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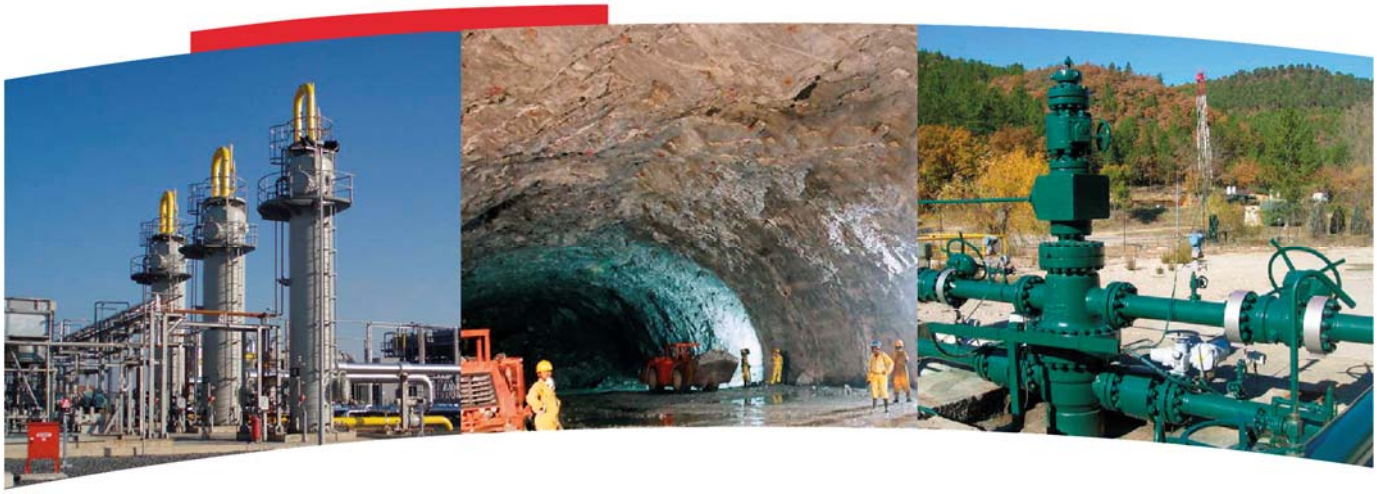
ENTREPOSE



JSC GEORGIAN OIL AND GAS CORPORATION

SAMGORI SOUTH DOME PROJECT STEP 2

TENDERING DOCUMENTS FOR THE CDIW CONTRACT

EXHIBIT A - SCOPE OF WORK AND SPECIFICATIONS

GK-SSD12-STO-RPT-0002-3

REVISION 3

MAIN PURPOSE OF THE REVISION AND TYPE OF MODIFICATIONS

Second revised issue with inclusion of new milestones (Section 7)

Third revised issue

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LIST OF APPENDICES

1. GENERAL

1.1. DEFINITIONS

Defined terms within this Scope of Work are capitalized. For the eventual CDIW (Contract for Drilling and Integrated Works – the CONTRACT) the specific terminology used in this Scope of Work will be reviewed, and where required, will be aligned with the AGREEMENT, which stands for the conditions of contract. For Purposes of Tender, the Term “EMPLOYER" shall have the same meaning as the term “OWNER" as defined in the AGREEMENT.

In case of discrepancy between the present document and its Appendices, the present document prevails.

1.2. PERFORMANCE OF THE WORK

The CONTRACTOR shall design, procure, transport to site, construct, hook-up, test and handover the subsurface facilities to meet the requirements specified in the CDIW CONTRACT.

The scope of CONTRACTOR’s supply includes (without limitation):

- The provision of all equipment, facilities materials and related works necessary for the civil works associated to rig pad, rig platform, campsite, access roads,
- Drilling, logging, coring, testing and temporary completion of the two appraisal wells EXP-1 and EXP-2,
- The provision of well equipment, as further explained in the present document and described in Appendix 1, and
- The deliverables as set out in chapter 8

The CONTRACTOR shall perform the WORK in accordance with terms and conditions of the CDIW CONTRACT and such additional drawings and explanations as the OWNER may provide to the CONTRACTOR from time to time to detail and illustrate the WORK. Any part of the WORK not expressly detailed in the CDIW CONTRACT or in the drawings or documents furnished to the CONTRACTOR, but necessary for the proper completion of the WORK and necessary to meet properly the requirements for which the WORK is intended, shall be carried out by CONTRACTOR at CONTRACTOR’s expense, just as if such WORK had been specifically mentioned or shown in the drawings or documents.

The CONTRACTOR shall perform the WORK safely and with due care, competence, diligence and efficiency, in accordance with sound principles and best practices in the subsurface engineering, drilling, and subsurface construction industry applied to Underground Gas Storage (UGS) construction. It shall strictly comply with the provisions of the CDIW CONTRACT and all specifications and drawings referred to in the CDIW CONTRACT or thereafter furnished by the OWNER. It shall comply with any conditions or warranties implied by law, shall be first class in every particular and shall be free from faults or defects in construction and workmanship and in any design or engineering furnished by the CONTRACTOR.

The completed WORK shall be, in all respects, fit for the purpose intended by the OWNER. The CONTRACTOR guarantees the OWNER that all materials and supplies furnished by the CONTRACTOR for the WORK shall be new, merchantable of the most suitable grade, and fit for their intended purposes. The CONTRACTOR shall obtain from each Vendor for all materials to be incorporated into the wells, a Vendor's warranty for the benefit of the CONTRACTOR, and the OWNER.

The CONTRACTOR shall be fully liable for the adequacy, stability and safety of all of its and its Sub-Contractor's operations and methods of construction.

Unless otherwise provided in the CDIW CONTRACT, the CONTRACTOR shall provide all labour, project management and coordination, supervision, designs, engineering, materials, tools, equipment, works and facilities and other items specified in the CDIW CONTRACT necessary for the subsurface construction and handover of the WORK (unless otherwise specified by the OWNER).

The CONTRACTOR shall reinstate any areas disturbed during the WORK including any temporary access ways, construction areas and/or storage areas. The CONTRACTOR shall ensure the protection of all adjacent natural environment, property or facilities from damage by construction activities and is responsible for the restoration of the areas surrounding the WORK to their original state.

The CONTRACTOR shall be responsible for the controlled removal and disposal of all scrap, debris, waste and other items, not needed for the final use of the WORK, in a safe and environmentally friendly manner. The CONTRACTOR shall be responsible for removing all construction temporary facilities, excess construction materials and generated wastes from the worksite before Final Acceptance for each well.

1.3. OWNER'S ENGINEER

The OWNER has appointed GEOSTOCK as SERVICE COMPANY to be and act as the OWNER's ENGINEER for the Management and Quality Assurance / Quality Control (QA/QC) of the WORK.

The OWNER's ENGINEER shall appoint a Wellsite Drilling Engineer for the whole drilling operation. He will be in charge of the QA/QC of the WORK performed by the CONTRACTOR.

Responsibility of drilling and choice of drilling parameters lies with the CONTRACTOR on the basis of the CDIW CONTRACT scope of work and specifications and on the detailed engineering program (refer to section 3.4). The OWNER's ENGINEER shall have a control on key elements of the data acquisition in the wells (logging depths and acquisitions, casing shoe depth setting, coring start / end depths, and the like).

The main objectives of the OWNER's ENGINEER Wellsite Drilling Engineer are:

- QHSE check and evaluation of all operations on the wellsite,
- Witness on behalf of the OWNER to verify that drilling program and data acquisition objectives are achieved,
- Monitor the drilling operations schedule,
- Control of the drilling activities cost whenever applicable,

- Witness the critical operations and tests included in the WORK to ensure requirements and objectives defined by the CDIW CONTRACT and the detailed engineering programs are achieved,
- Check and verify the final well documentation delivered by the CONTRACTOR.

The OWNER's ENGINEER Wellsite Drilling Engineer will be mobilized onsite prior to spudding the first well in order to finalize the preparation of the drilling campaign, participate a Pre-Spud Meeting with the CONTRACTOR and its subcontractors, and accept or deny the date of MOBILISATION FIRST WELL. Prior to the date of MOBILISATION FIRST WELL, an engineer will supervise the progress of the WORK through dedicated missions.

The OWNER's ENGINEER Wellsite Drilling Engineer will relocate to the wellsite 10 days prior to the anticipated date of MOBILIZATION FIRST WELL. An OWNER's ENGINEER Geologist will be onsite during open-hole logging (all runs from the 12 1/4" section) and coring operations in Upper Eocene and Middle Eocene sections. An OWNER's ENGINEER Reservoir Engineer will be onsite during the Middle Eocene well testing operations (EXP2 well) and Upper Eocene micro-fracture testing operations (EXP2 well).

An OWNER's ENGINEER HSE auditor will carry out spot mission on site to ensure the implementation of the specific HSE plan for the WORK.

Regarding the control of progress of the WORK, the OWNER's ENGINEER shall control the Progress down to Top of Middle Eocene, and the progress and cost control for the Middle Eocene section, as further explained in section 1.4.4.

1.4. STANDARDS & CODES OF PRACTICE

1.4.1. General

As a minimum, the WORK shall be designed, constructed, tested and delivered in accordance with, by order of precedence:

1. Present Exhibit A relevant sections
2. Relevant sections of the latest editions of the codes, standards, rules and regulations listed in the applicable specifications and philosophies.

The order of precedence for standards is national standards, international standards, industry norms and OWNER standards.

In the event of ambiguity between these documents, the CONTRACTOR shall immediately, in writing, seek clarification from the OWNER. Any clarification so given shall not be considered grounds for a request for a variation to the CDIW CONTRACT.

1.4.2. Discipline Design Bases & Data

The CONTRACTOR may use only design and engineering software packages specifically approved by the OWNER. The CONTRACTOR is to submit software packages names and description intended to be used, for OWNER review. Approval by OWNER shall not be unreasonably withheld.

1.4.3. Major Schedule Elements and Milestones

Regarding planning of the two appraisal wells, GOGC requires that both wells be drilled in parallel using two drilling rigs. Tender documents require a maximum duration for performance of the WORK of 244 days from the EFFECTIVE DATE of the CDIW CONTRACT up to the latest date of issuance by the CONTRACTOR of the Final Acceptance Certificate as described in section 7 of present Exhibit A.

MOBILISATION FIRST WELL shall be the achievement of part of the WORK agreed and certified in writing by the OWNER REPRESENTATIVE that the CONTRACTOR has mobilized all CONTRACTOR EQUIPMENT and CONTRACTOR PERSONNEL and has completed all other mobilization activities required to render CONTRACTOR ready and available to spud the first WELL at the WORKSITE. MOBILISATION SECOND WELL shall be the achievement of part of the WORK agreed and certified in writing by the OWNER REPRESENTATIVE that the CONTRACTOR has mobilized all CONTRACTOR EQUIPMENT and CONTRACTOR PERSONNEL and has completed all other mobilization activities required to render CONTRACTOR ready and available to spud the second WELL at the WORKSITE.

1.4.4. Project Management

The CONTRACTOR shall prepare a Project Execution Plan including the following sections:

1. Project Execution Plan including in particular, the following specific documents:
   - Detailed Engineering, Procurement and Construction schedule (including the WORK key milestones as defined by OWNER in the document - tendering requirements),
   - Description of the resources allocated to the WORK,
   - List of subcontractors.

2. Management Plan that will document how it intends to manage the interfaces between the CONTRACTOR and its subcontractors and how will be organized the communication between the CONTRACTOR and the OWNER, and between the CONTRACTOR and the OWNER's ENGINEER, for all aspects of the WORK. This section shall include in particular the following specific items:
   - Project organization chart,
   - Communication procedures,
   - Roles and responsibilities,
   - Interfaces management, internal and external.

3. Project Quality Plan defining in particular but not limited to the applicable "Documents Workflows" and "Documents Numbering" rules for the Project.
   The CONTRACTOR shall follow the applicable ''Documents Workflows'' and ''Document Numbering'' rules for the Project defined by the OWNER's ENGINEER.

4. Progress and Cost control follow-up
   1. Progress down to Top of Middle Eocene
      The CONTRACTOR shall report on a daily basis to the OWNER's ENGINEER the progress of the WORK for all operations included down to top of Middle Eocene of the wells EXP1 and EXP2. For clarity purpose, such operations will include, but not be limited to, mobilization, civil works, equipment purchase, subcontractors' equipment delivery and/or commitment for delivery, drilling operations, casing setting and cementing, logging operations in open hole and cased hole, coring operations, etc.
   2. Cost control and progress from Top of Middle Eocene
      The CONTRACTOR shall apply the procedure defined by the OWNER'S ENGINEER to follow-up all costs and associated progress during the WORK dedicated to Middle Eocene section of the wells, in accordance with the CDIW CONTRACT. All data related to such cost and commitment follow-up shall be delivered to the OWNER's ENGINEER on the worksite both with (1) paper and digital elements, and (2) in a summarized digital format (Excel spreadsheet). The purpose shall be for the OWNER's ENGINEER to review and monitor such cost control and progress of the WORK.

1.4.5. HSE Plan

The CONTRACTOR shall prepare a structured customary HSE plan to make sure that the WORK is carried out as per the highest industry standards in Health, Safety and Environment.

The HSE Plan shall at least:

- Comply with Georgian legislations and legal requirements regarding HSE,
- Develop a preventative risk management approach to HSE based on the identification and mitigation of HSE related risks,
- Ensure continuous performance improvement in HSE,
- Ensure appropriate HSE training for all personnel,
- Develop an information and communication plan focused on HSE that aims at developing the commitment to HSE of all employees, staff and subcontractors,
- Set a quantitative method that enables to control and monitor the Project HSE performance.

