Targets: The drilling supports the geotechnical characterisation of the proposed Gawa and Moke dam sites (main dams and saddle dam), the Kibali River Bridge crossing, and potential quarry/borrow-pit material sources, for the Pre-Feasibility/Feasibility design of the Hydropower Projects. This is geotechnical site-investigation drilling; it is not exploration or grade-control drilling and is not directed at ore-body definition. Equipment Used: The Contractor shall deploy a minimum of two (2) core drilling rigs (or such other number as demonstrated in the Contractor's Level II programme to meet the required completion date) capable of nominal 76mm diameter rotary core drilling to the depths and inclinations shown on the drawings (Annexures B, C and D), together with drilling barges and ancillary equipment suitable for the remote, steep and riverine conditions described in Section 3 of the Tender Package. Weak, weathered or fractured material shall be drilled using a split-inner, double-tube core barrel (e.g. NWD4 or approved equivalent); single-tube core barrels shall not be used. Reverse Circulation (RC), man-portable or helicopter-portable drilling methods are not required under this Contract unless separately instructed in writing by the Engineer / Geotechnical Consultant. Scope of Work The Contractor shall carry out the geotechnical drilling scope described in this Schedule 1 and the Tender Package Annexures, comprising: - Twelve (12) boreholes at Gawa HPP (approx. 290m, comprising 10 vertical and 2 inclined boreholes); - Nine (9) boreholes at Moke HPP (approx. 270m, comprising 5 vertical and 4 inclined boreholes); - Eight (8) vertical boreholes at Moke Saddle Dam (approx. 105m); - Four (4) vertical boreholes at the Kibali River Bridge (approx. 60m); and - Nine (9) exploratory boreholes for quarry/borrow-pit material sources (approx. 135m), at locations and to depths instructed by the Engineer / Geotechnical Consultant. Normal, difficult, very difficult and river-crossing drilling setups apply across the above locations, including rig positioning, anchoring and barge moves for river crossings. Hole Location & Depth: Borehole positions, depths and inclinations are as shown on the drawings (Annexures B to D) and are provisional; they may be adjusted by the Engineer /

	Geotechnical Consultant in response to access, geological conditions or investigation findings. No borehole shall be terminated, abandoned or closed without the Engineer's / Geotechnical Consultant's approval. Drilling Methods: Rotary core drilling shall produce a nominal 76mm diameter borehole with continuous core recovery; drill runs shall generally not exceed 1.5m. Temporary casing shall be installed where necessary to stabilise the borehole and shall not be left in place without the Engineer's / Geotechnical Consultant's approval. Inclined boreholes shall be drilled at the inclination and direction shown on the drawings. Support Equipment: The Contractor must provide the support equipment necessary to perform the Services, including (without limitation): drilling barges (for river-crossing setups), rig anchoring and skid/positioning equipment, water pumps and hoses, drilling-fluid mixing and containment equipment, generators, spill kits, first-aid and fire-fighting equipment, and PPE. Core Orientation & In-Situ Testing: Core-orientation surveys shall be carried out in the boreholes identified in the drawings/Bill of Materials (2 No. at Gawa, 4 No. at Moke). Standard Penetration Tests and water-pressure (packer) testing shall be carried out at the depths and frequencies instructed by the Engineer / Geotechnical Consultant, in accordance with the Technical Specifications listed under 'Applicable Standards' below. Deep downhole survey tools (gyro camera, rig aligner) are not required for the depths and hole types under this Contract. Core Handling & Transport: Recovered core shall be placed sequentially into labelled core boxes, protected from disturbance and weather, and transported to the core-storage area designated by KGM. Depth markers shall be inserted at the end of each drill run and marked to the nearest 5cm. Any interval of core loss or artificial breakage shall be clearly marked. Site Preparation & Housekeeping: KGM will indicate and arrange the initial creation/clearing of access routes and drilling platforms. The Contractor shall maintain good housekeeping at each drill site and shall contain drilling fluids, cuttings, fuel and waste, preventing uncontrolled discharge to the Kibali River or surrounding environment. Transportation & Logistics: KGM will arrange local and international transportation of the Contractor's personnel, transportation associated with mobilisation/demobilisation of drilling rigs and ancillary equipment, and transportation between the mine and the investigation sites, and will provide fuel for the drilling rigs (see 'Other materials to be supplied by the Company' below). The Contractor is responsible for movement of rigs between borehole positions, rig anchoring, barge establishment for river crossings, and providing equipment dimensions, weights and packing lists to KGM sufficiently in advance. Equipment Compliance: All drilling rigs and support vehicles shall comply with KGM's Light and Mobile Equipment requirements and the Barrick Global Drilling Standard (see 'Applicable Standards' below) and shall be inspected and approved by KGM/the Engineer before use. Any tasks, functions or responsibilities not specifically described as part of the Drilling Services, which are necessary or incidental to the proper provision of the Drilling Services, are deemed to be
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	included as part of the Drilling Services as if specifically described in this Schedule.
Purpose	The purpose of the Drilling Services is geotechnical site investigation, not exploration or grade-control drilling. The drilling programme provides subsurface geotechnical data (soil/rock stratigraphy, weathering, core recovery, groundwater conditions and in-situ test results) to support the geotechnical design of the proposed Gawa and Moke Hydropower Project dams, the Kibali River Bridge, and the identification of suitable quarry/borrow-pit construction-material sources, for the Pre-Feasibility/Feasibility phase of the Kibali River Hydropower Project.
Quantity	The Works comprise a single, fixed-term geotechnical drilling campaign (not a multi-year annual programme) of approximately 42 boreholes and 860 linear metres of drilling, provisionally allocated as follows: - Gawa HPP: 12 boreholes, approx. 290m; - Moke HPP: 9 boreholes, approx. 270m; - Moke Saddle Dam: 8 boreholes, approx. 105m; - Kibali River Bridge: 4 boreholes, approx. 60m; and - Quarry/borrow-pit exploration: 9 boreholes, approx. 135m. These quantities are provisional. The Contract is remeasurable and the Engineer / Geotechnical Consultant may increase, decrease or omit quantities in response to access, geological conditions or investigation findings. Tendered rates shall remain fixed for the Contract period.
Completion Date	Work is scheduled to commence on the Start Date stated in the Contract Specifics (anticipated 20 October 2026) and to achieve Practical Completion by the date stated in the Contract Specifics (anticipated 20 March 2027), in accordance with the Contractor's accepted Level II programme (Tender Package Sections 1.6 and 4.1). The current planning basis assumes two (2) drilling rigs; a Contractor proposing an alternative number of rigs must demonstrate in its Level II programme that the Works can be completed within the required period. Any demobilisation and site reinstatement shall be completed as part of, and prior to, the End Date.
Other materials to be supplied by the Company:	The Company will provide to the Contractor the following: - Accommodation and messing; - Local and international transportation of the Contractor's personnel; - Transportation associated with mobilisation and demobilisation of drilling rigs and ancillary equipment; - Transportation between the mine and the investigation sites; - Initial creation or clearing of access routes and drilling platforms; - Fuel for the drilling rigs; - Community liaison; - Mine-access coordination and site security arrangements; and - A designated core-storage area.

Applicable Standards	The Works shall be carried out in accordance with the drawings, the Engineer's / Geotechnical Consultant's instructions, and the following standards, which are incorporated into and form part of this Contract: - Standard Specifications for Subsurface Investigations, Committee of Transport Officials (COTO), 2010 (measurement and payment basis; issued as Annexure A to the Tender Package); - Site Investigation Code of Practice, First Edition, Geotechnical Division of SAICE, January 2010; - Engineering Geological Soil and Rock Description Guidelines, SAIEG, February 2026; - The Barrick Global Drilling Standard (Version 6.2), which sets out mandatory minimum requirements for drilling equipment, personnel, environmental infrastructure and standard operating procedures for surface drilling operations conducted for or on behalf of Barrick, including rotary core drilling. The Barrick Global Drilling Standard is attached to and forms part of this Contract as Annexure G; and - Applicable KGM Site Standards and Procedures, including the KGM Light and Mobile Equipment requirements, and (where the Contractor holds certification) ISO 9001 (Quality Management), ISO 14001 (Environmental Management) and ISO 45001 (Occupational Health & Safety). Where a conflict arises between these standards, the order of precedence shall be: (i) the drawings and the Engineer's / Geotechnical Consultant's instructions; (ii) the Technical Specifications listed above; and (iii) the Barrick Global Drilling Standard, which applies as the minimum health, safety and equipment baseline. The applicable law and mandatory KGM/Barrick safety requirements always prevail. The Geotechnical Consultant's instructions should control technical execution only where they do not conflict with safety or contractual requirements.
Drilling Crew Competency	All drilling crews to have suitably accredited certification: • Driller Assistant Training– (Assist Drilling Operations) • Driller Training– (Drilling Operations) • Supervisor Training – (Drill Site Operations) Contractors shall provide training matrix for all drilling crews to show progress of the above courses.
Working Hours	Working hours shall be as set out in the Contractor's accepted Level II programme and drilling method statement, having regard to KGM site access, security and daylight/river-condition constraints at each location. Night drilling shall only be undertaken where expressly provided for in the accepted programme and supported by adequate lighting, fatigue management and safety arrangements in accordance with the Barrick Global Drilling Standard and KGM's Fatigue Management Standard.

Reporting	The Contractor shall maintain a Daily Drilling Journal for each drilling rig and borehole and submit it to the Engineer / Geotechnical Consultant by the start of the following working day and shall submit a written weekly report every Saturday (unless otherwise agreed), in accordance with Tender Package Sections 4.1 and 4.2. Reports shall be submitted in the format (including any digital reporting system) notified by KGM. Reporting accuracy and timeliness form part of the Key Performance Indicators in Schedule 3.
Rig Capacity	The current planning basis assumes two (2) active core drilling rigs. A Contractor proposing a different number of rigs shall demonstrate in its Level II programme that the Works can be completed within the required period (Tender Package Sections 2.4 and 4.1).

Core Recovery and Quality Management Protocol

The following tolerances apply to all rotary core drilling operations under this Contract. These standards ensure data quality and drilling integrity. Any borehole, or portion of a borehole, that fails to meet these tolerances due to matters within the Contractor's control shall be corrected or redrilled at the Contractor's cost, subject to the Engineer's / Geotechnical Consultant's instruction.

The Contractor is expected to achieve these quality requirements through its own equipment, method and supervision, without the need for constant Company oversight.

Parameter	Geotechnical Drilling Tolerance
Core Recovery	Continuous core recovery shall be achieved; drill runs shall generally not exceed 1.5m. No avoidable core loss will be accepted. The Contractor shall adjust its equipment and method, at its own cost, where recovery is compromised by unsuitable equipment, technique or workmanship.
Depth Marking	Depth markers (core blocks) shall be inserted at the end of every drill run and marked to the nearest 5cm; any interval of core loss shall be clearly marked.
Core Handling	Core shall be extracted and boxed with minimal disturbance; any non-natural breakage occurring during retrieval or boxing shall be marked with an "X" on both ends of the broken pieces.
Borehole Position	The borehole collar shall be set at the position approved by the Engineer / Geotechnical Consultant; any deviation from the approved location requires the Engineer's / Geotechnical Consultant's prior approval.
Drilling Equipment	A split-inner, double-tube core barrel (e.g. NWD4 or approved equivalent) shall be used in weak, weathered or fractured material; single-tube core barrels shall not be used. Casing, testing and core-orientation equipment shall be as approved by the Engineer / Geotechnical Consultant.
Inclination & Alignment	Vertical and inclined boreholes shall be drilled and maintained within the inclination and directional tolerance approved by the Engineer / Geotechnical Consultant for the relevant drawing or instruction.

Parameter	Geotechnical Drilling Tolerance
Borehole Completion	Boreholes shall be drilled to the depth instructed by the Engineer / Geotechnical Consultant and shall be closed, sealed, backfilled or marked (standpipe and cap, or concrete marker) as instructed, with 100% compliance.

Non-Conforming Work and Redrilling

- Corrective Work:
 - Where a borehole or drill run does not meet the tolerances in this Schedule 1 due to unsuitable equipment, technique, workmanship or failure to follow instructions, the Contractor shall correct the work at its own cost, which may include redrilling, repeating tests, replacing damaged core boxes or reinstating disturbed areas.
 - No payment will be made for defective work, avoidable core loss, invalid tests, unauthorised work, or corrective work arising from matters within the Contractor's control.
- Approval:
 - No borehole shall be terminated, abandoned, redrilled or closed without the Engineer's / Geotechnical Consultant's approval.
 - KGM and the Engineer / Geotechnical Consultant reserve the right to reject work that does not meet the tolerances or instructions given under this Contract.

END OF SCHEDULE 1

Schedule 2

Contract Pricing

This Schedule sets out the commercial pricing basis for this Contract. The Contract is remeasurable: tendered rates in the priced Bill of Quantities (“BoQ”) shall remain fixed for the Contract period, while quantities are remeasured based on the Works actually executed and certified by the Engineer / Geotechnical Consultant. All rates are stated in United States Dollars and exclude VAT. All drilling and testing must meet the quality, position and recovery tolerances specified in Schedule 1. Failure to meet those tolerances will result in non-payment and, where applicable, correction or redrilling at the Contractor's cost.

1. Bill of Quantities Pricing Basis

BoQ COTO Section	Description	Unit(s)	Basis of Payment
1	Establishment of Contractor	Sum / day / cal day	Lump sum and time-related items per the priced BoQ; time-related items paid per day for the Contract duration.
3	Establishment and Provision of Rigs and Equipment	Sum / no.day	Lump-sum establishment plus a rate per rig per day, allocated across Gawa, Moke, Moke Saddle Dam, Kibali River Bridge and quarry/borrow-pit exploration as remeasured.
5	Drilling Setups and Movement	No. / km	Per setup (normal, difficult, very difficult, inclined, river-crossing) and per km moved between boreholes, as certified by the Engineer / Geotechnical Consultant.
10	Rotary Core Drilling	m	Per metre drilled, by material category and (where applicable) inclination, as certified against actual drilled and remeasured length.
12	Core and Soil Material Recovery	m	Per metre of core/soil recovered, by material category, as certified.
13	Casing	m (Rate Only)	Rate-only items for casing installed, casing in harder material/boulders/gravel, casing left in the hole, and casing in inclined holes; valued only where instructed.
14	Drilling Aids	P Sum / %	Provisional sum for purchase price of drilling aids, plus contractor mark-up (%) for handling and profit, valued only where instructed and used.
19	Core Orientation Surveys	No.	Per core-orientation survey carried out, as instructed.
23	Standard Penetration Tests	No.	Per test carried out and validly recorded.
26	Water-Pressure Testing	No. / hour	Per set-up, per packer installation, and per hour of testing carried out.
31	Core Boxes	No.	Per core box supplied, labelled and handed over.
33	Core Photography	No.	Per core box photographed.
35	Marking of Holes	No.	Per standpipe and cap, or concrete marker block, installed as instructed.
37	Standing Time	hour	Per hour of KGM-approved standing time (drill rig), where instructed by the Engineer / Geotechnical Consultant.

- (A) Rates shall be as set out in the priced Bill of Quantities workbook (Kibali HPP – Geotech Estimate Rev 4.xlsx), which forms part of this Contract and is reproduced in full in Section 6.3 of the Tender Package. “Rate Only” items are priced for the valuation of variations; “Sum” items are lump sums. In the event of any discrepancy between the Excel workbook and Section 6.3 of the Tender Package, the Excel workbook shall govern.

2. Standing Time and Ancillary Rates

Item	Rate / Basis
Mobilisation of drilling rigs and ancillary equipment	Transportation arranged and paid for by KGM (Schedule 1); equipment preparation, loading and securing costs are included in the Establishment rates (BoQ Sections 1 and 3).
Demobilisation of drilling rigs and ancillary equipment	Transportation arranged and paid for by KGM (Schedule 1); equipment preparation, loading and securing costs are included in the Establishment rates (BoQ Sections 1 and 3).
Standing Time (drill rig, per hour)	Payable at the rate in BoQ item 37.1 only for standing time approved in advance by the Engineer / Geotechnical Consultant.
Lost or damaged casing, core barrels, bits or in-situ testing equipment due to unforeseen adverse ground conditions	Valued at [TO BE COMPLETED]% of the depreciated replacement value of the item, where loss or damage occurs despite the Contractor's use of approved equipment and method, at the direction of the Engineer / Geotechnical Consultant.
Drilling aids mark-up for handling and profit	As priced in BoQ item 14.3 (%), applied to the provisional sum for drilling aids purchased under BoQ item 14.2.

- (B) Standing time is only payable where approved in advance by the Engineer / Geotechnical Consultant, in accordance with BoQ item 37.1.

3. Fixed Fees and Inclusions

- Fixed Fee: All fixed and time-related charges are included in the rates set out in BoQ Sections 1 and 3. No additional fixed fees are payable.
- Drilling Consumables: All drilling consumables (drill rods, bits, core barrels, drilling fluids and similar items) necessary to perform the Works are included in the rates, except for casing (BoQ Section 13) and drilling aids (BoQ Section 14), which are priced separately as rate-only / provisional-sum items.
- Casing and Drilling Aids: Priced and valued in accordance with BoQ Sections 13 and 14 respectively, on the basis set out in this Schedule.

Payments:

Payment shall be made on the basis of monthly interim payment certificates for actual remeasured quantities and tendered BoQ rates, approved variations and approved standing time, following verification of the Contractor's Daily Drilling Journals and weekly reports and certification by the Engineer / Geotechnical Consultant, in accordance with clause 11 and the Employer's standard payment terms.

END OF SCHEDULE 2

Schedule 3

Key Performance Indicators

1. Overview

This framework outlines how monthly performance against **Quality, Safety, Operational** and **Environmental** will be assessed and how it impacts the Contractor's payment through bonuses or deductions.

- **Bonus Eligibility:** A **pass score** in all four KPI categories will result in a **bonus payment equivalent to 1%** of the total Monthly Claim.
- **Deduction for Non-Compliance:** A **fail score** in any KPI category will result in a **deduction of 1%** from the total Monthly Claim.
- All bonuses and deductions are applied to the **original gross Monthly Claim** amount and reconciled monthly.

2. KPI Categories and Scoring Thresholds

A. Quality Performance (Score out of 125)

Based on compliance with the geotechnical core recovery and quality management standards in Schedule 1.

- **Pass:** ≥110 points
- **Fail:** <110 points

Core Recovery and Quality Management

Parameter	Geotechnical Drilling Standard	
Core Recovery	Continuous core recovery achieved; no avoidable core loss.	25
Depth Marking & Labelling	Depth markers at every drill run (nearest 5cm); core boxes correctly labelled (project, borehole, box no., depth interval).	20
Core Handling	Core extracted and boxed with minimal disturbance; non-natural breaks marked with an "X".	20
Borehole Position	Collar set at the position approved by the Engineer / Geotechnical Consultant.	15
Equipment & Method Compliance	Approved core barrels, casing and testing equipment used in accordance with the Engineer's / Geotechnical Consultant's instructions.	15
Inclination & Alignment	Vertical/inclined boreholes maintained within the approved inclination and directional tolerance.	20
Borehole Completion & Records	Boreholes drilled to instructed depth and closed/marked as instructed; Daily Drilling Journal complete, with 100% compliance.	10
Total		125

B. Operational Performance (Score out of 70)

Based on drilling progress, rig availability, and reporting/invoicing accuracy.

- **Pass:** ≥63 points
- **Fail:** <63 points

Operational Performance Indicators

Item	Criteria	Standard	Rating	Rating Target
1	Drilling progress against the accepted Level II programme = actual drilling metres achieved / programme baseline metres for the period x 100%	Progress greater than 95% of the accepted programme baseline	25	95 to 100% = 25 85 to 95% = 15 80 to 85% = 10 Less than 80% = 0
2	Drill rig availability = (Calendar time – operational delay time) / (Calendar time) x 100%	Drill rig availability greater than 90%	20	More than 90% = 20 80 to 90% = 10 Less than 80% = 0
3	Reporting accuracy and timeliness = (Daily Drilling Journals and weekly reports submitted on time) / (total due) x 100%	100% of Daily Drilling Journals and weekly reports submitted on time	15	100% = 15 90 to 99% = 8 Less than 90% = 0
4	Invoicing accuracy = (Total invoices – disputed/corrected invoices) / (Total invoices) x 100%	Invoicing 95% accuracy when first submitted	10	95 to 100% = 10 90 to 95% = 6 85 to 90% = 3 Less than 85% = 0
Maximum Score			70	Total

C. Safety Performance (Score out of 60)

Based on compliance with the Contractor's safety procedures and this Contract.

- **Pass:** ≥50 points
- **Fail:** <50 points

Safety Performance Indicators

Measurement	Unacceptable Standard	Acceptable Standard	Weight	Guide-lines
Drug & Alcohol testing (on site)	Positive Test	Negative tests	10	-5 per breach
PPE on site	Failure to meet requirements	Full PPE compliance	5	-2 per breach
Safety Incidents or non-conformances	High-level incidents	No high-level incident	10	-5 per breach
Participation in Safety Leadership Program (Field Inspections, CCV and Planned Task Observations.)	Failure to achieve Monthly Leadership Targets	In accordance with Monthly Leadership Targets	5	-2 per breach

Measurement	Unacceptable Standard	Acceptable Standard	Weight	Guidelines
Total Reportable Injury Frequency Rate (TRIFR)	Higher than 0.4	0 or less than 0.4	10	-5 per breach
Incidents	Failure to report	Report all incidents	20	-10 per breach
Total			60	

D. Environmental Performance (Score out of 70)

Based on compliance with the Contractor's environmental management procedures and this Contract.

- **Pass:** ≥63 points
- **Fail:** <63 points

Measurement	Unacceptable Standard	Acceptable Standard	Weight	Guidelines
Drilling Fluid Management	Improper disposal or spillage	Proper containment and disposal as per SOPs	10	-5 per incident
Drill Site Rehabilitation	Failure to rehabilitate drill pads post-drilling	Drill sites fully rehabilitated	10	-5 per site not restored
Waste Management	Improper segregation or dumping of waste	Proper waste segregation and disposal	10	-3 per breach
Water Usage Monitoring	Excessive water usage beyond permit limits	Water usage within permitted levels	10	-5 per exceedance
Oil and Diesel Spillage	Spills not reported or cleaned	All spills reported and cleaned	10	-10 per unreported spill
Dust Control	Excessive dust without mitigation measures	Effective dust suppression in place	5	-2 per incident
Noise Management	Exposure of personnel to Noise exceeding permissible levels (>85 dB) without hearing protection.	Noise levels within permissible limits by use of proper hearing protection.	5	-2 per exceedance
Environmental Incident Reporting	Failure to report incidents	All incidents reported promptly	10	-10 per unreported event
Total			70	

4. Payment Timeline and Governance

- **Reconciliation:** KPIs will be reviewed and reconciled monthly by the 10th of the following month.
- **Agreement:** Final bonus/deduction amount to be jointly agreed by the Company and the Contractor by the **15th day** of the month following reconciliation. If there is a dispute in relation to any final bonus/deduction payment, the Parties will resolve the dispute pursuant to clauses 11 and 22.
- **Application:** Bonus or deduction will be applied to the next Monthly Claim.

END OF SCHEDULE 3

Schedule 4

Insurance Requirements

[TO DELETE ANY OF THE INSURANCES THAT DO NOT APPLY TO THIS SPECIFIC CONTRACT]

Types of Insurances and Requirements to Insurance Companies

1. In addition to any mandatory requirements to the insurances to be obtained by the contractor in accordance with the applicable Laws, the Contractor shall at its own cost and expense effect and maintain throughout the validity of the Contract, the following insurance policies []:
 - (i) Workers' Compensation and Employer's Liability Insurance: insurance in accordance with the requirements of applicable Laws which shall cover legal liability for death of or injury (including illness) to Contractor Personnel (including any other person deemed by statute to be an employee of the Contractor) engaged in doing anything for the purpose of the performance of the Supply or executing the Contractor's rights or obligations under this Contract with policy limits not less than US\$ 1 million per occurrence or as required by the laws of the states affected by the Agreement.
 - (ii) Motor Vehicle Liability Insurance: insurance which shall comply with applicable Laws, covering legal liability for injury, illness or death of persons and loss or damage to property arising out of or in connection with vehicles used (whether or not owned) in connection with this Contract with policy limits not less than US\$1 million per occurrence.
 - (iii) Commercial General Liability Insurance (Bodily Injury Property Damage, and if applicable, coverage for explosion, collapse and underground): insurance written on a broad form occurrence basis covering legal liability in respect of death or personal injury of third parties (including the Company Personnel) and physical loss of and/or damage to any property (including the Company's existing property and any parts of the Supply which have been accepted by the Company) occurring in connection with the performance of the Supply or executing the Contractor's rights or obligations under this Contract with policy limits not less than US\$ 5 million per occurrence.
 - (iv) Contractor's Plant and Equipment: insurance covering all loss or destruction of, and damage to, the Contractor's Plant and Equipment used in connection with this Contract, with policy limits not less than the replacement value of the Contractor's Plant and Equipment. If Contractor's Plant and Equipment is used underground additional property damage cover should be obtained.
 - (vi) Where any insurance policy effected and maintained by the Contractor includes an annual aggregate limit of indemnity, the Contractor shall advise the Company of any claim that may reduce the annual aggregate limit of indemnity and the Company may require the Contractor to effect and maintain additional insurance cover which reinstates that limit that has been eroded by payments under the policy, at the Contractor's cost and expense.
2. The Contractor shall procure that each insurance policy to be taken out in accordance with the Contract:
 - (i) is effected with an insurer of international repute and reasonably acceptable to the Company;
 - (ii) is on terms specified in this Contract or, if not so specified, provide a reasonable and appropriate level of cover having regard to the risks assumed by the Parties in relation to the performance of this Contract; and
 - (iii) incorporate a provision requiring the giving of notice to the additional insureds at least thirty (30) days prior to the cancellation, non-renewal or material modification of any such policies.

3. The insurance policies to be effected and maintained by the Contractor under this Contract, with the exception of professional indemnity insurance, shall, where permitted by Law:
- (i) include the Company and such other parties as the Company may designate and their respective affiliates, officers, directors and employees as an additional named insured;
 - (ii) be primary and non-contributory with respect to any insurance carried independently by the additional named insureds;
 - (iii) include a waiver of subrogation endorsement in favour of the additional named insureds for losses or claims arising out of the performance of this Contract;
 - (iv) provide that each additional named insured is insured in its own right and the insurance applies, except in respect of limits of liability and deductible, as if a separate policy has been issued to each additional named insured; and
 - (v) provide that any non-disclosure, act, omission, breach or default by any insured shall not in any way adversely affect the cover provided to another insured.

Proof of Insurance

4. The Contractor shall provide the Company with a scanned copy in Adobe Portable Document Format (PDF format) of all certificates of currency as satisfactory evidence of each insurance policy to be affected in accordance with this Contract signed by either the Contractor's insurer or insurance broker:
- (i) seven (7) days prior to the Start Date;
 - (ii) within fourteen (14) days of any request by the Company; and
 - (iii) immediately on any change to, or renewal of, a policy.
5. The Contractor shall:
- (i) not materially alter the terms and conditions of any insurance policy effected and maintained under this Contract unless prior written agreement has been obtained from the Company (such agreement shall not be unreasonably withheld);
 - (ii) immediately notify the Company in writing of the cancellation or lapse of any insurance policy; and
 - (iii) if requested by the Company, provide copies of the insurance policies it is required to effect and maintain under the Contract.
6. If the Contractor fails to effect or keep in force any of the policies of insurance which are required by this Contract to be affected or kept in force, or fails to comply with the requirements of this Schedule, the Company may:
- 7.
- (i) effect and keep in force any relevant insurance and pay any premiums as may be necessary for that purpose; and
 - (ii) recover as a debt due from the Contractor the amount so paid and the amount of any excess borne by the Company and/or deduct such amounts from any monies otherwise due to the Contractor under this Contract.

Grounds to Refuse Claim

8. The Contractor shall not do, or cause or allow any Contractor's Personnel to do, any act or make any omission which would provide grounds for an insurer to refuse payment of any claim made under any insurance policy effected in accordance with this Contract. Any such refusal of a Claim by an insurer shall not release the Contractor from any of its obligations, responsibilities or liabilities under this Contract.

Subcontractors

9. If the Contractor engages Subcontractors in performance of the Services and/or delivery of the Goods, the Contractor shall ensure that the relevant Subcontractor effects similar insurance (to the extent applicable) to that specified in this Schedule and shall provide proof of such insurance in accordance with paragraphs 5-7 of this Schedule.

Deductibles

10. If the Contractor's insurances are subject to the application of any self-insured retention, excess or deductible, the amount of the self-insured retention, excess or deductible shall be declared to the Company. The Company is entitled to require the Contractor to reduce the amount of any self-insured retention, excess or deductible where the Company considers that such amount is unreasonable.
11. The Contractor shall be responsible for any excess or deductible relating to the insurances effected by the Contractor.