- Provide an emergency response plan in case of accident,
- Provide a list of hazardous materials and products intended to be stored on site, and the intended storage method.

1.4.6. Updates of project management documents

The CONTRACTOR shall update whenever needed the project management documents (Project Execution Plan, and Project HSE Plan).

2. Background and Objectives

2.1. Background

A feasibility study commissioned by GOGC and conducted by GEOSTOCK on the conversion of the Samgori South Dome (SSD) depleted oil field into an underground gas storage was executed in 2016.

Following the completion of this Feasibility Study (Project Step 1), some additional works are necessary before Final Investment Decision (FID) for construction of the storage can be taken. These additional works are constituting Project Step 2 of SSD UGS Project.

Project Step 2 aims at decreasing the uncertainties and risks related to:

- The efficiency of the caprock to provide adequate gas tightness during storage operations (from both petrophysical and geomechanical point of views),
- The western spill point characterization, which drives the risk of gas spillage towards the West of SSD,
- Petrophysical reservoir characterization (fracture and matrix properties characterization) which drive the overall performance of the storage,
- Fluids characterization (oil, gas, water analyses),
- The characterization of the upper layers above the primary caprock (petrophysical properties, pressures, fluid content),
- The potential interferences between SSD storage operations and other neighbouring subsurface operations related to the Middle Eocene aquifer.

Two appraisal wells need to be drilled during Project Step 2 in order to confirm the results of Project Step 1 study and to gain more detailed information on the reservoir, caprock and overburden.

Appendix 2 gives several maps that show:

a) The location of Samgori structure in Georgia,

b) The location of other oil fields in the region of Samgori,

c) A focus of the same on Samgori South Dome area,

d) An East-West cross section across different oil fields,

e) The depth structure map of Samgori South Dome with the location at reservoir level of existing (already drilled) wells on the structure and the location of the 2 appraisal wells incl. in Project Step 2,

f) The surface location of these wells.

2.2. Geological and oil context

The Samgori South Dome oil field is located inside Block XI-B license in Eastern Georgia, at about 30 km east of Tbilisi. The Samgori South Dome oil field is an anticline structure, which was discovered in 1978. 20 wells were drilled on the structure, most of them between 1978 and 1983. The last well drilled in Samgori South Dome is the well JSD-1 drilled in 2013 by Jindal Petroleum. Samgori South Dome is originally an oil field with no gas cap. The field has been producing oil since 1979, with peak production occurring between 1981 and 1984. Production has been declining since 1984.

The field is producing from the Middle Eocene formation. The reservoir rock consists of fractured volcanic tuffs, of which accessible porosity mainly lies in fractures, vugs and possibly karsts. Potential porous and permeable matrix intervals are also possible. The oil field is supported by a large regional aquifer outcropping and charging in the Tbilisi area. Reservoir pressure is today known to have returned to original pressure, i.e. about 200 bar at the depth of the original oil-water contact at 1650 m (from sea level) or 2,400 m (from ground level at the center of the structure). This corresponds to a sub-hydrostatic pressure gradient between 0.082 and 0.088 bar/m from ground level.

Samgori South Dome (SSD) is one of the four producing fields from Middle Eocene inside Block XI-B license (Teleti in the west, Samgori in the northeast, Patardzeuli in the east connected to the Ninotsminda field in the neighbouring license block). Development and oil production from these fields in the Middle Eocene reservoir are mature, with more than 200 wells in these fields drilled since the 1970's. Latest developments in the area include infill horizontal wells drilled in the Ninotsminda Middle Eocene oil and gas field in the neighbouring license block.

2.3. Definition of the WORK

The CONTRACTOR and its subcontractors will deliver the following works that define the WORK:

- Detailed well engineering and drilling program for two vertical wells EXP1 and EXP2, based on the present document main body, and raw programs provided in Appendix 3, Appendix 4 and Appendix 5,
- Construction of the rig sites including access roads, camp sites and renaturation of the temporary sites areas;
- The complete provision of drilling rig works from the mobilization of the drilling rigs with the relevant equipment and personnel to the transport, rig up, drilling operation/workover, rig down and demobilization;
- The provision of all necessary equipment and works necessary for the wells construction and data acquisition according to the present document main body, and raw programs provided in Appendix 3 and Appendix 4, namely:
    - Casings and tubings, cementing hardware, casing/tubing running ,
    - Coring (incl. core handling at surface, core stabilization (for unconsolidated or fractured formations) and core shipping to a core analyses laboratory not yet chosen but potentially

in western Europe, drilling data recording),
- Mud logging (incl. sampling and description, drilling data recording),
- Drill bits and BHA (incl. directional drilling),
- Drilling fluids incl. solids control and waste management,
- Cementing,
- Wireline logging,
- Well testing (incl. bottom-hole fluid sampling and samples shipping to a fluid analysis laboratory not yet chosen but potentially in western Europe),
- Well stimulation (acidizing),
- Well completion equipment and completion,
- Fishing,
- Wellhead equipment according to the raw program provided in Appendix 5,
- Consumables (gasoil),
- Water supply,
- Wellsite geologist.

- Provision of containers and disposal of any waste arising as a result of the rig operation (hazardous waste, lubricants, excrement, sewage, household, etc.).

2.4. Objectives of the WORK (2 appraisal wells)

One of the wells (EXP-1) is intended to penetrate the Middle Eocene reservoir at the western spill-point of the structure, and the other one (EXP-2) in the centre of the structure (see map “e” in Appendix 2). An intense data acquisition program is planned in both wells. After finishing all the logging and testing, the wells shall be equipped with temporary completion equipment.

Such temporary completion equipment will remain in place until the future construction stage of Samgori South Dome underground storage, during which these two wells will be re-completed to serve as control wells during storage operations for reservoir pressure and fluids interface monitoring.

The objectives of well EXP-1 are:

- Improvement of the structural characterization of the field in the west spill point zone,
- Improvement of the reservoir characterization through well logging,
- Coring in the bottom of the caprock (40 m) for petrophysical and mechanical evaluation,
- Improvement of the overburden characterization through well logging.

The objectives of well EXP-2 are:

- Improvement of the reservoir characterization through well logging and testing,

- Coring a minimum of 100 m from in the Middle Eocene reservoir for detailed petrophysical evaluation,
- Coring in the bottom of the caprock (40 m) for petrophysical and mechanical evaluation,
- Formation micro-fracture test of the caprock for in-situ stress evaluation,
- Improvement of the overburden characterization through well logging.

2.5. Duration of the WORK

The duration of the WORK is of 8 months (244 calendar days) from EFFECTIVE DATE of the CONTRACT up to the latest date of issuance by the CONTRACTOR of the Final Acceptance Certificate as described in section 7 of present Exhibit A.

3. Specifications for Drilling engineering

3.1. Generic Well Design Memorandum

The Generic Well Design Memorandum (GWDM) shall be prepared by the BIDDER to constitute a part of his answer to the Call for Tender for the WORK.

Exhibit A gives the major elements to be taken into account by the BIDDER to prepare such Generic Well Design Memorandum.

Additionally, the Tender Documents include an outline drilling programme prepared by the OWNER's ENGINEER that shall also serve as a basis. In case of discrepancy between the Appendices of Exhibit A and the Outline Drilling Programme prepared by the OWNER's ENGINEER, the first shall prevail.

However, it is the responsibility of the BIDDER to produce the Generic Well Design Memorandum for both EXP-1 and EXP-2 wells.

This GWDM will be used as a basis for the CONTRACTOR (in case of award of the CDIW CONTRACT to the BIDDER) to develop the detailed individual well drilling programs that will cover, but shall not be limited to:

- Drilling hazards identification and mitigation;
- Wellbore trajectories including vertical section;
- Anti-collision study to avoid intercepting wells already drilled on Samgori South Dome structure.
- Surveying program;
- Landing into objective strategy;
- Cellar allocation;
- Borehole diameters and associated casing sizes. Clearance between pipe and open hole should allow easy casing running without excessive drag and good cementing operations as well as cement bond;
- Drill bits and BHA's (Bottom Hole Assembly) base program;
- Mud design, not damaging for aquifers and reservoir zones and with a formation adapted specific gravity. In particular, the mud system to be used in the reservoir formation (drill-in fluid) should be carefully adapted to the actual reservoir pressure with a view to minimize formation invasion and subsequent permanent damage. Only additives essential for filtration control and cuttings carrying has to be present in the drill-in fluid. The removal of the drill-in fluid (incl. mud cake) should be mostly non-residue. Methods like floating mud cap drilling can be considered for drilling of the Middle Eocene reservoir if LCM injection is not successful to cure mud losses, but must not jeopardize well control;
- Casing shoes location and Formation Integrity Test requirements for deepening the well with safe kick tolerances;

- Casing running and cementing program (including cement evaluation procedures);
- Casing testing requirements;
- BOP's arrangements;
- Mudlogging and continuous gas detection arrangement;
- Coring program;
- Electric line logging;
- Waste management;
- Casing and tubing design based on stress analysis for various load cases;
- Wellhead and Christmas tree design;
- Completion design;
- Completion testing requirements;
- Well testing (EXP-2) and downhole pressure monitoring (EXP-1).
- Wellbore sketches with stratigraphic column and lithology.

It shall include a list of all tests and checks necessary to ensure:

- Compliance with Georgian regulations,
- A gas leak free path to surface is established by the last casing shoe & cementation / production packer / tubing (including SSSV for the primary barrier) / wellhead assembly over the operating pressure envelope of the future underground gas storage,
- A leak free secondary containment to this path is achieved by the production casing / wellhead assembly,
- Christmas tree is fully functional and nitrogen pressure tested.

3.1.1. Tubular requirements / specifications

Appendix 4 of the present document in its column called “CASING” indicates grades of casings and tubing. However, it is the responsibility of the BIDDER, in its Generic Well Design Memorandum, to produce the list of tubular equipment (casing, tubing ...) that will be needed for the WORK, including:

- Pipe specifications including pup joints,
- Planned quality control to ensure delivery of equipment in accordance with specifications,
- List of planned suppliers for tubulars;
- Applicable industry specifications (API, ISO).

The CONTRACTOR (in case of award of the CDIW CONTRACT to the BIDDER) will develop all necessary applicable detailed specifications for all equipment needed for the WORK.

3.1.2. Wellhead requirements / specifications

Appendix 5 of the present document includes a wellhead design scheme. However, it is the responsibility of the BIDDER, in its Generic Well Design Memorandum, to produce a list of wellhead equipment that will be needed for the WORK:

- Equipment specifications for all wellhead sections including the Christmas tree,
- Quantity of spare parts and tools,
- Planned quality control to ensure delivery of equipment in accordance with specifications,
- List of planned suppliers for wellheads,
- Applicable Industry specifications (API, ISO).

The CONTRACTOR (in case of award of the CDIW CONTRACT to the BIDDER) will develop all necessary applicable detailed specifications for all equipment needed for the WORK.

3.1.3. Completion equipment requirements / specifications

Appendix 4 of the present document in its column called “TEMPORARY COMPLETION” indicates elements of this completion. However, it is the responsibility of the BIDDER, in its Generic Well Design Memorandum, to produce a list of completion equipment that will be needed for the WORK:

- Equipment specifications in particular for packers, completion accessories & SSSV,
- Quantity of spare parts and tools,
- Planned quality control to ensure delivery of equipment in accordance with specifications,
- List of planned suppliers,
- Recommended specifications (API, ISO).

The CONTRACTOR (in case of award of the CDIW CONTRACT to the BIDDER) will develop all necessary applicable detailed specifications for all equipment needed for the WORK.

3.1.4. Wellhead and subsurface safety valve control panels requirements / specifications

The BIDDER shall define the requirements for the hydraulic control panels that will be used to operate wellhead actuated valves and the SSSV.

The CONTRACTOR (in case of award of the CDIW CONTRACT to the BIDDER) will develop all necessary applicable detailed specifications for all equipment needed for the WORK.

The CONTRACTOR shall have to liaise with the OWNER's ENGINEER for the above ground valve actuation and for the interface with the surface facilities to be defined during the design of the surface facilities.

3.1.5. Well pads design and layout

The CONTRACTOR shall perform all land surveys and soil studies that are necessary in order to establish the well pad design and layout.

The CONTRACTOR shall prepare the specifications and the drawings of the two well pads so that they can accommodate for the drilling rigs and ancillaries, its subcontractors and the OWNER offices. This includes the general lay-out of the well pads as well as the specifications of all permanent and temporary constructions to be performed on the well pads such as, but not limited to, well cellars and related foundations, conductor pipes, concrete hard ground, spillage containment system or stone hard ground, sewage/septic tanks, ditches, fences. In order to do so, the CONTRACTOR shall have to liaise with the OWNER so that the proposed layout and specifications are compatible with the regulations, the local constraints, and the requests of the OWNER.

The layout of the well pads and the cellar specifications shall be based on the principles mentioned in Appendix 1 of the present document, and shall take into account the nominated drilling rigs requirements, wellhead dimensions and the possibility of performing future workovers without having to shut down the future or present nearby wells.

The cellars shall be watertight both to avoid infiltrations into the ground or the cellar to be filled with groundwater. A pump sump (for dewatering the cellar) has to be arranged in one of the corners.

All ground surfaces in areas where they could possibly be contaminated by hydrocarbons or fluids from the rig mud system shall be designed to be watertight to avoid any infiltration of these products into the ground. These watertight areas shall be designed in such a way that the fluids they recover cannot flow to unprotected areas. If the cellars can be used to drain some of the fluids recovered on these watertight areas during the drilling and completion operations, it shall be designed in such a way that during the exploitation phase, water that could possibly run on the ground does not flow into the said cellars.

All retention pits used to recover used drilling mud, fluids and cuttings shall remain tight during all drilling operations.

All hard grounds, concrete or stone, shall be designed based on the results of soil studies and the anticipated loads they will have to support during the drilling operations. Materials used for hard stone grounds shall be clean hard stone with fines of appropriate sizes for a smooth surface.

The CONTRACTOR shall also at this stage define all the works to be performed to enable access to the site during drilling from the public road network.

The CONTRACTOR shall provide the static load calculations of the foundations for the drilling rigs under maximum load conditions. The static loads of the rigs shall be supported by designated foundations and not by the cellar structure.

3.1.6. Documents to be submitted to authorities

The CONTRACTOR shall prepare for the OWNER in proper format all the necessary documents that will have to be filed with Georgian authorities regarding the well pad construction work.

The CONTRACTOR shall also prepare for the OWNER the detailed well program / casing design in proper format to be submitted to seek authorisation for drilling the wells. The documentation provided by the CONTRACTOR to the OWNER should include all necessary information and design documents for such application and in particular, the casing design with load cases and results.

All these documents shall be written in both English and Georgian language.

3.1.7. Drilling works / consumables specifications

The BIDDER shall prepare specifications for all works requested by the drilling operations as per Appendix 1 and the list here below but not limited to:

- Directional drilling,
- Drill bits,
- Mud products and mud engineering,
- Solid control (centrifuges w/ flocculation (if needed)),
- Mud logging,
- Coring,
- Casing/tubing running and cementing hardware,
- Cleaning of casing/tubing threads and thread inspection for gastight connections,
- Cementing,
- Wellhead (rig up supervisor, pressure test)
- Wireline logging (open hole and cased hole),
- Drilling waste handling and disposal,
- Handling,
- Storage for equipment, consumables, fluids and products etc.

These specifications shall include a precise description of the equipment, materials, manpower and facilities that will be used to provide these works.

For works to be subcontracted, the BIDDER shall provide the list of planned subcontracted companies.

3.1.8. Completion works specifications

The BIDDER shall prepare specifications for completion works including but not limited to:

- Completion and slotted liner installation and testing,
- Completion fluids management including filtering and treatment,
- Associated works: slick line, electric line...

3.1.9. Testing works specifications

The BIDDER shall prepare specifications for clean-up and well testing works including but not limited to:

- Surface installation with choke manifold, separator, cold flare, storage tank, calibrated pressure and flowrate measurement equipment, surface sampling equipment and sand/solid particles production monitoring,
- Bottom-hole shut-in tool (DST type tool) including bottom-hole pressure recording and bottom-hole fluid sampling,
- Tubing for testing and inner tubing for nitrogen lifting,
- Coil tubing running if necessary,
- Nitrogen and acid pumping,
- Surface sampling,

3.1.10. Additional drilling equipment requirements

Should additional drilling equipment be needed the CONTRACTOR can at its convenience rent it from a third party.

3.1.11. Fishing back-up

The CONTRACTOR shall organise for availability of fishing tools and services that might be needed in relation with the planned drilling and completion programs by:

- Defining common fishing tools needed,
- Locating suppliers where these fishing tools are available,
- Auditing fishing tool condition and maintenance,
- Securing from suppliers a quick delivery onto the rig site or otherwise holding some principal fishing tools in stock on rig site,
- Mobilizing on the drilling rig the fishing tools (list to be supplied) and services during all the drilling phase.

3.1.12. Drilling utilities

The CONTRACTOR shall make all necessary arrangements for all utilities required during the drilling/ completion operations. This includes, but is not limited to:

- Industrial water supply,
- Sanitary water supply,
- Drinking water supply,
- Telephone lines,
- High speed internet access,
- Evacuation of sewage /septic tanks,
- Housekeeping and domestic waste management,
- Camp including but not limited to offices, rest rooms, canteen etc.

3.2. Well prognosis

During drilling, the CONTRACTOR shall update on a continuous basis the true depths for correction and ensure proper placement of the drain-hole section in the target reservoirs.

The CONTRACTOR shall ensure that electric logs run in the wells are properly calibrated, that input recording parameters are appropriate and shall check the quality of the logs.

The CONTRACTOR shall timely provide to OWNER's ENGINEER raw log data with all relevant information.

3.3. Core Data Acquisition programme

The coring program is defined in Appendix 3 and Appendix 4 of the present document.

The cores must be labelled, described, photographed and preserved following good oilfield practice and sent without delay to the relevant testing laboratory (not yet chosen).

If the cores are taken in unconsolidated or fractured formations, the cores have to be stabilized for transport. Thereby internal damaging of the core shall be excluded by using sufficient stabilization methods depending on core analyses and formation properties.

3.4. Detailed drilling / completion program

After CDIW CONTRACT award, and following a workshop with the OWNER's ENGINEER to establish a Drilling Well On Paper (DWOP), the CONTRACTOR shall for each well, establish in line with the Generic Well Design Memorandum, a Detailed Drilling Program and a Detailed Completion Program.

The Detailed Drilling Program shall include all the detailed engineering data necessary to ensure delivery of a fit for purpose well such as (but not limited to):

- Well targets, directional surveying, anti-collision,
- Casing and drilling scheme, mud program, drill bit program, planned bottom hole assemblies, casing running procedures,
- Detailed cementing procedures including cement placement simulations + cement slurry formulations + cement tests results,
- Pressure tests (FIT, wellhead),
- Detailed program for data acquisition operations (wireline logs, coring, well testing…),
- Drilling wellheads w/ BOP stack,
- Cellar allocation, and
- A detailed step-by-step program covering all steps from spud to start of completion work.

Special emphasis shall be put on the cementing procedure of the 7" production casing which must lead to produce a gas tight cement bond above the shoe of this casing. Achieving this objective is essential for preventing gas from leaking away from the underground reservoir up into the upper formations and is considered a key quality milestone for the wells.

The Detailed Drilling Programme shall include all tests and checks necessary to ensure:

- Drilling is conducted safely with adequate kick tolerance margins, in compliance with Georgian regulations or OWNER's requirements and with sound industry practice,
- A gas tight, leak-free containment from reservoir to surface is established by the production casing and by the cement placed in the annulus and in the casing shoe area.

The CONTRACTOR shall establish for each well a Detailed Completion Program that shall include all the necessary detailed engineering data to ensure delivery of a fit for purpose completion, an efficient well clean out.

The Detailed Completion Programme shall include a detailed completion schematic with:

- OD's, ID's, planned depth of all completion components,
- Description and detailed characteristics of all completion accessories (at least connections, grade of steel),

- Composition of the different fluids used during the completion (completion fluid, packer fluid),
- A step by step program covering the change over from mud to completion fluid with filtering requirements,
- Running in the slotted liner and completion equipment and testing,
- Nippling-up the Christmas tree, testing, and
- Cleaning out the well.

It shall include all tests and checks necessary to ensure:

- Compliance with Georgian regulations,
- A gas tight, gas leak-free path to surface is established by the production packer / tubing (incl. SSSV) / wellhead assembly,
- The Christmas tree is fully functional and pressure tested.

3.5. Drilling and completion engineering support during well construction

The CONTRACTOR shall provide at all time adequate engineering support to the well construction operations during the well construction. Qualified drilling and completion personnel shall at all time be assigned to the project for drilling and completion work surveillance with the ability to make all required adaptations and changes to the planned program, should it be necessary.

CONTRACTOR personnel assigned to the project shall benefit from CONTRACTOR in house expert support and shall be able to access and use all relevant CONTRACTOR software's and expert resources.

3.6. End of well documentation

The CONTRACTOR hands over 3 sets of an end of well documentation package after completion of the work on each well and no later than 15 days after completion of this work issue to the OWNER. It will include as a minimum:

- The deliverables described in the mud logging / coring / electrical logging / well testing and measurement works requirements;
- The Drilling End of Well Report that will include at least all relevant drilling and completion data, as built wellbore sketches with lithostratigraphic column and mud logging data, mud log, detailed as built completion diagrams, a summary of the drilling and completion operations, the days versus depth performance achieved versus planned, the casing and completion string tallies, the casing

running and cementing reports including cement slurry compositions and a description of the pumping sequences with slurry and displacement volumes, raw and interpreted cement logs, the results of the directional surveys and sketches showing the as built wellbore trajectory, the drill bit records, the drilling mud characteristics, a recap of evacuated drilling wastes, well testing data, the daily operations reports both for drilling and completion, initial detailed drilling and completion programs including additional procedures issued, incidents record and lessons learnt;

- Record of all tests and checks performed showing that:
    - A gas leak free path has been established from reservoir to surface thru production casing shoe and its cementing, production packer tubing and wellhead;
    - A leak free secondary containment has been established by the production casing;
    - The Christmas tree is fully functional and pressure tested.
- The Mud Logging report;
- The Well Testing Report (for well EXP-2) that will include at least: operations sequence, surface data acquisition and onsite analyses, bottom-hole pressure/temperature data, bottom-hole sampling and samples transfer operation report.
- The Geological End of Well Report that will include at least: drilling / casing phases summary, formation well tops (real vs. predicted), well logging operations report, coring operations report, composite log covering all sections with logging data available, mud logging summary with cuttings descriptions, core description if applicable depending on the core handling and conservation procedure applied.

All deliverables issued by the CONTRACTOR shall be in the English language.

3.7. Documentation for submission to Georgian regulatory bodies

The CONTRACTOR shall prepare all documents relating to the well construction work that would be necessary for submission to Georgian regulatory body, as requested by the OWNER (documents in Georgian language).

4. LONG LEAD EQUIPMENT PROCUREMENT

4.1. Casings and tubing

Based on the Detailed Drilling Programme and Detailed Completion Programme, and on applicable technical requirements set in the present document, the CONTRACTOR shall establish and will be responsible for the detailed technical specifications the casings and tubings will have to fulfil. The CONTRACTOR shall buy the casings and tubings directly from an API licensed tubular goods manufacturer or stocker agreed by the OWNER. The CONTRACTOR shall appoint a competent third party for inspection and witnessing during tubular manufacturing when applicable.

Upon receipt of the tubulars, the CONTRACTOR shall provide the OWNER with a manufacturer certificate certifying the compliance of the tubulars with API 5CT specifications and with the inspection certificates issued by the third party in charge. Once delivered, the tubulars shall be stored under the CONTRACTOR responsibility, following State of the Art and good oil and gas field practice.

4.2. Wellhead equipment

Based on the Detailed Drilling Programme and on the Detailed Completion Programme and on applicable technical requirements set in the present document, the CONTRACTOR shall establish the technical detailed specifications the wellhead equipment will have to fulfil. The CONTRACTOR shall buy wellhead equipment directly from an API licensed wellhead manufacturer agreed by the OWNER. The CONTRACTOR shall appoint a competent third party for inspection and witnessing during wellhead manufacturing. Upon receipt of the wellhead equipment, the CONTRACTOR shall provide the OWNER with a manufacturer certificate certifying the compliance of the wellhead equipment with the API 6A specifications and with the inspection certificates issued by the third party in charge.

Once delivered, the wellheads shall be stored under the CONTRACTOR responsibility, following State of the Art and good oil and gas field practice.

4.3. Casing attachments

Based on the Detailed Drilling Programme and the Detailed Completion Programme and on applicable technical requirements set in the present document, the CONTRACTOR shall establish the technical detailed specifications the casing attachments will have to fulfil. The CONTRACTOR shall buy casing attachments directly from an API licensed manufacturer agreed by the OWNER. Once delivered, the casing attachments shall be stored under the CONTRACTOR responsibility, following State of the Art and good oil and gas field practice.

5. WELL DRILLING & COMPLETION REQUIREMENTS

5.1. Casing seats

The depths of the different casings proposed in Appendices 3 and 4 have to be revised, adjusted or endorsed by the CONTRACTOR based on his own studies, judgement and experience, taking into account but not limited to the following parameters:

- Pore pressure,
- Fracture pressure,
- Mud weight profile,
- Geology and geomechanics,
- Protection of the aquifer formations drilled through,
- Drilling requirements (kick off depth, deviation, dogleg severity, etc.),
- Kick tolerance requirements,
- Achievement of a gas tight cementation of the 7” casing across the caprock,
- Knowledge of local conditions.

The CONTRACTOR shall consider setting the 7” casing seat in the bottom of the Navtlugi formation (Upper Eocene), as close as possible to the top of the Middle Eocene reservoir in order to:

- Reduce the risks of borehole instability associated with keeping long shale section opened in the 6" hole,
- Reduce the length of the shale in contact with the reservoir during the well life.

5.2. Casings

The choice of the casing sizes is driven by the diameter of the completion and by the size of the last hole section. For the 7" casing it is of primary importance that the casing be properly cemented across the shales of the Upper Eocene Navtlugi formation to prevent storage gas from leaking upwards to upper formations.

All Materials has to be specified in accordance to API Spec 5CT and API TR 5C3.

5.3. Wellheads

The wellheads shall be supported by the 13 3/8" casing string and will support a 13 5/8" 3,000 psi BOP stack during the 12 1/4" phase and 8 1/2" phase, and a 7 1/16" 5,000 psi BOP stack during the 6" drilling phase. The configuration and the characteristics of the wellheads / BOP stacks assemblies used during well construction shall comply with Georgian regulations and API recommendations.