END OF SCHEDULE 4

Schedule 5

IP Requirements

NOT APPLICABLE

END OF SCHEDULE 5

Schedule 6

Responsibility Matrix

Item	Contractor Responsible	Company Responsible	Contractor Pays	Company Pays
Mobilisation & Demobilisation				
Mobilisation of all drilling equipment	X			X
Demobilisation of all drilling equipment	X			X
Site establishment of drilling equipment and set up of laydown area	X		X	
Labour				
Expatriate Labour Hire and Salaries	X		X	
Local Labour Recruitment	X		X	
Local Labour Salaries	X		X	
Training	X		X	
Work Permits & Visas	X		X	
Medivac services for Contractor's personnel	X		X	
Inventory/Consumables				
Inventory	X		X	
Freight on Inventory	X		X	
Importation of inventory	X		X	
Fuel		X		X
Water Pumps/carting	X		X	
PVC or casing	X		X	
Cement or additives	X		X	
Damaged bits as a result of ground conditions	X		X	
Any additional equipment without consent of the client used as a result of ground conditions	X		X	
Survey				
Core orientation tool	X			X
Camp (for all drilling personnel)				
Camp infrastructure		X		X
Camp Operation		X		X
Area for onsite laydown		X	X	
Others				
Equipment Hire	X		X	
Insurance	X		X	
Mine Security surveillance		X		X
Additional laydown area / drill site security	X		X	
International Travel		X		X
Local Travel		X		X
Management	X		X	
Accounting	X		X	
Licences (drilling assets)	X		X	
Office Consumables	X		X	

Item		Contractor Responsible	Company Responsible	Contractor Pays	Company Pays
Capex					
Importation of Capex		X		X	
Freight on Capex		X		X	
Taxation on importation		X		X	
Drilling Activities					
Operation	Rig moves, mast down to mast up greater than one hour	X		X	
	Bit and bottom hole assembly changes, including tripping of rods	X		X	
	End of Hole pulling of rods	X		X	
	Core-box delivery to the core-storage area designated by KGM	X		X	
	Mixing stabilizing fluids or chemicals	X		X	
	Clean/flush out hole	X		X	
	Re-entering Holes (at client request)	X			X
	Running, freeing and retrieving stuck rods	X		X	
	Hole logging / surveying conducted by Contractor	X		X	
	Un-bogging drill rig	X		X	
	Collaring in operations	X		X	
	Clearing access for equipment and/or the core-storage/laydown area		X		X
	Running water lines where this causes a delay in drill rig operations	X		X	
Standby	*NOTE: Standby in excess of 120hrs per calendar month, chargeable at rate as per Schedule 2				
Non-Operational	Running water lines where this causes a delay in drill rig operations		X	X	
	Delays while waiting for Company instructions or decisions		X	X	
	Delays due to fault of the Company		X	X	
	Delays due to blasting and mining activities				
	Delays due to political, civil, or labour unrest		X	X	
	Time spent undergoing and / or awaiting inductions		X	X	
	Delays due to inadequate or unsuitable drill site and sump preparation (ref. the Contractor's pre-drill inspection checklist)		X	X	
	Delays due to poor road access, inclination to be no greater than 15 degrees		X	X	

Item		Contractor Responsible	Company Responsible	Contractor Pays	Company Pays
	Delays due to hole logging / surveying conducted by Company (beyond that provided by Contractor)		X	X	
	Waiting for water due to poor road access or water sources		X	X	
	Travel time to drill rig if more than 30 minutes per shift (if caused by distance, poor roads or site security)		X	X	
Taxation					
Duties and Customs		X		X	
Personnel Income Taxes		X		X	
VAT		X		X	

END OF SCHEDULE 6

Kibali HPP Geotechnical Investigations

Rev

4

Date

26-Aug-26

Coto Ref	Project Ref	Description (All references refer to main COTO items)	Unit	Qty	Rate USD	Amount USD
SECTION 1	1	ESTABLISHMENT OF CONTRACTOR				
1.1	1.1	Establishment of contractor				
	1.1.1	Fixed Charges	Sum	1		
	1.1.2	Time related items	day	55		
	1.1.3	Health and Safety obligations	cal day	55		
	1.1.4	Environmental management	sum			
	1.1.5	Provision of labour (per person)	hour			
SECTION 3	2	ESTABLISHMENT AND PROVISION OF RIGS AND EQUIPMENT				
3.1	2.1	Core drilling rigs (2 No rigs)				
	2.1.1	Gawa	no.day	18.1		
	2.1.2	Moke	no.day	16.9		
	2.1.3	Moke Saddle Dam	no.day	6.6		
	2.1.4	Kibali River Bridge	no.day	3.8		
	2.1.5	Quarry/Borrow pit exploration	no.day	8.4		
3.4	2.1.6	Drilling barges	sum	1		
3.5	2.2	Establishment of other plant and equipment				
3.5.6	2.2.1	Core orientation equipment	sum	1		
3.5.7	2.2.2	Water pressure equipment	sum	1		
3.6	2.3	Any other equipment or plant, as specified and listed in Bill of Quantities				
	2.3.1	Other - contractor to specify	sum	1		
SECTION 5	3	SETTING UP				
5.1	3.1	Mobile setups				
5.1.1	3.1.1	Core drill				
	3.1.1.1	Gawa	No	12		
	3.1.1.2	Moke	No	9		
	3.1.1.3	Moke Saddle Dam	No	8		
	3.1.1.4	Kibali River Bridge	No	4		
	3.1.1.5	Quarry/Borrow pit exploration	No	9		
5.2	3.2	Skid Setups				
5.2.1	3.2.1	Normal skid setup	No			
	3.2.1.1	Gawa	No	1		
	3.2.1.2	Moke	No	1		
	3.2.1.3	Moke Saddle Dam	No	2		
	3.2.1.4	Quarry/Borrow pit exploration	No	9		
5.2.2	3.2.2	Difficult skid setup	No			
	3.2.2.1	Gawa	No	1		
	3.2.2.2	Moke	No	1		
	3.2.2.3	Moke Saddle Dam	No	5		
	3.2.2.4	Kibali River Bridge	No	4		
5.2.3	3.2.3	Very difficult skid setup				
	3.2.3.1	Gawa	No	10		
	3.2.3.2	Moke	No	7		
	3.2.3.3	Moke Saddle Dam	No	1		
5.3	3.3	Setting up on inclined holes				
	3.3.1	Extra over 5.1 or 5.2, core drill				
	3.3.1.1	Gawa	No	2		
	3.3.1.2	Moke	No	4		
5.4	3.4	Setting up in specialised circumstances				
	3.4.1	Extra over 5.1 or 5.2, core drill				
	3.4.1.1	Setups requiring river crossings				
	3.4.1.1.1	Gawa	No	2		
	3.4.1.1.2	Moke	No	3		

	3.4.1.1.3	Moke Saddle Dam	No	1		
5.5	3.5	Movement between boreholes				
	3.5.1	Extra over 5.1 or 5.2, core drill	km			
	3.5.1.1	Gawa	km	0.5		
	3.5.1.2	Moke	km	0.5		
	3.5.1.3	Moke Saddle Dam	km	0.5		
	3.5.1.4	Kibali River Bridge	km	0.5		
	3.5.1.5	Quarry/Borrow pit exploration	km	1		
SECTION 10	4	ROTARY CORE DRILLING				
10.3	4.1	In Category C materials				
	4.1.1	Gawa	m	290		
	4.1.2	Moke	m	270		
	4.1.3	Moke Saddle Dam	m	105		
	4.1.4	Kibali River Bridge	m	60		
	4.1.5	Quarry/Borrow pit exploration	m	135		
10.5	4.2	In very closely fractured material (extra over item 10.3)				
	4.2.1	Gawa	m	90		
	4.2.2	Moke	m	80		
	4.2.3	Moke Saddle Dam	m	30		
	4.2.4	Kibali River Bridge	m	18		
10.10	4.3	Extra over for drilling inclined holes in all categories				
10.10.3	4.3.1	Inclination < 30 degrees and > 0 degrees	m			
	4.3.1.1	Gawa	m	80		
	4.3.1.2	Moke LB Option 2	m	150		
SECTION 12	5	CORE AND SOIL MATERIAL RECOVERY				
12.1	5.1	Soil material recovery in all material types				
	5.1.1	Gawa	m	15		
	5.1.2	Moke	m	15		
	5.1.3	Moke Saddle Dam	m	15		
	5.1.4	Kibali River Bridge	m	10		
	5.1.5	Quarry/Borrow pit exploration	m	15		
12.4	5.2	Core recovery in Category C material				
	5.2.1	Gawa	m	290		
	5.2.2	Moke	m	270		
	5.2.3	Moke Saddle Dam	m	105		
	5.2.4	Kibali River Bridge	m	60		
	5.2.5	Quarry/Borrow pit exploration	m	135		
12.6	5.3	In very closely fractured material				
	5.3.1	Gawa	m	85		
	5.3.2	Moke	m	90		
	5.3.3	Moke Saddle Dam	m	30		
	5.3.4	Kibali River Bridge	m	15		
	5.3.5	Quarry/Borrow pit exploration	m	35		
SECTION 13	6	CASING				
13.1	6.1	Casing, which may be removed (by size)	m	R/O		
13.2	6.2	Casing in material of category B or harder (Extra over 13.1)	m	R/O		
13.3	6.3	Casing in boulders or gravel (Extra over 13.1)	m	R/O		
13.4	6.4	Casing left in the hole (Extra over 13.1) by size	m	R/O		
13.5	6.5	Casing in inclined holes (Extra over 13.1)	m	R/O		
SECTION 14	7	THE USE OF DRILLING AIDS				
14.2	7.1	Purchase price of drilling aids	P Sum			
14.3	7.2	Mark-up for handling and profit	%			
SECTION 19	8	CORE ORIENTATION SURVEYS				
19.1	8.1	Core orientation surveys				
	8.1.1	Gawa	No	2		
	8.1.2	Moke	No	4		
SECTION 23	9	STANDARD PENETRATION TEST				
23.1	9.1	Standard Penetration Test				

	9.1.1	Gawa	No	36		
	9.1.2	Moke	No	27		
	9.1.3	Moke Saddle Dam	No	24		
	9.1.4	Kibali River Bridge	No	8		
SECTION 26	10	WATER PRESSURE TESTING				
26.1	10.1	Set up at borehole				
	10.1.1	Gawa	No	12		
	10.1.2	Moke	No	9		
	10.1.3	Moke Saddle Dam	No	8		
26.2	10.2	Installation of set of packers				
	10.2.1	Gawa	No	58		
	10.2.2	Moke	No	54		
	10.2.3	Moke Saddle Dam	No	21		
26.3	10.3	Carry out pressure test				
	10.3.1	Gawa	hour	60		
	10.3.2	Moke	hour	70		
	10.3.3	Moke Saddle Dam	hour	30		
SECTION 31	11	CORE BOXES				
31.1	11.1	Core boxes				
	11.1.1	Gawa	No	58		
	11.1.2	Moke	No	54		
	11.1.3	Moke Saddle Dam	No	21		
	11.1.4	Kibali River Bridge	No	12		
	11.1.5	Quarry/Borrow pit exploration	No	27		
SECTION 33	12	CORE PHOTOGRAPHY				
33.1	12.1	Core photographs				
	12.1.1	Gawa	No	58		
	12.1.2	Moke	No	54		
	12.1.3	Moke Saddle Dam	No	21		
	12.1.4	Kibali River Bridge	No	12		
	12.1.5	Quarry/Borrow pit exploration	No	27		
SECTION 35	13	MARKING OF HOLES				
35.1	13.1	Standpipe and cap				
	13.1.1	Gawa	No	2		
	13.1.2	Moke	No	4		
35.2	13.2	Concrete block only				
	13.2.1	Gawa	No	10		
	13.2.2	Moke	No	5		
	13.2.3	Moke Saddle Dam	No	8		
	13.2.4	Kibali River Bridge	No	4		
	13.2.5	Quarry/Borrow pit exploration	No	9		
SECTION 37	14	STANDING TIME				
37.1	14.1	Standing time				
	14.1.1	Drill rig	hour			
		TOTAL (excl VAT)				

Gawa

Boreholes

	Depth	Vertical/Slope	Joint orientation	Water testing	Packer stages
BH G01	10	Vertical	No	Yes	2
BH G02	20	Vertical	No	Yes	4
BH G03	40	Inclined (30 deg)	Yes	Yes	8
BH G04	35	Vertical	No	Yes	7
BH G05	35	Vertical	No	Yes	7
BH G06	40	Inclined (30 deg)	Yes	Yes	8
BH G07	30	Vertical	No	Yes	6
BH G08	15	Vertical	No	Yes	3
BH G09	15	Vertical	No	Yes	3
BH G10	10	Vertical	No	Yes	2
BH G11	20	Vertical	No	Yes	4
BH G12	20	Vertical	No	Yes	4
	290			80	58
				2	

Moke LB Option 2

Boreholes

	Depth	Vertical/Slope	Joint orientation	Water testing	Packer stages
BH ML20	15	Vertical	No	Yes	3
BH ML21	40	Inclined (30 deg)	Yes	Yes	8
BH ML22	40	Inclined (30 deg)	Yes	Yes	8
BH ML23	40	Vertical	No	Yes	8
BH ML24	40	Inclined (30 deg)	Yes	Yes	8
BH ML25	30	Vertical	No	Yes	6
BH ML26	20	Vertical	No	Yes	4
BH ML27	15	Vertical	No	Yes	3
BH ML28	30	Inclined (30 deg)	Yes	Yes	6
	270			150	54
				4	

Moke LB Saddle Dam

Boreholes

	Depth	Vertical/Slope	Joint orientation	Water testing	Packer stages
BH ML40	10	Vertical	No	Yes	2
BH ML41	10	Vertical	No	Yes	2
BH ML42	15	Vertical	No	Yes	3
BH ML43	15	Vertical	No	Yes	3
BH ML44	15	Vertical	No	Yes	3
BH ML45	15	Vertical	No	Yes	3
BH ML46	15	Vertical	No	Yes	3
BH ML47	10	Vertical	No	Yes	2
	105				21

Sizes of common core holes

Size	Hole (outside) diameter		Core (inside diameter	
	mm	inch	mm	in
AQ	48.0	1.890	27.0	1.0
BQ	60.0	2.360	36.4	1.4
NQ	75.7	2.980	47.6	1.8
NQ2	75.7	2.980	50.6	1.9
NQ3	75.7	2.980	45.0	1.7
HQ	96.0	3.782	63.5	2.5
HQ3	96.0	3.782	61.1	2.4
PQ	122.6	4.827	85.0	3.3
PQ3	122.6	4.827	83.0	3.2
LTK48	48.0	1.890	35.3	1.3
LTK60	60.0	2.360	43.9	1.7

9)
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062
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712

STANDARD SPECIFICATIONS
FOR
SUBSURFACE INVESTIGATIONS
2010

SECRETARIAT

SANRAL
PO BOX 415
PRETORIA
0001

STANDARD SPECIFICATIONS

FOR

SUBSURFACE

INVESTIGATIONS

2010

FOREWORD

The need for an updated version of the original CSRA Standard Specification for Subsurface Investigations (1993) has been universally expressed by Geotechnical Engineers, Engineering Geologists and Drilling Contractors for a number of years. The South African National Roads Agency Limited (SANRAL) therefore took the initiative in 2006 to invite various individuals from the geotechnical consulting and drilling contracting fraternity to proactively contribute towards this task. This document is the end result of this reviewing and updating process.

A decision was taken not to include standard specification sections for carrying out geophysical investigatory methods into this updated version, although it is fully realised and respected that geophysical investigative methods play an all important role in subsurface investigatory work.

It was also decided not to include sections for carrying out pavement investigations as these are covered by other manuals.

SANRAL wishes to thank the following persons involved in revising and updating this latest edition of the Standard Specifications for Subsurface Investigations (2010):

Consulting Engineers and Engineering Geologists: Messrs AJ Stuart, GV Price, D Haskins, P Pretorius and Mrs O van der Merwe

Drilling Contractors: Messrs H A Rossouw, N Mackintosh and D Rossiter

Road Authorities: Messrs R Damhuis and EH Terblanche

Feedback

Any constructive comments and feedback for possible incorporation into future editions will be appreciated.

STANDARD SPECIFICATIONS FOR SUBSURFACE INVESTIGATIONS

CONTENTS

	Page
Foreword	2
Table of Contents	3
Section 1 Establishment of the Contractor	4
Section 2 Housing for Engineer's Site Staff	11
Section 3 Establishment and Provision of Rigs and Equipment	12
Section 4 Setting Out and Survey	14
Section 5 Setting Up	15
Section 6 Access	18
Section 7 Cutting Down of Trees and Crops	20
Section 8 Percussion Drilling	21
Section 9 Augering	26
Section 10 Rotary Core Drilling	28
Section 11 Washboring	32
Section 12 Core and Soil Material Recovery	33
Section 13 Casing	36
Section 14 The Use of Drilling Aids	38
Section 15 Stabilisation Grouting	40
Section 16 Disturbed Sampling	41
Section 17 Undisturbed Sampling	42
Section 18 Borehole Orientation Surveys	44
Section 19 Core Orientation Surveys	45
Section 20 Orientated Integral Core	46
Section 21 Down the Hole Photography	48
Section 22 Vane Shear Testing	49
Section 23 Standard Penetration Test	51
Section 24 Dynamic Probing (Super Heavy)	53
Section 25 Cone Penetration Test	54
Section 26 Water Pressure Testing	57
Section 27 Grout Acceptance Testing	59
Section 28 Piezometers	62
Section 29 Inclometers	65
Section 30 Water Sampling and Borehole Water Rest Level	67
Section 31 Core Boxes	68
Section 32 Core Sheds	71
Section 33 Core Photography	73
Section 34 Transportation	75
Section 35 Marking of Holes	76
Section 36 Machine and Hand Trenching	79
Section 37 Standing Time	81
Section 38 Logging and Profiling	82
Section 39 Preparation of Records	86
Section 40 Occupational Health and Safety	89
Section 41 Environmental Management	96

SECTION 1: ESTABLISHMENT OF THE CONTRACTOR

1.1 DESCRIPTION

This section covers all work and costs required for the establishment of the Contractor's organisation, camps, stores, plant and equipment, tools, etc., on the site and the subsequent removal thereof after completion of the work. It also covers the payment of certain general obligations, risks and liabilities and general items of cost not covered elsewhere.

1.2 CONTRACTOR'S CAMP

Subject to the approval of the Engineer, the Contractor shall negotiate with property owners near the site for a suitable place to establish his camp.

Both the position of the camp and the standards of the facilities provided by the Contractor will be subject to the approval of the Engineer, the local authority and the landowner. Under no circumstances will the Contractor be permitted to establish camp within the road reserve or in an environmentally sensitive area.

1.3 GENERAL ITEMS TO BE PROVIDED FOR

The Contractor shall, under this section, provide for the following items to the satisfaction of the Engineer and in compliance with the contract documents.

- (i) Access to the Works and regulation of traffic as may be required by the Engineer
- (ii) Preliminary clearing and preparation of the camp site or sites and the site of the Works generally, the maintenance and final cleaning up thereof after completion of the Works
- (iii) Accommodation, camps and stores (as required) as well as approved sanitary facilities. Camps, etc., shall at all times be kept in a clean, neat and hygienic condition. Camps shall be fenced for security purposes.
- (iv) All plant, equipment and tools
- (v) Water supply to cover all technical and personnel requirements
- (vi) Electrical power supply and lighting as required
- (vii) Office accommodation for the Engineer, if required
- (viii) Temporary storage of samples and cores/core boxes
- (ix) All transport
- (x) Liabilities to the Engineer, landowner(s) and public
- (xi) Any other item required on site, for which payment is desired and not provided for in the Bill of Quantities
- (xii) All access tracks to boreholes
- (xiii) All maintenance work related to the above mentioned items
- (xiv) Programme: The Contractor shall, after discussions with the Engineer, produce an agreed programme for the execution of the work. This programme shall be based on the preliminary programme provided in the tender document.

1.4 SURVEY EQUIPMENT

If so specified in the Project Specifications the Contractor shall provide and maintain in good condition, survey equipment on the site for the duration of the works.

The equipment shall at all times be available for use by the Engineer. The Engineer shall be responsible, fair wear and tear and routine maintenance excluded, for any loss or damage to the equipment resulting from the actions or negligence of the Engineer or his employees.

1.5 DETAILS

(i) Office accommodation for the Engineer

The Contractor shall provide suitable office accommodation for the Engineer in compliance with the Project Specifications for the use of the Engineer on site. This accommodation shall be to the satisfaction of the Engineer and may be semi-portable, and in the form of a dismantlable office or a caravan.

The provision and moving of the office and other named buildings shall not be separately paid for and full consideration for costs in this regard must be made in the tender under Item 1.1 "Establishment of Contractor on Site".

The type of office accommodation and number of moves to be undertaken shall be as detailed in the Project Specifications.

(ii) Communications

If so required in the Project Specifications, the Contractor shall, provide a telephone link in both his office and that of the Engineer, be it a surface line or a cellular line. The Contractor shall pay all charges, rentals and other costs in this connection. The costs of the monthly call charges for the Engineer's telephone shall be recovered under the contract from the Provisional Sum provided.

The Contractor shall supply both the Employer and the Engineer with the names, telephone and fax numbers, and addresses of key personnel in his organisation so that they may be contacted during or after office hours in case of emergency.

(iii) Provision of labour

The Contractor shall provide the Engineer with labour as required for surveys or any other duties as may be requested by the Engineer.

(iv) Site instruction books

The Contractor shall supply and keep two site instruction books on the site. These shall be in self-carbonised, duplicate format.

All instructions issued on site by the Engineer and/or any of his representatives authorised to issue instructions will be written in the first book and a copy given to the Contractor. All requests from the Contractor to the Engineer or his representative shall be entered in the second book and a copy handed to the Engineer or his representative. The carbon copy of all instructions and requests shall be left in these books and form an integral part of the site records.

(v) Natural site materials

Apart from the cores or samples required in terms of this contract, materials present on site such as gravel, stone, sand, water and the like are, and remain, the property of the landowner concerned. If the Contractor requires to make use of such materials he shall be fully responsible for making arrangements with the landowner for the use thereof. The Engineer reserves the right to ask for proof of satisfactory arrangements with landowners in the event of the Contractor intending to make use of materials on site.

(vi) Environmental Matters

The requirements of Section 41: Environmental Management shall be adhered to in all respects, and particularly to the aspects relating specifically to drilling (see 41.11).

(vii) Water quality

Only clean water, free from contamination (particularly in so far as this might lead to pollution or affect the quality of the cores and samples recovered), shall be employed. The Engineer shall approve all water used.

(viii) Clearance Certificates

The Contractor shall submit clearance certificates, as per Figure 1.1, obtained from the landowner(s) affected by the Contract, to the Engineer on completion of the work and before issue of the certificate of practical completion (see Section 39.3). These clearance certificates shall contain details of the works carried out on that property, with a statement that the landowner is satisfied with the remedial measures carried out.

1.6 LEGAL AND CONTRACTUAL REQUIREMENTS AND RESPONSIBILITIES TO THE PUBLIC

The Contractor shall take all the necessary steps to comply with the Conditions of Contract, particularly in respect to the insurances and sureties required and his obligations to the public and the Employer. He shall comply with all the statutory regulations.

The Contractor shall assess his obligations, and make allowances for the cost of compliance with this legislation. He shall take special note of the legislation relating to the government's Broad Based Black Economic Empowerment Act.

No separate payment shall be made for observing these requirements as it is deemed to be included in the amount tendered for under Section 1.

The Contractor shall further assess his obligations in so far as the Occupational Health and Safety Act, and the appurtenant Construction Regulations that regulate the Contractor's construction methods so as to ensure health and safety of his employees and of the public. Details of these obligations are given in Section 40.

1.7 EXTENSION OF TIME

The Contractor shall be entitled to claim for an extension of Time for Completion in terms of the Conditions of Contract which may be caused by inclement weather and consequential delays ("rain days").

1.7.1 Extension of time resulting from inclement weather

Extension of time resulting from inclement weather shall be calculated according to the method as outlined below.

A delay caused by inclement weather conditions ("rain days") will be regarded as a delay only if, in the opinion of the Engineer, all progress by a drill or other rig on the working programme of the Contractor has been brought to a halt. Only delays on Working Days shall be taken into account for the extension of time.

Rain days shall be agreed to between the Engineer and the Contractor for each Working Day on which at least 10mm of rain falls and on which the Contractor is unable to continue with his operations on site. Where, following rain days, conditions on site are such that the Contractor is unable to work safely and effectively, such days will also be counted as rain days. Rainfall shall be recorded on site at a gauge erected at the Contractor's camp. Note that where there are multiple rigs on site and some of the units can continue to work, a rain day shall be measured in proportion to those rigs that cannot work relative to the total number of rigs on site. For example if 2 rigs out of a total of 5 rigs cannot work; 0.4 rain days shall be measured.

Rain days shall be measured and agreed to at the end of each month and no retrospective measurements will be allowed. Note the requirements of Section 39: Preparation of Records in this regard.

Rain days shall be added to the contract period given in the contract to define the actual Time for Completion, as set out in the Conditions of Contract.

1.7.2 Programme

The Engineer shall provide in the Project Specifications the production rate (all-in metres per drill rig per Working Day) and number of drilling rigs that he has assumed in arriving at the Time for Completion in the preliminary programme in the project documentation. The Contractor shall provide the number of drill (and other) rigs necessary to complete the work within the Time for Completion. Under normal circumstances, taking into account factors such as average depths of holes, number and difficulty of set-ups, materials to be drilled, etc, the average all-in production rate for a coring rig will usually be between 5 and 8m per rig per **Working Day**.

1.8 ACCOMMODATION OF TRAFFIC

The accommodation of traffic on a project shall be carried out in accordance with the requirements of Section 1500 of the COLTO Standard Specifications for Road and Bridge Works for State Road Authorities and the South African Traffic Roads Signs Manual (Volume 2, Chapter 13). The specific requirements for individual contracts shall be detailed in the Project Specifications and appropriate pay items generated.

1.9 MEASUREMENT AND PAYMENT

The establishment of the Contractor on site shall be measured as two separate items;

(i) Fixed obligations

A lump sum to provide full compensation for the fixed part of the Contractor's general obligations, i.e. that part which is substantially fixed and is not a function of the time required for the completion of the work, and includes the following:

- Setting up and maintaining his organisation, personnel, camps, accommodation, ablution and other facilities, offices and stores, and constructional plant and equipment on site, and their removal on completion of the contract. The Contractor shall be liable for any costs and obligations related to the occupancy of the camp site.
- Complying with the Conditions of Contract, including the effecting of insurances and providing the required sureties.

Payment shall be made as follows:

- (a) Fifty (50) percent of the tendered amount shall become payable in the first payment certificate after the Contractor has established his equipment and camp to the satisfaction of the Engineer, has made a substantial start to the execution of the works and the contract insurances are in force and effect. The Engineer may however make lesser payments in any payment certificate if the above provisions have not been met and shall then pay the balance up to 50 percent of the tendered amount when establishment is satisfactory.
- (b) The next twenty (20) percent of the tendered amount is payable under the payment certificate where the value of the work already done exceeds one half (1/2) of the tender sum (excluding VAT). The conditions regarding reduced payment as mentioned in (a) above, are also applicable here.
- (c) The remaining thirty (30) percent of the tendered amount shall become payable in the final payment certificate.

(ii) Time related obligations

This is a daily rate to provide full compensation for that part of the Contractor's general obligations that are mainly a function of the time for completion of the work. Measurement shall be per day which shall mean Working Day, commencing on the day of the Site Handover, being the date on which access has been granted to the Contractor to Site. **Working Day is defined as 7:00 to 17:00 on weekdays and 07:00 to 13:00 on Saturdays.**

Payment of the time related portion of establishment shall be made after compliance with the requirements of clause (i) (a) above and shall continue until the Time for Completion of the works or the billed quantity, whichever is the greater. The Engineer may reduce or withhold payment under this item if the Contractor fails to comply with the requirements of the Specifications or Conditions of Contract related to his organisation and establishment.

(iii) Health and safety obligations

This shall be measured per **Calendar Day** (commencing on the day of the Site Handover) and continue to the Time for Completion and covers all costs related to improving construction methodologies in order to provide a relatively healthy and safe working environment, and allows the Contractor to make separate allowance for the cost of compliance with legislation.

(iv) Environmental management

This shall be measured as a lump sum and shall cover all the Contractor's obligations as set out in Section 41 of these Specifications. Payment shall be made in instalments of 10% per month, with the balance being paid in the final payment certificate.

(v) Provision of labour

This shall be measured per hour or part thereof for which the person is used by the Engineer and shall include all costs (transport, supervision, etc) necessary for him to carry out the tasks required by the Engineer.

(vi) Telephone for the Engineer

Where required in the Project Specifications, the Contractor shall provide for the sole use of the Engineer a telephone (either fixed-line or mobile) capable of receiving telephone, fax and data signals. The prime cost of the supply and call charges shall be recovered monthly on provision of documentary proof of the actual cost thereof from the service provider. Alternatively, the Engineer may elect to employ his own telephone, in which case the prime cost of the calls/data transmission made in connection with the contract shall be paid. The Engineer shall provide documentary proof of the costs that are directly related to the project and provided by the Engineer and certified as being directly related to the contract.

PAY ITEMS

1.	Establishment of Contractor on site	Unit
1.1	Establishment of contractor on Site	
1.1.1	Fixed charges	lump sum (sum)
1.1.2	Time related charges	day (d)
1.1.3	Health and safety obligations	calendar day
1.1.4	Environmental management	lump sum (sum)
1.2	Provision of labour (per person)	hour (h)
1.3	Cost of Engineer's telephone	prime cost sum (PC sum)
1.4	Mark-up for handling and profit on Item 1.3	percent (%)

NOTE:

The total of the amount tendered for the sum of Items 1.1.1 and 1.1.2 shall NOT EXCEED 15% of the TENDER SUM unless the tenderer can satisfy the Engineer that this ratio is not applicable. The total of the amount tendered for the sum of Items 1.1.3 and 1.1.4 shall be NOT LESS THAN 5% of the TENDER SUM, unless the tenderer can satisfy the Engineer that this ratio is not applicable.

Should the tenderer tender a total in excess of the stipulated 15% or less than the stipulated 5%, unless the tenderer can satisfy the Engineer that these percentages are not applicable, the Engineer shall be entitled to adjust the respective totals to 15% and 5% respectively and adjust the other rates in the tender proportionately to retain the tender sum at that tendered by the tenderer.

(CONTRACTOR'S LETTERHEAD)

CONTRACT NUMBER: *(Insert contract number)*

CONTRACT NAME: *(Insert Name)*

CLEARANCE CERTIFICATE

FARM NAME & No :

LANDOWNER (or authorised occupier) :

ADDRESS AND CONTACT DETAILS :

.....

(Tel) (.....)..... (Cell)

(Fax) (.....)..... (e-mail).....

In respect of the work carried out on the named land, it is hereby certified as follows:

- 1 The access tracks, camp site (if applicable), borehole and other investigation positions, fences and gates and any other related aspects used by the Contractor for the purposes of the Contract have been fully treated and rehabilitated in accordance with the Contract and to the Owner/Occupier's satisfaction.
- 2 The Contractor has concluded his operations, removed his equipment and left the land, access ways and general areas of the farm in a state that meets with the full satisfaction of the Engineer.

In respect of 1:

Owner/Occupier.....Date.....Witness 1

Contractor.....Date.....Witness 2

Furthermore, in signing this clearance certificate, I undertake not to make any further claims to the Employer (*insert Employer's name*) or the Contractor (*insert Contractor's name*) with regards to the activities undertaken for the abovementioned contract and the condition of the property as specified.

In respect of 2:

Engineer.....Date.....

Witness 1Witness 2

Figure 1.1: Example of Clearance Certificate

SECTION 2 HOUSING FOR ENGINEER'S SITE STAFF

2.1 DESCRIPTION

Accommodation for the Engineer's site staff may be required. The choice of accommodation will depend on the Engineer and shall be detailed in the Project Specifications.

2.2 MEASUREMENT AND PAYMENT

Payment shall be as a provisional sum item in accordance with the provisions of the Conditions of Contract.

Reimbursement of the cost will be made only after acceptable proof of payment to the supplier by the Contractor has been provided to the Engineer.

PAY ITEMS

2.	Housing for Engineer's site staff	Unit
2.1	Accommodation	provisional sum (P sum)
2.2	Mark-up for handling and profit	percent (%)

SECTION 3 ESTABLISHMENT AND PROVISION OF RIGS AND EQUIPMENT

3.1 DESCRIPTION

This section relates to the provision on site and subsequent removal of drilling rigs or plant and equipment necessary to complete the specified Works.

It must be noted that the term “borehole” is a generic term used to denote all investigation positions.

Details of the plant and equipment to be provided shall be given in the Project Specifications with respect to machine type and size, kW rating, bucket width, tracked or tyred, etc in order for the Contractor to source appropriate plant or equipment.

3.2 MEASUREMENT AND PAYMENT

A drilling rig or equipment unit shall be regarded as established once it has been properly erected and commissioned and is in full working order, together with all equipment, tools, accessories and crew required to execute the particular work.

The tendered rate shall include full compensation for providing the plant, transporting it to site, erecting, commissioning and finally dismantling it and loading and transporting it away from site.

Measurement shall only be made in respect of Working Days on which the rig or equipment unit is in operation and in full working order for more than 75% of the Working Day (07:00 to 17:00 weekdays and 07:00 to 13:00 on Saturdays). Note that this implies that rain days will not be measured. No payments shall be made after the Time for Completion (see Section 39).

No drilling rig, plant or other equipment shall be brought onto, or removed from the site, without the written authority of the Engineer.

3.2.1 Provision of drilling rigs

The quantity to be paid for under Items 3.1 to 3.2 shall be the product of the number of rigs and the duration of the time (measured per Working Day or part thereof on which they are working) for which they are required on site, authorised by the Engineer in writing, and brought onto site

3.2.2 Establishment of other plant and equipment

This shall be measured as a Lump Sum and shall cover the costs of establishing the required plant and equipment at the position where it is to be used, and the subsequent de-establishment thereof on completion of the works, or on instruction of the Engineer.

The daily costs for the plant and equipment shall be provided for under the relevant sections, i.e. Section 6 Access, Section 19 Core Orientation Surveys, Section 26 Water Pressure Testing, Section 27 Grout Acceptance Testing and Section 36 Machine and Hand Trenching.

PAY ITEMS

3.	Establishment and provision of rigs and equipment	Unit
3.1	Core drilling rigs (see Section 10)	number day (no.day)
3.2	Percussion drilling rigs (with compressor, see Section 8)	number day (no.day)
3.3	Large diameter auger rig (see Section 9)	lump sum (sum)
3.4	Drilling barges (see Section 5)	lump sum (sum)
3.5	Establishment of other plant and equipment (see Sections 6 and 36)	
3.5.1	Bulldozer (specify details)	lump sum (sum)
3.5.2	Tractor-loader-backhoe (TLB) (specify details)	lump sum (sum)
3.5.3	Excavator (specify details)	lump sum (sum)
3.5.4	Front end loader (specify details)	lump sum (sum)
3.5.5	Water truck (specify details)	lump sum (sum)
3.5.6	Core orientation equipment	lump sum (sum)
3.5.7	Water pressure equipment (Section 26)	lump sum (sum)
3.5.8	Grouting equipment (Section 27)	lump sum (sum)
3.5.9	DPSH equipment (Section 24) lump sum (sum)	
3.6	Any other equipment or plant, as specified and listed in the Bill of Quantities	lump sum (sum)

SECTION 4 SETTING OUT AND SURVEY

4.1 DESCRIPTION

This section relates to the setting out of boreholes and related survey. The boreholes shall be located at the positions as indicated on the drawings supplied, or as detailed in writing by the Engineer. The extent of the work involved in setting out and surveying in and details of the beacons established by the Engineer in accordance with the Conditions of Contract, is given in the Project Specifications.