The working pressure of the wellheads (casing head housing, casing head spool, tubing head, adapters and blow out preventers) used throughout the well construction shall at all time exceed the maximum anticipated wellhead pressures. They shall be satisfactorily pressure tested at the beginning of each drilling or completion phase, to a pressure exceeding the maximum anticipated pressure.

The BOP stacks shall be tested in accordance with API recommendations as often as necessary in the course of the WORK to guarantee their tightness and proper functioning with no more than three weeks (21 days) between two pressure tests and no more than 1 week between function tests (API RP 53).

The Christmas tree shall be sized so that it provides full bore access into a 4 1/2" completion. Its pressure rating shall be 5000 psi.

The wellheads shall be designed to have the ability to be safely operated up to the maximum expected pressure on every drilling section plus a safety margin of 10%.

The maximum well-head pressure during gas storage operation in the Middle Eocene reservoir is expected to be 231 bar including a 10% safety margin.

5.4. Cement tops

Appendix 3 and Appendix 4 indicate that:

- The 30" - 32” and 18 5/8" conductors, the 13 3/8” surface casing and the 9 5/8” intermediate casing be cemented to surface,
- The 7” production casing be cemented up to minimum 200 meters inside the 9 5/8” casing.

5.5. Completion

A gas tight temporary packer completion (purchase and installation) is part of the WORK.

6. TECHNICAL REQUIREMENTS FOR THE WORK

6.1. Introduction

All delivered subsurface facilities shall be compliant with the Environmental and all other applicable regulations in force in Georgia.

6.2. Well pad construction and clean out

The well pad areas will be delivered to the CONTRACTOR as naked land in a status identical to that the CONTRACTOR will have the possibility to assess by himself.

The CONTRACTOR shall perform all the construction works necessary for the drilling rigs, their ancillaries and the drilling associated works, as per the well pad layout and the specifications defined in the Detailed Drilling Programme. This includes, but not limited to, well cellars and foundations, conductor pipes, concrete hard ground, spillage containment system, stone hard ground, temporary sewage/septic tanks, ditches, fences.

The CONTRACTOR shall also perform all the work necessary to create a suitable access road to the well pads from the public road network.

At the end of the well construction work, the CONTRACTOR on request of the OWNER shall remove / destroy all temporary constructions the OWNER does not want to keep. The CONTRACTOR shall then deliver to the OWNER a re-naturated pad clean of any debris or wastes, septic / sewage tanks empty.

6.3. Drilling rigs and ancillary equipment/works

The CONTRACTOR shall have to provide drilling rigs and all drilling works related equipment in order to be able to complete the WORK per the planned timeframe.

Outline Drilling Programme (Document number GK-SSD12-STO-RPT-0021-0) includes torque and drag calculations performed by the OWNER during feasibility stage. However, it is the responsibility of the BIDDER to produce these calculations and hydraulics calculations so as to ensure the suitability for the WORK drilling programs of the drilling rigs.

The characteristics of the drilling rigs shall be adequate to safely complete the drilling works required by the WORK. The rigs shall be able to conduct the drilling works in full compliance with applicable Georgian regulations.

As a preliminary indication, it is suggested that the rigs shall at least have:

120 metric tons dynamic hook load, shall be equipped with a rotary table or a top drive unit with at least 13,000 ft lbs continuous torque capacity at required rotary speeds and shall able to rack 2,300 m of 5” drill

pipe (plus BHA) without laying down. The clearance between beams and ground level under the substructure shall be high enough to accommodate for the height of the wellhead/ BOP stack assemblies.

Drawworks shall be 1,000 HP input power minimum with auxiliary brake. To reduce noise emissions a low noise main brake (disc or other) is preferred.

The driller control panel shall be enclosed in a control room equipped with an air-conditioning system.

All drill stem equipment shall be in accordance to API Spec 7-1. All drill pipe (DP) shall be Premium Class DP in accordance with API Spec 5D. All Connections shall be in accordance to API Spec 7-2 (or higher).

All drill string components shall be inspected per DS-1 SC5 requirements or similar/higher (i.e. NS-2) before campaign (2 wells) and additionally after reaching max. running hours. DP shall be re-inspected at least after 2,500 running hours. Drill Collars (DC), Heavy Weight Drill pipe (HWDP) and Subs shall be re-inspected after at least 300 rotating hours or 500 running hours.

All handling equipment for the planned drill string and bottom-hole assembly (BHA) components shall be provided as well as all required handling equipment for the casings to be run including circulating heads with adequate pressure and tension rating.

The rigs shall be equipped with a minimum of 2 x 800 HP triplex pumps (3rd pump on standby with 1 d max mobilization time). The mud tank volumes and set up shall be adequate for mixing new mud and planned mud change overs (2 independent mixing hoppers, 100 m^3 of reserve mud tanks, ±50 m^3 water tanks). The active mud tank volumes shall not be less than 150 m^3.

Vacuum and “poor boy" mud gas separators with sufficient capacity and trip tank are required.

Generators compressors and engines shall have full noise shielding in line with a night noise so as to comply with Georgian regulation. Generators shall provide enough power for the 2 mud pumps at full load, plus all mixing equipment and the rotary table / top drive running plus all ancillary rig equipment.

The rigs shall be equipped with:

- A 13 5/8” 3,000 psi BOP stack compliant with Georgian applicable regulations as well as API that will at least include a 3,000 psi annular preventer, one 3,000 psi double ram preventer equipped with pipe rams on the upper level and blind/shear rams in the upper level, one drilling spool flange with double valve 3" min. kill line with backpressure valve and a double valve 4" min choke line (thereof min. one hydraulically actuated valve and two choke valves, one of it automatically incl. remote control panel).
- A 7 1/16” 5,000 psi BOP stack compliant with Georgian regulations as well as API that will at least include a 5,000 psi annular preventer, one double ram preventer equipped with pipe rams and blind/shear rams, a drilling spool flange with double valve 3" min. kill line with backpressure valve and a double valve 4" min choke line (thereof min one hydraulically actuated valve and two choke valves, one of it automatically incl. remote control panel). If floating mud cap drilling is conducted for drilling the reservoir, the CONTRACTOR has to consider the usage of a rotating control device (RCD).
- BOP stack remote control in the tool pusher office and at the rig floor.

- A BOP closing unit with enough pressure accumulator capacity to close, open and close the entire system (annular, rams and valves) and with full back up for the primary pump.
- Ram sizes to suit all tubular strings to be used with spares; spare annular rubbers and all required equipment to perform full BOP stack testing
- To secure the well on the drill pipe side the following minimum requirements shall be applied according to API 53 RP:
    - For kelly operated rigs an upper kelly valve shall be installed between the swivel and the kelly and a lower kelly valve shall be installed immediately below the kelly.
    - For top drive systems two Full Open Safety Valves (FOSV) shall be installed. The upper valve shall be pneumatically or hydraulically controllable from the driller's console. The lower valve shall be a manually operated FOSV.
    - A spare drill pipe safety valve shall be readily available (stored in open position with wrench accessible) on the rig floor at all times. This valve(s) and crossover sub(s) shall be equipped to screw into any drill string member in use. The outside diameter of the drill pipe safety valve shall be suitable for running into the hole.
    - An Inside BOP (IBOP) valve shall be available for use when stripping the drill string into or out of the hole. The valve(s), crossover sub(s), or profile nipple shall be equipped to screw into any drill string member in use.

Shielded low impact lighting shall be sufficient to lighten adequately all working areas at night.

Camp at rig site shall include offices for CONTRACTOR staff and supervision, an office for short staying subcontractors, a meeting room, an office for OWNER or its representatives, a social room with food reheat facility for drill site personnel, a change room with showers and toilet, potable water tank and a coverall laundry. All offices/trailer should have air-condition systems.

High pressure and steam cleaners shall be provided for rig floor and well pad cleaning.

The drilling rigs shall operate on a 24/7 basis. Rig personnel shall be experienced and tool pushers, drillers and assistant drillers shall have a well control certification (IWCF or similar).

Rig personnel shall include at least the following personnel:

- On a daily basis: one tool-pusher, 3 roustabouts, 1 mechanic, 1 electrician
- On a per shift basis: one driller, one assistant driller, one derrick-man, two floor- men (can be less if rig automated).

The BIDDER shall deliver in its Generic Well Design Memorandum as part of his answer to the Call for Tender a list (IADC standard) with specifications of the rig and its ancillary equipment.

6.4. Wellbore trajectory requirements

The wellbore trajectories shall be planned and executed in such a way as to prevent any collision with existing wells at the time of the drilling.

Wellbore tortuosity shall be kept as low as possible. In order to do so, planned wellbore trajectories shall be designed with doglegs not exceeding 1°/10 m and the executed trajectories shall be such that directional surveys do not show doglegs exceeding:

- 1.5°/10 m over a borehole section of more than 60 meters,
- 2°/10 m over a borehole section of more than 20 meters.

Should the wellbore trajectory requirements above not be fulfilled, the OWNER reserves the right to ask for the CONTRACTOR to P&A the non-compliant borehole section and to re-drill it at CONTRACTOR's expenses.

6.5. Casings and tubing

6.5.1. Metallurgy, Threads, and Range

The following assumptions are made for the injected storage gas composition according to EASEE standard:

- Maximum CO_2 content of 2.5% ,
- H_2S content of injected gas below 5 mg/sm^3.

CO_2 content of the associated gas from the native reservoir oil through analysis of available historical data shows scattered values for CO_2 concentrations from 0 to 1.2% mol in the associated gas.

Geochemical analysis from planned core and fluid samples will evaluate the possibility of CO_2 / H_2S generation from interactions between injected gas and reservoir rock and native reservoir fluids.

There is no specific concern about the metallurgy of the conductor casings (30 - 32" & 18 5/8").

Consequently the advised classes are as follows:

- 13 3/8" surface casing: 54,5 ppf, J-55 (First gas shows in JSD-1 observed @ 259 m).
- 9 5/8" Intermediate casing: 43.5 ppf, J-55.
- 7" Production casing: 20 ppf, N-80, Premium gas tight connections with multiple metal to metal seal and torque shouldered shall be selected for the production casing and for the tubing.
- The type of threads and the manufacturer preselected by the CONTRACTOR shall be submitted by the CONTRACTOR to the OWNER REPRESENTATIVE for approval before purchasing.

Additionally, all tubulars will be ordered Range 3, even for the tubing in order to reduce the number of connections. Tubing pup joints of various lengths will be required to prepare the completion sub-assemblies and facilitate the completion space out. Casing pup joints will also be required if a threaded casing hanger is selected to prepare a sub assembly and also for spacing out to adjust the casing shoe.

6.5.2. Calculations

The CONTRACTOR shall demonstrate that the tubular and completion equipment he proposes to use in the wells shall withstand the stresses they will be submitted to inside the full operating envelope of the wells.

In order to do so recognized casing/tubing design software will be used. Such software will have the ability to take into account both thermal and pressure induced stresses (such as TDAS, Wellcat, etc.).

All relevant casing load cases shall be checked.

For the casings, this shall include at least, but is not limited to the following load cases:

- Cementing operations (mud internal, mud and cement external) for conductor pipes, surface, intermediates, and production casings.
- Green cement pressure test (test pressure + mud internal, mud and cement external) for surface intermediate and production casings.
- Full evacuation (0 internal, mud external) for conductor pipe and all casings.
- Gas kick (gas and mud internal, pore pressure external) for surface, intermediate and production casing.
- Pressure test (test pressure and mud internal, pore pressure external) for surface, intermediate and production casing.
- Surface tubing leak cold (shut in WHP and packer fluid internal, mud and cement water mix to shoe and pore pressure in open hole) for production casing.
- Surface tubing leak hot (shut in WHP and packer fluid internal, mud and cement water mix to shoe and pore pressure in open hole) for production casing.

For the tubing, this shall include at least but is not limited to the following load cases:

- Full evacuation (0 internal, 30 bar annulus surface pressure, mud or packer fluid external, production temperature).
- Full evacuation Hot (0 internal, 30 bar annulus surface pressure, packer fluid external, static temperature).
- Shut in full of gas cold (shut in WHP and gas internal, mud or packer fluid external, static temperature).
- Shut in full of gas hot (shut in WHP and gas internal, packer fluid external, production temperature).

- Pressure test (test pressure and packer fluid internal, packer fluid external).
- Surface tubing leak hot (production temperature, annulus and tubing pressures equalize at surface, packer fluid external).
- Surface tubing leak hot (static temperature, annulus and tubing pressures equalize at surface, packer fluid external).

6.5.3. Safety factors

The proposed tubulars shall be such that the calculated safety factors exceed the minimum safety factors listed here below:

Minimum safety factors	Conductor casing	Surface casing	Intermediate casings	Production casing	Tubing
Burst	1.1	1.1	1.1	1.1	1.1
Collapse	1.0	1.0	1.0	1.0	1.0
Axial pipe body	1.25	1.25	1.25	1.25	1.25
Axial conn.	1.8	1.8	1.6	1.6	1.6
Compression	N/A	1.1	N/A	N/A	N/A
Triaxial	1.25	1.25	1.25	1.25	1.25

6.5.4. QA/QC

6.5.4.1. Reference documents:

The tubular will be manufactured as per the following API documents (latest edition):

- API RP 5C1 Care and use of casing and tubing,
- API TR 5C3 Formulas and calculations for casing and tubing,
- API Spec 5 CT Steel pipe for use as casing or tubing for wells.

6.5.4.2. Inspection

CONTRACTOR will appoint a third party for witnessing factory tests and inspections during their manufacturing process in accordance or similar to inspection certificate 3.2 of EN 10204.

6.5.4.3. Delivery and storage

The tubulars shall be delivered with thread protectors, and the threads shall be protected against corrosion by a storage thread compound. The contractor shall arrange for the delivery of the tubular equipment and shall make sure that proper handling procedures are applied. The contractor shall create or secure a tubular storage area for casing and tubing storage in between delivery time and use time. On this area, the tubulars will be stored so that they are not in direct contact with the ground, with threads protected by a storage compound and thread protectors. Different weights or grades of same size tubulars shall be kept separate.

6.6. Wellhead equipment

6.6.1. Reference documents

The wellhead equipment shall be designed, manufactured inspected and tested according to:

- API 6A and ISO 10423 for wellhead equipment,
- NACE MR 0175 for SSC resistant metallic materials.

6.6.2. Description of Well head and Xmas tree assembly

The wellhead and Christmas tree assembly will typically (but not limited to) consist of:

- casing head housing / ground flange 13 5/8" 3,000 psi, with two outlets 3 1/8" 3,000 psi,
- casing head spool 13 5/8" x 11" 3,000 psi with two outlets 3 1/8" 3,000 psi,
- tubing head spool 11" 3,000 psi x 7 1/16" 5,000 psi with two outlets 2 1/16" 5,000 psi,
- tubing head adaptor 7 1/16" x 4 1/16" 5,000 psi,
- christmas tree assembly 4 1/16" 5,000 psi with 2 master valves and one wing.

The contractor shall liaise with the OWNER's ENGINEER regarding the number and location of the fittings required on the Christmas tree for pressure/ temperature measurements remotely controlled.

6.6.3. Technical requirements

The following aspects must be taken into account to select the appropriate level of technology required for the wellhead equipment.

- Type of well: Gas well
- Eruptive well
- Pressure : Medium pressure (< 5,000 psi)
- Temperature: -20 °C to +120 °C
- H_2S risk: H_2S content of storage gas below 5 mg/m^3

6.6.4. Equipment selection

6.6.4.1. Pressure rating

The pressure rating of the equipment will be 3,000 psi for the casing head housing / spools and 5,000 psi for tubing head housing and the rest of the equipment.

6.6.4.2. Temperature rating

With a maximum reservoir temperature of 120 °C the temperature rating of the equipment shall be Class U.

6.6.4.3. Material class

A corrosion study shall be performed to confirm the material class to be selected for the equipment.

Note: the feasibility study made by the OWNER's ENGINEER proposed material class CC. This result needs to be checked and endorsed by the CONTRACTOR.

6.6.4.4. Minimum Product specification level (PSL)

The maximum WHP expected is below 5,000 psi with the well in no sensitive environment and without cracking (domain 2 or 3). In such case the recommended PSL level should at least be PSL 2. Considering the expected well lifetime the Christmas tree equipment will be at least PSL 3. This result needs to be checked and endorsed by the CONTRACTOR.

6.6.4.5. Minimum Performance requirement (PR)

The performance requirement defines how the equipment shall perform applying the designed pressure and temperature and in contact with the required fluid. It is recommended to order the casing heads with PR 1 as a minimum and the rest of the equipment, the tubing head and the Christmas tree for which more reliability is required, with PR 2 as a minimum.

6.6.5. Inspection

A factory third party inspection of the equipment shall be taken in charge by the CONTRACTOR and performed in accordance or similar to inspection certificate 3.2 of EN 10204. A stack-up test could also be performed at the manufacturing plant to ensure that all the equipment including wellhead, tools and running tools are ready to use.

6.6.6. Detailed description of the equipment

6.6.6.1. Casing head housing assembly and associated tools

- Casing head housing: 13 3/8" CSG connection on bottom x 13 5/8" 3,000 psi flange on top
- Tie-down screws suitable to wear bushing, 2 unscrewable lifting eyes on top
- Two blind flanges 3 1/8" 3,000 psi with 1/2" NPT bull plug respectively needle valve and pressure gauge

- Suitable ring gaskets, bolts
- Casing hanger for 9 5/8" casing with extended neck, bottom and top connection suitable for 9 5/8" casing string
- Wear bushing for the casing head housing
- Test plug for the casing head housing
- Running/retrieving tool for wear bushing with 4 1/2 IF top connection
- Running/retrieving tool for test plug with 4 1/2" IF top connection

6.6.6.2. Casing head assembly

- Casing head: 13 5/8" 3,000 psi flange on bottom x 11" 3,000 psi flange on top with bottom preparation for 9 5/8" casing hanger extended neck with double elastomeric seals, 2 unscrewable lifting eyes
- Tie-down screws suitable to wear bushing, 2 unscrewable lifting eyes on top
- Two blind flanges 3 1/8" 3,000 psi with 1/2" NPT bull plug respectively needle valve and pressure gauge
- Suitable ring gaskets, bolts
- Casing hanger for 7" casing with extended neck, bottom and top connection suitable for 7" casing string
- Wear bushing for the casing head
- Test plug for the casing head
- Running/retrieving tool for wear bushing with 4 1/2" IF top connection
- Running/retrieving tool for test plug with 4 1/2" IF top connection
- for drilling operations only: adapter flange 11" 3,000 psi on bottom x 13 5/8" 3,000 psi on top, flange high as low as possible (only temporary, can be part of CONTRACTORs rentable equipment)

6.6.6.3. Tubing head assembly

- Tubing head 11" 3,000 psi flange on bottom x 7 1/16" 5,000 psi flange on top with bottom preparation for 7" casing hanger extended neck with double elastomeric seals
- Tie-down screws suitable to wear bushing, 2 unscrewable lifting eyes on top
- Two blind flanges 2 1/16" 5,000 psi with 1/2" NPT bull plug respectively needle valve and pressure gauge
- Suitable ring gaskets, bolts
- Tubing hanger for 4 1/2" tubing with extended neck and preparation for “feed thru" 0.25" control line and 0.25" electric line with metal seal preparation on top, on top threaded for 3 63/64" BPV LH.
- Wear bushing for the tubing head

- Test plug for the tubing head
- Running/retrieving tool for wear bushing with 4"1/2 IF top connection
- Running/retrieving tool for test plug with 4"1/2 IF top connection

6.6.6.4. Tubing head adaptor

- Tubing head adaptor 7 1/16" 5,000 psi flange on bottom x 4 1/16" 5,000 psi flange on top with bottom preparation for tubing hanger metal seal, one flanged outlet for 0.25" hydraulic control line and one outlet for the 0.25" electric line (this outlet will be designed with the down hole gauges manufacturer)
- Suitable ring gaskets, bolts

6.6.6.5. Christmas tree

- 4 1/16" 5,000 psi Y-type Christmas tree (one wing)
- 4 1/16" 5,000 psi manual master valve min. 4" ID
- 4 1/16" 5,000 psi operated master valve min. 4" ID with hydraulic or pneumatic actuator with manual override and position indicator
- Blind flange 4 1/16" 5,000 psi with 1/2" NPT bull plug (wing)
- 4 1/16" 5,000 psi manual swab valve min. 4" ID
- 4 1/16" 5,000 psi cap flange and 1/2" NPT needle valve plus pressure gauge
- Suitable ring gasket, bolts

Note:

- The CONTRACTOR shall have to liaise with the OWNER's ENGINEER to make sure all fittings and valves for glycol injection and for instrumentation hooked up into the surface control command system are included in the wellhead (a 4 1/16" instrument flange might be required).
- The type of actuator will be selected after liaising with the OWNER's ENGINEER.

6.6.6.6. Notes

- Two or three 2 1/16" 5,000 psi manual valves will be ordered for future pumping or testing operations.
- If two rigs operate simultaneously two complete sets of tools and running tools shall be ordered.
- A list of spare parts will be also ordered with the equipment; this list must be prepared and proposed by the MANUFACTOR.
- The BIDDER list of the wellhead suppliers shall be approved by the OWNER.
- Wear bushings shall be used at all time while drilling and tripping to protect internal bowls from damage by drill string.

6.7. Directional drilling works

The CONTRACTOR shall provide all the equipment and qualified personnel for the directional drilling works required to execute the planned wellbore trajectories. This includes but is not limited to bottom-hole assemblies needed to complete the directional work.

In order to avoid collisions between wells, directional drilling operations shall be conducted in such a way that the ellipse of uncertainty of the well being drilled shall not intersect the ellipse of uncertainty of already existing wells. For planning the separation factor should exceed 2 and a confidence level of at least of 95% should be used.

Computer software shall be available on site to perform all necessary calculations regarding well trajectories including well path coordinates, uncertainty calculations and separation between wells calculations.

All drill stem equipment of Drilling works (Mud Motor, MWD, Jar, Other) shall be inspected per manufacturers/suppliers recommendation or at minimum DS-1 Cat 3 (or higher) before campaign (2 wells) and additional after reaching maximum running hours. Maximum running hours before re-inspection shall be in accordance with the supplier / manufacturer of the tools and for mud motors and jars at least after 200 rotary hours or 400 running hours. After stuck pipe events or fishing of (or part of) the BHA, the whole BHA shall be re-inspected. All connections shall be in accordance to API Spec 7-2 (or higher).

Mud Motors and MWDs shall be functioned tested before delivery and on Run in Hole (RIH).

Drill Bits and mud motors (bearing seals) shall be visually inspected on every RIH / Pull Out Of Hole (POOH).

6.8. Drilling mud

6.8.1. General

The CONTRACTOR shall provide all products and chemicals necessary to the make-up and to the maintenance of the drilling muds used throughout the construction of the wells.

Mud products used to drill through aquifers shall be water based mud with components limited to those that will not pose a threat to water resources.

The CONTRACTOR shall design and adapt the mud composition and the mud properties to ensure adequate hole cleaning and to preserve the borehole stability.

In addition the CONTRACTOR shall design drill-in fluid as mud system for the 6” phase in such a way that damage to the underground gas storage reservoir shall be kept to a minimum and shall be reversible through adequate treatment/cleanout procedure.

Prior to cementing casings, the CONTRACTOR shall condition the mud to properties adequate to ease as much as possible its displacement by the cement slurry.

The mud density shall be maintained and monitored in a way that will prevent at all time influxes from the drilled formations into the wellbore.

The CONTRACTOR will provide onsite a mud cabin equipped with all necessary equipment to perform all the standard measurements commonly done on the mud systems that will be used. An experienced mud engineer will periodically check the properties of the drilling mud as many times as required with a minimum of 2 checks per day. He will determine the products to be added in the mud system and will conduct all necessary pilot tests to determine the treatments required to bring the mud to the required specifications.

The CONTRACTOR will timely manage all products and equipment delivery (loading, transport, unloading and on site storage).

At completion of the WORK, the CONTRACTOR shall take back all unused mud products.

6.8.2. Solid removal

Besides rig solid removal equipment, the CONTRACTOR shall provide all additional solid removal equipment (such as centrifuges) that might be necessary to efficiently remove fine solids from the active drilling mud.

6.8.3. Drilling waste

The CONTRACTOR shall evacuate all generated wastes to an adequate landfill or treatment facilities in compliance with applicable Georgian regulations (this includes but is not limited to all garbage, scrap iron, used oils, solvents, oily rags, packaging…)

The CONTRACTOR shall perform all treatment and evacuation of all drilling wastes (used drilling muds and cuttings, oily or muddy liquids recovered on proof surfaces, wash waters…) out of the site to treatment facilities or discharge areas duly authorized to receive these wastes. Transportation and documentation shall be performed in compliance with applicable regulations.

The CONTRACTOR shall take all guarantees and insurances for the case of an accidental spill in between the drilling site (loading location) and the treatment or storage facility (unloading point) as well as for the way back and this for all the different products he will have to transport. In case of accidental spillage, the CONTRACTOR shall be liable for the cleaning and will bear the cost of such cleaning.

The CONTRACTOR shall organize for all drilling wastes to be recovered in a tight containment (tank, lined pits….) to prevent the soil from being contaminated. In case of spill over, the contractor shall perform a complete clean up.

No discharge into the environment is allowed.

As needed, periodic analysis of the wastes will be conducted to make sure that the characteristics of the wastes hauled out of the drill site comply with the authorization of the landfill or of the treatment facility to which they will be delivered. Results of these analyses shall be communicated to the OWNER.

Evacuation of all wastes out of either of the drill sites shall be completed no later than 10 days after the end of the drilling operations on the considered the drill site.

All wastes movement shall be documented and kept track of, as required per Georgian regulations.

In addition, the CONTRACTOR shall maintain a log of all waste transportation outside of the drill site with the date of the transportation, the nature of the waste, its estimated quantity, the name of the trucking company, the license number of the truck, the name of the driver and the destination of the wastes.

6.9. Mud logging

The CONTRACTOR shall provide full mud logging and drilling data collection and monitoring.

The Programme given below is a minimum required and the CONTRACTOR shall elaborate and propose their own concept. A digital copy (PDF format) of the mudlog, drilling data log, pressure log and gas ratio log, at original 1:200 and 1:500 vertical scales, are required on a daily basis.

Lithological sampling will commence either at the 18 5/8" casing shoe or at the depth where mud returns commence, and will continue to total depth (TD).