The Contractor shall provide on site a hand-held GPS, which he shall use for the initial setting out of borehole positions. The GPS shall be capable of reading and storing co-ordinates to WGS84 in accordance with the South African Grid System (X and Y co-ordinates in metres) and also in degrees, minutes and 3 decimals of a minute. The co-ordinates of any borehole set out by the Contractor shall be recorded on the Daily Drilling Journal (see Section 39) and a schedule of these shall be provided separately to the Engineer. No payment will be made for this work and the Contractor shall allow for this in his rates.

The Contractor shall take all steps necessary to protect existing survey pegs, reference pegs and bench marks and shall re-establish such at his own expense and to the satisfaction of the Engineer should they be disturbed as a result of his activities on site.

The Engineer will indicate the direction and the inclination of all boreholes to the Contractor. Where inclined drilling is required, the initial setting out of the hole shall be carried out using a GPS and compass to the direction and inclination (degrees below horizontal), as provided by the Engineer. The actual direction and inclination of the hole shall be determined by the following method:

- Once the hole has been drilled to about 5m depth, insert drill rods into the hole such that they extend at least 3m out of the top of the hole
- Sight along the direction of the rods and place two reference pegs (steel peg in 200 x 200 x 200mm concrete block, co-ordinated using the GPS) on the line of the hole. These reference pegs to be 3 and 8m from the hole.
- Measure this direction using a compass
- Measure the inclination of the rods using a clino-compass or similar to an accuracy of 1° (degrees below horizontal)

Where the accuracy of setting out of an inclined hole is critical, the Engineer may order that the azimuth shall be set out by a professional surveyor.

A surveyor approved of or selected by the Engineer shall carry out any accurate levelling and co-ordination in accordance with the requirements of TMH 11.

4.2 MEASUREMENT AND PAYMENT

Any survey work by a surveyor instructed by the Engineer shall be paid by means of a Provisional Sum.

Reimbursement for the cost will be made only after the Contractor has provided to the Engineer acceptable proof of payment to the supplier.

PAY ITEMS

4.	Setting out and survey	Unit
4.1	Setting out and survey	provisional sum (P sum)
4.2	Mark-up for handling and profit	percent (%)

SECTION 5 SETTING UP

5.1 DESCRIPTION

This section relates to the setting up of individual drilling, augering and other investigatory equipment and subsequent removal after completion of the work. The rates tendered shall be deemed to include for the access of personnel and transport to and the subsequent removal of labour, plant or any other incidentals necessary for the operations from each borehole.

Distinction shall be made between the methods and degree of difficulty of setup at each borehole using the following criteria:

Mobile setups are defined as positions which are accessible using a 4x4 truck and for which some hand clearing of bush and smaller rocks is required, All other setups shall be considered to be skid setups.

Normal skid setups are defined as positions at which the average ground slope over which the skidding takes place is less than 1:3 and / or the distance to be skidded is less than 100m.

Difficult skid setups are defined as positions at which the average ground slope over which the skidding takes place is more than 1:3 and / or the distance to be skidded is more than 100m but less than 200m.

Very difficult skid setups are defined as positions at which the average ground slope over which the skidding takes place is more than 1:2 and / or the distance to be skidded is more than 200m.

The method of setup at any borehole shall define the payment rate under which the setup and removal shall be made, but shall be subject to the approval of the Engineer. Should the Contractor utilise a setup method different to that specified and approved by the Engineer, payment shall be made according to the type originally specified, unless the Contractor can prove to the Engineer's satisfaction that the use of the setup method originally specified was impractical. In this regard the Contractor should note the following:

- (a) The provisions of Section 6 "Access";
- (b) Some hand clearing of rocks and bush, as may be classified as reasonable by the Engineer, to obtain access to a mobile setup position may be required. If unreasonable clearing is required this will be paid for in accordance with the relevant items under Section 6 or under Item 1.2, Provision of Labour, as may be decided by the Engineer;
- (c) If it is necessary to dismount the rig from the crawler, trailer, truck, etc., at the position of the borehole to carry out the actual boring operation, this will be measured as a mobile setup;
- (d) The grouping (if any) of boreholes according to the difficulty to access given in the Project Specifications or in the Bill of Quantities.

Rigs shall be securely anchored to be able to provide the necessary reaction to drilling and to prevent movement of the rig relative to the borehole. For inclined boreholes (as defined in Section 10) it may be necessary to provide a concrete drilling platform to which the rig is anchored and a suitable tripod. On completion of drilling, all platforms, benches and any other facilities created by the Contractor shall be entirely removed or reinstated, all to the satisfaction of the Engineer.

Where piled drilling platforms, embankments, coffer dams and other similar techniques are required for boring over water or in positions necessitating their construction, they shall be securely and rigidly constructed and capable of withstanding all loads and thrusts generated by the plant and equipment to be operated on them. Upon completion they shall be completely dismantled and removed, including any supports that may have been driven into the underwater bed, to the satisfaction of the Engineer.

Where drilling is carried out from a barge or pontoon this shall be securely anchored to prevent drifting and, if necessary, to provide the necessary reaction to drilling forces. The tendered rates shall take into account the specific requirements as set out in the Project Specifications.

No dug sumps are permitted and drum sumps must be used, except in exceptional circumstances and then, only with the specific approval of the Engineer for individual boreholes.

Before drilling commences at any hole, the Engineer's approval of the setting up of the rig will be required and after completion of the hole, the rig shall not be removed without the Engineer's approval. For this approval before and after drilling of the hole, the Contractor must allow the Engineer, except if other arrangements have been negotiated, a waiting time of one hour (for each occurrence) before any Standing Time may be claimed in accordance with Section 37.

5.2 MEASUREMENT AND PAYMENT

The setups ordered by the Engineer shall be measured by number for the method of setup employed. Setting up on inclined holes shall be measured extra over the relevant setup item. Setting up on drilling barges, piled platforms and other specialised circumstances shall be measured separately as stated in the Project Specifications.

Movement of rigs between boreholes: The first kilometre shall be deemed to be included in the rates for setting up. For boreholes more than 1 km apart the unit of measurement for the distance moved (by the shortest practicable route, as approved by the Engineer) shall be per kilometre (measured to the nearest 0.1km) by which the distance exceeds 1km and shall be extra over the setup rate.

Besides the different set-up categories as listed below, distinction may be made between different categories of boreholes (as regards difficulty of access) as specified in the Project Specifications or reflected in the Bill of Quantities.

PAY ITEMS

5.	Setting up	Unit
5.1	Mobile setups	
	5.1.1 Core drill	number (no.)
	5.1.2 Percussion drill	number (no.)
5.2	Skid setups	
	5.2.1 Normal skid setups	number (no.)
	5.2.2 Difficult skid setups	number (no.)
	5.2.3 Very difficult skid setups	number (no.)
5.3	Setting up on inclined holes	
	Extra over 5.1 or 5.2	number (no.)
5.4	Setting up in specialised circumstances	
	Extra over 5.1 or 5.2 (specify type)	number (no.)
5.5	Movement between boreholes	

Extra over 5.1 or 5.2 (specify rig type)

kilometre (km)

SECTION 6 ACCESS

6.1 DESCRIPTION

To obtain access to some borehole positions, access tracks may have to be constructed by the Contractor. The plant to be used shall be agreed with the Engineer. Only one track shall be permitted to obtain access to any investigation position and the Engineer shall approve the alignment of such tracks. Wherever possible, the access tracks shall follow contours and shall avoid large shrubs, trees and sensitive areas such as wetlands, mangroves, dunes, stream banks and other areas subject to erosion. Entry points of these access tracks should, if possible, be obscured by using doglegs or stony patches to discourage unauthorised use.

Clearing of vegetation shall be kept to a minimum. Low vegetation should rather be driven over and rolled in in preference to bulldozing so as to keep the root stock. In the event that an access track is bulldozed, the topsoil should be stockpiled and any cleared indigenous vegetation piled on top of the topsoil stockpiles in order to redistribute seeds during rehabilitation.

Particular attention shall be paid to the landowner's requirements and the tracks' impact on the environment.

On completion of use of such access tracks, they shall be reinstated as soon as practicable, as described in Section 41, or as directed by the Engineer. The extent of this reinstatement work, and any payment therefore, shall be as detailed in the Project Specifications

It must be noted that where the Contractor has taken insufficient care during the contract and has used more than one track to a borehole, this reinstatement shall not be measured and paid for.

Where access tracks are required to be built, these may be constructed using:

- Bulldozer
- Tractor-loader-backhoe (TLB)
- Excavator
- Other equipment as required

The capacities, sizes and power ratings for individual units of plant shall be detailed in the Project Specifications.

6.2 MEASUREMENT AND PAYMENT

Measurement and payment shall be on a daily (10 hour) basis per Working Day during which the machine is on site in working order and shall include the cost of the hire of the plant, fuel, the operator, supervision by the Contractor and all other incidental costs. Should the machine break down for more than an hour in any one day, payment for that day shall be reduced proportionately relative to the time when the machine was operative, with the provision that should it be inoperative for more than 4 hours in any one day, it shall not be measured at all for that day.

Establishment of the machine on site shall be measured and paid for under Section 3.

Reinstatement of access tracks shall be measured as a lump sum and shall include all costs and incidentals necessary to carry out the reinstatement, as detailed in the Project Specifications.

PAY ITEMS

6.	Access tracks	Unit
6.1	Making of access tracks using different types of equipment as given in the Bill of Quantities	
6.1.1	Bulldozer (specify details)	day (d)
6.1.2	Tractor-loader-backhoe (TLB) (specify details)	day (d)
6.1.3	Excavator (specify details)	day (d)
6.1.4	Front end loader (specify details)	day (d)
6.1.5	Water truck (specify details)	day (d)
6.1.6	Other equipment as required	day (d)
6.2	Reinstatement of access tracks	lump sum (sum)

SECTION 7 CUTTING DOWN OF TREES AND CROPS

7.1 DESCRIPTION

Where setting up at a drilling, testing or auger site or the provision of access thereto involves the cutting down and removal of trees, or the destroying of crops, such trees shall only be cut down or the crops destroyed on the written instructions of the Engineer and after written approval and agreement has been reached with the landowner concerned.

In the case where trees and crops have to be destroyed, compensation to the landowner for the loss of trees of commercial value and crops and damage at a reasonable price agreed to by the landowner, and approved by the Engineer, shall be paid by the Contractor and recovered under the contract. Payment to the Contractor shall be made only upon production of a receipt, signed by the landowner, indicating proof of payment to the landowner and the landowner's acceptance of the compensation paid to him. The Contractor shall measure the area (in hectares) and shall be responsible for the physical destruction and removal of the crops.

All trees, shrubs or vegetation destroyed by the Contractor without the Engineer's approval shall be recompensed to the satisfaction of the landowner and Engineer at the Contractor's cost.

7.2 MEASUREMENT AND PAYMENT

Clearing of trees of less than 150mm in diameter and bush shall be included in the rates tendered by the Contractor in Sections 1, 5 and 6.

For trees greater than 150mm in diameter the measurement and payment for the cutting down and removal thereof shall be per number, with distinction being made between trees of diameter between 150 and 300mm and trees of diameter greater than 300mm. For measurement purposes the diameter of any tree shall be measured at a height of 1m above general ground level at the location of the tree involved.

The unit of measurement for the destruction and removal of crops shall be per hectare and payment of compensation to landowners shall be made under a provisional sum.

Reimbursement for the cost will be made only after the Contractor has provided to the Engineer acceptable proof of payment to the supplier.

PAY ITEMS

7.	Cutting down of trees and crops	Unit
7.1	Cutting down of trees and removal thereof	
7.1.1	Between 150 and 300mm diameter	number (no.)
7.1.2	Greater than 300mm diameter	number (no.)
7.2	Destruction of crops	hectare (ha)
7.2.1	Compensation to landowner	provisional sum (P sum)
7.2.2	Mark up for handling and profit	percent (%)

SECTION 8 PERCUSSION DRILLING

8.1 DESCRIPTION

This section relates to drilling by means of a compressed air or similar type percussion rig, including an appropriate compressor, as approved by the Engineer. The Contractor shall provide details with his tender of the drill rig and the make and capacity of the compressor.

The size to be drilled shall be between 100 and 250mm diameter (as given in the Project Specifications) and the rig shall employ a down-the-hole hammer. The drilling may be:

- Conventional open hole drilling – where a bottom discharge hammer is used and the sample passes up between the drill pipe and the wall of the hole.
- Reverse circulation (RC) drilling – where a dual wall drill pipe is used and the sample passes up the outer annulus (air in the inner annulus). A centre sample hammer may be used which has a hollow centre and the sample passes directly into the dual wall pipe. If a conventional hammer is used, the sample has to travel up and enter a vertical slot set above the hammer.
- Symmetrix drilling where the casing is installed as drilling proceeds and the sample passes up through the hammer (see RC drilling above).

Sophisticated data recorders (such as the Jean Lutz system) are available to record drilling parameters such as torque, penetration speed, bit pressure, etc (up to 7 parameters can be recorded simultaneously). The Engineer may order that such a recorder be coupled to the percussion rig where it is appropriate to record these parameters in order to facilitate interpretation of subsurface conditions. This technique will normally only be used in dolomitic terrain where conditions are highly variable.

If, during percussion drilling, underground cavities are encountered, the depth thereof below ground level shall be carefully measured, as shall the depth to the bottom of the cavity. The Engineer shall immediately be notified of the existence of such cavities or cracks wider than 100mm.

No payment shall be made for the recovery of washings and chips blown out during drilling and allowance shall be made under this item for any costs thus incurred.

Blow-out samples shall be bagged and labelled as follows:

- From each metre drilled. A representative sample (minimum 250g) of the washings and chips blown out during percussion drilling shall be collected. These shall be placed into a plastic bag (nominal 250 x 200mm, 20µ) as follows:
 - o Shake sample into corner of bag
 - o Twist bag 3 times to seal off the sample from the record ticket
 - o Turn bag inside out
 - o Place record ticket into the bag so that it can be read from the outside
 - o Twist off the bag (3 turns) and turn it inside out again.
 - o The record ticket shall reflect the project and site name, borehole number, depth range and penetration speed (minutes and seconds). This data shall be in indelible, waterproof writing. If a ticket becomes illegible, the contractor may be required to redrill the hole at his cost.
- Of each borehole. On completion of a borehole, the samples from an individual borehole, in depth sequence, shall be inserted into a separate plastic sleeve (nominal 100mm diameter and 50µ thick), which is tied off at each end. The site, borehole number and final hole depth shall neatly and legibly be written onto the sleeve in indelible pen (minimum 3mm thick).

The time of penetration shall be measured for each metre penetrated and recorded on an approved form. The time for penetration shall be measured with a stopwatch to an accuracy of better than 5 seconds for each metre drilled and shall be the actual drilling time and shall not include time when the bit is jammed, adding of rods, etc. No payment shall be made for the time recording and allowance must be made under other items for the costs incurred.

Holes drilled in dolomitic terrain shall be backfilled with a soil-cement mortar (using the material blown out of the hole and 5% cement), with a 6:1 sand/cement plug in the uppermost 2m. The borehole number shall be scratched into surface of the plug. In non-dolomitic terrain a nominal 6:1 soil-cement plug shall be placed in the uppermost 2m of the borehole.

8.2 RECORDING OF WATER REST LEVEL

If water is encountered in holes drilling on dolomitic sites, the water rest level must be accurately measured. Should the Engineer so instruct, the water rest level shall be measured at 24 hour intervals until it has stabilised. In this case, a 25mm ID uPVC pipe (slotted and with a geotextile sock over the lowermost 1m) shall be inserted to the full depth of the hole and the annulus between the hole wall and the pipe backfilled with sand.

8.3 PERCUSSION DRILLING JOURNAL (PDJ)

The purpose of this sheet is to act as a written communication between the Contractor and the Engineer. The report sheet contains valuable operational and performance data and shall be submitted to the Engineer on a daily basis. Figure 8.1 gives an example of a PDJ.

8.4 MEASUREMENT AND PAYMENT

The quantity to be paid for shall be per linear metre actually drilled, including cavities through which drilling may have been conducted with percussion equipment, measured from the mean ground level in the immediate vicinity of the drill hole. Measurement shall differentiate between the type and diameter of the drilling employed. Inclined drilling (at angles between horizontal and 85°) shall be measured extra over the rate for vertical drilling.

Backfilling and plugging (if required) shall be measured separately. No separate payment will be made for the measuring of water rest levels.

The rates shall include for the recording of the drilling operations in accordance with the PDJ and for the taking, labelling and rendering of samples of chips, as required, to the Engineer. Furthermore, distinction shall be made between the various depths at which percussion drilling is carried out, in increments of 50m

Casing shall be measured per metre of casing installed and shall differentiate between casing installed temporarily and removed after completion of the hole ("casing in-and-out") and casing left in the hole on the instructions of the Engineer.

Casing installed in the hole shall be measured per linear metre and shall include for removal, where applicable, after completion of drilling. Where uPVC piping is installed, the rate shall include for installing the sand annulus.

Where foam is added to improve sample recovery, it shall be measured in litres.

PAY ITEMS

8.	Percussion drilling	Unit
8.1	Percussion drill (specify type and diameter of drilling)	
8.1.1	Percussion drilling (in 50m increments)	metre (m)
8.1.2	Inclined drilling (Extra Over Item 8.1.1.)	metre (m)
8.2	Backfilling hole	metre (m)
8.3	Cement plug in uppermost 2m	metre (m)
8.4	Percussion casing	
8.4.1	Casing in-and-out	metre (m)
8.4.2	Casing left in the hole	metre (m)
8.4.3	Permanent casing (25mm ID uPVC)	
	8.4.3.1 Supply of casing	metre (m)
	8.4.3.2 Installation of casing (including sand annulus)	metre (m)
8.5	Addition of foam	litre (ℓ)

NOTE:

Payment for the establishment of drilling rigs and compressors is covered under **Section 3** and setting up under **Section 5** (mobile setups only).

Standing time shall be paid in accordance with **Section 37**.

PERCUSSION DRILLING JOURNAL

Date
 Client.....
 Project/Site Contractor
 Hole no..... Casing in & out (m)
 Total depth..... Casing installed (m)
 Inclination/Bearing Casing permanently damaged (m)

Rig
 Air pressure
 Air capacity
 Bit diameter (mm)
 Water struck (m & l)
 Water rest level (m)

Depth (m)	Pen. time min/s	Formation					Hammer action			Air loss				Water struck	Moisture condition			Hole collapses	Water/foam added	Casing		Sample recovered				REMARKS (e.g. type of material)
		Cavity	Very soft	Soft	Fairly hard	Solid	Very irregular	Irregular	Regular	None	Slight	Medium	Total		Wet	Moist	Dry			Depth	Good	Medium	Poor	None		
0-1																										
1-2																										
2-3																										
3-4																										
4-5																										
5-6																										
6-7																										
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27-28																										
28-29																										
29-30																										

Remarks.....

DATA DESCRIPTION BY:.....

OPERATOR:.....

Figure 8.1 : Example of typical Percussion Drilling Journal

Explanatory notes to PDJ:

Penetration time	The time for penetration shall be measured by means of a stopwatch to an accuracy of 5 seconds for each metre drilled and shall be the actual drilling time and shall not include time when the bit is jammed, adding of rods, etc.
Hammer action	Columns are provided to permit the operator / observer simply to tick in the appropriate column. It must be noted whether the percussion action of the hammer is regular, irregular or very irregular nature for each metre being drilled. This information is valuable in the interpretation of the nature of the horizon
Foam/water added	The quantity and depth range over which foam or water was added in order to improve/ facilitate sample recovery must be noted.
Water struck	If water is struck, the depth shall be noted and an estimate (based on the blow-out) of the quantity should be noted.
Water rest level 24 hours after completion	It is imperative that the borehole is kept open to permit measurement of the water rest level. Plumbing to the bottom of the borehole is required to ensure that the water is not perched on a collapsed portion of the borehole.
Permanent casing	If the Engineer instructs the installation of small bore permanent casing for monitoring the water level, the following shall be provided: • Install 25mm ID uPVC piping, slotted and with geotextile sock over bottom 1m. • Backfill the annulus between the borehole walls and the casing with sand Install standpipe and cap (see Figure 35.1 and Figure 35.2)
Depth observations	Where changes of strata, penetration rate or hammer action occur, the actual depth at which it occurs (to an accuracy of 100mm) must be noted. For example, if a change from soft to solid occurs at 5.2m, insert 0.2 into the "Soft" column and 0.8 into the "Solid" column.
Remarks	Describe any other observations that will assist the Engineer. For example "From 20m, air blows out of BH35".

SECTION 9 AUGERING

9.1 DESCRIPTION

This section relates to the drilling of holes by means of an approved augering system, as required in the Project Specifications, where so required by the Engineer.

9.1.1 Sampling of small diameter auger holes (<200mm diameter)

During augering carried out using a small diameter auger flight on a core drilling rig, continuous samples of the augered material shall be recovered, inserted into plastic sleeves approximating N-size diameter core and sealed. The depth of extraction shall be marked onto the plastic and placed in sequence into a core box. No additional payment shall be made for such sampling.

9.1.2 Sampling of large diameter auger holes (>200mm diameter)

During augering using a separate, large diameter auger rig, a grab sample shall be taken from the bottom of the flight each time the flight is withdrawn and laid out in depth sequence next to the hole for the Engineer's inspection. The Engineer may order that samples be taken from various horizons for testing and these shall be measured and paid for in accordance with Section 16.

9.1.3 Backfilling of holes

No separate payment will be made for the backfilling of small diameter holes.

Large diameter auger holes shall be backfilled to the satisfaction of the Engineer and allowance for compaction of the backfilled material shall be made. All material removed from the hole shall be heaped above the hole and, if the backfill settles more than 300mm below the surrounding ground level, the Contractor shall source and compact such additional material to fill up to ground level. Any settlement which occurs within one month of completion of the hole or the completion of the Works (whichever is the longer) shall be the Contractor's responsibility. Any spoil left over after augering shall be disposed of and the area around the hole tidied, as ordered by the Engineer.

Backfilling of, and tidying up around auger holes, shall not be paid for separately, except where the Engineer instructs that backfilling of an auger hole is to be delayed until after the auger rig has left the position of the hole or its vicinity.

9.2 SAFETY EQUIPMENT

The large diameter augering shall be carried out in accordance with "Code of practice: The safety of persons working in small diameter shafts and test pits for civil engineering purposes" as produced by the Geotechnical Division of SAICE.

The Contractor shall provide safety equipment as described in the above document for each large diameter auger operating on site, to the satisfaction of the Engineer. The Engineer shall not allow augering to commence unless all the safety equipment is on site, in working order and at least one person who is familiar with the use thereof, is present at each auger rig.

The Contractor may be required to provide additional sets of profiling and safety equipment as detailed in the Project Specifications. Such sets shall be measured and paid for per set per Working Day for which they are required on site on the written instruction of the Engineer.

9.3 MEASUREMENT AND PAYMENT

Payment for augering using small diameter equipment shall be per linear metre and shall include for all equipment and personnel necessary for the execution thereof.

The unit of measurement for large diameter augering shall be a daily rate per Working Day (10 hours per day) for each Working Day that the rig is on site in working order, as required by the Engineer. The rate shall include all the operational requirements of the rig, setups, personnel, safety and profiling equipment, backfilling of the holes, and its subsequent de-establishment.

If the Engineer instructs that backfilling of large diameter auger holes be delayed until after the auger rig has left the position of the hole or its vicinity, this shall be measured for each meter length of auger hole backfilled to the satisfaction of the Engineer, irrespective of the depth or diameter of the hole.

PAY ITEMS

9.	Augering	Unit
9.1	Small diameter augering (<200mm diameter)	metre (m)
9.2	Large diameter augering (>200mm diameter)	
9.2.1	Daily rate hire	day (d)
9.2.2	Backfilling of hole (only when delayed by Engineer)	metre (m)
9.3	Additional safety equipment as detailed in Project Specifications	day (d)

NOTE:

Establishment of the large diameter auger rig is measured under Section 3.

SECTION 10 ROTARY CORE DRILLING

10.1 DESCRIPTION

This section relates to rotary core drilling through various categories of weak and strong material. Weak material in general comprises material from which samples may be obtained by means of a small diameter auger fitted to the drilling rig and all other material, which requires the use of diamond or tungsten bits, shall be considered to be strong material. Unless specified to the contrary, all drilling in material classified as weak or weathered rock shall be carried out using a split-inner, double-tube, swivel type core barrel (such as NWD4) to permit full core recovery. In strong material a conventional double-tube, swivel type core barrel may be employed. Single tube core barrels may not be used.

At the commencement of drilling each hole, the Engineer shall indicate to the Contractor the depth to which the hole is to be drilled. The Engineer, however, reserves the right to vary the required depth of the hole at any stage during the drilling of that hole.

To prevent undue delays, the Contractor shall give the Engineer reasonable notice when he anticipates that the required depth will be reached in any particular hole, but in any case, no drilling rig shall be dismantled and moved away from any particular hole on reaching the required depth until the Contractor is notified in writing by the Engineer that the drilling rig may be moved. The Engineer may order the re-establishment of any drilling rig moved away without his written authority, and such work shall then be carried out at the Contractor's expense and no further payment for setting up the drilling rig will be made. Authority to move a rig on completion of drilling shall not be withheld unreasonably. The Contractor shall be entitled to "standing time" according to Section 37, should the delay of authority to move a drilling rig after drilling has been completed at a hole, exceed one hour. Each drilling rig used on the Contract by the Contractor shall be in the charge of a competent drilling supervisor, who shall be capable of completing the Daily Drilling Journals (DDJ), and be experienced in drilling in the types of formation expected on the site.

Continuous core recovery shall, unless otherwise specified by the Engineer, be obtained whenever possible in both hard and soft material. In general, all drilling shall be N size.

Inclined holes shall be defined as all holes ordered to be drilled with an inclination of between the horizontal and 85°.

If the drilling equipment should become stuck or lodged in a borehole, or if, for any other reason, further drilling is not possible in that hole, the Contractor must immediately notify the Engineer and the Engineer will then decide if:

- (i) the hole is drilled deep enough to be acceptable, in which case payment for drilling to the depth reached will be made;
- (ii) The depth drilled is insufficient, and that a new hole shall have to be drilled, in which case no payment will be made for the unsatisfactory hole, unless the stoppage is due to unforeseen subsoil or geological conditions. In such case payment will be made for both the abandoned hole and the new hole. The Engineer shall in this event have due regard to the conditions encountered in already completed holes and the precautions taken by the Contractor to prevent loss of the hole.

The Contractor shall, unless specified to the contrary in the Project Specifications, provide a point load apparatus for the testing of cores. The apparatus which is equipped with a digital readout, together with a current certificate of calibration from an approved source, shall be to the satisfaction of the Engineer.

On completion of any drill hole, the hole shall be sealed and made safe to the satisfaction of the Engineer in accordance with Sections 28, 29 or 35 or as detailed in the Project Specifications.

Should the Engineer decide that core recovery of very friable rock is unsatisfactory due to the nature of the material, he may instruct that a triple tube core barrel be used. Such core barrels shall have a bottom discharge diamond crown and a plastic inner tube liner. Where a decision is made to use a triple tube core barrel after a portion of the hole has been drilled to a smaller diameter, the hole shall be reamed out and paid for under the relevant items. Core samples shall be supplied in the inner tube liner (with caps fitted at each end).

The diameter of the core to be sampled during the triple tube drilling/sampling operation shall be as specified in the Project Specifications and the following information may be used as a guideline.

Triple tube drilling/classes of undisturbed sampling

Quality of sample	Typical core barrel type	Casing diameter required (mm)	Core diameter (mm)
Class 1	Triefus	111	75
Class 1	HMLC	139	70
Class 2	NMLC	89	53

Reference: Current Practice of Soil Sampling in Southern Africa. Giddings and Kantey 1976

Note: Double tube core barrels (NWD4, NXCM, TNW, etc) cannot produce Class 1 samples.

10.2 DEPTH RECORDING

Drilling depths shall be accurately measured using the "stick-up" and rods in the hole, whenever the core barrel is withdrawn. Where the Engineer instructs, the depth of the hole shall be plumbed by inserting rods to the bottom of the hole, and marking the stick-up. The rods shall be withdrawn from the hole and screwed together next to the hole so that the length of rods can be accurately measured.

10.3 MEASUREMENT AND PAYMENT

The quantity to be paid for shall be the linear metre actually drilled to the satisfaction of the Engineer. All measurements of depths drilled shall be measured from the point at which physical drilling commences. When drilling in material classified as very closely fractured, the unit of measurement shall be the number of pulls of the core barrel necessary to achieve optimum core recovery.

Consistency and Hardness

For measurement and payment purposes distinction shall be made between the consistency and hardness of the materials drilled as follows:

CATEGORY	CLASSIFICATION	Typical UCS (MPa)	TYPICAL MATERIAL DESCRIPTION
A	Can be augered	<3	Soils, very weak rock resembling soil on retrieval. Rock is friable and can be crumbled under finger pressure. Can be peeled with a knife
B	Cannot be augered, PLI less than 5MPa	3 – 100 to150	Soft to hard rock Discontinuities may be discoloured up to 10mm deep. Can just be scraped with a knife. Dull sound under a hammer.
C	PLI greater than 5MPa	>100 to150	Very hard rock Rings under a blow from a hammer. Generally no visible signs of weathering

D	PLI greater than 5MPa	>100 to 150	Very hard rock that is abrasive.
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Rule of thumb: Point Load Index of 5 MPa is equal to a UCS of about 100 to 150 MPa.

Category D is paid extra-over category C. Differentiation shall be made under category D in the Bill of Quantities for different abrasive rock types, such as vein quartz, chert, banded ironstone, quartzite and silcrete

The point load index (PLI) shall be determined in accordance with the equipment and techniques given in "Rock Slope Engineering" 1973, Hoek and Bray, p 96. In the event of any dispute, unconfined compression strengths shall be determined on the cores in order to resolve the matter. The cost of such compressive testing (which shall be carried out in a SANAS accredited testing laboratory acceptable to the Engineer), in the event that the testing results in the Contractor being paid under a higher (more expensive) category than was originally proposed, shall be borne by the Employer. Should the testing not result in an upward adjustment to the payment category, the cost of testing shall be borne by the Contractor.

Very closely fractured material

Payment for drilling in very closely fractured material shall be extra over the payment made for drilling of material category C and shall be measured per pull of the drill string.

Very closely fractured material is defined as rock of at least category C hardness containing uncemented joints or fractures inclined at an angle of less than 45° to the axis of the borehole, which occur at a consistent average spacing of less than 25mm for a drilled length in excess of 300mm, and which part on drilling. Boulders and gravel shall not be measured under this item.

Triple tube drilling

Payment for drilling with a triple tube core barrel shall be paid extra over the appropriate rate. Split inner, double tube drilling (NWD4 or similar), is not triple tube drilling and shall not be measured as such.

Gravel

Gravel shall be defined to be any hard aggregate (at least B category) of average dimension between 6 and 60mm, with or without a matrix of loose material, and which moves during drilling, resulting in difficult drilling, and where the hard aggregate occupies more than 30% of the volume of the hole (measured per individual drill run).

Cobbles and Boulders

The definition shall be as for gravel but the average dimension shall be between 60 and 300mm.

Inclined drilling

Payment for inclined holes shall be an extra over payment per metre of hole drilled, taking into account the inclination of the hole (angle measured from horizontal).

Concrete drilling

Any drilling through concrete shall be measured under category B material. Where steel is encountered in reinforced concrete, this shall be measured and paid for per millimetre (measured as the diameter of the bar cut), extra over the rate for category B material. Where a bar is cut on both sides of a core, each cut shall be measured separately.

No payment shall be made under this section for any other rotary drilling undertaken for which there is a specified rate in any other section. This refers inter alia to augering, use of drilling aids, washboring, etc.

Unless listed in the Bill of Quantities or detailed in the Project Specifications, all drilling shall be independent of the depth or length of drilling, if this is less than 30m. Beyond 30m depth/length, increments, if any, as given in the Bill of Quantities shall apply.

NOTE

Where drilling is carried out in material such as very dense sands or very friable rock and only occasional fragments of material and totally disturbed wash samples are recovered and it is either not required nor ordered by the Engineer that a more sophisticated drilling technique be adopted, such drilling shall be paid for as washboring under Section 11 and no core recovery will be paid for under Section 12.

PAY ITEMS

10.	Rotary core drilling	Unit
10.1	In category A materials	metre (m)
10.2	In category B materials	metre (m)
10.3	In category C materials	metre (m)
10.4	In category D materials (EO Item 10.3) by different rock types	metre (m)
10.5	In very closely fractured material (EO Item 10.3)	pull
10.6	Triple tube drilling (EO Item 10.1 and 10.2)	metre (m)
10.7	Drilling in gravel	metre (m)
10.8	Drilling in cobbles and boulders	metre (m)
10.9	Drilling steel in concrete	millimetre (mm)
10.10	Extra Over for drilling inclined holes in all categories	
	10.10.1 Inclination >60° and <85°	metre (m)
	10.10.2 Inclination <60° and >30°	metre (m)
	10.10.3 Inclination <30° and >0°	metre (m)

SECTION 11 WASHBORING

11.1 DESCRIPTION

This section relates to the recovery of samples by means of washboring.

Washboring is in general not considered a satisfactory method of sub-surface soil profiling. It may be more satisfactorily carried out in conjunction with split spoon sampling and standard penetration testing, as specified in Section 23. Washboring may be permitted under certain special conditions, but the prior approval of the Engineer is required and it is in any case to be limited to the absolute minimum depth of hole. Washboring may be carried out using casing or with a core barrel. During washboring, samples of the sediment in the wash water shall be taken every metre and collected in plastic sheaths, labelled in accordance with Section 16 and placed into core boxes.

11.1 MEASUREMENT AND PAYMENT

The quantity to be paid for shall be the linear metre of borehole actually advanced using this method.

Where washboring is carried out using a core barrel, and it is subsequently required that casing be installed past this zone, that casing shall be paid for under Section 13.

PAY ITEMS

11.	Washboring	Unit
11.1	Washboring	metre (m)

SECTION 12 CORE AND SOIL MATERIAL RECOVERY

12.1 DESCRIPTION

This section relates to the recovery of cores and materials obtained during drilling in situations requiring to be cored. Unless instructed by the Engineer, continuous core recovery or sampling shall at all times be striven for.

Core is defined as Category A or harder material which is recovered as material of a complete circumference (or which can be reassembled as a complete circumference) and where the core recovery exceeds 50% (measured per individual drill run). All other material, including gravel and boulders and cases where the "core" recovery is less than 50%, shall be classified as "soil material" and shall be measured separately for the purposes of this section.

In the event of unsatisfactory core recovery being prevalent the following shall apply:

- (i) Should poor core recovery result from poor equipment and/or drilling technique and/or inexperienced drill operators the Engineer may order that improved equipment be brought to the site, a different drilling technique be employed, a more experienced driller be employed or a combination of these remedies be used. No extra payment shall be made for compliance with such orders, nor shall unsatisfactory work be paid for.
- (ii) Where loose, friable or other problematic material, which is unable to be satisfactorily retained in the core barrel, be encountered the Engineer shall determine what should be done to improve core recovery, such as the use of triple tube barrels and instruct the Contractor accordingly. The Contractor shall be paid for the work done according to the appropriate item(s), and for any additional work ordered.
- (iii) The Engineer may instruct that the length of successive drill runs be reduced until satisfactory core recovery is obtained.
- (iv) Instruct that the hole be re-drilled using any of the remedies given above.

The decision of the Engineer with regard to the above shall be final.

When core is extracted from the core barrel, this shall be carried out as follows:

- In such a way to minimise disturbance of the core
- With minimal hammering on the barrel
- Over a plastic sheet (minimum 500µ) to ensure that no core/fragments are lost
- To ensure that the sequence of the core is maintained

Where the core is fractured or broken, use shall be made of a core-handling tray into which the core shall be packed from the core barrel prior to placing it in the core box. The objective shall be to ensure that the core is correctly assembled from the barrel before insertion into the box. The core tray shall consist of a half round section of pipe of the same diameter and length as the core barrel inner tube and fitted with holding brackets so that it does not fall over. If possible, this core shall be slid from the tray directly into the box, as would be possible if a removable, split inner tube were being used.

Where a split inner tube is used, core shall be transferred directly from the split inner to the core box (sheathed as required).

Unnatural core breaks: These are defined as man-made breaks resulting from breaks to fit core into a core box, down-the-hole breaks to extract core, breaks resulting from hammering to extract core from the core barrel, or any other actions by the driller. All such breaks shall be clearly marked on the core (by means of twin ("tram") lines across the core break), to

distinguish such breaks from natural breaks or joints. Tram lines must be clearly and indelibly marked on the core using a Koki (or similar) pen of at least 3mm width.

In hard, massive rock it can happen that the core does not break off at the bottom of the core barrel and a core stub is left behind on the bottom of the hole. An apparent core loss will thus be recorded for such a drill run, with "too much" core being recovered on the next drill run. In such a case, the core actually recovered for each drill run (even it is more than 100%) must be recorded, but a note made on the core (and on the DDJ) to alert the Engineer to the fact that the core did not break off at the required point.

If cores are lost, mixed up, destroyed or rendered unsatisfactory for identification purposes in any way before final acceptance by the Engineer, the Contractor shall be required, entirely at his own cost, to re-drill, re-sample and to deliver new cores to the Engineer.

The object of the drilling investigation is to obtain maximum core recovery at all times and this shall be the aim of the Contractor. As an indication, the following recoveries shall be considered as minima (due consideration being had to circumstances):

Nature of Materials	Minimum Percentage
Gravel and boulders	30% soil material recovery
Category A	80% core recovery
Category B	90% core recovery
Category C	95% core recovery
Category D	99% core recovery

If, taking into consideration factors affecting the percentage core recovery, core recoveries are less than these minima and the Engineer is of the opinion that this could have been prevented by the Contractor taking greater care, the payment rates for core recovery shall be reduced proportionately in the ratio that the actual percentage core recovery bears to these minima.

Example of calculation of measurement and payment (per drill run)

Rate is:	R400 per m
In category B (min. recovery reqd. is):	90%
Drill run:	1.5m

If core recovery 100 to 90% :	For example 94%
	Pay for actual meterage (1.5m x 0.94%) recovered at R400p/m
	Pay for 1.41m at R400 = R562.00

If core recovery less than 90% :	For example 80%
	Pay for actual meterage recovered at reduced rate (80%) of the required rate (90%)
	1.20m (80% of 1.5m) at (80 x 90)% of R400
	i.e. 1.20m at R288.00 = R345.60

12.2 MEASUREMENT AND PAYMENT

The quantity to be paid for shall be the linear metre of core or soil material actually recovered and packed into the core box to the satisfaction of the Engineer. Measurement shall be made for individual drill runs in accordance with the minimum percentages given. The core recovery for each drill run shall be measured in place on the split inner tube before transfer to the core box.

No distinction shall be made for the depths or inclination of holes from which the core is recovered.

THE RATES FOR CORE RECOVERY SHALL NOT BE LESS THAN 50% OF THE RATES FOR ROTARY CORE DRILLING (SECTION 10), UNLESS THE CONTRACTOR CAN PROVE THAT THIS RATIO IS NOT APPLICABLE. THE RATE FOR SOIL MATERIAL RECOVERY SHALL BE NOT LESS THAN 50% OF THE RATE FOR SMALL DIAMETER AUGERING (SECTION 9). IF NECESSARY, TENDERED RATES SHALL BE ADJUSTED ACCORDINGLY, PRIOR TO THE AWARD TO THE CONTRACT.

PAY ITEMS

12. Core and Material Recovery	Unit
12.1 Soil material recovery in all material types	metre (m)
12.2 Core recovery in Category A material	metre (m)
12.3 Core recovery in Category B material	metre (m)
12.4 Core recovery in Category C material	metre (m)
12.5 Core recovery in Category D material	metre (m)
Extra over 12.4 in different rock types	
12.6 In very closely fractured material	metre (m)
12.7 Triple tube drilling	metre (m)

NOTE

- 1 No payment shall be made under this section for core recovered during integrally sampled core (Section 20).
- 2 No core or material recovery will be measured for wash samples recovered during rotary core drilling.
- 3 Triple tube core shall be supplied in the plastic inner tube liner (with caps at both ends).

SECTION 13 CASING

13.1 DESCRIPTION

This section relates to the installation, irrespective of the method employed, of casings necessary for the drilling of boreholes and the removal or leaving in the hole thereof, as instructed by the Engineer. On completion of drilling at each hole, the Engineer shall notify the Contractor whether the casing, if any, is to be left in the hole.

If casing is irrecoverably jammed in any borehole the Engineer may, at his discretion, pay for any casing so lost. The Engineer's decision shall be based on:

- (a) Whether every reasonable attempt has been made by the Contractor to extract part or all of the casing
- (b) That the Contractor took every reasonable precaution during drilling to ensure that the casing would not become jammed (for example, rotating the casing every morning to ensure its freedom, the use of drilling aids and maintaining water return).

Whether casing is left in the borehole or not, the Contractor shall comply with the requirements as set out in Section 35.

The Contractor shall supply detail, in his Daily Drilling Journal (DDJ), of any casing installed, left permanently or jammed in a hole.

13.2 MEASUREMENT AND PAYMENT

The quantity to be paid for shall be the linear metre of casing actually installed and/or subsequently removed or on instruction of the Engineer, left permanently in the hole, or casing irrecoverably jammed in the hole (for which the Engineer has agreed to pay), measured from the casing reference height. Unless depth increments are detailed in the Bill of Quantities, payment shall be irrespective of depth.

For the purposes of measurement, the length of casing installed shall be measured relative to a casing reference level as follows:

- (a) For dry holes. From the mean adjacent ground level
- (b) For wet holes. From 0.5m above the highest normal water level or such height necessary to protrude through the drilling barge or platform

Casing in category B or harder material, in boulders or gravel shall be measured per linear metre and paid extra over the rate for removable casing.

Where casing has already been installed and a reduction in the size of the casing is required for further advance, no payment shall be made for the portion(s) of the smaller diameter casing(s) contained within the larger diameter casing.

No extra payment shall be made for the use of drilling fluids or muds for the installation of casing unless agreed to and approved by the Engineer.

Casing in inclined holes (see Section 10) shall be an extra over payment per metre of casing installed, regardless of size.

PAY ITEMS

13.	Casings	Unit
13.1	Casing, which may be removed (by size)	metre (m)
13.2	Casing in material of category B or harder (Extra over 13.1)	metre (m)
13.3	Casing in boulders or gravel (Extra over 13.1)	metre (m)
13.4	Casing left in the hole (Extra over 13.1) by size	metre (m)
13.5	Casing in inclined holes (Extra over 13.1)	metre (m)

NOTE. Where washboring is ordered by the Engineer (see Section 11), casing shall normally not be paid for separately.

SECTION 14 THE USE OF DRILLING AIDS

14.1 DESCRIPTION

This section relates to the use of drilling aids such as mud or fluid to facilitate drilling. The intention of the contract is at all times to optimise core recovery and it is therefore required, as standard practice, that the Contractor employs such drilling aids as are necessary to achieve this and these will not be paid for. The Contractor shall select the type of drilling aid used for the particular circumstance when instructed to use them by the Engineer.

Only biodegradable drilling aids shall be employed. The Contractor is required to produce documentary proof of this fact prior to commencing any drilling. The use of drilling aids in any borehole shall specifically be noted on the Daily Drilling Journal (DDJ).

Drilling aids shall be properly disposed of after use, to the satisfaction of the Engineer, and it shall not at any time be discharged into any watercourse, drain or place in which it may cause pollution or contamination.

14.2 MEASUREMENT AND PAYMENT

The purpose for which a drilling aid is employed shall dictate the measurement and payment therefore.

- (i) To improve bit life, reduce friction, aid in removal of cutting and facilitate core recovery. This is considered to be to the contractor's advantage and shall not be measured and paid for.
- (ii) If instructed or agreed to by the Engineer to be used in lieu of casing to keep a hole open. This shall be measured and paid for per linear metre of hole drilled using this method.
- (iii) All other circumstances shall be considered exceptional and the Engineer shall pay for the actual purchase price of the mud which shall be measured and paid for under a provisional sum. The quantity of drilling aid to be paid for shall be the nett cost of the drilling aid used in the drilling of the hole, plus a mark-up for handling and profit. Transport, labour, equipment and any other costs for the installation of the drilling aid shall be deemed to be included in the Contractor's mark-up for handling and profit.

Reimbursement for the cost will be made only after the Contractor has provided to the Engineer acceptable proof of payment to the supplier.

When considering such a case, the following shall be taken into consideration:

- (a) the objective of achieving maximum core recovery
- (b) that no other technique would have the desired result
- (c) the uniqueness of the conditions prevailing

Examples of circumstances which might be considered exceptional:

- The presence of artesian water requiring the use of heavy muds
- Complete loss of drilling water at depth where sealing of the hole with casing or by stabilisation grouting (see Section 15) is not practical, and where loss of water circulation might result in loss of the hole
- The installation of casing in thick sands where, unless mud is used, the casing could jam.

PAY ITEMS		
14.	Drilling aids	Unit
14.1	Use in lieu of casing	metre (m)
14.2	Purchase price of drilling aids	provisional sum (P sum)
14.3	Mark-up for handling and profit	percent (%)

SECTION 15 STABILISATION GROUTING

15.1 DESCRIPTION

Grouting for the stabilisation of fractured or brecciated zones or boulders encountered, or in other situations as agreed to by the Engineer, may be undertaken with the approval of the Engineer. The grout employed shall usually be cement but the type of grout to be employed shall be decided upon by the Contractor with due regard to the circumstances. Only such grouting as ordered or approved by the Engineer shall be measured for payment.

Whenever possible, grouting shall be arranged to take place at the end of a working day so that it may set overnight and be drilled out the next morning. If this is not possible, and is agreed to by the Engineer, Standing Time shall be payable in accordance with Section 37, but only in the event that it exceeds two hours in these particular circumstances.

Where grout is cored out, this shall be placed into the core box in the position from which it was drilled out, as a record of the grouting carried out.

15.2 MEASUREMENT AND PAYMENT

The quantity to be paid for shall be the actual quantity of grout employed (measured in 50kg bags) and the length of hole (measured in linear metres) requiring to be grouted. No payment shall be made for drilling out of grout and this cost must be included in the other rates.

PAY ITEMS

15.	Stabilisation grouting	Unit
15.1	Supply of grout	bag
15.2	Installation of grout	metre (m)

SECTION 16 DISTURBED SAMPLING

16.1 DESCRIPTION

This section relates to the recovery of disturbed samples when so ordered by the Engineer. ASTM D420 is applicable.

In unstable conditions use may be made of bailing buckets or similar approved methods for the recovery of disturbed samples.

Large-scale sampling may be done by using a large diameter auger, care being taken to minimise the intermingling of materials from different horizons so as to give a true reflection of the variation of layers with depth.

Disturbed samples shall be taken at depths as ordered by the Engineer. Small samples shall be stored in sealed, transparent, durable containers, each container being clearly and indelibly marked with the depth and the borehole number. Large samples shall be collected in durable bags, which will be supplied by the Engineer, and clearly marked and labelled as to origin and situation, as in the case of small samples. Sample sizes will depend on the purpose for which they are required, and may vary from a few kilograms to 90kg, or larger.

The Engineer's prior approval is required before any disturbed sampling is undertaken and agreement on the exact procedure to be adopted and the frequency with which samples are to be taken shall be arrived at before commencing work under this section.

16.2 MEASUREMENT AND PAYMENT

The measurement for disturbed samples shall be the number of samples collected as ordered by and to the satisfaction of the Engineer and shall include for the provision of sample bags/containers, personnel, equipment, transport, labelling and all other items related to the taking of samples. Distinction shall be made as regards the size of the samples.

PAY ITEMS

16.	Disturbed sampling	Unit
16.1	Samples (by size)	number (no.)

SECTION 17 UNDISTURBED SAMPLING

17.1 DESCRIPTION

17.1.1 Thin-walled tube samples

Undisturbed sampling shall be carried out in accordance with the "American Society for Testing and Materials" (ASTM) test method D1587. The Engineer may order undisturbed sampling using thin walled tubes while the investigation is in process. Sampling shall be carried out either by means of a thin walled sampling tube of generally not less than 63mm internal diameter (ie. to fit inside N size casing), or as may be specified in the Bill of Quantities or as ordered by the Engineer. The depths at which samples shall be taken in a borehole shall be as determined by the Engineer.

All sampling tubes shall be of 16 or 18 gauge stainless steel, rust free and be coated with a thin layer of lacquer to prevent rusting. All tubes employed shall have machine-prepared, sharp cutting edges and shall be able to accommodate a minimum of 600mm of sample, to the satisfaction of the Engineer. Prior to commencing any undisturbed sampling, the Contractor shall submit to the Engineer for his approval, a sample tube to be employed as a reference standard. Once approved by the Engineer, he shall retain this reference tube until completion of the contract and all sampling tubes employed on the contract shall be judged against this reference standard.

Samples shall be supplied in the sampling tube. Before the samples are waxed up with microcrystalline wax as described in ASTM D1587, the top end shall be inspected to determine whether in fact a sufficiently acceptable length of undisturbed sample has been obtained. Should, in the opinion of the Engineer, too great a length of disturbed cuttings or sludge be present in the tube, the sample shall then be discarded and a new sample shall be taken. All samples shall be sealed and packed in such a way as to be able to resist damage during normal handling and transport. The minimum length of sample is usually 300mm of undisturbed material, but conditions may be such that it is not possible to recover this amount of sample.

The Engineer may order that piston sampling be carried out in such materials as cannot successfully be sampled by means of conventional thin wall sampling. The equipment to be employed shall comprise a sampling tube as above with an inner piston fitted with a least two rubber sealing rings set into the piston. The length of the piston shall be not less than twice the diameter of the sample tube and shall be fitted on a small diameter inner rod which passes through the head of the sampling tube and thence to surface through the inside of the rods on which the sampler is mounted. Prior to undertaking piston sampling the Contractor shall provide the Engineer with a detailed method statement and provide the sampler for inspection by the Engineer.

The piston sampler shall be advanced to the bottom of the hole or drill rods with the piston at the bottom edge of the sampling tube and the inner rods protruding up through the bore of the drill rods. The inner rod shall then be held stationary, by clamping to the drill rig, while the sampling tube is advanced past the stationary piston. Once the sampling tube is fully advanced (determined by measurement), the inner rod shall be clamped relative to the drill rods and the whole assembly withdrawn without rotation or disturbance. If at all possible the assembly shall be withdrawn entirely without uncoupling drill rods. If this is not possible, extreme care shall be taken when uncoupling the drill rods to ensure that no relative movement takes place between the inner and drill rods.

Samples shall be clearly marked on an aluminium, or similar rustproof material, tag which is tied to the tube with the Contractor's name, borehole number, sample length, the orientation of the sample (i.e. which end is up), contract number, the depth at which it was recovered and the date on which the sample was taken.

As a general rule, it is not possible to carry out thin wall sampling in material where the SPT "N" value exceeds 20 and the Contractor shall be the sole judge of whether or not it is feasible to take a sample without damage to the sample tube. Should the Engineer

nevertheless instruct the Contractor to proceed with sampling, this will be measured whether or not a sample is recovered and the Engineer shall pay for the replacement or repair cost if the tube were damaged.

17.1.2 Block samples

When so ordered by the Engineer, the Contractor shall recover undisturbed block samples from the sides of trenches or large diameter auger holes. The block samples shall be cut in accordance with BS5930, section 19 and shall ideally be 300 x 300 x 300mm. After careful removal from its in-situ position, it shall immediately carefully and completely be wrapped in clingfilm (at least 3 layers) to ensure that it remains intact and the moisture content of the sample remains constant. A label (clearly and indelibly marked) shall be inserted under the outermost layer of film so that it can be read from the outside. The label shall indicate the depth of sample, test pit/auger hole number and the orientation of the sample (ie which side of the sample is "up").

Samples shall be delivered to the Engineer as soon as possible after extraction for safekeeping. The Engineer shall advise where the samples are to be delivered to.

17.2 MEASUREMENT AND PAYMENT

The quantity to be measured shall be the number of samples recovered to the satisfaction of the Engineer and shall include for all items necessary to extract, protect and maintain the sample in an undisturbed condition

Sampling tubes remain the Contractor's property and the Engineer must return these to him within 6 weeks of practical completion of the work (see Section 39), in the same condition in which they were received. The Engineer shall replace (or pay the replacement cost to the Contractor) for any damaged or retained tubes. The Contractor shall advise the Engineer one week before the expiry of the 6 weeks deadline that he requires the tubes to be returned. The Engineer is required to return the tubes within one week after receiving such notification. Should the Engineer fail to return the tubes within the stipulated period, he shall return them either when he becomes aware that he has them, or within one week of receiving notification from the Contractor to this effect.

PAY ITEMS

17.	Undisturbed sampling	Unit
17.1	Thin walled tube samples	number (no.)
17.2	Piston samples	number (no.)
17.3	Block samples	number (no.)

SECTION 18 BOREHOLE ORIENTATION SURVEYS

18.1 DESCRIPTION

"Down-the-hole" inclination and direction surveys of certain drill holes may be ordered by the Engineer while the investigation is in progress using suitable instruments approved by the Engineer. The survey interval within any particular drill hole shall be determined by the Engineer, but shall normally be carried out at intervals not exceeding 100m in vertical holes and at intervals between 20 and 30m in all inclined holes. The inclination and direction angles are to be determined to within an accuracy of 0.5° and may be required to be measured and recorded at least twice at each ordered survey point within the drill hole.

When the Engineer orders this work, the Contractor shall provide, for the Engineer's approval, full details of the type of instrument he intends using and a detailed method statement setting out how he will undertake these surveys. The Engineer reserves the right to withdraw his approval of any such instrument if, in his opinion, the results are not consistent and satisfactory and the Contractor shall then, at his own cost, arrange for the provision on site of acceptable alternative equipment.

18.2 MEASUREMENT AND PAYMENT

The establishment and provision on site and conducting of surveys shall be paid under a provisional sum. Reimbursement of the cost will only be made after provision of acceptable proof of payment to the supplier by the Contractor is provided to the Engineer.

PAY ITEMS

18.	Borehole orientation surveys	Unit
18.1	Provision of equipment and surveying	provisional sum (P sum)
18.2	Mark up for handling and profit	percent (%)

SECTION 19 CORE ORIENTATION SURVEYS

19.1 DESCRIPTION

Core orientation surveys may be ordered by the Engineer while drilling is in progress and shall be carried out using approved methods. Distinction, as given in the Project Specifications, shall be made between the depths at which surveys may be required. Surveys may be required in vertical holes. Each core orientation shall be carried out in conjunction with a direction and inclination survey as described in Section 18 (if so ordered by the Engineer).

As part of these surveys (if required in the Project Specifications), the Contractor may be required to extend the orientation of the core upwards and downwards from a section of orientated core. This shall be done by fitting the core pieces together, marking the core by means of an oriented reference line and packing the core into the core box with the reference line uppermost on the core. The extension of the orientation shall be extended as far as possible upwards and downwards, or as ordered by the Engineer. In order to prevent movement of the core, it may be required that the core be cushioned with bubble wrap as detailed in Section 31.

Prior to undertaking any surveys, the Contractor shall provide the Engineer with a detailed method statement and provide the equipment for inspection by the Engineer.

19.2 MEASUREMENT AND PAYMENT

The quantity to be paid for shall be the number of surveys as ordered by the Engineer and carried out to his satisfaction.

PAY ITEMS

19.	Core orientation surveys	Unit
19.1	Core orientation surveys	number (no.)

NOTE:

Establishment of the equipment on site shall be measured under **Section 3** only when ordered by the Engineer.

SECTION 20 ORIENTATED INTEGRAL CORE

20.1 DESCRIPTION

This section relates to the recovery of Orientated Integral Core (OIC) from such boreholes and depths as may be required and instructed by the Engineer.

Prior to commencing any core orientations, the Contractor shall provide details of the equipment to be used and a detailed method statement for the process.

OIC sampling entails the accurate placing into rock (with a suitable grout) of an orientated small bore pipe which is overcored and recovered once the grout has set.

Typically the method that may be employed is:

- (i) Drill to depth required
- (ii) Drill with cone shaped or bullnose bit to provide a tapered (funnel) section at the bottom of the hole
- (iii) Drill a pilot hole (E size or similar) to 1.5m below the bottom of the hole using appropriately sized bushes to ensure that the hole is drilled centrally in the borehole
- (iv) Grout in an orientated grout pipe. The grout employed shall be selected by the Contractor with due regard to the circumstances.
- (v) Over-core the grout pipe once the grout has set

Due care shall be taken to ensure that the pilot hole is drilled straight, centrally in the hole and is well flushed to clear it of cuttings. It is preferable that over-coring be carried out using at least TNW size as this provides a larger diameter core than conventional NXM size.

In certain instances it may be necessary, on the Engineer's instructions and only if all previous attempts using unpressured grout have been unsuccessful, to pressure grout the core to ensure a satisfactory sample. The Contractor shall make provision for such pressure grouting if required.

The orientation of the grout pipe shall be known to an accuracy of 1°. The measurement of the orientation shall be by means of a compass or other approved method and shall be reported to the Engineer and recorded on the DDJ. In addition, two reference pegs 5 and 15m from the borehole (10mm diameter steel pegs set in 200 x 200 x 200mm concrete), shall be set out in the orientation of the grout pipe, for subsequent surveying in.

The timing of the grouting of the core shall be arranged in such a way that, circumstances permitting, it shall take place at the end of a day's work. Drilling out of the core may then commence on the following morning if the grout has set sufficiently. Should it not be possible to arrange this, the provisions of Section 37 shall apply in respect of the drilling rig and crew, for any time lost during normal working hours.

If ordered by the Engineer, the orientation of the core may be required to be extended upwards and downwards by the same process as given in Section 19.

20.2 MEASUREMENT AND PAYMENT

The quantity to be paid for shall be per linear metre of OIC recovered to the Engineer's satisfaction.

The grouting carried out shall not be measured under Section 15 and the cost thereof shall be included in the rates for this work. Any core recovered under this item will not be measured under Section 12.

PAY ITEMS

20.	Orientated integral core	Unit
20.1	Orientated core	metre (m)

NOTE:

Standing time relating to this work shall be measured and paid according to **Section 37**, if applicable

SECTION 21 DOWN THE HOLE PHOTOGRAPHY

21.1 DESCRIPTION

If ordered by the Engineer, in cases where insufficient data is available from the recovered core, a photographic or video recording is to be made by means of down-the-hole equipment. The equipment and method of photography shall be to the satisfaction of the Engineer and as provided for in the Project Specifications.

Permanent records of the work on colour filmstrip, videotape or digitally stored must be produced by the Contractor and will be retained by the Engineer. In the case of ordinary borehole photography the Contractor shall supply the Engineer with the negatives and two prints of each photograph. In the case of video recording only one copy of the videotape is to be supplied. Digital data shall be supplied on CD in jpeg format (or other format which can easily be viewed using "normal" and not highly sophisticated software).

The Contractor shall ascertain at tender stage, from the specialist providing this service, the exact minimum borehole diameter required to deploy the down-the-hole borehole photographic equipment (video, digital or other borehole camera) and shall ensure that the equipment will fit into the diameter of holes to be drilled on the contract. A list of possible service providers is provided in the Project Specifications.

A short method statement and quotation for this work regarding the proposed equipment, methods, cable lengths, hourly rates for the equipment and personnel shall be provided with the tender.

21.2 MEASUREMENT AND PAYMENT

The provision of this equipment and the photography shall be paid under a Prime Cost Sum.

Payment against the Prime Cost Sum shall be as follows:

- a) The amount actually paid by the Contractor to the service provider in the execution of the Engineer's written instruction;
- b) Plus a percentage mark up for handling and profit.

The Contractor shall not be entitled to any further payments or to a fee, commission, rebate, discount or similar payment or consideration from the service provider and shall disclose and subtract such amounts from the amount claimed in a) above.

Payment shall be made only after production by the Contractor of proof of payment to the supplier.

PAY ITEMS

21.	Down the hole photography	Unit
21.1	Provision for down-the-hole photography service provider	prime cost sum (PC sum)
21.2	Mark up for handling and profit	percent (%)

SECTION 22 VANE SHEAR TESTING

22.1 DESCRIPTION

The in-situ shear strength of materials may be determined by means of a vane shear apparatus complying with the American Society for Testing and Materials (ASTM) Designation D2573.

The apparatus shall consist of a stainless steel cruciform of which the length is twice the overall blade width as ordered by the Engineer. The Engineer shall indicate in the Project Specifications the range of vane sizes which he requires to be provided on site. At each testing position the dimensions of the vane(s) to be employed shall be agreed with the Engineer.

The torque shall be applied by means of a standard calibrated torque wrench or similar equipment. A current certificate of calibration from a source approved by the Engineer shall be supplied to the Engineer before any testing is commenced. The torque wrench shall be designed to give minimum backlash and shall be capable of producing a minimum torque of 700Nm.

The vane rod shall be completely enclosed in a sleeve suitably designed to exclude soil particles and the effects of soil adhesion throughout the length it penetrates the soil. The sleeve shall commence just above the blades at a distance of approximately twice the diameter of the rod.

The rods connecting the vane to the torque instrument shall be sufficiently strong to withstand axial thrust and yet be flexible. Bearings used to locate the rod centrally within the borehole shall be fitted to the rods as the system is lowered down the hole.

The apparatus shall be checked before each usage.

Procedure

- (a) The bottom of the hole shall be cleaned out and all loose and disturbed material removed.
- (b) The vane together with the connecting rods and bearings shall be lowered down the borehole, which will normally be cased. Rod couplings should remain tight during the lowering procedure. The spacing of the bearings is dependent on the rigidity of the rods, and should normally be between 3 and 7m centres.
- (c) With the vane resting on the undisturbed soil at the bottom of the borehole, and the rods centrally located, the vane shall be steadily pressed, without twisting, into the soil to a depth of approximately four diameters of the borehole.
- (d) The torque wrench shall then be connected to the rods and a torque applied to shear the soil. The torque reading at point of shear shall be noted. The rate of application of torque should be such as to produce a rotation of the rods of approximately 6° per minute, or as directed by the Engineer.
- (e) Once shear has been achieved the rods shall be rapidly rotated and the residual shear torque reading noted. The residual value shall be taken as that recorded after the vane has been rotated through 10 revolutions.
- (f) Recording Test Results
The results of the vane shear tests shall be recorded in a suitable format as approved by the Engineer, and shall include the following information:
 - (i) date of test
 - (ii) location and depth of test, borehole number
 - (iii) type of vane shear apparatus (size and shape of vane)
 - (iv) torque at point of shear
 - (v) residual shear torque reading
 - (vi) rate of application of torque
 - (vii) time required to achieve shear

22.2 MEASUREMENT AND PAYMENT

Vane shear tests will be measured by number for tests carried out on the instruction of and to the satisfaction of the Engineer and for setting up at each borehole. Distinction will be drawn between tests at less than and greater than 15m depth.

Establishment of the equipment on site shall be measured as a Lump Sum when ordered by the Engineer and shall include for the cost of de-establishment on completion of the work.

PAY ITEMS

22.	Vane shear tests	Unit
22.1	Establishment of equipment on site	lump sum (sum)
22.2	Setting up at each borehole	number (no.)
22.3	Tests	number (no.)

SECTION 23 STANDARD PENETRATION TEST

23.1 DESCRIPTION

Standard penetration tests (SPT) shall be carried out in accordance with the international reference test procedure laid down in the proceedings of the First International Symposium on Penetration Testing (ISOPT-1) 1988 except that the number of blows for each 75mm of the total 450mm penetration shall be recorded. Prior to any SPTs being carried out, the Engineer shall inspect and approve the equipment to be used.

Before commencing the test, the borehole shall be cleaned to the depth where the testing is to be done. Care must be taken to prevent disturbance of the material to be sampled. The washing out of the hole by means of side discharge bits is allowable, but not by means of washing through an open tube. Care shall be taken to ensure that the borehole is cleaned right to the bottom of the hole in all circumstances. Where casings are used, the bottom end of the casing shall be no closer than 150mm to the level where the tests are commenced.