Data will include monitoring and/or provision of the following parameters (not limited to):

6.9.1. Gas Parameters

- FID total gas,
- FID chromatographic analysis,
- Report background gas, circulation gas, connection and trip gas
- Calculation and provision of Gas Ratio Analysis (GRA) data in the requested log format.
- Continuous H_2S detection: ditch gas line, active mud pits & shakers,
- Report any H_2S associated with the above,
- Continuous CO_2 detection,
- Dräger portable detector for O_2, CH_4, H_2S, CO_2

6.9.2. Drilling Parameters

- Depth,
- Rate of penetration,
- Weight on bit,

- Rotary and bit RPM,
- Mud pit levels,
- Pump strokes,
- Calculation of lag time,
- Formation pressure analysis and prediction,
- Drill string torque and drag,
- Flow rate,
- Standpipe pressure,
- Mud density in/out.

6.9.3. Cuttings sampling

The Programme given below is a minimum required and the CONTRACTOR shall propose their own scope.

- 24" hole cuttings samples:
  Cuttings samples should be collected by the mud logger at 10 m intervals, subject to availability of mud returns and ROP.
- 17 1/2" hole cuttings samples:
  Cuttings samples should be collected by the mud logger below the 18 5/8" casing shoe at 5 m intervals, subject to availability of mud returns and ROP.
- 12 1/4" Hole Cuttings Samples:
  Cuttings samples should be collected by the mud loggers below the 13 3/8" casing shoe at 5 m intervals, subject to availability of mud returns and ROP.
- 8 1/2" Hole Cuttings Samples:

  Cuttings samples should be collected by the mud logger below the 9 5/8" casing shoe at 3 m intervals, subject to availability of mud returns and ROP.
- 6" hole Cuttings samples:
  Cuttings samples should be collected by the mud logger below the 7" casing shoe at 3 m intervals, subject to availability of mud returns and ROP.

6.9.4. Lithological Description Format on site

For all cuttings description the CONTRACTOR wellsite geologist and mud loggers shall apply the listing below:

- Colour,
- Grain size

- Sorting,
- Grain shape,
- Texture and fabric,
- Hardness,
- Cementation,
- Grain composition,
- Structure,
- Accessories and inclusions,
- Porosity estimate,
- Show descriptions should include:
  - Odor,
  - Visible staining,
  - Fluorescence intensity,
  - Percentage of sample fluorescing,
  - Speed of cut,
  - Colour of cut (natural light),
  - Colour of cut fluorescence,
  - Residual colour (natural light).

6.9.5. General Deliverables

The CONTRACTOR shall provide a final copy of the mud log, formation pressure log, gas ratio log and drilling data log in hard copy and digital formats at the end of each well, as appendices to the final Mud Log Report (MLR). A detailed register of samples must be included in the final MLR. This should explain all missing sample intervals and summarise packing and dispatch of all samples including a description of packaging and any other relevant information.

Digital Mudlogging Data in LAS format and PDF formats shall be provided on CD or DVD with a header giving field names, curve names and units of measure:

- Mud log 1:200 and 1:500, TVD and MD as appropriate,
- Pressure log: 1:200 and 1:500, TVD and MD as appropriate,
- Gas log: 1:200 and 1:500, TVD and MD as appropriate,
- Drilling log: 1:200 and 1:500, TVD and MD as appropriate,
- Mud log depth and time databases.

The monitoring of recorded drilling parameters should be visualized on rig floor (as EX-proof) and in offices of toolpusher, drilling supervisors and OWNER'S ENGINEER as a minimum.

6.10. Coring

The CONTRACTOR shall collect cores from the two vertical wells.

Appendix 3 and Appendix 4 are showing the coring programme for each well:

- EXP-1: 40 m coring length at the base of the 8 ½" section (Navtlugi caprock formation),
- EXP-2:
    - 40 m coring length at the base of the 8 ½" section (Navtlugi caprock formation),
    - 100 m coring length (minimum requirement) in the 6'' section (Middle Eocene reservoir).

The CONTRACTOR shall cut the cores in such a way that core recovery is maximized and that the cores are recovered undisturbed:

- For coring inside the fractured Middle Eocene reservoir, suitable equipment for this type of fractured formation shall be used to optimize core recovery (with adequate core catcher system) and prevent core jamming.
- Coring parameters and mud properties shall be selected to prevent core jamming.
- The core barrel length shall be selected based on local experience.

The CONTRACTOR shall propose coring methodology, core handling and conservation procedures to optimize core preservation in the purpose of routine and special core analysis measurements and mechanical measurements.

Core will be stored in appropriate core containers provided by the CONTRACTOR. Special attention will be paid to packaging in order not to damage the cores during transportation using such as having foam injected around the cores in the core containers prior to transportation.

A core gamma ray unit shall be available in order to get accurate correlations between core measurements and measurements from electrical logging.

The CONTRACTOR shall ship the cores in appropriate containers to a core analyses laboratory (to be selected by the OWNER's ENGINEER). Core laboratory analysis is taken in charge by the OWNER's ENGINEER.

6.11. Cementing requirements

The CONTRACTOR shall deliver all cementing works that will be required to deliver a fit for purpose well.

The CONTRACTOR shall deliver casing cementations that will isolate from each other the aquifers that need to be isolated. Such cementations will seal off around the casing shoes in order to provide enough integrity to allow for a safe deepening below casing with a high enough kick tolerance margin. Additionally, such cementations shall have to keep the gas from leaking out of the underground gas storage to other formations or in annular spaces during the well life cycle.

Special emphasis shall be placed on the cementing of the 7” production casing as its cementation shall provide a gas tight seal to prevent communications between the underground gas storage and the upper formations.

6.11.1. Casing cementing objectives

- 30 - 32" and 18 5/8" conductor: avoid mud returns in cellar, isolate underground waters and provide support to the conductor pipes that shall be cemented to surface.
- 13 38" surface casing: isolate the surface deposits and the surface aquifers, provide shoe integrity to drill down to the top of the Upper Eocene (12 1/4" phase) with acceptable kick tolerance. The casing shall be cemented to surface.
- 9 5/8" intermediate casing: provide shoe integrity with acceptable kick tolerance (top of reservoir). The casing shall be cemented to surface.
- 7” casing: provide shoe integrity to drill into the Middle Eocene. Seals off the reservoir and prevents future gas from escaping to upper formations. The casing shall be cemented at least 200 m inside the 9 5/8" casing.

6.11.2. Cement formulations and testing

Unless otherwise approved by OWNER’S ENGINEER, all cement slurry formulations shall use API class G cement.

The CONTRACTOR shall have all cement slurry formulations laboratory tested prior to being used and test results with all supporting documentation (such as recorded parameters during test) shall be made available to the OWNER’S ENGINEER. Tests performed shall comply with API RP 10B-2.

The CONTRACTOR shall perform all tests necessary to ensure the characteristics of the cement slurries are adequate to deliver fit for purpose cementing.

As a minimum, the following tests shall be performed on all formulations of cement slurries used for casing cementing:

- 30" - 32", 18 5/8", and 13 3/8" casing: thickening time and compressive strength (UCA).

- 9 5/8" casing: thickening time, compressive strengths (UCA + destructive test at 12, 24 and 48 hours), free water, settling time, fluid loss, rheology including compatibility of slurry with spacer and of spacer with mud if required for 0/100, 25/75, 50/50, 75/25, 100/0 mixes.
- 7" casing : thickening time, compressive strengths (UCA + destructive test at 12, 24 and 48 hours), free water at maximum well angle, settling time, fluid loss, transition time over hardening time, rheology including compatibility of slurry with spacer and of spacer with mud if required for 0/100, 25/75, 50/50 , 75/25, 100/0 mixes.

Tests shall be conducted using site water as mix water.

For the 9 5/8" casing slurry formulations shall be such that free water shall not exceed 1 %, and fluid loss shall be kept below 300 ml. A minimum 500 psi compressive strength shall be attained at the time drilling resumes.

For the 7” casing slurry formulations shall de designed with proper additives to prevent gas migration from the reservoir, with zero free water and less than 50 ml fluid loss and with transition time as short as possible. A minimum 2,000 psi compressive strength for the tail and a minimum of 72 h shall be attained at the time drilling resumes.

Immediately before the cementing operation a check of the thickening times shall be performed using a sample of the cement delivered to the site and mix water from the site.

Tests shall be conducted for each slurry at adequate BHST (bottom hole static temperatures) and BHCT (bottom hole circulating temperatures)

Should bentonite be used as a lightweight agent in slurry formulation, it shall comply with API Spec 10.

6.11.3. Cementing procedure

Based on rheology from lab tests, CONTRACTOR shall perform a cement placement simulation to insure that with the pumping rates planned, downhole pressures will at all time stay within the safe pore pressure/fracture pressure window.

For each cementing job, the CONTRACTOR shall establish a detailed cementing procedure that will at least include:

- The formulation selected for the cement slurry(ies) and spacer(s),
- The result of the cement tests,
- The hole cleaning and mud conditioning requirements required prior to cementing,
- The results of the cement placement simulation, the centralizer placement calculations, the slurry volumes and displacements calculations based on borehole calliper data, tubular diameters and planned cement tops, and
- A step-by-step detailed procedure.

6.11.4. Cementing operations

The CONTRACTOR shall take all necessary steps and provide adequate equipment to insure that slurries are mixed as designed and tested, and that homogeneous slurries are pumped into the well.

For the 9 5/8" and 7" casing the CONTRACTOR shall use a mixing equipment setup that limits variations in pumped cement slurry characteristics such as with recirculating mixing or batch mixing. Except for dry blended additives, additives shall be added to mixed water before mixing starts and accurate measurement of additive quantities shall be performed. If needed, additional tank volumes shall be provided to guarantee against accidental mix between prepared mix water and drilling mud.

Down hole mixing between mud and cement shall be prevented by always using dual bottom and top plug systems whenever possible and by having enough spacer fluid (at least 150 m of annular volume) of appropriate characteristics pumped ahead of the cement.

Whenever possible, pipe movement shall be considered during cementing to ease the displacement of the mud by the spacer and the cement.

Cement displacement/ pumping rates shall be as high as possible without inducing risks of lost returns and without sacrificing slurry density control.

Cementing units shall be soundproofed and equipped with a nuclear densitometer and with a system to record pumping rates, cumulated volumes pumped, injection pressure, and slurry density.

Whenever possible, the casing string shall be pressure tested at maximum anticipated surface pressure when bumping the plugs.

The cementing unit area shall be left clean at the end of each cementing operation. Unused slurry or unused mixed water containing additives shall be directed to watertight pit.

6.11.5. Casing cementing report

For each casing cementing operation, the CONTRACTOR shall include in the end of well package a cementing report that will detail the composition of the cement slurries and spacers used, and the pumping rates and volumes. Additionally, this report will include the charts of recorded parameters during the cement job (pumping rates, volumes pumped, injection pressure, and slurry density) and a description of all incidents that may have happened during the cementing operation and that could impact the final quality of the cement job.

6.11.6. Casing cementing quality requirement

The CONTRACTOR shall achieve and deliver the cementing of the casings in compliance with the following minimum quality criteria:

- The 13 3/8" surface casing shall be cemented up to surface that is with return of slurry at surface at or close to mixing density. Should a drop in level of cement occur, a cement horse collar shall be placed in the top 50 m by pumping slurry thru macaronis placed in the 18 5/8" x 13 3/8" annulus.

- The 9 5/8" intermediate casing shall be cemented up to surface that is with return of slurry at or close to mixing density, at the surface level.

The cement control logs shall demonstrate that the upper aquifers are isolated hydraulically from each other and from the surface by the cementing as required by Georgian regulations.

The results of the 9 5/8" casing shoe pressure test (or leak off test) shall allow for safe deepening down to the 7" setting depth above the Middle Eocene reservoir.

- The 7" production casing shall be cemented at least 200 m inside the 9 5/8" casing. The cement control logs shall demonstrate that the annulus above the casing shoe is sealed off by cement with adequate bonding so as to prevent gas from leaking into upper formations for conditions within the anticipated storage operating envelope. This result will be considered achieved if cement control logs show at least 30 m of high cement quality bond above the 7" casing shoe and if the 7" casing shoe pressure test does not leak off for a pressure at the shoe 10 % higher than the maximum anticipated gas pressure at shoe during gas storage operations.

6.12. Casing accessories

For gas wells with cycled reservoir pressure, the casing / annulus integrity is of prime importance and the cementing operations must be successful at maintaining a gas tight barrier during all the well life. Cement accessories (such as float shoes, float collars, bow type centralizers, rigid centralizers, stop collars, cementing plugs….) are essential to the success of the cementing operations.

The CONTRACTOR shall provide all casing accessories required to achieve successful cementing operations for all the casing strings to be run.

A particular emphasis shall be placed on the centralization of the 7" casing up into the 9 5/8" casing in order to ensure proper cement placement and thus prevent stored gas from leaking upwards to upper formations. Similarly, emphasis shall be put on the cementing of the 9 5/8" casing above its shoe, that will act as a last barrier for preventing gas leaking behind the 7" casing from entering the upper aquifers.

For the intermediate casing and for the 7" production casing, centralizer type, quantities and placement shall be such that the calculated stand-off of the casing in the hole exceeds 80 %. The Maximum spacing of the Centralizer shall be 40 m. The CONTRACTOR shall perform a centralizer placement study based on the actual wellbore trajectory to confirm that the centralization program he proposes provides such a stand-off.

All Float Equipment shall comply with API RP 10F.

All bow type centralizers used shall comply with API Spec 10D.