When drilling in sand or silt below the water table, the water level in the casing shall always be kept higher than the ground water level, so that sand and silt is kept from flowing into the borehole. A valid SPT cannot be executed where an influx of sand or silt has occurred, since such influx disturbs the materials under the base height of the casing, as well as causing greater friction against the sample tube. When boring under the said conditions, water shall be continuously added in order to maintain the water level in the casing level with the top of the casing. Steady water supply is extremely important during the removal of the drilling rods since a drop in level of the water in the hole accompanies removal. The rods must be removed slowly and gradually.

Samples recovered from the split barrel sampler shall be sealed in an approved, airtight, transparent container and placed in the core box at the relevant depth and the blow counts written onto the sample container.

Where site conditions are such or the Engineer orders this, SPTs may be taken one after the other in order to provide a "continuous" sample.

When it becomes evident that, due to the presence of gravel or pebble layers, SPT tests cannot be performed with the standard split barrel sampler, the driving shoe and the standard split barrel sampler shall be replaced with a 60° cone-end shoe and a normal tube barrel, the overall dimensions of which correspond to that of the standard split barrel sampler. The outside diameter of the cone-end shoe shall be 51mm and the total length from tip to base shall be 56mm.

The test with the cone-end shoe shall in all other respects be executed in accordance with ISOPT standards except that the number of blows for each 75mm of the total 450mm penetration shall be recorded.

Care shall be taken to ensure that the energy of the hammer is not reduced by friction between hammer and wall or by any other cause. "Refusal" of the SPT is defined as when the number of blows necessary to penetrate 75mm exceeds 25. If refusal occurs, the blow counts recorded till refusal and the actual penetration in mm for the last (refusal) cycle shall be recorded. The rods used during SPT tests shall have a stiffness of not less than that of type AW rods (43.7mm OD, 34.1mm ID, 6kg/m) or BW rods (54.0mm OD, 44.4mm ID, 8kg/m). Bearings (or steadies) shall be provided at 3m centres.

23.2 MEASUREMENT AND PAYMENT

The quantity to be paid for shall be each SPT as ordered by the Engineer and carried out to his satisfaction.

Where the depth at which the test is required exceeds 50m, depth increments (if any) as detailed in the Project Specifications and the Bill of Quantities, shall apply.

PAY ITEMS

23.	Standard penetration test	Unit
23.1	SPTs	number (no.)

NOTE:

Establishment of this equipment shall not be measured separately and the Contractor shall allow for this under the relevant rates in **Section 3**.

SECTION 24 DYNAMIC PROBING (SUPER HEAVY)

24.1 DESCRIPTION

Dynamic Probing (Super Heavy) (DPSH) sounding shall be carried out exactly like SPT sounding except that a sacrificial cone is to be used in place of the sampling tube and shoe. The cone shall have the same dimensions as the solid cone referred to in Section 23, but shall have a stub to fit loosely into the drill rod onto which it is mounted. When the drill rod is withdrawn after the final sounding, the cone will slip out of the rod and remain in the hole.

Blow counts are to be recorded for each 300mm penetrated and continue until refusal, or the required depth is reached, whichever is the shallower. On completion of the sounding, the rods shall be withdrawn by 600mm and then redriven to provide a measure of the friction on the rods. Blows may be imparted using either a continuous hammer or a snatch block arrangement, provided that the height of the fall of the hammer is accurately controlled.

Results shall be provided in an Excell spreadsheet of depth (in 300mm increments) versus blow count.

24.2 MEASUREMENT AND PAYMENT

Setups of the rig shall be measured by number and shall include transport, personnel, equipment and all costs necessary to set up the rig at each testing position.

DPSH soundings shall be measured per metre as ordered by the Engineer and carried out to his satisfaction and shall include the provision of results.

Where the depth at which the test is required exceeds 50m, depth increments (if any) as detailed in the Project Specifications and the Bill of Quantities, shall apply.

PAY ITEMS

24.	Dynamic Probing (Super Heavy)	Unit
24.1	Setup at each position	number (no.)
24.2	DPSH	metre (m)

NOTE:

Establishment of this equipment on site, when ordered by the Engineer, shall be measured under **Section 3**.

SECTION 25 CONE PENETRATION TEST

25.1 DESCRIPTION

The cone penetration test (CPT) or Dutch probing is carried out to determine the nature of soft materials and shall be carried out by a specialist sub-contractor.

Only apparatus conforming to the international reference test procedure laid down in the proceedings of the First International Symposium on Penetration Testing (ISOPT-1), 1988 and approved by the Engineer shall be acceptable. The type (mechanical or electrical) and sensitivity of the cones to be used shall be detailed in the Project Specifications. An operator who is familiar with the standard procedures shall carry out the tests.

In particular the following shall be applicable:

- (a) The equipment shall be capable of exerting a thrust of at least 100 kN
- (b) The rate of penetration of the equipment shall be 20 ± 5 mm/sec
- (c) The machine shall preferably have a minimum stroke of 1m
- (d) The precision of measurements made shall not be worse than the larger of the following values:
 - a. 5% of the measured value
 - b. 1% of the maximum value to the range
- (e) The pressures recorded shall be of the load cell/measuring device connected to the cone and not of the jacking system.
- (f) Depth measurements shall be accurate to at least 100mm

When the Engineer orders this work, the Contractor shall provide full details of the specialist subcontractor (equipment, operator and experience) whom he intends employing to undertake this work. The Engineer reserves the right to withdraw his approval of the subcontractor if, in his opinion, the results are not consistent and satisfactory. In this case another subcontractor shall be sought.

25.2 PROBING

Refusal of the equipment shall be taken as a total force of 100kN or a consistent cone resistance of 30MPa. Ground conditions may however be such (e.g. boulders present, friction build up on the rods so great that there is a danger of the rods becoming stuck in the hole, etc) that it may be necessary to cease probing before the refusal values stated are attained.

The insertion of a friction reducer may reduce the total friction on the rods and allow probing to proceed. The friction reducer shall not be closer than 1m to the base of the cone.

The maximum depth to which probing is to be carried out shall be given in the Project Specifications.

25.3 ANCHORING

Anchoring of the CPT rig is usually by means of screw auger anchors, which are screwed into the ground to provide a reaction to the thrust of the rig. Where ground conditions are such that it is not possible to screw in the anchors, the necessary reaction may be provided by means of grouted earth anchors, kentledge or other techniques as approved by the Engineer.

Whatever anchoring technique is employed it shall be capable of resisting an up-thrust of 100kN.

25.4 PROBING IN PRE-DRILLED HOLES OR OVER WATER

Where material which cannot be probed (boulders, ferricrete, etc) occurs overlying soft material, pre-drilling or augering through the hard material may be carried out. Casing (maximum B size) shall be installed in the predrilled hole and probing shall then be carried out from the bottom of the hole. Due care shall be taken that no obstructions occur at the end of the casing. This is particularly applicable when casing has been advanced through boulders. The casing shall not protrude more than 200mm above the ground level.

Where probing is carried out in water, casing as specified shall be installed to the bottom to prevent flexing of the rods. Whenever possible the rig shall be anchored to the bottom and only in water deeper than 3m may the probe rig be anchored to the barge or drilling platform only. In the latter case the barge / platform shall itself be securely anchored to the bottom to provide the necessary reaction and to ensure that vertical and horizontal movements of the barge / platform are kept to an absolute minimum. In tidal waters it may be necessary to programme the works so that probing is carried out either during neap tide or at the change of the tides to minimise vertical movements during probing.

25.5 TESTING

(a) Mechanical probing

The penetration tip shall comprise a cone and friction sleeve, which can be advanced independently to provide readings of cone and cone-plus-sleeve resistances. Readings shall be taken at a vertical spacing of 200mm.

(b) Electrical probing

Readings of resistances shall be continuous. Probing using a piezocone probe with dissipation tests may be carried out to determine the material type and permeability. Dissipation tests shall be carried out by stopping penetration of the equipment and recording the time taken for the pore pressure to stabilise. The test shall continue until an effectively constant pore pressure reading has been recorded for 5 minutes, or until the measured pore pressure returns to the hydrostatic value, or as ordered by the Engineer.

25.6 REPORTING OF RESULTS

Results shall be recorded on site in such a way that direct access to the data is available (e.g. either by written or chart records for mechanical probing and by continuous chart records for electrical probing); exclusive recording of test results onto magnetic tape or computer shall not be permitted. All supplied data shall include calibration data.

The results shall be reported as follows:

(a) Mechanical probing

- i. Values read from gauges or recorded on chart recorder shall be supplied to the Engineer.
- ii. Cone resistance and friction ratio shall be plotted (200mm interval readings) on a combined graph for each hole to the scales specified in the standards.

(b) Electrical probing

- (i) As for (a) (i) above
- (ii) Cone resistance and friction ratio or cone resistance and pore pressure shall be plotted continuously to the same scale as (a) (ii) above

- (iii) Any dissipation tests carried out shall be plotted on a graph to a suitable scale of pore pressure versus time. Each dissipation shall be plotted separately and record the hole number, depth of the test and the date on which it was performed.

25.7 CALIBRATION

The probing and recording equipment shall be calibrated and a current certificate of calibration from SANS (or approved equivalent) shall be supplied to the Engineer. Regular (bi-weekly) checks in the field with an appropriate field control unit shall be carried out to ensure the accuracy of the measuring and recording systems. Should the field checks reveal calibration or performance irregularities the Engineer may order that the Contractor at his own cost carry out a full calibration.

25.8 MEASUREMENT AND PAYMENT

CPT probing shall be paid for under a provisional sum for probing carried out to the satisfaction of the Engineer. Reimbursement of the cost will be made only after provision of acceptable proof to the Engineer of payment by the Contractor to the supplier.

PAY ITEMS

25.	Cone penetration testing	Unit
25.1	CPT probing	provisional sum (P sum)
25.2	Mark up for handling and profit	percent (%)

SECTION 26 WATER PRESSURE TESTING

26.1 DESCRIPTION

This work shall be carried out in accordance with BS5930.

The object of the test is to measure the apparent permeability of the rock mass at such depths in a borehole as may be designated on the drawings, or as may be requested by the Engineer. The anticipated maximum depth at which testing shall be carried out and the type of packers to be employed shall be given in the Project Specifications.

The water pressure tests shall be carried out using leak-proof upper and lower packers, so that a specific length of the borehole may be isolated from the rest of the borehole. Packers shall be a minimum length of 700mm to ensure a watertight seal. The spacing of the packers shall be specified by the Engineer but will usually be 1.50m. The Engineer may order single packer tests where testing is carried out between the packer and the bottom of the hole. Any test shall be abandoned and the packers re-seated if evidence of leakage past the packers is forthcoming during the test.

Immediately prior to testing of the borehole the Contractor shall ensure that the test equipment is calibrated over the full range of flow rates and pressures attainable, to the satisfaction of the Engineer.

The tests shall consist of pumping water into the isolated zone of the borehole between the packers placed therein, at three different pressures, a, b, and c, in the following sequence:

First	10 minutes at low pressure	a
Second	10 minutes at medium pressure	b
Third	10 minutes at high-pressure	c
Fourth	10 minutes at medium pressure	b again
Fifth	10 minutes at low pressure	a again

The flow of water into the isolated zone in the borehole shall be measured by means of a flow meter for each of the pressure stage periods, and the actual duration of each pressure stage shall also be accurately measured.

The pressures a, b and c shall be as requested by the Engineer and shall be dependent on the depth at which the test is carried out. The required pressures shall be maintained to an accuracy of 5% during the whole of the period of each pressure stage. The maximum delivery rate of the pump to be provided and the maximum testing pressure shall be as detailed in the Project Specifications.

The result of the water pressure tests shall be reported on a suitable report sheet to the satisfaction of the Engineer. The report sheet shall include the following information:

Date, borehole number, depths of upper and lower packers and actual length of zone tested, actual clock times of each pressure stage, flow-meter readings for each pressure stage testing period.

26.2 MEASUREMENT AND PAYMENT

Setting up at each borehole and the installation of packers (single and double packers shall be measured as one set) shall be measured by number. Individual water pressure tests shall be measured by the hour (to the nearest 15 minutes) for the actual number of tests ordered by the Engineer and carried out to his satisfaction

No distinction shall be made for water pressure tests carried out at different depths and different pressures, except as given on the Bill of Quantities.

If a pressure test is abandoned due to the leakage past the packers:

- (i) the test shall not be paid for;
- (ii) the installation of the packers shall be paid for if the leakage has resulted from conditions down the hole and not from poor workmanship, incorrect installation of the packers or poor quality or condition of the packers or other conditions within the control of the Contractor.

PAY ITEMS

26.	Water pressure tests	Unit
26.1	Set up at borehole	number (no.)
26.2	Installation of set of packers	number (no.)
26.3	Carry out pressure test	hour (h)

NOTE:

No standing time for the drilling rig shall be payable in respect of the time during which pressure tests are carried out.

Establishment of the equipment on site, when ordered by the Engineer, shall be measured under **Section 3**.

SECTION 27 GROUT ACCEPTANCE TESTING

27.1 DESCRIPTION

The object of the test is to measure the acceptance of grout by the rock mass at such depths in a borehole as may be designated on the drawings, or as may be requested by the Engineer. The anticipated maximum depth at which testing shall be carried out shall be as given in the Project Specifications.

Grout acceptance tests will normally be carried out in boreholes of N size or greater. Except in short boreholes of less than 5m depth, in which full depth grouting may be carried out, grout injection shall normally be of the upstage type using a packer to form the successive test stages upwards from the base of the borehole. Normally grout acceptance test stages will not exceed 5m.

The Contractor shall ensure to the satisfaction of the Engineer that the equipment used to carry out the test, the grout mixer, grout pump, pressure gauges, grout pipes, hoses and packers, is capable of carrying out the test under the full range of conditions specified. Ordinarily, the test equipment shall be capable of delivering not less than 60 litres of liquid grout per minute at the borehole being tested, at a maximum pressure of 3 500kPa, and of supplying water as required for pressure testing. The grout mixer shall be capable of continuously and uninterruptedly mixing the grout.

Packers used in the test may be of the mechanical or inflatable type. They shall be such that they seal the borehole at the specified level and they shall be capable of withstanding water pressure exceeding the maximum grout or water pressure to be used at that level without leakage. In the case of a shallow borehole in which full depth grouting is carried out, the Engineer may permit the use of a standpipe connection and grout cap if conditions so warrant.

Where instructed by the Engineer, the Contractor shall incorporate in the cement grout other materials such as inert fillers, sand and chemicals to control setting time, or to use bentonite, -chemical and chemical grouts. Where the use of chemicals is instructed, the Contractor shall maintain the proportions approved by the Engineer and shall complete the injection within the setting time for the grout. The proportions of all ingredients in the grout mix shall be as instructed or approved by the Engineer.

Cement grout without chemicals, which is not injected within two hours, and chemical grout, which is not injected within the setting time of the grout after mixing, shall not be used for grouting.

Prior to the carrying out of any grout acceptance tests in a borehole, the borehole shall be thoroughly washed by flushing it from its base until such time as the flushing water discharged at the top of the borehole is consistently clear.

All stages to be tested in boreholes in respect of grout acceptance shall normally be water pressure tested before grouting. The apparent permeability of the rock mass shall be measured in Lugeon units by the water pressure test as specified in Section 26 (1 Lugeon = 1.0ℓ /m of hole length/minute of water loss at a pressure of 1 000kPa). If the water pressure test indicates a Lugeon value of 0.5 Lugeon units or less for the stage to be grout tested, the stage will be considered to be not significantly groutable and it shall not be grout tested.

The pressure used for grouting will vary according to the conditions prevailing in the rock mass to be grout tested, and shall be as high as practicable but shall be limited so as not to cause displacement of the ground or of any structures in the vicinity of the borehole being tested. Grouting pressure shall generally be 25kPa for each metre of depth below ground level of the stage being tested with a maximum pressure of 3 500kPa, but this may be varied by the Engineer on the basis of test results.

While grouting proceeds the Contractor shall watch for leakage of grout or other untoward happenings. Grout leaks shall be caulked, but if this is not successful and the leaks are excessive, grouting shall be stopped and resumed when the grout already injected into the

leaking fissures has hardened. If this results in already-mixed grout having to be discarded, such grout shall be measured and paid for. Precautions shall be taken by the Contractor to ensure that grout does not enter drains or affect any nearby structures. The Engineer may order the establishment of level reference points, upheaval gauges, etc., to be observed as a check against uplift. If these are ordered, they shall be paid for as specified in the Project Specifications. Any appreciable movement of these shall be taken as an indication that the grouting pressures used are excessive and the pressures shall be immediately relieved.

Grouting of a stage shall be started on the approval of the Engineer after the water pressure test thereof, by the addition of cement and, if approved by the Engineer, bentonite or other materials, to the injection water by means of the grout mixer to make up the initial grout consistency of 5 volumes of water to 1 volume of dry cement. The grout injection pressure shall be gradually increased from zero to 100kPa, which pressure should be maintained for a period of 5 minutes during which the presence of leaks in the grouting system and ground movements should be checked for. Thereafter, the injection pressure shall be gradually increased over a period of some 25 minutes to the specified maximum pressure for the stage test. Should the pressure not build up to the specified maximum with the grout pump working comfortably, the grout shall be thickened until the specified maximum pressure is attained with the pump working comfortably. If the pump should then slow down while working at the maximum pressure for the stage, the mix shall be thinned. The object shall be to inject solids into the relevant section of the borehole as fast as possible but under full control at the specified maximum pressure.

The grouting of any test stage shall not be considered as complete until refusal of further grout injection occurs at the specified maximum pressure for the stage, or until approved by the Engineer. The conditions in a test hole may be such that it is necessary to stop the grouting in order to allow the grout already injected to set, at which time grouting may recommence. This procedure may have to be repeated a number of times. In this event, each grouting stage shall be considered to be a separate test, regardless of the duration of the length of time allowed for the grout to set.

The grouting valve at the collar of the borehole shall then be closed with the test stage under the maximum specified pressure. After grouting a borehole shall be left undisturbed for not less than 24 hours, unless otherwise approved by the Engineer. Thereafter water pressure testing and grouting of a further test stage in the borehole may be proceeded with as required.

Grout acceptance testing of a borehole shall not be considered as complete until approved by the Engineer.

The results of the grout acceptance tests shall be reported on a suitable report sheet to the satisfaction of the Engineer. The report sheet shall reflect the following information:

Date, borehole number, depth of test, actual length of stage tested, details of the water pressure test as required in Section 26, details of the grout injection including grouting pressures, grout consistencies, type of materials used, quantities of material injected and the times involved for each operation. Other relevant information such as grouting procedure used, surface leakage of grout, etc, shall also be recorded.

27.2 MEASUREMENT AND PAYMENT

The quantity to be paid shall be the actual number of tests ordered by the Engineer, and carried out to his satisfaction. Should any single test be longer than one hour the time by which the test exceeds one hour shall be measured and paid for under Section 37.

Additional measurement shall be made of the actual quantity of grout material used in the grout acceptance tests or the quantity of grout discarded on the instructions of the Engineer when it is necessary to wait for grout to set in the hole before grouting may proceed.

PAY ITEMS

27.	Grouting acceptance testing	Unit
27.1	Grout acceptance tests	number (no.)
27.2	Grout material (50 kg). By grout type	bag

NOTE:

The establishment of the grouting equipment, when ordered by the Engineer, shall be measured and paid for under **Section 3**.

SECTION 28 PIEZOMETERS

28.1 DESCRIPTION

This section relates to the supply, installation and testing of piezometers installed as ordered by the Engineer.

The type of piezometers shall be detailed in the Project Specifications. Typical piezometer types are:

- (i) *Standpipe piezometers.* Consists of a porous tip connected to a riser pipe down which the water level may be sounded.
- (ii) *Hydraulic piezometers.* Ground water pressure is detected at a porous tip, conducted through small-bore plastic tubes and measured remotely using a pressure gauge.
- (iii) *Electrical piezometers.* As for the hydraulic type but the pressure is read near the porous tip using a pressure transducer.
- (iv) *Pneumatic piezometers.* Comprises two air-filled tubes connecting the measuring points to a valve located close to the porous element. The valve equalises water and air pressure, which can then be measured remotely.

28.2 DRILLING TECHNIQUE

In holes in which piezometers are to be installed, drilling aids shall be biodegradable polymers approved by the Engineer. However, when drilling aids have been used, it shall be removed from the borehole wall by flushing and jetting with water until the water return is clear, to the satisfaction of the Engineer. The utmost care shall be taken to minimise disturbance of the natural material in the sides of the hole.

If the Contractor deems it necessary to install casing in the borehole during drilling, the casing shall be carefully withdrawn at the same rate and to the same level as the grouting and filling of the borehole.

Any protective housings or other method to prevent vandalism of piezometers shall be specified in the Project Specifications.

28.3 INSTALLATION

At least 10 Working Days prior to the commencement of installation a detailed method statement setting out the procedures to be followed and the equipment to be employed shall be submitted to the Engineer for his approval. Only personnel suitably experienced in the operation shall undertake the installation of piezometers under the direct supervision of the Engineer. Before installation, piezometer tips shall be soaked in de-aired water for at least 24 hours. After installation the piezometers shall be completely flushed with de-aired water.

The installation method to be employed will be dependent on the circumstances of individual sites but could typically be as follows (see BS5930 : Code of practice for site investigation):

- (i) Lower porous tip into position, about 200mm from bottom of hole
- (ii) Pour a sand : water mixture down until tip is covered to a depth of about 300mm. The sand shall have a D_{10} of between 0.1 and 0.7mm.
- (iii) Seal off sand layer with bentonite pellets tamped lightly using a ring punner.
- (iv) Seal remainder of borehole by pouring down a cement : bentonite grout (typically 4 parts bentonite with 8 to 12 parts water and 1 part CEM II cement).

28.4 PERMEABILITY TESTING

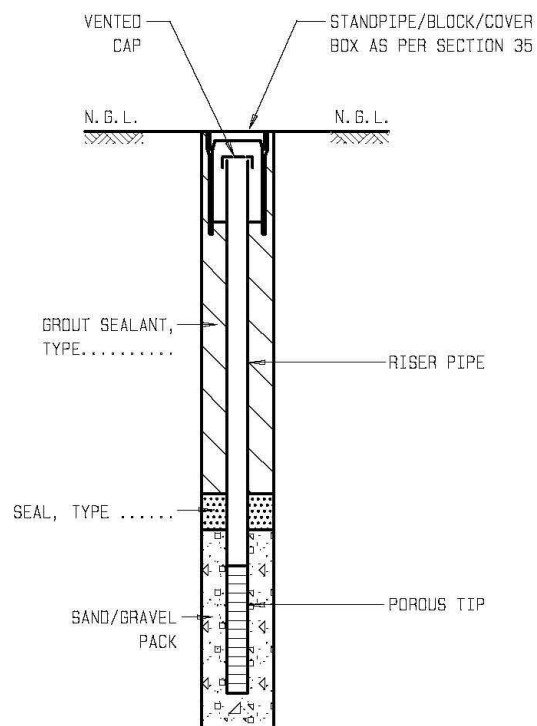
The equipment and testing procedures to be employed is dependent on the type of piezometers used. A detailed method statement setting out the procedures to be followed and the equipment to be employed shall be submitted to Engineer at least 10 Working Days before commencement of any testing.

28.5 MEASUREMENT AND PAYMENT

The supply of piezometers shall measured by the number for different types of piezometers. Installation of piezometers shall be measured by metre of piezometers installed and shall include for all grout, sand, piping, labour and any other incidentals necessary for the installation. The performance of permeability testing shall be measured per hour to the nearest 15 minutes.

PAY ITEMS		
28.	Piezometers	Unit
28.1	Supply (by type)	number (no.)
28.2	Installation	metre (m)
28.3	Permeability testing	hour (h)

CONTRACT NAME : BOREHOLE NO. :
CONTRACT No. : CONTRACTOR :
CONSULTANT : FIELD ENG/GEOL :



**STANDARD
 SPECIFICATION
 2010**

**EXAMPLE OF STANDPIPE
 PIEZOMETER INSTALLATION**

FIGURE 28.1

PIEZOMETER INSTALLATION ROW

SECTION 29 INCLINOMETERS

29.1 DESCRIPTION

This section relates to the supply and installation of an inclinometer system to monitor the amount and location of lateral movements of structures and slopes. A detailed method statement setting out the procedures to be followed and the equipment to be employed shall be submitted to the Engineer for his approval at least 10 Working Days prior to any installation.

The casing to be supplied and installed may be either plastic or aluminium and have four longitudinal grooves on the inside of the casing at 90° spacing as manufactured by Slope Indicator Company, Seattle, WA, USA, or similar which has been proven to be compatible with the intended monitoring equipment. The internal and external diameters of the casing shall be selected to suit the size of hole drilled but will always be as close as possible to the internal diameter of the hole drilled. Individual casing lengths shall be glued using a conventional solvent – cement (PVC Weld or similar) and/or pop-riveted as necessary.

Prior to the installation of the inclinometer casing the orientation at which the measurement grooves are to be installed shall be agreed and approved by the Engineer.

The installation of the casing shall typically proceed as follows:

- (i) Fill hole with bentonite : cement grout (nominal 3:1 in 8 to 12 parts water).
- (ii) Withdraw borehole casing.
- (iii) Insert inclinometer casing (sealed at bottom) into borehole ensuring that it is inserted to the correct depth.
- (iv) Weight or clamp casing to hold it in position and **ensure that it will not move down vertically if not inserted right down to the bottom of the hole.**
- (v) Twelve to twenty-four hours later, after the grout has achieved an initial set and the casing no longer tends to float out of the hole, remove weights and clamps and flush out the casing using clean water.

All joints in the casing shall be sealed using tape, glue or other methods to prevent the entry of grout into the casing. If required, telescopic sections shall be incorporated in the casing. The bottom of the casing shall be closed off using a purpose-made plug which shall be glued and riveted/screwed and waterproofed using suitable duct tape. All rivets or screws used shall be non-corrodible (brass, stainless steel, etc).

Where the base of the casing is to be rigidly grouted into rock, this shall be with a cement grout and the length of the grouted socket shall normally be 3m.

The casing shall be tested for acceptability by inserting the inclinometer (supplied by the Engineer) into the hole for the full depth of the casing. The inclinometer shall be inserted down both sets of grooves.

The installation of the casing shall be carried out under the direct supervision of the Engineer and utmost care shall be taken at all times to ensure accuracy of installation and reliability of operation.

Utmost care shall be taken to ensure that nothing enters the casing before a permanent protective cover, as detailed in the Project Specifications, has been installed over the collar of the casing (see Section 35). **This includes the detail of the connection of the inclinometer casing to the concrete block/collar at ground level, so as to ensure that the top of the casing will not move differentially versus the top of the protective cover and concrete block provided at ground level.**

29.2 MEASUREMENT AND PAYMENT

The casing shall be measured and paid for per linear metre for the supply and successful installation thereof. The installation rate shall include for the supply of all grout, labour, transport, tools and any other incidentals necessary for the successful installation of the casing. The permanent protective cover shall be measured by number.

The inclinometer readings taken following initial installation shall be taken to be included in the installation rate. Any subsequent set of readings shall be measured by number and shall include all costs, including travel, to take the readings.

PAY ITEMS

29.	Inclinometers	Unit
29.1	Supply of casing	metre (m)
29.2	Installation of casing	metre (m)
29.3	Permanent protective cover	number (no.)
29.4	Taking of readings (per set)	number (no.)

SECTION 30 WATER SAMPLING AND BOREHOLE WATER REST LEVEL

30.1 DESCRIPTION

The actual level of water in the borehole shall be measured twice daily, at night after completion of drilling and before the start of drilling, as specified in Section 39 and no additional payment shall be made for these measurements.

After completion of each hole drilled, except where the Engineer orders the contrary, the elevation of the borehole water rest level must be recorded. If the Contractor neglects to do this timeously, and it becomes impossible to measure the water rest level for any reason, the Engineer may instruct the Contractor to re-drill the hole at his own cost.

To record the depth of the water rest level, the borehole is, where feasible, to be pumped or bailed dry, covered against ingress of rain or surface water and left for 24 hours. The water level is to be measured at 24 hourly intervals. Once the water level has become steady over a 24-hour period, this level is to be recorded as the water rest level elevation. If inflow into the hole is such that it cannot practically be bailed or pumped out, the water level after 24 hours shall be taken as the water rest level.

The Engineer may, on completion of recording the water rest level elevation, order that a water sample be taken. The sample shall be 2 litres minimum and be placed in a clean, sealed, marked glass container that has been rinsed out with the water being sampled and be delivered to the Engineer's laboratory. To prevent exsolution of any dissolved gases, only sample containers filled to the brim shall be acceptable.

In any hole in which the water rest level is to be measured and in which there is a danger of collapse of the hole, nominal 19mm uPVC tubing shall be installed before removal of casing. Any couplings shall be glued and the lowermost 1 metre of the tubing shall be perforated and covered with a geotextile sock.

30.2 MEASUREMENT AND PAYMENT

The measurement of water rest levels shall be measured by number for each measurement to establish the water rest level.

Water samples shall be measured by number.

The supply and installation of uPVC tubing shall be measured per linear metre.

PAY ITEMS

30.	Water measurements	Unit
30.1	Recording water rest levels	number (no.)
30.2	Water samples	number (no.)
30.3	uPVC tubing	metre (m)

SECTION 31 CORE BOXES

31.1 DESCRIPTION

This section covers:

- (a) the quality of the storage boxes in which the cores are stored,
- (b) the marking of the boxes and
- (c) temporary storage of the core boxes.

31.2 CORE boxes

For the storage of all soil samples in plastic sleeves and for cores, suitable core boxes made of timber or other approved material shall be provided to comply with the following requirements:

- (i) They shall be able to accommodate the size of core specified in the Bill of Quantities and be 1.50m long (I.D)
- (ii) Longitudinal partitions to the full depth of the box shall be provided. In the case of N size core 4 partitions (i.e. to accommodate 7.5m of core) shall be provided. The partitions shall be fixed to the base and ends of the box
- (iii) The boxes shall not be more than 500mm wide
- (iv) A hinged lid (at least two 50mm hinges) of sufficient thickness to prevent warping shall be provided.
- (v) Two hasps and staples shall be provided on the long side of the box opposite the hinges.
- (vi) The boxes shall be acceptable to the Engineer and shall, except if the size of core drilled dictates otherwise, be of the same external dimensions.

Before drilling may commence, the Contractor shall:

- Firstly, supply a sample core box for the Engineer's approval. The accepted sample box shall be retained by the Engineer for the duration of the contract for reference purposes,
- Thereafter, ensure that there are always sufficient core boxes (meeting the approved standard) on site to accommodate core production

If, in the opinion of the Engineer, the core boxes are so dirty or poorly marked or if required to minimise weathering, wooden boxes shall be painted inside and out with at least 2 coats of a good quality white PVA (to ensure obliteration of all marks and dirt), to his satisfaction.

31.3 MARKING OF BOXES

The following information shall be indelibly marked on the inside and outside of the lid of the box. All information shall be neat and legible, failing which the Engineer may require the information to be stencilled. Freehand writing shall be allowed on the ends and long side of the box.

The following information shall be provided as a minimum:

	Information required	Example
(i)	Contract number	NRA 170105/4
(ii)	Route number and section	Road P73/1
(iii)	Section name	Modimolle - Putberg
(iv)	Structure name / number	Bridge 2475
(v)	Borehole number	Br 75/1
(vi)	Box number and sequence	Box 3 of 7

(vii)	Depth range	8.20 to 14.92 m
(viii)	Date of contract	October 1991

Plus any other information required by the Engineer, all as detailed in the Project Specifications.

The information given in (iv) to (vii) shall be marked on the long side of the box (i.e. where hasps and staples are), and (v) to (vi) on both ends of the box.

31.4 PACKING OF THE CORES

The core / samples shall be placed in core boxes in book order and shall be clearly and indelibly marked to define the beginning and end of each drill run and any other intermediate depths required by the Engineer.

Colour coded indicator blocks shall be used to demarcate cores lost or removed as follows:

- White painted run blocks, marked with the depth below ground or reference level shall be inserted in the core box at the appropriate point to mark the end of each drill run. These run blocks shall be mechanically fixed to the partitions to prevent any movement of the core or run blocks during handling and transport.
- Yellow painted spacer block approximating the length of the sampled core shall be substituted for all core which has been sampled and removed for testing purposes. The yellow block shall have the sample number and length of core removed neatly written on it.
- Blue spacer block shall be inserted for lengths of core lost, at the depth where core was lost, approximating the length of core lost and marked "core loss".

Only core or samples from one drill hole shall be placed in any particular core box. Friable material, material liable to disintegrate (slaking mudstone, etc) or soft or loose material, must, if necessary, be placed in a plastic sleeve, before being placed in the core box.

If the core placed in the boxes is liable to move it shall be securely chocked to prevent movement by means of spacer blocks to fill the gaps at the end of core partitions. If required in the Project Specifications, the Contractor shall lay the core on a bedding of bubble wrap folded into the individual core partitions and folded over on top of the core to protect it and prevent movement relative to the lid.

After all the necessary markings and information have been put on the cores and all cores are in the correct position, the core boxes shall be photographed according to the specifications set out in Section 33.

31.5 TEMPORARY STORAGE OF CORE BOXES

All core boxes shall be stored at the site of a borehole until such time as drilling of the hole is complete, whereafter they may be removed to storage at the Contractor's camp or any other site as approved and ordered by the Engineer. No core boxes may be removed from the site without the written instruction of the Engineer.

Core stored temporarily on the site shall at all times be protected against exposure to the elements or damage of any nature. They shall at all times be covered with a waterproof cover and shall be stored at least 200mm above ground level. Any core boxes that become unserviceable due to exposure to the weather shall be replaced by the Contractor

The Contractor shall remain responsible for the protection and safekeeping of the samples and core boxes until they have been photographed and delivered to the place of permanent storage, whereupon they become the responsibility of the Engineer.

31.6 MEASUREMENT AND PAYMENT

The measurement for the supply of core boxes will be the number of core boxes actually used for the storage of core or samples to the satisfaction of the Engineer. No separate measurement or payment will be made for the temporary storage of core.

PAY ITEMS

31.	Core boxes	Unit
31.1	Core boxes	number (no.)

SECTION 32 CORE SHEDS

32.1 DESCRIPTION

This section relates to the provision of core sheds for the permanent storage of core boxes.

32.2 CORE SHED

The size of the core shed and the number of core boxes to be accommodated shall be detailed in the Project Specifications and shall be built as early as possible during the contract (and the Contractor shall programme accordingly) to permit safe storage of the core.

The shed may be a standard, commercially available unit, but the following general requirements shall apply:

- The walls shall be at least 2.4m high
- The roof shall:
 - have a slope of at least 1:6
 - include clear panels for illumination (min. 5% of roof area)
 - have an overhang of at least 500mm all round
- The concrete floor shall slope for drainage
- The door shall be big enough to allow access for a loaded LDV
- It shall be weather and vandal proof
- The shed shall be positioned as agreed with the Engineer, taking into account aspects such as access, prevailing wind and rain directions and drainage.
- A 50mm brass padlock (insurance grade 3 or better) with 3 keys shall be provided.
- The hasp and padlock shall be protected against vandalism by a steel pipe welded to the door / frame, which allows access to the end of the padlock to unlock it.
- It shall be of such a size that the boxes may be stacked in such a way to permit access to individual boxes without having to unpack all the boxes.
- All boxes shall be raised at least 100mm above the floor.
- Where termites may occur, boxes shall be placed on core racks and the feet shall be inserted into oil-filled (minimum 100mm deep, SAE30) tins to prevent termites reaching the boxes. In addition, all boxes shall be treated with an approved insecticide and painted as detailed in Section 31.

The site of the shed(s) shall be detailed in the Project Specifications or timeously decided by the Engineer during the contract to permit the Contractor time to complete the shed(s) within the contract period, all as detailed in the Contractor's programme.

The Contractor shall provide detail of the core shed that he proposes to supply with his tender.

32.3 CORE RACKS

Core racks, if required in the Project Specifications, shall be provided in modules of nominal 2,1 x 1,2m size erected parallel to the long walls of the shed.

The rack module is to meet the following requirements:

- (i) an overall loading of 1600 kg per module;
- (ii) is entirely dismantlable;

32.4 ARRANGEMENT OF BOXES

Core boxes shall be packed into the core shed in a sequence to be agreed with the Engineer and in such a way to allow access in future to locate and remove particular core boxes. The boxes shall be arranged in such a way that core boxes from a single borehole shall be in

sequence and also be grouped relative to their origin. For example, all the core boxes from a single structure or cutting shall be grouped.

The Contractor shall provide a neat schematic inventory indicating the location of individual boxes within the shed. One copy of the schematic shall be given to the Engineer and a copy permanently fastened to the wall of the shed, in a prominent position, in a sealed, weatherproof plastic envelope(s), such that the schematic may be read through the plastic. The schematic shall be checked and certified by the Engineer.

32.5 NAME BOARD

If required in the Project Specifications, a name board shall be securely fastened above the core shed door, right under the overhang to protect it against the elements. The name board shall be 750 x 500 x 2mm, rust proofed, undercoated and painted white (enamel), mild steel (or similar, approved equivalent). Such names/lettering as detailed in the Project Specifications shall be neatly and indelibly stencilled on the board.

32.6 MEASUREMENT AND PAYMENT

Core sheds shall be measured by number erected to the satisfaction of the Engineer and shall include for all erection, transport, labour, tools and any incidentals necessary.

Core racks shall be measured by number for each module and shall include all costs for transport, erection, tools, planking and any incidentals necessary.

Name boards shall be measured by number and shall include for all materials, labour, mounting, painting, stencilling and any incidentals necessary.

PAY ITEMS

32.	Core sheds	Unit
32.1	Core shed	number (no.)
32.2	Core rack module	number (no.)
32.3	Name board	number (no.)

SECTION 33 CORE PHOTOGRAPHY

33.1 DESCRIPTION

This section relates to the taking, for record purposes, of photographs of all core, samples or any other items requiring to be photographed by the Engineer.

At least two weeks prior to commencing photography the Contractor shall supply, for the Engineer's approval, a sample photograph which will be used as a standard to judge the photographs supplied under the contract. The Engineer shall retain the accepted photograph as a reference until completion of the contract.

33.2 QUALITY OF PHOTOGRAPHS

The Contractor shall provide digital photographs in jpeg format with a resolution of at least 3.5 Mega pixels and a maximum file size of 700 Kbytes per photograph, in order to provide a realistic total file size..

The photographs shall comply with the following:

- (i) The digital photos shall be professionally printed on semi-gloss paper to a size of 150 x 100mm (nominal) (i.e. jumbo size) with 2 photos per A4 page. The file number shall be printed at the base of the photo as required in 32.4. Two hard copies of each page shall be provided and each bound into a separate albums.
- (ii) A standard colour chart shall be included in the photograph, an original copy of which shall be included with the photos for reference purposes.
- (iii) The box shall occupy between 85 and 95% of the long dimension of the photo.
- (iv) Plastic sleeves shall be cut or folded back so that the material therein is clearly visible. After photography, core or samples that were in plastic sleeves, shall be resheathed.
- (v) Core will normally not be wetted before photography.
- (vi) No shadows are permitted on the core.
- (vii) The box shall be parallel to all four sides of the photograph.
- (viii) All written data must be clearly legible.
- (ix) The photographs must be clear and in focus and shall not be over- or under-exposed.
- (x) The core box shall be orientated so that the core reads like a book in increasing depth from top left.

The core box shall be positioned relative to the photographer to ensure that the photograph is not oblique to the pole of the centre of the box.

Photographs shall preferably be taken in natural light, but not in direct sunlight. Where a flash is used, care shall be taken that this does not produce a bright stripe down the length of the core (most likely to occur when the core is wetted) or reflections from the data box. These may be avoided by using twin flashes angled towards the core box from either side of the camera position.

33.3 IDENTIFICATION DATA

This shall be provided by way of a photographic data title box, which will be as follows:

- (i) Have dimensions closely approximating the lid of the standard core box;
- (ii) Be painted in matt to minimise glare;
- (iii) Have a lettering / numbering set so that the identification data may be composed from pre-stencilled letters and numbers. These numbers and letters shall be not less than 40mm high, 6mm wide and on a matt background (as per ii above);
- (iv) Incorporate a standard colour reference chart, standard grey scale, standard neutral grey card and a 500mm long scale in 100mm divisions.

The following information shall be included on each photograph

- (i) That information given in Section 31.3 (i) to (viii)
- (ii) The Contractor's name
- (iii) The Consulting Engineer's name

33.4 PRESENTATION OF PHOTOGRAPHS

The contractor shall supply a CD containing the photographs in jpeg electronic format. The photograph file names on the CD shall be as follows:

Contract no_quarry or BP no_Borehole no_Box no_of_no boxes

Example For contract N.010-030-2003/1D-SS, Quarry 4, Borehole 4-3, Box 2 of 4 the file name would be:

N010_030_2003-1D-SS_Q4_BH4-3_Box_2_of_4

The photograph file names on the CD shall be the same as the borehole numbers allocated by the Engineer, and appearing in the photographs. Two colour hard copies of each photograph, as indicated in Section 33.2 above, shall be provided, together with the CD.

33.5 MEASUREMENT AND PAYMENT

The quantity to be measured shall be the number of photographs taken as ordered and approved by the Engineer. Each photograph shall consist of two prints as described in 33.2.

PAY ITEMS

33.	Core photography	Unit
33.1	Core photographs	number (no.)

SECTION 34 TRANSPORTATION

34.1 DESCRIPTION

This section relates to the transport of samples and core boxes to laboratories offices or places of permanent storage, as and when ordered by the Engineer. If the distance is less than 50 kilometres the Contractor is required to make provision for the transportation of samples and core boxes to laboratories, offices or places of permanent storage under Section 1, "Establishment of the Contractor on site".

Care shall be taken to ensure that all core boxes and samples shall be delivered in the same condition in which they left the site. A delivery note listing all core boxes or samples shall accompany each delivery and shall be certified by the Engineer.

Should the Engineer require regular deliveries of samples or core boxes, the frequency thereof shall be stated in the Project Specifications. In the absence of such a statement the Contractor shall be entitled to assume that all samples and core boxes shall be delivered to permanent storage after completion of the investigations and may be carried out in the minimum number of trips.

34.2 MEASUREMENT AND PAYMENT

The quantity to be paid for shall be the distance in kilometres (when this exceeds 50km), measured in one direction only, from the centre of the site to the laboratory, offices or permanent place of storage or as indicated in the Project Specifications over which the sample or core boxes have to be transported.

Distinction shall be made between transport equipment of capacities less than 1.5 ton and greater than 1.5 ton.

PAY ITEMS

34.	Transportation of samples and core boxes	Unit
34.1	Vehicle of less than 1.5 ton	kilometre (km)
34.2	Vehicle of greater than 1.5 ton	kilometre (km)

SECTION 35 MARKING OF HOLES

35.1 DESCRIPTION

This section relates to the marking of holes, as indicated on the drawings or as ordered by the Engineer.

Unless the Engineer orders to the contrary, all holes shall be marked after completion of the hole by one of the two methods (as shown in Figure 35.1) detailed below:

- (i) Standpipe and cap, alternatively plastic or steel cover

Where it is required, on the order of the Engineer, that access to a hole be maintained a standpipe with lockable cap shall be installed.

If there is a risk of vandalism, the standpipe and cap as shown in Figure 34.1 may be replaced with a lockable plastic water meter-box cover. This shall be a Kent Standard Plastic Meterbox (nominal 310L x 165H x 200mm W – or equivalent, approved similar) cast centrally into the concrete block so that the top of the box is flush with the top of the concrete. See Figure 35.2.

If boreholes are located where pedestrian or vehicular traffic is present, a steel cover box (Besaans VP meter box or equivalent approved similar) shall be provided, as detailed on Figure 35.2.

- (ii) Concrete block only

All holes not marked as (i) above shall be marked by means of a concrete block.

The number of the borehole shall be marked by punching it in figures not less than 10mm high onto an R12 marker rod, before being cast into the concrete. This shall be bent into a cranked shape (see Figure 35.1). The marker rod shall be worked into the concrete such that the top of the rod is level with the top of the block. Any concrete or laitance obscuring the number shall be cleaned off before the concrete sets. The scratching of numbers into wet concrete is not acceptable.

Large diameter auger holes shall be marked by means of a concrete block as per (ii) above. The block shall be offset 1m from the edge of the auger hole.

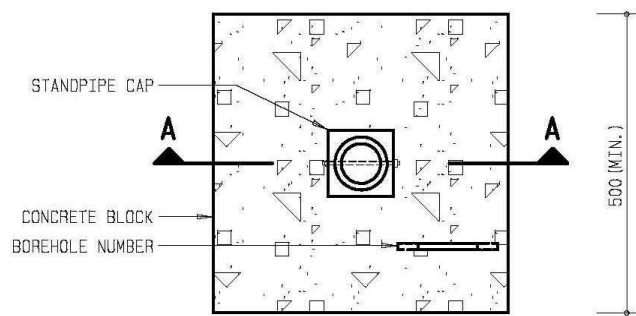
The concrete block shall be nominal 1:3:6 concrete. Blocks shall be cast 200mm into, and not on top of the ground. A block made of sand/cement is not acceptable.

35.2 MEASUREMENT AND PAYMENT

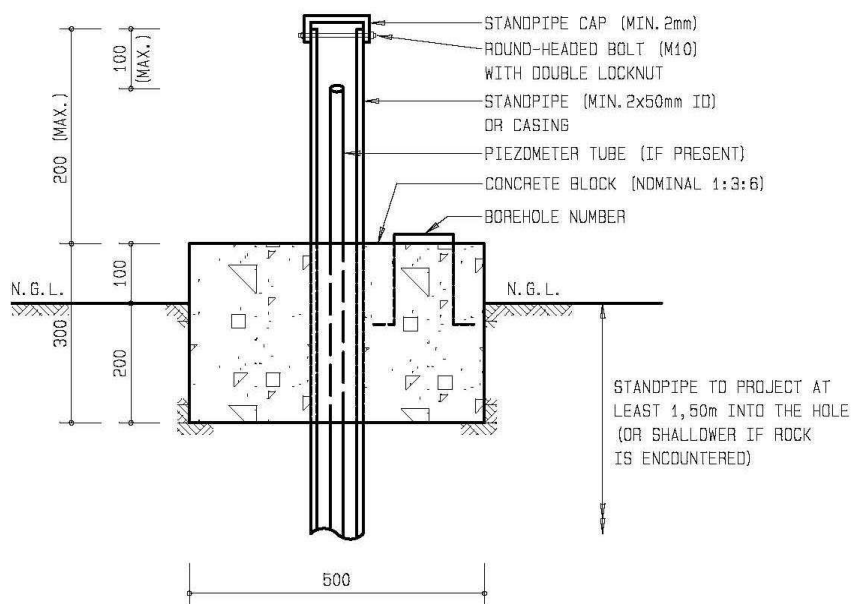
The quantity to be paid for shall be the number of holes actually marked to the satisfaction of the Engineer.

PAY ITEMS

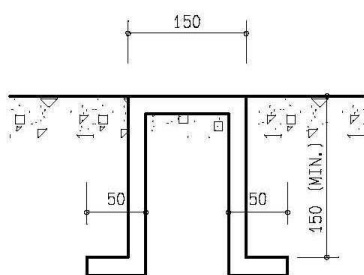
35.	Marking of holes	Unit
35.1	Standpipe and cap	number (no.)
35.2	Concrete block only	number (no.)
35.3	Plastic water meter box cover	number (no.)



PLAN VIEW



SECTION A-A



DETAIL OF R12 MARKER ROD

NOTES:

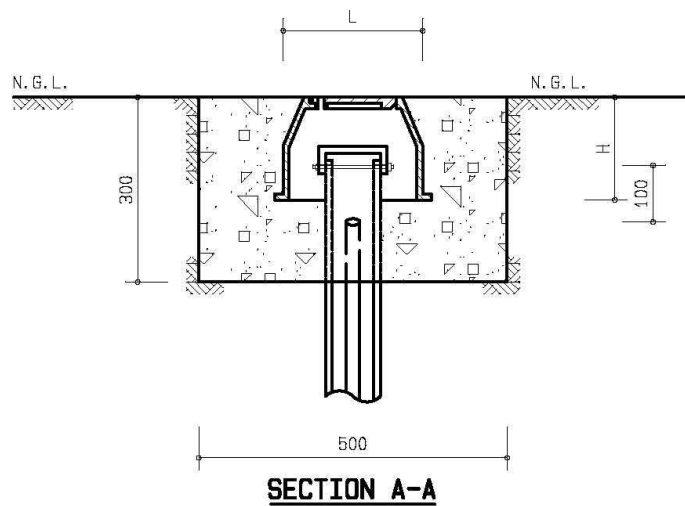
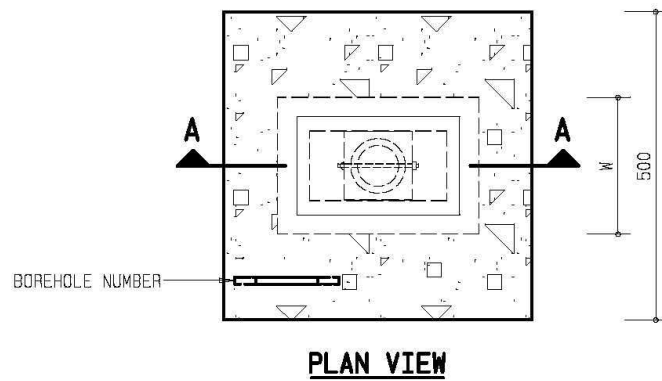
1. STANDPIPE OMITTED WHEN BLOCK ONLY REQUIRED.
2. BOREHOLE NUMBER (10mm LETTERS) PUNCHED ON FLAT GROUND ONTO CRANKED R12 STEEL MARKER ROD.
3. TOP OF MARKER ROD TO BE FLUSH WITH TOP OF BLOCK. CLEAN OFF ALL CONCRETE/LAINTANCE TO ENSURE NUMBER LEGIBLE.

**STANDARD
SPECIFICATION
2010**

MARKING OF HOLES

FIGURE 35-1

MARKING OF HOLES.DRW



NOTES:

1. WHERE VEHICULAR OR PEDESTRIAN TRAFFIC, USE BESAANS VP CODE 2604 METER BOX* (325 L, 170 H, 220 W).
2. WHERE RISK OF VANDALISM, USE KENT STANDARD PLASTIC METER BOX* (310 L, 165 H, 200 W).
3. IN ALL OTHER RESPECTS BLOCK, STANDPIPE, ETC IDENTICAL TO FIGURE 35.1.

* OR SIMILAR APPROVED EQUIVALENT

**STANDARD
SPECIFICATION
2010**

DETAIL OF COVER BOX

FIGURE 35-2

DETAIL OF COVER BOX.DRW

SECTION 36 MACHINE AND HAND TRENCHING

36.1 TRENCHING

Trenching is the formation of trial pits, which are generally long in relation to their width, and are used to expose sections of soil and rock strata for visual examination and possible bulk sampling. Prior to any trenching, the natural vegetation (generally grass) shall be carefully removed (as sods) and placed aside for later replacement. Topsoil shall be stockpiled separate from subsoil. On completion of the trenching, the backfill shall be neatly levelled off (with the topsoil replaced at surface) and the vegetation sods neatly replaced and bedded down over the backfilled area in such a way as to promote their re-growth. Any excess material from the backfilling shall be spread thinly over the surrounding area in such a way as not to prevent the existing vegetation from growing up through it.

Trenching may be carried out by machine (as detailed in the Project Specifications), by hand (excluding the use of pneumatic tools), or a combination of the two. The minimum width of trench, which is acceptable, shall be 0.5m. The specified machine shall be provided on a daily hire basis (inclusive of fuel and operator) and shall be supplied to the Engineer, who will direct operations, including trenching positions, depths, sampling positions and the preparation of soil profiles. The machine shall be available on site for 10 hours on each day that it is required. Should the machine break down for more than an hour in any one day, payment for that day shall be reduced proportionately relative to the time when the machine was operative, with the provision that should it be inoperative for more than 4 hours in any one day, it will not be measured at all for that day.

The cost of repair of any services damaged during trenching carried out under the direction of the Engineer shall be to the cost of the Employer.

At all times strict safety precautions must be observed. No person shall be allowed to excavate by hand or enter into a trench in excess of 1.5m depth unless the sides have been adequately shored to the satisfaction of the Engineer. Hard hats must be worn at all times by labourers during excavation and any personnel who enter such trenches. The safety precautions as given in "A code of practice on the safety of persons working in small diameter shafts and test pits for civil engineering purposes, 2007" as published by SAIEG, SAICE Geotechnical Division and AEG are applicable to this work.

Such sampling as may be required by the Engineer shall be carried out in accordance with Section 16.

After inspection by the Engineer, the trench must immediately be backfilled to the satisfaction of the Engineer. All material excavated from the trench shall be heaped above the hole and if the backfill settles more than 300mm below the surrounding ground level, the Contractor shall provide and compact such additional material to fill up to ground level. For the purpose of this section, any settlement which occurs within one month of completion of the hole, or the completion of the works (whichever is the longer) shall be the Contractor's responsibility.

If the Engineer instructs any trench to remain open, a suitable fence comprising at least 4 strands of suitably spaced wire wrapped with plastic danger tape, strained between approved Y-section metal standards or 75mm diameter creosoted wooden poles spaced not more than 2m apart, to the satisfaction of the Engineer, shall be erected by the Contractor so that the trench area is fully demarcated and enclosed. If the open trench is near roadways, or habitation, battery powered warning lights must be provided overnight until such time as the hole has been backfilled to the satisfaction of the Engineer as above.

The fence shall be erected sufficiently far, as agreed to by the Engineer, from the edges of the trench to ensure that it continues to function even if the sides of the trench collapse.

The Engineer may instruct that trenching be carried out at the position of a drill or auger hole to determine the presence of services.

36.2 MEASUREMENT AND PAYMENT

Hand excavation shall be measured and paid for on an hourly rate per labourer employed on this work. Differentiation shall be made for hand excavated trenches not deeper than 1.5m and trenches deeper than 1.5m, the latter to include for the cost of shoring.

Machine excavation shall be measured on a daily (10 hour) basis during which the machine is on site on the instructions of the Engineer, in working order and shall include the cost of provision, fuel, operator, supervision by the Contractor and all other incidental costs. Should the machine break down for more than an hour in any one day, payment for that day shall be reduced proportionately relative to the time when the machine was operative, with the provision that should it be inoperative for more than 4 hours in any one day, it shall not be measured at all for that day.

Protective fencing shall be measured by the linear metre installed.

Backfilling of holes will not be paid for separately, except where holes are ordered to be left open and backfilled after the trenching phase of the investigation has been completed. In this event the number of holes backfilled shall be measured.

PAY ITEMS

36.	Machine and hand trenching	Unit
36.1	Hand excavation	
36.1.1	Up to 1.5m depth	hour (h)
36.1.2	In excess of 1.5m depth	hour (h)
36.2	Machine excavation (by type)	
36.2.1	Tractor-loader-backhoe (TLB) (specify size)	day (d)
36.2.2	Excavator (specify size)	day (d)
36.3	Safety fencing	metre (m)
36.4	Backfilling of holes (only as ordered by Engineer)	number (no.)

NOTE:

Establishment shall be measured and paid for under **Section 3**. Details of the machine to be provided (kW rating, bucket size, depth capacity, etc) shall be specified in the Project Specifications.

SECTION 37 STANDING TIME

37.1 DESCRIPTION

Should the Contractor at any time during the contract period be required to discontinue the Works on the site as a result of a written order from the Engineer, or because the Contractor is awaiting instructions, approval or decisions of the Engineer, with the result that the Contractor's workers and equipment cannot otherwise be gainfully employed, he shall be entitled to compensation for such time loss during normal working hours. Standing time shall only be applicable in respect of major units of equipment such as drilling rigs, auger rigs, bulldozers, TLBs and excavators.

It is stressed however, that standing time during normal working hours and on Working Days is only applicable should the work be stopped by order of the Engineer, or where decisions are being awaited from the Engineer. It shall be expected of the Contractor to notify the Engineer in writing one full day ahead that he will require instructions, approval or other decisions at a certain time. Without such prior written notice, no standing time compensation shall be considered.

Standing time does NOT include time when drilling is discontinued for the purposes of taking directional, angular or any other readings, or activity in connection with the work and the Contractor himself carries out these operations. Where a third party, over whose operations the Contractor has no control, carries out the tests or surveys, standing time shall apply. The Contractor shall however programme and co-ordinate his operations and those of the third party in such a way to minimise the likelihood of standing time.

37.2 WORKING HOURS

For the purpose of calculating standing time, "normal working hours" shall be taken from 07:00 to 17:00 on Mondays to Fridays and 07:00 to 13:00 on Saturdays (statutory holidays excluded), which defines a Working Day. If the Contractor should find it necessary to extend normal working hours by working longer hours and/or by working during weekends and holidays, he shall acquire the Engineer's approval at least 3 Working Days prior to such extension of working hours, and shall furnish reasons for his request. In this regard attention is drawn to the Conditions of Contract for this contract.

Such approval shall only be given on a week-to-week basis and can be withdrawn by the Engineer at any time. Without the Engineer's prior written approval, no standing time shall be paid outside of normal working hours.

37.3 MEASUREMENT AND PAYMENT

Standing time shall only be measured for payment for periods in excess of one hour. The actual measurement will be made for the full period during which standing time was agreed for any specific unit of plant measured to the nearest 0.25 hour.

PAY ITEMS

37.	Standing time	Unit
37.1	Standing time (Specify different plant)	hour (h)

SECTION 38 LOGGING AND PROFILING

38.1 DESCRIPTION

This section relates to the logging of borehole cores, percussion samples and the profiling of large diameter auger holes, trenches or test pits by a competent specialist approved of or selected by the Engineer and approved of by the Employer.

In the event that the Engineer requires the boreholes to be logged and profiles recorded under the Contract, the specialist shall be an Engineering Geologist who is Member of the South African Institute of Engineering Geologists (SAIEG), or under the direct supervision of such a Member. An experienced Geotechnical Engineer (registered with ECSA and a Member of the Geotechnical Division of SAICE) may also undertake this work, but only if timeous approval has been obtained from the Employer.

The work shall be carried out in accordance with "Guidelines for soil and rock logging in South Africa", editors ABA Brink and RMH Bruin. Proceedings of the Geoterminology Workshop 1990. Produced by SAIEG, SAICE Geotechnical Division and AEG. Second Impression, 2002

The Contractor shall furnish assistance in respect of labour, equipment or the supply of information and results as may be requested by the specialist to enable him to carry out his tasks. These operations shall be measured and paid for under the relevant sections of these specifications. The Contractor shall provide a site for the logging which is under cover and where the core boxes can be placed on drums or similar to raise them to about waist height.

Standing time shall be applicable if the actions of the specialist result in on-site delays to the Contractor. The logs and profiles supplied by the specialist shall be neatly typed on standard forms (see examples in Figure 38.1 to 38.3).

38.2 MEASUREMENT AND PAYMENT

The services of the specialist shall be paid for as a provisional sum. Reimbursement of the cost will be made only after provision of acceptable proof to the Engineer of payment by the Contractor to the supplier.

PAY ITEMS

38.	Logging and profiling	Unit
38.1	Services of specialist	provisional sum (P sum)
38.2	Mark up for handling and profit	percent (%)

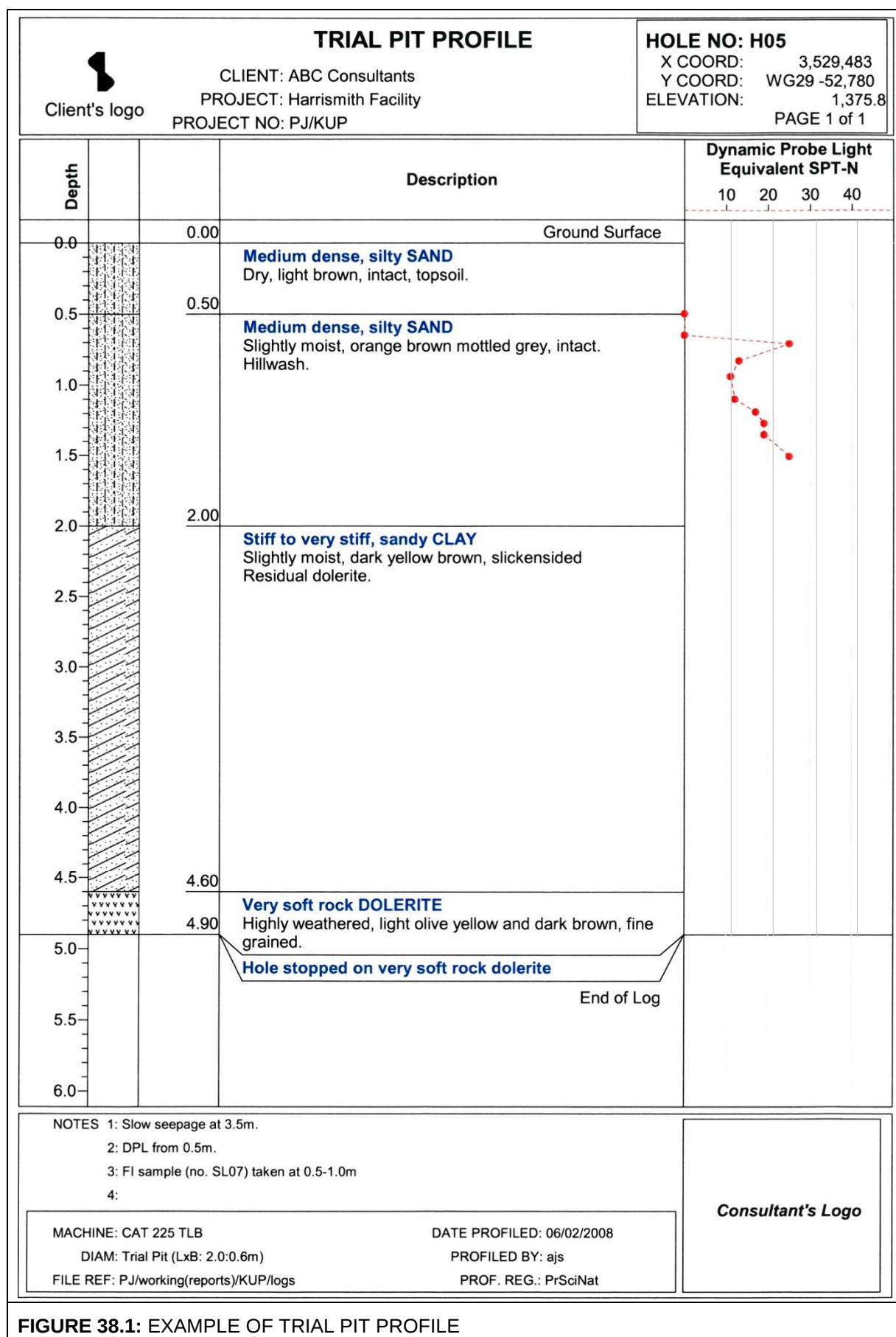


FIGURE 38.1: EXAMPLE OF TRIAL PIT PROFILE



CORE BOREHOLE LOG

CLIENT: SANRAL
PROJECT: George Bridges/N2
SITE: Pacaltsdorp
CONTRACT NO.: NRA N02-019-2009/1

HOLE NO: BH-P1

X COORD: 3,763,591
Y COORD: WG23 51,249
ELEVATION: 201.15
PAGE 1 of 1

Core size	% Mat. recov.	% Core recov.	RQD %	No. of fract.	SPT - N value	Water	Sample	Legend	Depth (m)	Description
									0.00	Ground Surface
NXC	57	0	na	na					0.60	Clayey SAND Dark brown, with scattered, sub-rounded, granite gravel (max 10, ave 5). Topsoil
NXC	100	0	na	na					1	Medium dense, clayey SAND Light orange brown, mottled dark red and light grey, contains fine gravel and rotten plant material. Residual granite/Fill?
NXC	100	0	na	na					2	
Nwd4	77	0	na	na					3	
S	P	T			24				3.80	
Nwd4	100	0	na	na					4	Dense, clayey GRAVEL Abundant angular gravel in orange brown, sandy clay. Residual granite.
S	P	T			33				4.54	
Nwd4	91	0	na	na					5	Dense, gravelly SAND Abundant angular gravel (max 5, ave 4), speckled in light grey, clayey sand. Completely weathered granite.
Nwd4	80	0	na	na					6.07	
Nwd4	50	0	na	na					6	Very soft rock, biotite GRANITE Highly weathered, light orange to grey, speckled black, friable (partly recovered as a sandy gravel), coarse grained. Cape Granite Suite (George Pluton).
S	P	T			Ref				7	
Nwd4	100	0	na	na					8	
S	P	T			87				9	
Nwd4	100	0	na	na					10	
S	P	T			Ref				10.65	Hole stopped after 3 SPT refusals, very soft rock End of Log
Nwd4	66	14	0	4					11	
S	P	T			Ref					

NOTES 1: Casing: 0 - 7.5m
2: Samples: FI at 2.8m and PLT at 10m
3: Water rest level: (6.9m 09/04) (3.6m 10/4) 3.8m 11/04/2009
4:

CONTRACTOR: AN-OTH DRILLING
MACHINE: YWE D6
INCLINATION: Vertical
FILE REF: P:CO9/N2/logs

DRILLING DATE: 08/04/2009
DATE LOGGED: 15/04/2008
LOGGED BY: eop
PROF. REG.: Pr.Eng.