6.13. Casing and tubing make up

The CONTRACTOR shall make sure that tubulars are run in safely and as per the recommendations of the tubulars manufacturers. Adequate and properly maintained equipment (lifting equipment, hydraulic casing tongs) and experienced personnel shall be used for all casing and tubing make up. The hydraulic tongs shall be properly calibrated for torque. API connections shall be made up as per API recommendations and premium connections shall be made up as per manufacturer recommendations.

Production casing and tubing premium gas tight connections shall be inspected by a competent third party at the rig floor for any defect in the metal to metal seal area prior to be made up and run in. For these connections a stabbing guide shall be used to reduce the risk of damage to the metal to metal seals when stabbing in.

A torque turn recorder with a dedicated qualified operator shall be used for recording and checking the makeup of the premium gas tight connections. This torque/turn unit is of prime importance to ensure that the premium connections are properly torqued and thus prevent gas leakage thru the threads.

The torque vs. turns graph of each connection must be verified carefully on the rig floor. Should torquing be not acceptable, both singles involved in the makeup shall be laid down and replaced.

A job report will be issued after each job. This report will include:

- The names of the personnel on site,
- The reference number and description of the equipment used,
- The data of the tubulars used (No., weight, grade, range, thread, torque, etc.),
- A time breakdown of the operation,
- The chart of each connection.

6.14. Electrical logging / Measurement works

The programmes given in Appendix 3 (well EXP-1) and Appendix 4 (well EXP-2) shall be acquired and delivered according to best practices in the oil and gas industry.

In case of wireline tool or equipment failure, the CONTRACTOR shall bear all costs related to back-up tools/equipment mobilization and stand-by time waiting for back-up tools/equipment.

The BIDDER shall deliver in its Generic Well Design Memorandum as part of his answer to the Call for Tender a list with specifications of the tools he intends to use.

The CONTRACTOR shall ensure that electric logs run in the wells are properly calibrated, that input recording parameters are appropriate, and shall check the quality of the logs.

Repeat sections of at least 70m shall be recorded for each log for checking the repeatability of logs response.

For the well EXP-2, the wireline logging program includes, in addition to the programme described in the column “Logging” of Appendix 4:

- The wireline micro-fracture testing operation in Navtlugi caprock formation (Upper Eocene) (included in column “Testing” of Appendix 4). The CONTRACTOR shall provide interpretation for these tests (including analysis of tests sequences, leak-off pressure, fracture opening / re-opening pressure, and fracture closure pressure).
- The optional wireline dual-packer formation testing (Middle Eocene), conditioned by the results of the DST test and associated bottom-hole fluid sampling (included in column “Testing” of Appendix 4).

The CONTRACTOR shall propose procedures for sidewall coring methodology, core handling, conservation, containment, transfer and preparation for shipping, to optimize core preservation.

The CONTRACTOR shall ensure that formation fluid sampling methodology, handling, conservation, containment transfer and preparation for shipping, preserves formation fluid samples (acquired with the formation testing tool).

The CONTRACTOR shall ship the sidewall core samples and formation fluid samples in appropriate containers to the analyses laboratories (to be selected by the OWNER’s ENGINEER).

Laboratory analyses of core and fluid samples are taken in charge by the OWNER’s ENGINEER.

Data is to be formatted and delivered in accordance with industry best practice.

The CONTRACTOR shall provide the following deliverables:

- Raw field prints of every log shall be provided to the OWNER and OWNER’s ENGINEER in hard and soft copies immediately after logging,
- As part of the Geological End-Of-Well report:
  1. General well data,
  2. Operational summary and time breakdown,
  3. Data quality/hole conditions,
  4. Well-site corrections made to record logs.
- Sets of CD or DVD's with images of standard log presentations (PDF format in continuous plot - not page by page), digital data of all recorded logs in agreed formats (LAS and DLIS) and the report in PDF format.
- Hard Copy Logs: one copy of the final paper prints at 1:200 and 1:500, TVD and MD.
- Report: one hard copy.
- For petrophysical interpretation (for each phase)
  1. Final well trajectory,
  2. Surface temperature,

3. Bottom hole temperature,
4. Geothermal temperature,
5. Water characteristics: Rw (ohm.m) at RwT (°C),
6. Mud characteristics: Rmf at MST (°C) and density.

For Wireline operations a weak point calculation (with software) for all logging runs is necessary. The cable head shall include a weak point. Maximum 60% of the tension limit of the weak point shall be applied (for more the approval of OWNER's ENGINEER is required).

For Slickline operations a Maximum of 60% of the tension limit of the line shall be applied (for more the approval of OWNER's ENGINEER is required).

All logging tool assemblies have to be approved by OWNER's ENGINEER prior to RIH.

6.15. Temporary Completion equipment

After EXP-1 well completion, the CONTRACTOR shall set a memory pressure gauge at the landing nipple bottom-hole, in order to record interferences with production testing and drilling (mud losses) in well EXP-2. At the end of drilling operations in well EXP-2, the CONTRACTOR shall retrieve the memory gauge in well EXP-1 and provide the acquired data.

The CONTRACTOR shall design, select, supply, test and install temporary completion equipment in line with Appendices of the present document. The key points to be considered for the selection of the completion equipment are outlined below:

- Completion should be easy to run but also easy to remove with minimum well control issues and limited potential damages for reservoir.
- All completion accessories shall be compatible with casing design and mechanically as strong as or stronger than completion tubing.
- All completion accessories shall be sufficient for the well conditions while operating. All materials has to be specified in accordance to API Spec 5CT and API TR 5C3. The connections of the hole completion equipment has to have premium gastight connections (multi metal seal, torque shouldered).

Elements are as follows (see Appendices 3 and 4 for depths):

- Landing nipple profile (for SSSV with control line) and the wireline retrievable SSSV,
- flow couplings above and below SSSV,
- 4 1/2" Tubing, 17.00 ppf, API N-80,
- Sliding side door as close to the packer as possible,
- Retrievable production packer for 7" casing, suitable for gas production with differential pressure of

max. 1,000 psi, max. absolute pressure 5,000 psi, temperature range from 5 to 120 °C, connection to tubing via polished bore receptacle (PBR) or overshot tubing seal divider (OTSD), landing nipple profile for bottom-hole pressure gauges and plugs,

- Releasing tool,
- 4 1/2" Slotted Liner with tubing shoe (as wireline re-entry guide) at +-15m above TD,
- wireline retrievable subsurface safety valve (SSSV) with 0.25" control line, SSSV seat compatible with landing nipple profile,
- SSSV control line panel on surface incl. power connector.

The following standards must be observed for the choice of the completion equipment:

- in general: ISO 14998,
- for production packer: API Spec 11D1,
- for landing nipple: API Spec 14L,
- for SSSV: Spec 19V.

Inspection:

CONTRACTOR will appoint a third party for witnessing factory tests and inspections during their manufacturing process in accordance or similar to inspection certificate 3.2 of EN 10204.

Documentation:

After setting the production packer, setting control and pressure test for the packing should be done and recorded by the CONTRACTOR.

The SSSV shall be installed with wireline under use of lubricator, and tested by the CONTRACTOR. The tests shall be recorded.

The CONTRACTOR has to prepare a documentation and give it as hardcopy (twice) and digital copy (PDF format) to the OWNER after the completion is finished. The documentation has to content at least drawings of all completion accessories (with details for length, OD, ID, drift, grade, specifics etc.), furthermore material certifications, the tally list(s), pressure test data and reports/field tickets of sub-contractors as a copy.

6.16. Clean out / testing works

In the well EXP-2, a production test with DST equipment is planned in the upper 20m of the Middle Eocene section.

The objectives of this well test are:

- To sample oil from the reservoir (bottom-hole sampling),

- To assess permeability through transient analysis of bottom hole pressure recording during flowing and shut-in periods,
- To assess interference with well EXP-1, if well EXP-1 is completed before testing Middle Eocene in well EXP-2.

The outline clean-up / well test sequence is:

- 24 to 48 hours clean-up flow and initial shut-in period,
- 24 hours production flow with bottom-hole fluid sampling,
- 24 hours shut-in period with bottom-hole pressure recording.

The test shall be carried out with a Drill Stem Test (DST) equipment with packer set inside the 7" casing.

Bottom-hole pressure shall be recorded throughout the test sequence: clean-up, production flow and shut-in periods.

Bottom-hole fluid sampling shall be performed during the flowing period after clean-up of the well. Single phase samplers (pressure compensated chambers) shall be used in order to keep the fluid samples in monophasic condition. Samples shall be transferred at surface in single-phase sample bottles (monophasic transfer) adequate for shipping, and then shipped to a fluid analysis laboratory (to be selected by the OWNER's ENGINEER but potentially in western Europe).

Fluid laboratory analysis is taken in charge by the OWNER's ENGINEER.

Nitrogen lift (through inner tubing string, or coiled tubing) will be necessary during clean-up and probably during production flow, as reservoir pressure is sub-hydrostatic in the Middle Eocene reservoir (0.082 to 0.088 bar/m pressure gradient from ground level).

Surface data acquisition and onsite analysis during well test shall include:

- pressures and temperatures (well-head, separator and other surface installations),
- flow rates (oil, gas, water) and shrinkage factor,
- sand/particles production,
- surface fluid sampling (oil, gas, water), measurement of BSW (Basic Sediment and Water), salinity and pH of produced water, gas gravity, oil stock tank gravity.

An acid job shall be prepared in case acid-soluble LCM has been used to treat losses or the well is not productive.

A well testing report shall be produced by the CONTRACTOR including: operations sequence, surface data acquisition and onsite analyses as listed above, bottom-hole pressure/temperature data, bottom-hole sampling and samples transfer operations.

6.17. Drill bits requirements

The CONTRACTOR shall provide all drill bits that will be necessary to drill the wells down to the planned TD. All drill bits shall be specified in accordance to IADC classification system.

6.18. Fishing back-up

The CONTRACTOR shall secure the availability of all fishing equipment that could be needed to fish out drilling or completion equipment in case such fishing would be necessary. Fishing equipment shall be available onto the rig site within less than 48 hours. The CONTRACTOR has to keep available a minimum of suitable fishing tools on rig site for standard drill stem equipment. If a fishing operation occurs, a reasonable amount of attempts has to be conducted in agreement with OWNER REPRESENTATIVE.

6.19. Storage of equipment

The CONTRACTOR shall organize for storing and warehousing of equipment with advance delivery from manufacturers such as but not limited to, tubular equipment, wellhead equipment, and completion equipment. The CONTRACTOR will have to find a nearby location suitable for storing these equipment and will have to equip this location so that equipment is stored safely and as per manufacturer or industry recommended practices. The CONTRACTOR shall also organize for the security of the stored equipment.

6.20. Transportation, lifting, craneage and handling works

The CONTRACTOR shall organize, provide and include in its offer all transportation, lifting, craneage and handling works necessary for the execution of the WORK.

6.21. Well monitoring

During the course of the works on each wellpad, the CONTRACTOR shall monitor on a daily basis the existing wellbore annuli (9 5/8" casing x 7" tubing, 13 3/8" x 9 5/8" and 18 5/8" x 13 3/8") for pressure and presence of gas. In case of abnormality, the CONTRACTOR shall perform all actions necessary to determine the origin of the problem (including, but not limited to, bleeding off, sampling, fluid analysis…).

7. WELLS PERFORMANCE & REQUIREMENTS

The CONTRACTOR shall ensure the drilled wells and their temporary completions will meet the following requirements:

- Wells and drains positioned within target areas as defined in wells geological prognosis.
- Gas tightness:
    - The production casing shoe and its cementing shall not allow for gas leaking behind casing over the full operating envelope of the underground storage.
    - The packer / tubing / completion accessories / wellhead assembly shall provide a gas tight conduit so that no gas enters the annulus between tubing and production casing at operating conditions of the underground gas storage.
    - The production casing and the wellhead shall offer a gas tight secondary containment.
- Geological / Reservoir data acquisition: the formation evaluation program shall be performed.
- Well life cycle: Wells shall be designed for a 40 years or more life cycle.
- All wells delivered comply with Georgian regulations and requirements.
- All construction work is carried out safely without accident and with minimum disruption to the surroundings.
- Measures taken to remedy lost circulation during drilling operations shall target minimum damage to the reservoir, and minimum impact on the quality of acquired data.

The handover of the wells by the CONTRACTOR to the OWNER shall be done in several phases:

7.1. Preliminary Phased Technical Acceptance

Technical Acceptance milestones on each well are detailed below. Each of them shall be issued by the OWNER's ENGINEER in the form of a Preliminary Technical Acceptance Milestone Certificate.

For criteria related to coring, data acquisition (wireline logging, well testing) and drilling of the Middle Eocene formation, the acceptance shall take into account potential variation of the program due to geological hazards during well operations, if such variation has been agreed with the OWNER before being implemented.

Milestone 1 is a single milestone (one only for the two Wells).

Milestone 2 to 7 are related to each of the two wells (one Milestone per well).

1. **Milestone n°1**: Acceptance by the OWNER'S ENGINEER of all documents labelled OMFED (One Month From Effective Date) in section 8.

2. **Milestone n°2**: Acceptance by OWNER'S ENGINEER of MOBILISATION FIRST WELL (resp. MOBILISATION SECOND WELL) as defined in the CONTRACT, and that make the spud date of the first well (resp. second well) acceptable to the OWNER's ENGINEER. Such acceptability shall be related, but not limited to:
   - o mobilization of all rigs equipment,
   - o fishing equipment,
   - o finalisation and completion of civil works related to well pads and access roads,
   - o equipment purchase and delivery or delivery schedule for equipment not yet present on the WORKSITE,
   - o subcontractors' equipment delivery and/or commitment for delivery, etc.