Consultant's Logo

template: COTO BH log

FIGURE 38.2: EXAMPLE OF CORE BOREHOLE LOG

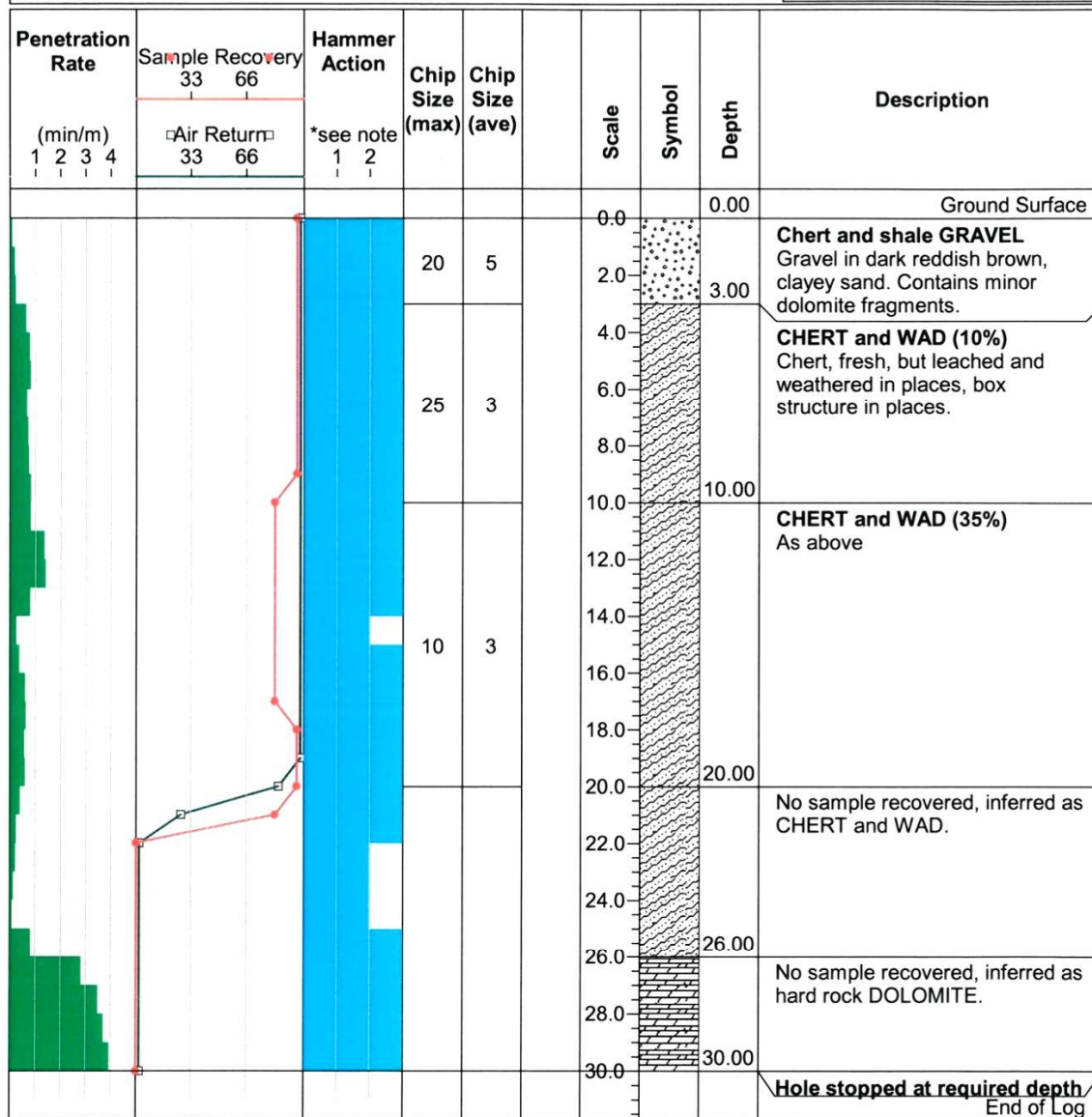


PERCUSSION BOREHOLE LOG

CLIENT: SANRAL
PROJECT: R21 upgrade: Bridge 2740: Sesmyl Spruit
PROJECT NO: PN093/K1P

HOLE NO: P40/1

X COORD: 2,863,510
Y COORD: WG29 074,682
ELEVATION: 1451.56
PAGE 1 of 1



NOTES 1: Hammer Action: 0 = none, 1=v.irregular, 2=irregular, 3=regular
2: No sample recovery 21 to 30m; total air loss below 22m.
3: Hole backfilled (soil/cement) and plugged.
4: Water applied regularly from 9 to 30m; collapsing 12 to 14m.
5: Original water level: 9.0m
6: Casing installed: 28.3m

CONTRACTOR: DI Drilling
INCLINATION: Vertical
DIAM/COMP: 165mm/180kPa
MACHINE: Rock 240
HAMMER TYPE: DTH button

DATE DRILLED: 15 Feb 2008
DATE LOGGED: 3 March 2008
LOGGED BY: ajs
PROF. REG.: PrSciNat.

Consultant's logo

FILE REF: P: PN093/working/geotech drilling

FIGURE 38.3: EXAMPLE OF PERCUSSION BOREHOLE LOG

SECTION 39 PREPARATION OF RECORDS

39.1 DESCRIPTION

This section relates to the preparation and submission of records of work during the investigation. Records shall be kept on forms approved by the Engineer.

39.2 DAILY JOURNALS

The Contractor shall prepare individual Daily Journals for each drill rig or major equipment unit (see example of Daily Drilling Journal as Figure 39.1) and these shall be submitted to, and agreed with the Engineer within 24 hours of the completion of each day's operations. A typical Percussion Drilling Journal is shown in Figure 8.1. The record shall contain the following information, where relevant:

- (a) Contract name, location and stake value
- (b) Contractor's and driller's names
- (c) Weather conditions
- (d) Exploratory hole/pit/test position number
- (e) Date of boring, pitting and testing referred to and the depth at the end of each working day or shift
- (f) Plant in use and rig number
- (g) Diameters, depths and types of all casings used
- (h) Approximate depth of each change of stratum
- (i) Brief description of each stratum
- (j) Records of all water levels encountered with full details of any fluctuations. (includes standing water levels in the drill holes before drilling commences each morning and at the end of the day)
- (k) Orientation of the drill hole, given as its azimuth and inclination below horizontal (eg. 312°/68°)
- (l) Method of penetration and flushing system
- (m) Type of core barrel and bit used
- (n) Depth of start and finish of each core run
- (o) Condition of out coming flush water, water return and loss, and the nature of the cuttings, drilling aid used
- (p) Total core recovery with information as to possible location of core losses
- (q) details of backfilling and grouting
- (r) Records of any tests, their depths of execution and results
- (s) Records of any samples taken
- (t) Records of any downtime, delays, etc

The report shall also include a brief description of any difficulties encountered during operations and any relevant information in respect of the character of the sub-surface conditions, such as cavities, obstacles, use of special type samplers or traps, etc.

The Daily Journals shall be required for every Working Day that a drill rig or major equipment unit is on site, whether or not it is operative. These Daily Journals shall be accepted as a substantial record of the operations on site and it is in the Contractor's interest to ensure that these are as detailed as possible. Claims for extension of time (and any other claims) that the Contractor may have, will be based on these records. Should the Contractor not supply Daily Journals within the stipulated time period, the Engineer shall have the right to instruct the Contractor to stop work with the particular unit of equipment until such time as all the outstanding Daily Journals have been supplied to him. Additionally, the Engineer has the right to reject any claim from the Contractor which cannot be substantiated by Daily Journals in the Engineer's possession.

39.3 PRACTICAL COMPLETION RECORDS

In order that a certificate of practical completion of the work, as per the Conditions of Contract, may be issued to define the actual Time of Completion of the field operations, the following records shall be provided:

- (i) Daily Journals;
- (ii) Borehole water rest levels;
- (iii) List of undisturbed samples handed to the Engineer;
- (iv) Any notifications of intention to claim;
- (v) List of all boreholes marked;
- (vi) Clearance certificates from landowners (see Figure 1.1);
- (vii) The results of any field testing carried out (except that carried out by specialist subcontractors);
- (viii) Written approval from the Engineer allowing removal from site of the Contractor's plant and equipment;
- (ix) Any other items as may be specified in the Project Specifications or timeously requested in writing by the Engineer.

39.4 RECORDS FOR FINAL PAYMENT CERTIFICATE

In addition to the above records, the Contractor shall supply the following before issue of the final payment certificate:

- (i) Core photographs;
- (ii) Final and agreed quantities;
- (iii) Proof of payment to all suppliers of prime cost and provisional sum items;
- (iv) Final logs and profiles required under Section 38;
- (v) List of all core boxes delivered to permanent storage;
- (vi) The results of any testing, survey, etc. performed by specialist subcontractors ;
- (vii) Proof that any matters requiring attention under Section 40: Occupational Health and Safety and Section 41: Environmental Management have been satisfactorily attended to.
- (viii) Any other matters as specified in the Project Specifications or timeously requested in writing by the Engineer.

39.5 MEASUREMENT AND PAYMENT

No payment shall be made for the preparation and submission of records and any costs shall be deemed to be included in the relevant rates tendered for the Works.

EXAMPLE OF DAILY DRILLING JOURNAL

Contractor: BEST GEOTECH DRILLERS Pty Ltd				Page 1.. of 1...		Borehole No.		Br15/3	
Client: XYZ		Rig, no. & model: Seco B12				Drilling			
Project: N4/8 NELSPRUIT BYPASS Gateway - Karino		Driller: M A Buick				Type	From	To	Total
Contract no: NRA017020982		Supervisor: D Ford				Auger	0	3.00	3.00
Site: Bridge 15		Start/End Date	04/03/2007	07/03/2007	NWD4	3.00	9.96	6.96	
Water Rest Level:		S.P.T. (no): 2				TNW	9.96	12.65	2.69
Inclination (° below horizontal): 30°		Block only:		SP + block: 1		Casing	0	3.25	3.25
Direction/Azimuth: 150°		UDS (no): 1		Piezo		0	12.50	12.50	
Set-up: Skid 150m		Core Boxes: 2		Final depth: 12.65m		Grout	0		

Date (dd/mm) start/end	Drilling Type	Depth Drilled		Run Adv (m)	Core Recovered		Strata Description and comments	Drill category (A,B etc).	Drill water		Test Depth (m)	S.P.T. blows/ 75mm
		From (m)	To (m)		m	%			Colour	%		
4 Mar	A	0	1.50	1.50					na			
(07:15)	SPT	1.50	1.95								1.50	2/3/2/3/2/4
	UDS	1.95	2.50								1.95	Shelby
	A	2.50	3.00	1.50			Water added		na			
	SPT	3.00	3.20						na	3.00	10/20/25	
	NWD4	3.00	4.50	1.50	Wash	0			Brown	100		
		4.50	5.96	1.46	1.30	89			Red	100		
(16:50)		5.96	7.36	1.40	1.10	79			Grey	75		
							DWLpm = 3.30m					
5 Mar							DWLam = 8.50m					
(07:00)	TNW	9.96	11.46	1.50	1.50	100	DWLpm = 4.40m		White	100		
(09:00)							Gearbox broke 09:00 #					
6 Mar							Standing, no water truck #					
7 Mar	TNW	11.46	12.65	1.19	1.10	92	DWLam = dry		White	50		
(07:00)												
							DWLpm = 4.10m					
Hole stopped on instruction of Engineer at 10:00, moved to hole Br15/5.												
							0 – 3.00 Red brown clay	Aug				
							3.00 – 5.96 Weathered dolerite	B				
Shelby sample delivered to RE. Standpipe piezometer installed in hole.												
							9.96 – 12.65m Hard dolerite	C				

Remarks: Drill water level to be measured mornings before drilling & evenings at end of day.

DWLam = am Drill Water Level DWLpm = pm Drill Water Level

rig not working, do not measure under Section 3

Figure 39.1: Example of Daily Drilling Journal (DDJ)

SECTION 40 OCCUPATIONAL HEALTH AND SAFETY

40.1 DESCRIPTION

This section covers the development of an Occupational Health and Safety plan that addresses all aspects of occupational health and safety in order to comply with the Occupational Health and Safety (OHS) Act, No. 85 of 1993, and Construction Regulations (2003), which the Contractor shall comply with in order to reduce the risks associated with the contract that may lead to incidents causing injury and/or ill health.

A Contractor shall, as a minimum, comply with:

- The OHS Act and Regulations (Act 85 of 1993), and Construction Regulations, plus any amendments. An up-to-date copy of which shall be available on site at all times.
- The Compensation for Occupational Injuries and Diseases (COID) Act (Act 130 of 1993), plus any amendments. An up-to-date copy of which shall be available on site at all times.
- Where work is being carried out on a “mine”, the Contractor shall comply with the Mines Health and Safety Act and Regulations (Act 29 of 1960), plus any amendments, and any other OH&S requirements that the mine may specify. An up-to-date copy of the Mines Health and Safety Act and Regulations shall be available on site at all times.

Compliance with this section does not absolve the Contractor from complying with minimum legal requirements and the Contractor remains responsible for the health and safety of his Employees and those of his mandataries.

40.2 HAZARD IDENTIFICATION AND RISK ASSESSMENT (Construction Regulation 7)

40.2.1 Risk Assessments

The Standard Specifications contain a generic list of project risks that have been identified as possibly applicable to the contract. It is, by no means, exhaustive and is offered as assistance to Contractors intending to tender.

40.2.2 Development of Risk Assessments

The Contractor shall, before the commencement of any construction work, perform a risk assessment by a competent person, appointed in writing, and the risk assessment shall form part of the OHS plan and be implemented and maintained as contemplated in Construction Regulation 5(1).

The risk assessment shall include, at least:

- the identification of the risks and hazards to which persons may be exposed
- the analysis and evaluation of the risks and hazards identified
- a documented plan of safe work procedures to mitigate, reduce or control the risks and hazards that have been identified
- a monitoring plan and
- a review plan

Based on the risk assessment, the Contractor shall develop a set of site-specific OHS rules that shall be applied to regulate the OHS aspects of the construction. The risk assessment, together with the site-specific OHS rules shall be submitted to the Employer before construction on site commences. Despite the risk assessments listed in paragraph 39.4, the Contractor shall conduct a baseline risk assessment and the aforesaid listed risk assessment shall be incorporated into the baseline risk assessment. The baseline risk assessment shall further include the standard working procedures and the applicable method statements based on the risk assessments

All variations to the scope of work shall similarly be subjected to a risk assessment process.

40.2.3 Review of Risk Assessment

The Contractor shall review the hazard identification, risk assessments and standard working procedures at each planning and progress report meeting as the contract work develops and progresses and each time changes are made to the designs, plans and construction methods and processes. The Contractor shall provide the Employer, Sub-contractors and all other concerned parties with copies of any changes, alterations or amendments as contemplated herein.

40.3 STRUCTURE AND RESPONSIBILITIES

40.3.1 Overall Supervision and Responsibility for OH&S

It is a requirement that the Contractor, when he appoints contractors (Sub-contractors) in terms of Construction Regulations 5(3), 5(5), 5(9), 5(10) and 5(12) includes in his agreement with such contractors the following:

- OHS Act (85 of 1993), Section 37(2) agreement: "Agreement with Mandatory"
- OHS Act (85 of 1993), Section 16(2) appointee/s as detailed in his/her/their respective appointment forms.

40.3.2 Further (Specific) Supervision Responsibilities for OHS

The Contractor shall appoint designated competent employees and/or other competent persons as required by the Act and Regulations. Below is a generic list of identified appointments and may be used to select the appropriate appointments for this contract. The Contractor shall note that it is a generic list only and is intended for use as a guideline.

Construction Vehicles/Mobile Plant/Machinery Supervisor	Ref. Section/Regulation in OHS Act Construction Regulation 21
Demolition Supervisor	Construction Regulation 12
Drivers/Operators of Construction Vehicles/Plant	Construction Regulation 21
Electrical Installation and Appliances Inspector	Construction Regulation 22
Emergency/Security/Fire Coordinator	Construction Regulation 27
Excavation Supervisor	Construction Regulation 11
Explosive Powered Tool Supervisor	Construction Regulation 19
Fall Protection Supervisor	Construction Regulation 8
First Aider	General Safety Regulation 3
Fire Equipment Inspector	Construction Regulation 27
Formwork & Support Work Supervisor	Construction Regulation 10
Hazardous Chemical Substances Supervisor	HCS Regulations
Incident Investigator	General Admin Regulation 29
Ladder Inspector	General Safety Regulation 13A
Lifting Equipment Inspector	Construction Regulation 20
Materials Hoist Inspector	Construction Regulation 17
OHS Committee	OHS Act Section 19
OHS Officer	Construction Regulation 6(6)
OHS Representatives	OHS Act Section 17
Person Responsible for Machinery	General Machinery Regulation 2
Scaffolding Supervisor	Construction Regulation 14
Stacking & Storage Supervisor	Construction Regulation 26
Structures Supervisor	Construction Regulation 9
Suspended Platform Supervisor	Construction Regulation 15
Tunnelling Supervisor	Construction Regulation 13
Vessels under Pressure Supervisor	Vessels under Pressure Regulations
Working on/next to Water Supervisor	Construction Regulation 24
Welding Supervisor	General Safety Regulation 9

In the event that the investigation takes place on, or next to a public road, the Employer may require that a Traffic Safety Officer be appointed. The above appointments shall be in writing and the responsibilities clearly stated together with the period for which the

appointment is made. This information shall be communicated and agreed with the appointees. Notice of appointments shall be submitted to the Employer. All changes shall also be communicated to the Employer.

The Contractor shall, furthermore, provide the Employer with an organogram of all contractors that he/she has appointed or intends to appoint and keep this list updated and prominently displayed on site. Where necessary, or when instructed by an inspector of the Department of Labour, the Contractor shall appoint a competent construction safety officer.

40.3.3 Designation of OHS Representatives (Section 17 of the OHS Act)

Where the Contractor employs more than 20 persons (including the employees of other contractors (sub-contractors) he has to appoint one OHS representatives for every 50 employees or part thereof. General Administrative Regulation 6 requires that the appointment or election and subsequent designation of the OHS representatives be conducted in consultation with employee representatives or employees. (Section 17 of the Act and General Administrative Regulation 6 & 7). OHS representatives shall be designated in writing and the designation shall include the area of responsibility of the person and term of the designation.

40.3.4 Duties and Functions of the OHS Representatives (Section 18 of the OHS Act)

The Contractor shall ensure that the designated OHS representatives conduct continuous monitoring and regular inspections of their respective areas of responsibility using a checklist and report thereon to the Contractor. OHS representatives shall be included in accident or incident investigations. OHS representatives shall attend all OHS committee meetings of which they are members, where such committee has been appointed.

40.3.5 Appointment of OHS Committee (Sections 19 and 20 of the OHS Act)

The Contractor shall establish an OHS committee where 2 or more representatives have been appointed for that workforce, they shall meet as specified in the Regulations.

40.4 ADMINISTRATIVE CONTROLS AND THE OCCUPATIONAL HEALTH & SAFETY FILE

40.4.1 The OHS File (Construction Regulation 5 (7))

As required by Construction Regulation 5(7), the Contractor and Sub- contractors shall each keep an OHS file on site. The following list is not exhaustive and shall only be used as a guide:

- Notification of construction work (Construction Regulation 3)
- Latest copy of OHS Act (General Administrative Regulation 4)
- Proof of registration and good standing with COID Insurer (Construction Regulation 4 (g))
- OHS plan agreed with the Employer including the underpinning risk assessment/s and method statements (Construction regulation 5 (1))
- Copies of OHS committee and other relevant minutes
- Designs/drawings (Construction Regulation 5 (8))
- A list of contractors (sub-contractors) including copies of the agreements between the parties and the type of work being done by each contractor (Construction Regulation 9)
- Appointment/designation forms as per paragraphs 2.1.1 and 2.1.2.
- Registers as follows:
 - o Accident/Incident register (Annexure 1 of the General Administrative Regulations)
 - o OHS representatives' inspection register
 - o Construction vehicles and mobile plant inspections by controller
 - o Daily inspection of vehicles, plant and other equipment by the operator/driver/user
 - o Demolition inspection register
 - o Designer's inspection of structures record
 - o Electrical installations, -equipment and -appliances (including portable electrical tools)
 - o Excavations inspection
 - o Explosive powered tool inspection, maintenance, issue and returns register (incl. cartridges and nails)

- o Fall protection inspection register
- o First aid box contents
- o Fire equipment inspection and maintenance
- o Formwork and support work inspections
- o Hazardous chemical substances record
- o Ladder inspections
- o Lifting equipment register
- o Materials hoist inspection register
- o Machinery safety inspection register (incl. machine guards, lock-outs etc.)
- o Scaffolding inspections
- o Stacking and storage inspection
- o Inspection of structures
- o Inspection of suspended platforms
- o Inspection of tunnelling operations
- o Inspection of vessels under pressure
- o Welding equipment inspections
- o Inspection of work conducted on or near water
- o All other applicable records including traffic safety officer reports.

The Employer will undertake audits on the OHS file of the Contractor from time-to-time.

40.5 TRAINING AND COMPETENCE

The contents of all training required by the Act and Regulations shall be included in the Contractor's OHS plan. The Contractor shall be responsible for ensuring that all relevant training is undertaken. Only accredited service providers shall be used for OHS training. The Contractor shall ensure that his and Sub-contractors' personnel appointed are competent and that all training required to do the work safely and without risk to health, has been completed before work commences. The Contractor shall ensure that follow-up and refresher training is conducted as the contract work progresses and the work situation changes. Records of all training must be kept on the OHS file for auditing purposes.

40.6 CONSULTATIONS, COMMUNICATION AND LIASON

OHS liaison between the Employer, the Contractor, the Sub-contractors, the designer and other concerned parties will be through the OHS committee as contemplated in paragraph 39.3.5. In addition to the above, communication may be directly to the Employer or his appointed agent, verbally or in writing, as and when the need arises.

Consultation with the workforce on OHS matters will be through their supervisors, OHS representatives and the OHS committee. The Contractor shall be responsible for the dissemination of all relevant OHS information to the Sub-contractors e.g. design changes agreed with the Employer and the designer, instructions by the Employer and/or his/her agent, exchange of information between contractors, the reporting of hazardous/dangerous conditions/situations etc. The Contractors' most senior manager on site shall be required to attend all OHS meetings.

40.7 CHECKING, REPORTING AND CORRECTIVE ACTIONS

40.7.1 Monthly Audit by Employer (Construction Regulation 4(1)(d))

The Employer will conduct monthly audits to comply with Construction Regulation 4(1)(d) to ensure that the Contractor has implemented and is maintaining the agreed and approved OHS plan.

40.7.2 Other Audits and Inspections by the Employer

The Employer reserves the right to conduct other ad hoc audits and inspections as deemed necessary. This will include site safety walks.

40.7.3 Contractor's Audits and Inspections

The Contractor is to conduct his own monthly internal audits to verify compliance with his own OHS management system as well as with this specification.

40.7.4 Inspections by OHS Representative's and other Appointees

OHS representatives shall conduct weekly inspections of their areas of responsibility and report thereon to their foreman or supervisor whilst other appointees shall conduct inspections and report thereon as specified in their appointments e.g. vehicle, plant and machinery drivers, operators and users must conduct daily inspections before start-up.

40.7.5 Recording and Review of Inspection Results

All the results of the abovementioned inspections shall be in writing, reviewed at OHS committee meetings, endorsed by the chairman of the meeting and placed on the OHS File.

40.8 ACCIDENTS AND INCIDENT INVESTIGATION (GENERAL ADMINISTRATIVE REGULATION 9)

The Contractor shall be responsible for the investigation of all accidents/incidents where employees and non-employees were injured to the extent that he/she/they had to be referred for medical treatment by a doctor, hospital or clinic. The results of the investigation shall be entered into an accident/incident register listed in paragraph 39.4.1.

The Contractor shall be responsible for the investigation of all minor and non-injury incidents as described in Section 24 (1) (b) & (c) of the Act and keeping a record of the results of such investigations including the steps taken to prevent similar accidents in future.

40.9 REPORTING

The Contractor shall provide the Employer with copies of all statutory reports required in terms of the Act within 7 days of the incident occurring.

40.10 OPERATIONAL CONTROL

40.10.1 Operational Procedures

Each construction activity shall be assessed by the Contractor so as to identify operational procedures that will mitigate against the occurrence of an incident during the execution of each activity. This specification requires the Contractor:

- to be conversant with Regulations 8 to 29 (inclusive)
- to comply with their provisions
- to include them in his OHS plan where relevant.

40.10.2 Emergency Procedures

Simultaneous with the identification of operational procedures (per paragraph 39.10.1 above), the Contractor shall similarly identify and formulate emergency procedures in the event an incident does occur. The emergency procedures thus identified shall also be included in the Contractor's OHS plan.

40.10.3 Personal & Other Protective Equipment (Sections 8/15/23 Of The OHS Act)

The Contractor shall identify the hazards in the workplace and deal with them. He must either remove them or, where impracticable, take steps to protect workers and make it possible for them to work safely and without risk to health under the hazardous conditions.

Personal protective equipment (PPE) should, however, be the last resort and there should always first be an attempt to apply engineering and other solutions to mitigating hazardous situations before the issuing of PPE is considered.

Where it is not possible to create an absolutely safe and healthy workplace the Contractor shall inform employees regarding this and issue, free of charge, suitable equipment to protect them from any hazards being present and that allows them to work safely and without risk to health in the hazardous environment.

It is a further requirement that the Contractor maintain the said equipment, that he instructs and trains the employees in the use of the equipment and ensures that the prescribed equipment is used by the Employee/s.

Employees do not have the right to refuse to use/wear the equipment prescribed by the Employer and, if it is impossible for an Employee to use or wear prescribed protective equipment through health or any other reason, the employee cannot be allowed to continue working under the hazardous condition/s for which the equipment was prescribed but an alternative solution has to be found that may include relocating or discharging the Employee.

The Contractor shall include in his OHS plan the PPE he intends issuing to his Employees for use during construction and the sanctions he intends to apply in cases of non conformance by his employees. Conformance to the wearing of PPE shall be discussed at the weekly inspection meetings.

40.10.4 Other Regulations

Wherever in the Construction Regulations or this specification there is reference to other regulations (e.g. Construction Regulation 22: Electrical Installations and Machinery on Construction Sites) the Contractor shall be conversant with and shall comply with these regulations.

40.10.5 Public Health & Safety (Section 9 of the OHS Act)

The Contractor shall be responsible for ensuring that non-employees affected by the construction work are made aware of the dangers likely to arise from said construction work as well as the precautionary measures to be observed to avoid or minimise those dangers. This includes:

- Non- employees entering the site for whatever reason
- The surrounding community
- Passers-by to the site

40.11 PROJECT/SITE SPECIFIC REQUIREMENTS

40.11.1 List Of Risk Assessments

- Clearing and Grubbing of the area/site
- Site establishment including:
 - o Office/s
 - o Secure/safe storage for materials, plant and equipment
 - o Ablutions
 - o Sheltered eating area
 - o Maintenance workshop
 - o Vehicle access to the site
- Dealing with existing structures
- Location of existing services

- Installation and maintenance of temporary construction electrical supply, lighting and equipment
- Adjacent land uses/surrounding property exposures
- Boundary and access control/public liability exposures (NB: the Employer is also responsible for the OHS of non-employees affected by his/her work activities.)
- Health risks arising from neighbouring as well as own activities and from the environment e.g. threats by dogs, bees, snakes, lightning etc.
- Exposure to noise
- Exposure to vibration
- Protection against dehydration and heat exhaustion
- Protection from wet and cold conditions
- Dealing with HIV/Aids and other diseases
- Use of portable & electrical equipment including:
 - o Angle grinder
 - o Electrical drilling machine
 - o power saws
 - o Electrical generators
 - o Bush cutters
 - o Chain saws
 - o welders
- Excavations including
 - o Ground/soil conditions
 - o Trenching
 - o Shoring
 - o Drainage of trench
 - o Augering
- Welding including
 - o Arc welding
 - o Gas welding
 - o Flame cutting
 - o Use of LP gas torches and appliances
- Loading and offloading of trucks
- Aggregate/sand and other materials delivery
- Manual and mechanical handling
- Lifting and lowering operations
- Driving and operation of construction vehicles and mobile plant including:
 - o Trenching machine
 - o Excavator
 - o Front end loader
 - o Mobile cranes and the ancillary lifting tackle
 - o Parking of vehicles and mobile plant and equipment
 - o Towing of vehicles and mobile plant and equipment
- Use and storage of flammable liquids and other hazardous substances
- Layering and bedding
- Backfilling of trenches
- Protection against flooding
- Use of explosives
- Protection from overhead power lines
- Any other as discovered by the Contractor's hazard identification exercise
- Any other as discovered from any inspections and audits conducted by the Employer or by the Contractor or any Sub- contractor on site
- As discovered from any accident/incident investigation.

40.12 MEASUREMENT AND PAYMENT

Payment for all obligations under this section shall be made under Item 1.1.3.

SECTION 41 ENVIRONMENTAL MANAGEMENT

41.1 DESCRIPTION

This section relates to the mitigation measures to be used to minimise the consequences of the contract on the environment.

The following philosophies and basic principles of environmental control and rehabilitation have been incorporated into the specifications:

- a) Any field or drill site is to be restored to its original, virgin state that existed before the works took place.
- b) Non-degradable material at the site and in the borehole shall be removed.
- c) No subsequent deterioration resulting from the works should take place.(e.g. Erosion or exotic vegetation).

41.2 ENVIRONMENTAL GUIDELINES, LEGISLATION AND STANDARDS

The Contractor shall identify and comply with all South African national and provincial environmental legislation and any amendments thereof or any legislation enacted in substitution therefore or which repeals same, including associated regulations and all local by-laws relevant to the project. Key national and provincial environmental legislation that is currently applicable to the design, construction and implementation phases of the project that must be complied with, are included in the following list. The list is intended to serve as a guideline only for the Contractor and is not exhaustive:

- Atmospheric Pollution Prevention Act, 1965 (Act No 45 of 1965).
- Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983).
- Environmental Conservation Act, 1989 (Act No 73 of 1989).
- Explosives Act, 1956 (Act No 26 of 1956).
- Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No 36 of 1947).
- Forest Act, 1984 (Act No 122 of 1984).
- Hazardous Substances Act, 1973 (Act No 15 of 1973).
- Lake Areas Development Act, 1975 (Act No 34 of 1975).
- Land Survey Act, 1921 (Act No 9 of 1921).
- Minerals Act, 1991 (Act No 50 of 1991).
- National Environmental Management Act, 1998 (Act No 107 of 1998).
- National Forests Act, 1998 (No. 84 of 1998).
- National Heritage Resources Act, 1999 (Act No 25 of 1999).
- National Veld and Forest Fire Act, 1998 (Act No 101 of 1998).
- National Water Act, 1998 (Act No 36 of 1998).
- Occupational Health and Safety Act, 1993 (Act No 85 of 1993).
- Provincial and Local Government Ordinances and Bylaws.
- World Heritage Convention Act, 1999 (Act No 49 of 1999).

The Contractor shall establish and maintain procedures to keep track of, document and ensure compliance with environmental legislative changes.

Where any legislation or regulations referred to in this EMP are repealed, amended or supplemented by any subsequent legislation or regulations which have been duly promulgated and have come into effect, the legislation thus referred to shall be deemed to have been repealed, amended or supplemented by the subsequent legislation or regulation in question, and shall be construed accordingly.

41.3 ENVIRONMENTAL MANAGEMENT PLAN

The generic Environmental Management Plan (EMP) described below sets out environmental specifications to ensure a holistic approach to the management of environmental impacts during subsurface investigation projects.

The detailed Environmental Management Plan is a dynamic document subject to similar influences and changes as are wrought by variations to the provisions of the project specification. Any substantial changes to the EMP shall be submitted to the Engineer for approval before any work commences.

41.3.1 Objectives of the EMP

The EMP has the following objectives:

- To specify the standards and guidelines that are required in terms of environmental legislation.
- To set out the mitigation measures and environmental requirements for all phases of the project in order to minimise the extent of environmental impacts, to manage environmental impacts and where possible, to improve the condition of the environment.
- To provide guidance regarding method statements which are required to comply with the environmental specifications.
- To define corrective actions to be carried out in the event of non-compliance with the specifications of this EMP.
- To prevent long-term or permanent environmental degradation.

41.3.2 Legislative Framework

The Contractor has agreed to comply with the EMP, and ensure compliance with the EMP by any third party appointed by the Contractor to fulfil its obligations within the terms and conditions set out in the Contract.

41.3.3 Structure of the EMP

This EMP applies to work undertaken during borrow pit, quarry and subsurface investigations (should exemption be granted by national DEAT) and includes the following:

- Background information regarding this EMP document and the Employer.
- Definitions relevant to this EMP.
- The relevant environmental guidelines, legislation and standards.
- General environmental requirements for investigation works.
- General environmental requirements relating to the decommissioning of the site.
- The requirements for the appropriate management and control of environmental obligations.

41.4 ENVIRONMENT AND HEALTH TRAINING AND AWARENESS

The Contractor shall ensure that its employees and any third party who carries out all or part of the Contractor's obligations under the Contract are adequately trained with regard to the implementation of the EMP, as well as regarding environmental legal requirements and obligations. All employees will have an induction presentation on environmental awareness. Where possible, the presentation needs to be conducted in the language of the employees. The environmental training by the Contractor should, as a minimum, include the following:

- The importance of conformance with all environmental policies, procedures, plans and systems.
- Basic awareness and understanding of the key environmental features of the work site and environs.
- Understanding, and importance of, and the reasons why, the environment must be protected.
- Ways to minimise the environmental impacts.
- Requirements of the EMP.
- Risks and protection from dangerous wild animals, specifically crocodiles (if applicable).
- Prevention and handling of fire.
- Emergency procedures.

- The significant environmental impacts, actual or potential, as a result of their work activities.
- The environmental benefits of improved personal performance.
- Their roles and responsibilities in achieving conformance with the environmental policy and procedures, including emergency preparedness and response requirements.
- The potential consequences of departure from specified operating procedures.
- The mitigation measures required to be implemented when carrying out their work activities.
- The importance of not littering.
- The need to use water sparingly.
- Details of and encouragement to minimise the production of waste and re-use, recover and recycle waste where possible.
- Details regarding archaeological and/or historical sites that may be unearthed during construction and the procedures to be followed should these be encountered.
- The procedures which should be followed should a grave be encountered or unearthed during the investigation.
- Details regarding floral/faunal species of special concern and protected species, and the procedures to be followed should these be encountered during the investigation.
- All works which may pose a hazard to humans and animals are to be adequately protected and appropriate warning signs erected.
- The Contractor shall provide adequate and operational fire safety equipment at all times. Personnel on-site shall be trained how to operate fire extinguishers etc.
- The use of construction vehicles shall be restricted to authorised personnel, and the speed limits adhered to at all times.
- The Contractor shall ensure that an HIV/AIDS awareness programme is implemented at the site camp. Weekly or monthly HIV/AIDS awareness topics should be identified which should be broadcast to all employees.

A training needs analysis shall be conducted by the Contractor to identify the appropriate environmental and health training requirements, and the appropriate target groups amongst the employees of the Contractor.

41.5 NON-COMPLIANCE AND REMEDIAL ACTION

Throughout the contract, the Engineer will monitor the ongoing EMP conformance by the Contractor and sub-contractors. The Engineer will consult with and report non-conformances with the EMP to the Contractor, with a copy of such report being given to each of the Contractor and the Employer. In any non-conformance report ("NCR") the Engineer must also stipulate the recommended corrective action to be taken to remedy such non-conformance.

The Contractor is deemed not to have complied with the EMP if, *inter alia*:

- There is evidence of contravention of the EMP specifications within the boundaries of the site, site extensions and access roads.
- There is contravention of the EMP specifications that relate to activities outside the boundaries of the site.
- Environmental damage ensues due to negligence.
- Contract activities take place outside the defined boundaries of the site.
- The Contractor fails to comply with corrective or other instructions issued by the Engineer within a specific time period.
- Littering on-site.
- Lighting of illegal fires on-site.
- Persistent or un-repaired oil leaks.
- Excess dust or excess noise emanating from site.
- Possession or use of intoxicating substances on-site.
- Any vehicles being driven in excess of designated speed limits.
- Removal and/or damage to fauna, flora or cultural or heritage objects on-site.
- Urination and defecation anywhere except in designated areas.

41.6 REMEDIAL ACTION

Remedial action shall be managed by the Contractor in two categories:

41.6.1 Specified Corrective Action

This constitutes remedial or mitigatory measures specified by the Engineer in any NCR, coupled with a specified time limit within which the specified corrective action must have been completed, at the expense of the party identified in the NCR as being responsible for carrying out the said work.

The Engineer may on request and in the Engineer's sole discretion, grant an extension of time for the implementation of such corrective action.

If the said corrective action has not been carried out within the period stipulated by the Engineer in the NCR, the non-conformance in question shall be dealt with as per b. hereunder.

41.6.2 Formal Remedial Work

Where a non-conformance has resulted in environmental damage to the Site which cannot be rectified as per Engineer's specified corrective action or where the Contractor has failed to carry out any of the Engineer's specified corrective action within the prescribed time limit (or permitted extension thereof), the Engineer shall convene a meeting between representatives of the Employer and the Contractor, at which appropriate remedial work/mitigatory measures shall be discussed and agreed, and failing agreement within 10 days, such dispute shall be resolved in accordance with the dispute resolution provisions contained in the Contract, **including stopping all work on site.**

The Engineer shall issue an instruction to the Contractor to procure execution of the remedial work as agreed between the parties, and the Contractor shall be obliged to procure such remedial work within the prescribed period to the satisfaction of the Engineer.

Failure by the Contractor to comply with an instruction from the Engineer to procure the carrying out of the required remedial work shall constitute a material breach of Contract, entitling the Employer to the applicable remedy provided for in the Contract. In particular, the Engineer shall be entitled to instruct the Contractor to cease all work on site until the situation has been remedied.

41.7 EMERGENCY PREPAREDNESS

The Contractor shall compile and maintain environmental emergency procedures to ensure that there will be an appropriate response to unexpected or accidental actions or incidents that will cause environmental impacts, throughout the life cycle of the project. Such activities may include:

- Accidental discharges to water and land.
- Accidental exposure of employees to hazardous substances.
- Accidental wild or forest fires.
- Accidental spillage of hazardous substances.

These plans should include:

- Emergency organisation (manpower) and responsibilities, accountability and liability.
- A list of key personnel.
- Details of emergency services applicable to the various areas along the route (e.g. the fire department, spill clean-up services, etc.).
- Internal and external communication plans, including prescribed reporting procedures where required by legislation.
- Actions to be taken in the event of different types of emergencies.
- Incident recording, progress reporting and remediation measures required to be implemented.

- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release.
- Training plans, testing exercises and schedules for effectiveness.

The Contractor shall comply with the emergency preparedness and incident and accident-reporting requirements, as required by the Occupational Health and Safety Act, 1993 (Act No 85 of 1993), the National Environmental Management Act, 1998 (Act No 107 of 1998), the National Water Act, 1998 (Act No 36 of 1998) and the National Veld and Forest Fire Act, 1998 (Act No 101 of 1998) as amended and/or any other relevant legislation.

41.7.1 Incident reporting and remedy

If a leakage or spillage of hazardous substances occurs on-site, the local emergency services must be immediately notified of the incident. The following information must be provided:

- The location.
- The nature of the load.
- The status at the site of the accident itself (i.e. whether further leakage is still taking place, whether the vehicle or the load is on fire).

Written records must be kept on the corrective and remedial measures decided upon and the progress achieved therewith over time. Such progress reporting is important for monitoring and auditing purposes. The written reports may be used for training purposes in an effort to prevent similar future occurrences.

41.8 RECORD KEEPING

41.8.1 Administration

Before a general Construction Activity commences, the Contractor shall give to the Engineer a written method statement setting out the following:

- The type of construction activity.
- Locality where the activity will take place.
- Identification of impacts that might result from the activity.
- Identification of activities or aspects that may cause an impact.
- Methodology and/or specifications for impact prevention for each activity or aspect.
- Methodology and/or specifications for impact containment for each activity or aspect.
- Emergency/disaster incident and reaction procedures (is required to be demonstrated).
- Treatment and continued maintenance of impacted environment.

The Contractor may provide such information in advance of any or all Construction Activities provided that new submissions shall be given to the Engineer whenever there is a change or variation to the original.

41.8.2 Records to be kept

The Contractor shall ensure that a filing system identifying all documentation related to the EMP is established.

A list of reports likely to be generated during the project is set out below, and all applicable documentation must be included in the environmental filing system catalogue or document retrieval index.

- Environmental Management Plan.
- Final design documents and diagrams issued to and by the Contractor and any third party who carries out all or part of the Contractor's obligations under the Contract.
- All communications detailing changes of design/scope that may have environmental implications.

- Daily, weekly and monthly site monitoring reports.
- Occupational Health and Safety reports.
- Complaints register.
- Training manual.
- Training attendance registers.
- Incident and accident reports.
- Emergency preparedness and response plans.
- Permits and legal documents, including letters authorising specific personnel of their duties as Occupational Health and Safety representatives or as part of emergency preparedness teams e.g. fire teams, etc.
- Disciplinary procedures.
- Monthly site meeting minutes during construction.
- All relevant permits.
- All method statements from the Contractor for all phases of the project.
- Weekly environmental report (regardless of whether there has been an incident)
- Copies of all toxic / hazardous waste dumping receipts.

41.9 ENVIRONMENTAL STANDARDS

41.9.1.1 Legislation

All applicable environmental standards contained within the environmental legislation shall be adhered to. The following environmental guidelines and standards are highlighted. The list is intended to serve as a guideline only for the Contractor and is not exhaustive.

41.9.1.2 *River and stream crossings*

Any alteration of a stream or river (i.e. alteration of the course or river bed) requires a permit from the Department of Water Affairs and Forestry (DWAF) in terms of Sections 21, 36, 40 and 41 of the National Water Act, 1998 (Act No 36 of 1998).

Permission is required from the Department of Agriculture for the removal of river bank vegetation and disturbance of the river bank itself for all river crossings under the Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983). All disturbances will have to be appropriately rehabilitated. It should be noted that pollution of the river water (silt-laden run-off, oil from machines, etc.) is a contravention of the National Water Act, 1998 (Act No 36 of 1998) and is not permitted.

Wetlands are also protected under the Conservation of Agricultural Resources Act, 1983 (Act No 43 of 1983), and under the National Water Act, 1988 (Act No 36 of 1998). Under the Conservation of Agricultural Resources Act, 1983, land users are forbidden to drain or cultivate any vleis without written permission. Under the National Water Act, 1988, no land use shall utilise the vegetation in a vlei or flood area of a watercourse in a manner that may cause the damage or deterioration thereof.

41.9.1.3 *Abstraction of water*

A licence is required from the Minister of Water Affairs and Forestry for the abstraction of water where the abstraction exceeds the levels prescribed by general authorisation. If water is to be abstracted, it will be necessary to obtain a licence from DWAF in terms of Sections 21, 40 and 41 of the National Water Act, 1998 (Act No 36 of 1998). The limit varies from area to area. Under normal conditions, this limit will not be exceeded, but the Contractor is required to ensure that the amount abstracted is below the applicable limit.

41.9.1.4 *Heritage sites*

In terms of the National Heritage Resources Act, 1999 (Act No 25 of 1999), a permit is required for the disturbance, removal or destruction of any national and provincial heritage sites, archaeological and paleontological sites, burial grounds and graves and public monuments and memorials. The demolition or dismantling of all man-made structures (including bridges) and buildings older than 60 years is subject to the approval of the

relevant provincial heritage council under the National Heritage Council Act, 1999 (Act No 11 of 1999).

If an artefact on-site is uncovered, work in the immediate vicinity shall be stopped immediately. The Contractor shall take reasonable precautions to prevent any person from removing or damaging any such article and shall immediately inform the Engineer of such discovery. The South African Heritage Resources Agency (SAHRA) shall be contacted such that an archaeological/heritage resources consultant can be appointed to record the site and excavate if necessary. Work may only resume this area once clearance is given in writing by the archaeologist.

41.9.1.5 Protected plants

In terms of the National Forests Act, 1998 (Act No 84 of 1998) and Government Notice 1339 of 6 August 1976 (promulgated under the Forest Act, 1984 (Act No 122 of 1984) for protected tree species), the removal, relocation or pruning of any protected plants will require a permit.

41.9.1.6 Waste disposal

All wastes (general and hazardous) generated during the construction of the road may only be disposed of to appropriately licensed (in terms of Section 20 of the Environment Conservation Act, 1989; Act No 73 of 1989) sites. Cognisance must also be taken of the relevant provincial legislation in this regard. It should also be noted that all controlling authority and regulations pertaining to litter in terms of the Environment Conservation Act, 1989 (sections 19, 19A and 24A), have been delegated to the provinces.

41.9.1.7 Public health

Soak-aways, french drains and other similar types of sewage effluent and human waste disposal facilities, are not permitted without the express approval of the Engineer and chemical toilets are required at all equipment units and at the Contractor's camp. If constructed, they must be approved by the nearest local authority in terms of their by-laws and relevant provincial standard by-laws.

41.9.1.8 Other permit requirements

In all cases, the Contractor will be responsible for procuring that any permits required are identified and obtained.

41.9.2 Site plan

Before construction commences, the Contractor shall submit a site layout plan to the Engineer for approval (approval of the site and intended mitigation measures may not be unreasonably withheld), and shall include, inter alia:

- Site access (including entry and exit points).
- Access and haulage routes.
- All material and equipment storage areas (including storage areas for hazardous substances such as fuel and chemicals).
- Construction offices and other structures (accommodation for staff, where required and considered appropriate).
- Areas where construction vehicles will be serviced.
- Security requirements (including temporary and permanent fencing, and lighting) and accommodation areas for security staff.
- Areas where vegetation will be cleared.
- Solid waste collection facilities for litter, kitchen refuse, and for all non-hazardous solid waste including office and workshop waste.
- Waste treatment facilities for sewage, grey water and workshop-derived effluents, where no formal facilities exist.
- Storage and disposal sites for hazardous wastes.

- Stormwater control measures.
- Provision of potable water and temporary ablution facilities.
- Potential pollution hazards, and mechanisms to manage these.

Only designated areas may be used for the storage of materials, machinery, equipment, site offices and accommodation facilities. The site offices and accommodation units should not be sited in close proximity to steep areas, as this will increase the potential for soil erosion. Preferred locations would be areas of little relief. If the route traverses watercourses, streams and rivers, it is recommended that the offices (and in particular the ablution facilities, aggregate stockpiles, spoil areas and hazardous material stockpiles) are located as far away as possible from any watercourse, and downstream of water bodies. Regardless of the chosen site, the Contractor's intended mitigation measures shall be indicated on the plan and approved by the Engineer.

Throughout the period of construction, the Contractor shall restrict all activities to within the designated areas on the construction layout plan. Any relaxation or modification of the construction layout plan is to be approved by the Engineer.

Detailed, colour photographs shall be taken of the proposed site before any clearing may commence. These records are to be kept by the Engineer for consultation during rehabilitation of the site.

The following restrictions or constraints should be placed on the site camp, and construction staff in general, and should be monitored by the Engineer:

- The use of rivers and streams for washing of clothes.
- The use of welding equipment, oxy-acetylene torches and other bare flames where veld fires constitute a hazard.
- Indiscriminate disposal of rubbish or construction wastes or rubble.
- Littering of the site.
- Spillage of potential pollutants, such as petroleum products.
- Collection of firewood.
- Poaching of any description.
- Latrining outside of the designated facilities.
- Burning of wastes and/or cleared vegetation.
- Hunting / poaching of animals.

41.9.3 Wastewater and sewage treatment

All effluent water from the construction camp/office sites shall be disposed of in a properly designed and constructed system, situated so as not to adversely affect water sources (streams, rivers, pans, dams, etc.). Only domestic type wastewater shall be allowed to enter this drain. Wastewater shall be channelled so as to reduce runoff and erosion.

Maintenance and servicing bays shall have a concrete floor and be fitted with sumps and collection tanks for wastewater that is contaminated with diesel, petrol and oil. This wastewater shall be removed to a registered disposal site.

Particular reference in the site establishment plan shall be given to the treatment of sewage generated at the site offices and staff accommodation, and on-site facilities for labour. Sanitary arrangements should be to the satisfaction of the Engineer, the local authorities and all applicable legal requirements. These may be in the form of portable serviced toilets, or toilets with connections to the municipal infrastructure. Soak pits shall not be used due to the high ground water levels and associated risk of contamination. Portable toilets will be provided at all sites where distances to the construction camp are great, and it would be impractical for construction staff to use facilities at the construction camp during the working day. Use of the veld for this purpose shall not, under any circumstances, be allowed.

Outside toilets should be provided with locks and doors and should be secured to prevent them from blowing over. The toilets should also be placed outside areas susceptible to flooding. The Contractor should arrange for regular emptying of toilets and will be entirely

responsible for enforcing their use and for maintaining such latrines in a clean, orderly and sanitary condition to the satisfaction of the Engineer.

41.9.4 Solid waste and litter

All refuse on-site shall be collected in drums and emptied at regular intervals. Separate containers shall be used for waste that can be recycled e.g. paper, cans and glass. These containers shall be taken to recycling centres. All other non-hazardous waste shall be taken to a registered waste disposal site.

No waste shall be burned at the site offices, or anywhere else on the site. The Contractor shall ensure that no waste is disposed of within quarries or borrow pits.

41.9.5 Hazardous waste

Hazardous waste such as fuel, oils etc. shall be disposed of in a DWAF approved hazardous waste landfill site. Receipted proof of disposal of all hazardous waste shall be submitted to the Engineer.

Used oil, lubricants and cleaning materials from the maintenance of vehicles and machinery should be collected in a holding tank and returned to the supplier. Water and oil should be separated in an oil trap. Oils collected in this manner should be retained in a safe holding tank and removed from site by a specialist oil recycling company for disposal at approved waste disposal sites for toxic/hazardous materials. Oil collected by a mobile servicing unit should be stored in the service unit's sludge tank and discharged into the safe holding tank for collection by the specialist oil recycling company. The Contractor shall ensure that an emergency preparedness plan is in place for implementation in the case of a spill or substances that can be harmful to an individual or the receiving environment.

All used filter materials should be stored in a secure bin for disposal off site. Hazardous waste shall not be stored or stockpiled in any area other than that designated on the construction-site layout.

Any contaminated soil shall be removed and replaced. Soils contaminated by oils and lubricants should be collected and disposed of at a DWAF approved hazardous waste landfill site. Receipted proof of disposal of all hazardous waste shall be submitted to the Engineer.

41.9.6 Cooking fuel

The Contractor shall provide adequate facilities for staff so that they are not encouraged to supplement their comforts on-site by accessing firewood or other flammable material from the natural surroundings. The Contractor shall ensure that adequate energy sources are available at all times for construction and supervision personnel for heating and cooking purposes.

41.9.7 Fire

All staff are to be prohibited from making fires in non-designated areas. The Contractor shall ensure that he has all the necessary fire fighting equipment on-site. The Contractor is to ensure that he is aware of the requirements of landowners, especially forestry and sugar cane plantation owners, in terms of fire control regulations on their property.

41.9.8 Flora and fauna

All undue interference with the natural flora and fauna is to be prohibited. Fauna and flora may only be disturbed to the extent that permission to do so has been obtained in terms of the applicable legislation. Should any indigenous vegetation unnecessarily or negligently be disturbed or destroyed, the Contractor shall be liable for replacement costs of same.

41.9.9 Access requirements

No access/haul roads other than those required for investigation purposes shall be developed. As far as possible, existing roads shall be used for access/haulage purposes. All new temporary access/haul roads shall be approved by the Engineer. See Section 6: Access

Access roads shall be constructed to and from the construction campsite. The measures outlined in Section 6.10 shall be followed for site clearance.

Access roads shall be constructed with adequate drainage measures to allow for storm water to drain away from the road without causing erosion.

41.9.10 Hunting

Hunting is strictly prohibited, including the use of traps and snares.

41.9.11 Construction water

Permission from the Department of Water Affairs and Forestry shall be obtained prior to abstracting water from any river or water resource where the volumes abstracted require registration or licensing in terms of the National Water Act, 1998 and any general authorisation in terms of Section 39(1) of the National Water Act, 1998. The point and method of abstraction shall be approved by the Engineer. See comment under 41.9.1.2.

41.9.12 Materials handling, use and storage

The Contractor's management and maintenance of his plant and machinery will be strictly monitored according to the criteria provided below, regardless of whether it is serviced on the site (i.e. at the place of construction activity or at a formalised workshop) or not.

41.9.12.1 *Safety*

All the necessary handling and safety equipment required for the safe use of petrochemicals and oils shall be provided by the Contractor to, and used or worn by the staff whose duty it is to manage and maintain the supplier's plant, machinery and equipment.

41.9.12.2 *Hazardous material storage*

Petrochemicals, oils and identified hazardous substances shall only be stored under controlled conditions. All hazardous materials shall be stored in a secured, appointed area that is fenced and has restricted entry. Storage of bituminous products shall only take place using suitable containers approved by the Engineer.

The Contractor shall provide proof to the Engineer that relevant authorisation to store such substances has been obtained from the relevant authority. In addition, hazard signs indicating the nature of the stored materials shall be clearly displayed on the storage facility or containment structure. Before containment or storage facilities can be erected, the Contractor shall furnish the Engineer with details of the preventative measures that are proposed to be installed in order to mitigate against pollution of the surrounding environment from leaks or spillages. The preferred method shall be a concrete floor that is bunded. The proposals shall also indicate the emergency procedures to be implemented in the event of misuse or spillage of substances that will negatively impact on an individual or the environment.

41.9.12.3 *Fuels and gas storage*

Fuel shall be stored in a secure area in a steel tank supplied and maintained by the fuel suppliers. Leakage of fuel should be avoided and, if found to occur, should be remedied immediately. An adequate bund wall (110% volume) should be provided for fuel and diesel areas to accommodate any spillage or overflow of these substances. The area inside the

bund wall should be lined with an impervious lining to prevent infiltration of the fuel into the soil.

Gas welding cylinders and LPG cylinders should be stored in a secure, well-ventilated area that is clearly marked with hazard signs.

41.9.13 Soil management

The Contractor shall ensure that minimal amounts of topsoil are lost due to erosion, either by wind or water. The Contractor shall be held responsible for the replacement, at his own cost, for any unnecessary loss of topsoil due to his failure to work according to the progress plan approved by the Engineer. The Contractor's responsibility shall also extend to the clearing of drainage or water systems that may have been affected by such negligence within and beyond the boundaries of the road reserve.

41.9.14 Weed and invader plant control

The Contractor shall remove all weeds and invader plants within the site affected by construction activities for the duration of the construction phase.

Weeds and invader plants will be controlled in the manner prescribed for that category by the Conservation of Agricultural Resources Act, 1983 or in terms of any other legislation. Removed vegetation must be disposed of at a DWAF approved waste disposal facility.

A registered pest control operator registered for the industrial application of herbicides shall apply herbicides, or shall supervise the application of herbicides in compliance with the terms of the Fertilisers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No 36 of 1947). Workers shall wear protective clothing to prevent herbicides being inhaled or having contact with the skin. The use of herbicides shall not be permitted within identified sensitive areas. Removal of weeds and invader plants within these areas must be undertaken by hand.

Spraying shall not take place in windy conditions, when the herbicide may drift onto indigenous plants.

Large weeds and invader plants (trees and large shrubs) may first be chopped near to ground level and then immediately stump treated .

41.9.15 The weed control programme shall be an on-going event throughout the life of the Contract.

Streams, rivers and dams should be protected from direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels, oils, aggregate, tailings, wash water, organic materials and bituminous products. In the event of a spillage, the Contractor will be liable to arrange for competent entities to clear the affected area.

Responsibility for spill treatment lies with the Contractor. The individual responsible for, or who discovers a hazardous waste spill must report the incident to the Engineer. The Engineer will assess the situation and act as required. In all cases, the immediate response shall be to contain the spill. The exact treatment of polluted soil/water shall be determined by the Engineer, in conjunction with a recognized expert. Areas cleared of hazardous waste shall be re-vegetated according to the Engineer instructions.

Should water downstream of the spill be polluted, and fauna and flora show signs of deterioration or death, specialist hydrological or ecological advice must be sought for appropriate treatment and remedial procedures to be followed. The requirement for such input shall be agreed with the Engineer. The costs of containment and rehabilitation shall be for the Contractor's account, including the costs of specialist input.

The Contractor must report any emergency incidents in accordance with its incident reporting procedure determined in accordance with Section 4.7 that should ensure compliance with NEMA and the National Water Act.

41.9.16 Preservation of indigenous plant material

Utmost care shall be taken to protect all indigenous plant material within the project. Should it be unavoidable, plant material may be temporarily removed and stored in a nursery set up for this purpose. The nursery shall be properly managed to ensure the continued good health of all plants. It shall consist of sun as well as shade areas and each plant shall receive the required treatment as obtained in its natural surroundings. Should it be the opinion of the Engineer that the Contractor has failed to take sufficient care of the stored plant material and high plant mortality is experienced, the Engineer may require the Contractor to replace the lost plants at his own cost.

On completion of the section of road from which the plants were removed they shall be replanted in a similar situation, as near to their original position as possible. Although it may be possible to move most plants, some may be too large to survive the upheaval. These identified trees and shrubs may only be removed and discarded after authority has been obtained from the Engineer. The Engineer may not unreasonably withhold such authority.

41.9.17 Decommissioning of site

41.9.17.1 *Construction camp*

All offices, structures, machinery and equipment shall be removed from site. Fences and gates shall be removed. Power and water supplies shall be disconnected, unless otherwise instructed by the Engineer. Concrete foundations and buried pipes shall be removed.

The site shall be scarified and topsoil from the stockpiles shall be placed over the area. The area shall be sown with an indigenous grass seed, either by hand seeding or by a system of hydro seeding (Appendix A if applicable). Advice on a suitable seed mix can be obtained from the Employer or the Department of Agriculture and Environmental Affairs.

The area shall be maintained, watered and fertilized, until an adequate grass cover has become established to the Engineer's satisfaction.

French drains shall be compacted and covered with a final layer of topsoil to a height of 100mm above the surrounding ground surface.

41.9.17.2 *Access roads*

Unless otherwise directed by the Engineer, all access and haul roads shall be ripped, scarified, top soiled and seeded.

All signs shall be removed.

41.9.17.3 *Photographs*

Photographs of the construction campsite, access roads, test pits and drill sites are to be taken before and during construction operations and after rehabilitation of the site. The Contractor shall be responsible for taking photographs and keeping updated records.

41.10 ENVIRONMENTAL CONSIDERATIONS APPLYING SPECIFICALLY TO DRILLING

The Contractor's attention is drawn to the following specific environmental restraints ruling on the site:

1. No dug sumps will be allowed and "drum" sumps must be utilised
2. No trees and shrubs may be removed/flattened in order to gain access to the site of a borehole and for working space, unless absolutely necessary. If, in the opinion of the Engineer, unnecessary damage has been done to the vegetation, the damaged vegetation shall be replanted at the Contractor's cost. The Engineer shall consider as "reasonable" an area of about 70m² as the working space for the rig and equipment.

3. A "drip sheet" of plastic (not less than 500µ thick) shall be provided under the rig to catch all leaks or spillages.
4. Any soils contaminated with oil, fuel or drilling aids shall be loaded into drums and disposed of at the nearest hazardous waste site, at the Contractor's cost. The Contractor shall produce documentary proof of his compliance.
5. The Engineer has the right to stop the use of, or instruct the removal from site of any vehicle or equipment until such time as it has been repaired to his satisfaction, with particular regard to oil and fuel leaks.
6. Only biodegradable drilling aids may be employed on the site. The Contractor shall produce documentary proof to this effect PRIOR to commencing any drilling.
7. When removing core from the core barrel, this shall be done over a plastic sheet similar to that in 3 above, so that no drilling oil/mud discharges onto the ground. Any oil/mud on this sheet shall be carefully collected and returned to the drum sump.
8. A portable chemical toilet shall be provided at each drill rig and the Contractor shall make the necessary arrangements for emptying and refilling the toilet by a reputable company specialising in this service. The Contractor shall provide proof of the contract with the service provider.
9. The Contractor shall make his own arrangements for a camp, but the Engineer has the right to inspect the camp to ensure that it is clean and hygienic and meets all the requirements of the OSH Act. The Contractor will not be permitted to camp at the drilling site.
10. Any fuel, oils, drilling aids stored on site shall be stored in a bunded enclosure and utmost care shall be taken when decanting these liquids to avoid spillages. Any soil contaminated by spillage shall immediately be removed, as detailed in 4 above.
11. Only one track may be employed to access a borehole. On completion of the drilling, the access track shall be rehabilitated (including replanting of vegetation, dumping of contour banks on steep slopes, etc) to the Engineer's satisfaction. If more than one track is created, it shall be reinstated to its former condition (including rehabilitation and replanting of vegetation, dumping of contour banks, etc, all to the satisfaction of both the Engineer and the landowner), all at the Contractor's cost, including (if any) compensation to the landowner.

41.11 GENERAL

A brief summary of all environmental considerations related to sections of the specifications with typical environmental impacts caused by, or resulting from, or causing damage to the environment are, listed in Table 41.1 below.

SECTION no.	OPERATION	Typical Environmental Impacts caused by/resulting from damage to/by														
		Vehicles (Erosion)	Tracks (Erosion)	Vegetation (Damage)	Excavations	Oil/fuel leaks	Sumps	Runoff	Drilling aids	Groundwater	Weeds	Waste	Toilets	Cooking	Fire	Grout spill
1	Establishment	x	x	x	x	x		x		x	x	x	x	x	x	
2	Housing	x	x	x	x	x		x			x	x	x	x	x	
3	Provision of rigs	x	x	x	x	x	x	x			x	x		x	x	
4	Setting out/ survey	x	x	x	x	x		x			x	x				
5	Setting up	x	x	x	x	x		x			x	x				
6	Access	x	x	x	x			x			x	x				
7	Crops	x	x	x	x						x				x	
8	Percussion drilling	x	x	x	x	x	x	x	x	x	x	x	x		x	x
9	Augering	x	x	x	x	x	x	x	x	x	x	x	x		x	x
10	Core drilling	x	x	x	x	x	x	x	x	x	x	x	x		x	x
11	Washboring	x	x	x	x	x	x	x	x	x	x	x	x		x	x
12	Core recovery	x	x													
13	Casing	x	x													
14	Drilling fluids								x	x						
15	Stabilisation grout									x						x
16	Disturbed samples	x	x	x	x			x			x					
17	Undisturbed sample	x	x	x	x			x			x					
18	Orientation surveys	x	x													
19	Core orientation															x
20	Integral core															x
21	DTH photography	x	x	x									x			
22	Vane shear			x	x										x	
23	SPT														x	
24	CPT	x	x												x	
25	Water pressure tests	x	x							x					x	
26	Grout acceptance	x	x													x
27	Piezometers	x	x													x
28	Inclinometers															x
29	Water rest levels															x
30	Core boxes			x												
31	Core sheds			x												
32	Core photos															
33	Transportation	x	x													
34	Marking of holes	x	x		x							x				x
35	Trenching	x	x	x	x	x		x		x	x					

41.12 CONCLUSIONS

This EMP should be considered to be a dynamic document, and should be updated as required on a continuous basis and, as necessary, for individual projects.

41.13

MEASUREMENT AND PAYMENT

Payment for observing these requirements is deemed to be included in the amount tendered for under "Establishment of Contractor on Site", Pay Item 1.1.4: Environmental Management. Any avoidable non-compliance with these rules shall be considered sufficient grounds for withholding payment in part or all of the amounts to be paid for the above item.