3. **Milestone n°3:** Acceptance by OWNER'S ENGINEER of 9 5/8" casing cemented and cement logs performed

<u>17 ½" drilling phase and 13 3/8" Casing:</u>

- Top of Cement to surface,
- Data acquisition (wireline logging, mud logging) performed as per established program and according to industry best practice.

<u>12 ¼" drilling phase and 9 5/8" Casing:</u>

- Top of Cement to surface,
- Sufficient quality of cement bond on fully cemented casing section,
- Detected cement bond with wireline measurement (CBL/VDL),
- Formation Integrity Test (FIT): gradient 0.16 bar/m; hydraulic (mud); 20 min test duration; max. pressure loss 10%; trend to zero pressure loss gradient,
- Pressure test of casings during FIT,
- Pressure test of hanger seals with a minimum of 180 bar (depending on actual wellhead equipment), 20 min test duration, no pressure loss.
- Data acquisition (wireline logging, mud logging) performed as per established program and according to industry best practice.

4. **Milestone n°4:** Acceptance by OWNER'S ENGINEER of 7" casing cemented and cement logs performed

<u>8 ½" drilling phase and 7" Casing:</u>

- Coring 40m in the bottom of the Navtlugi caprock formation as per established program,
- Top of Cement: min. length of 200 m into the 9 5/8" Casing,
- Sufficient quality of cement bond on fully cemented casing section, and good cement bond on casing shoe plus 50 m above,
- Detected cement bond and Top of Cement with wireline measurement (CBL/VDL),

- Formation Integrity Test (FIT): gradient 0.16 bar/m; hydraulic (mud); 20 min test duration; max. pressure loss 10%; trend to zero pressure loss gradient,
- Pressure test of casings during FIT,
- Pressure test of hanger seals with a minimum of 250 bar (depending on actual wellhead equipment), 20 min test duration, no pressure loss,
- Data acquisition (wireline logging incl. cap-rock micro-fracture testing for well EXP-2, mud logging) performed as per established program and according to industry best practice.

5. **Milestone n°5:** Acceptance by OWNER'S ENGINEER of End of operations included in 6" drilling phase

6" drilling phase:

- Drilling down to the final depth as per established program.
- Data acquisition (wireline logging in open hole, mud logging, well testing for well EXP-2) performed as per established program and according to industry best practice.
- For well EXP-2: coring a minimum of 100m as per established program.

6. **Milestone 6**: Acceptance by OWNER'S ENGINEER of Completion and Christmas tree installed and fully tested

Completion and Christmas Tree:

- Installation of completion equipment
- Control the setting of packer (mechanical with load, hydraulic pressure test from above, parameter depending on well condition),
- Pressure test of Tubing hanger seals with a minimum of 250 bar (depending on actual wellhead equipment), 20 min test duration, no pressure loss.
- Installation of Christmas Tree equipment
- Measurement at the wellhead of the pressure in the annulus 4 ½" x 7".

7. **Milestone n°7:** Acceptance by OWNER'S ENGINEER of all remaining WORK under the CONTRACT.

Milestone 7 shall be issued according to COMPLETION DATE not more than one month after approval by OWNER's ENGINEER of Preliminary Technical Acceptance Certificate of Milestone 6.

Milestone 7 Preliminary Technical Acceptance Certificate shall be issued by the OWNER'S ENGINEER when CONTRACTOR has performed following obligations:

1. Bottom-hole pressure gauge is retrieved from well EXP-1.
2. The well has been drilled, completed and tested as per contractual requirements including those expressed in this EXHIBIT A,

3. After additional work requested or accepted as a variation by the OWNER (if any) has been satisfactorily completed,
4. All Preliminary Technical Acceptance Milestone Certificates (Milestone 1 to Milestone 6) have been issued by the OWNER's ENGINEER,
5. The complete end of well documentation package described in chapter 3.6 and chapter 8 has been issued and accepted as complete by the OWNER.
6. Evacuation of all CONTRACTOR'S GROUP equipment or materials that are not part of the subsurface facilities, as per section 1.2
7. Complete cleaning of the location, including soil reclamation in case of contamination by oily products or chemicals, as per section 1.2
8. Evacuation of all scraps , garbage and wastes and in particular of all used muds and cuttings, as per section 1.2
9. After demolition of all temporary constructions and earth refill as well as renaturation, as per section 1.2
10. All reclamation work that would be needed on the access to the wellpads.

In particular:

- The End of Well Documentation package shall include all documentation and test records and certificates establishing:
  - The tightness of the production casing and its shoe,
  - The tightness of the completion string and of the wellhead,
  - The satisfactory functioning and testing of the Christmas tree valves.

7.2. Milestone Acceptance Certificates

These Milestone Acceptance Certificates are designed for partial acceptance by the OWNER of the WORK to be performed by the CONTRACTOR under the CONTRACT. Such partial acceptance by the OWNER shall not release the CONTRACTOR of any of its obligations under the CONTRACT.

Milestone Acceptance Certificates are issued per each well included in the WORK.

7.2.1. Milestone Acceptance Certificate MA 1

This Milestone Acceptance Certificate is defined per well as the achievement of Preliminary Technical Acceptance Milestone Certificates of Milestones 1, 2, and 3.

Milestone Acceptance Certificate MA 1 shall be submitted by the CONTRACTOR to the OWNER together with relevant documents showing that the corresponding MILESTONES 1, 2, and 3 are completed in full compliance with the CONTRACT, including Preliminary Technical Acceptance Milestone Certificates of Milestones 1, 2, and 3 signed by the OWNER'S ENGINEER.

7.2.2. Milestone Acceptance Certificate MA 2

This Milestone Acceptance Certificate is defined per well as the achievement of Preliminary Technical Acceptance Milestone Certificate of Milestone 4, and signature by the OWNER of Milestone Acceptance Certificate MA 1.

Milestone Acceptance Certificate MA 2 shall be submitted by the CONTRACTOR to the OWNER together with relevant documents showing that the corresponding MILESTONE 4 is completed in full compliance with the CONTRACT, including Preliminary Technical Acceptance Milestone Certificate of Milestone 4 signed by the OWNER'S ENGINEER.

7.2.3. Milestone Acceptance Certificate MA 3

This Milestone Acceptance Certificate is defined per well as the achievement of Preliminary Technical Acceptance Milestone Certificate of Milestone 5, and signature by the OWNER of Milestone Acceptance Certificate MA 2.

Milestone Acceptance Certificate MA 3 shall be submitted by the CONTRACTOR to the OWNER together with relevant documents showing that the corresponding MILESTONE 5 is completed in full compliance with the CONTRACT, including Preliminary Technical Acceptance Milestone Certificate of Milestone 5 signed by the OWNER'S ENGINEER.

7.3. Final Acceptance Certificate

The Final Acceptance Certificate is defined per well as the achievement of all Preliminary Technical Acceptance Milestone Certificates, under all provisions of the CONTRACT.

As a reminder, the Final Acceptance Certificate shall be issued by the CONTRACTOR to the OWNER for each well after:

1. The well has been drilled, completed and tested as per contractual requirements including those expressed in this EXHIBIT A,
2. After additional work requested or accepted as a variation by the OWNER (if any) has been satisfactorily completed,
3. All Preliminary Technical Acceptance Milestone Certificates have been issued by the OWNER's ENGINEER,
4. All previous Milestone Acceptance Certificates have been signed by the OWNER,
5. After the complete end of well documentation package described in chapter 3.6 and chapter 8 has been issued and accepted as complete by the OWNER.

6. Evacuation of all CONTRACTOR'S GROUP equipment or materials that are not part of the subsurface facilities, as per section 1.2
7. Complete cleaning of the location, including soil reclamation in case of contamination by oily products or chemicals, as per section 1.2
8. Evacuation of all scraps , garbage and wastes and in particular of all used muds and cuttings, as per section 1.2
9. After demolition of all temporary constructions and earth refill as well as renaturation, as per section 1.2
10. All reclamation work that would be needed on the access to the wellpads.

In particular:

- The End of Well Documentation package shall include all documentation and test records and certificates establishing:
  - The tightness of the production casing and its shoe,
  - The tightness of the completion string and of the wellhead,
  - The satisfactory functioning and testing of the Christmas tree valves.

7.4. Warranty Period

The CONTRACTOR shall warrant the following elements for each well, for a duration of 3 months starting on the day when the OWNER has signed the Final Acceptance Certificate for the considered well:

- Data recorded in the downhole gauge temporarily installed in well EXP1 must be readable, which shall be confirmed in writing by the OWNER's ENGINEER,
- Any potential claim related to renaturation of the WORKSITE has been settled,
- No Sustained Casing Pressure (SCP) in the first annulus (4 ½" x 7"), can be measured at the wellhead,
- Tightness of the wellhead equipment (no leakage),
- Full functionality of wellhead valves (including Christmas tree valves).

Sustained Casing Pressure (SCP) definition is according to API RP90-2 Annular Casing Pressure Management for Onshore Wells:

"Sustained Casing Pressure (SCP): Unintended pressure in an contained annulus resulting from the flow of pressurized formation fluids (liquid and/or gas) in communication with the subject annulus that:

a) Is measurable at the wellhead termination of a casing annulus,
b) Rebuilds after having been bled down, and
c) Is not caused by wellbore temperature fluctuations"

8. DELIVERABLE LIST

The preliminary list of documents to be delivered by CONTRACTOR during the WORK is listed below. The final list shall be agreed between the CONTRACTOR and the OWNER.

All deliverables issued by the CONTRACTOR shall be in the English language.

Whenever possible, all deliverables shall be delivered in hard copy (x2) and electronic format.

- AT: Answer to the Tender
- OMFED: One Month From Effective Date of the CDIW CONTRACT
- CONS: Construction
- PROC: During Procurement of equipment / subcontracts…
- INF: delivered for information
- EAR : delivered for OWNER Approval/Acceptance

Documents	When	INF	EAR	Comments
Generic Well Design Memorandum including, but not limited to: SECTION 1 - Drilling / Completion hazards identification and mitigation, - Wellbore trajectories, - Slot allocations, - Torque and drag calculations, hydraulic calculations - Drilling and casing scheme, - Mud design, - Drill bits and BHA's, - Coring, - Casing running / cementing / testing, - Wireline Logging including specifications of tools as per section 6.14, - Waste management, - Casing and tubing stress analysis and design (computed), - Wellhead / Christmas tree design and BOP's arrangements, - Completion design, - Well testing, - Down hole pressure monitoring, - Wellbore sketches with stratigraphic column and lithology. - Detailed Planning Schedule of the WORK, including at least: issuance of documents for Milestone 1, order placement for equipment, civil works, well pad construction, rig mobilization, drilling phases and well completion, rig demobilization, renaturation of the site, issuance of End-of-Well documentation, and issuance by CONTRACTOR of Final Acceptance Certificate (as defined in Section 7.3 of present Exhibit A). Milestones 1 to 7 (as defined in Section 7.1 of present Exhibit A) shall also be indicated on the planning.	AT		X	One per well

- All tests and checks relating to compliance with regulations, tightness of casing, tubing and wellhead and functioning and tightness of subsurface safety valve and Christmas tree SECTION 2 Tubular requirement/specifications: - Pipe specifications and quantities required, - Planned quality control, - List of proposed suppliers, - List of applicable industry specifications. Wellhead requirements/specifications: - Equipment specifications for all wellhead sections incl. Christmas tree and quantities required, - Spare parts and tools, - Planned quality control, - List of proposed suppliers, - List of applicable industry specifications (API, ISO, NACE). Completion equipment requirements/specifications: - Equipment specifications, - Quantities required, - Spare parts and tools, - Planned quality control, - List of proposed suppliers. Hydraulic control panel requirements/specifications: - Equipment specifications, - Quantities required, - Spare parts and tools, - Planned quality control, - List of proposed suppliers. SECTION 3 - Rig Contract Equipment list and characteristics list (IADC standard) with specifications of the rig and its ancillary equipment - Rig planned Upgrades SECTION 4 - Specifications for all works as per section 3.1.7 of Exhibit A - List of planned subcontracted companies as per section 3.1.7 of Exhibit A - Specifications for completion works as per section 3.1.8 of Exhibit A - Specifications for clean-up and well testing works as per section 3.1.9 of Exhibit A				
Project Execution Plan	OMFED		X	

Project HSE plan	OMFED		X	
Well pad : - design and layout, construction drawings and specifications, - construction details for cellar and dewatering system of well pad, - Drawings showing rig positioning and well test equipment positioning including flare.	OMFED		X	One per well
Well programs and casing designs for regulatory submission to authorities	OMFED		X	one per well
Well pad construction documents for regulatory submission to local authorities	OMFED		X	One per well
Drilling works, equipment and consumables detailed specifications including: - Directional drilling, - Drill bits, - Mud products and engineering, - Mud solid removal, - Mud logging, - Coring incl. side wall coring, - Casing and casing running, - Cementing, - Cementing hardware for casings, - Wire line logging, - Drilling waste handling and disposal, - Wellhead, - Fishing back up, - Crane and handling, - Consumables (gasoil) - Water supply - other, if required.	OMFED		X	One per well
Completion works, equipment and consumables detailed specifications including : - Completion fluids (packer fluid…) and filtering, - Tubular. - Completion Equipment, - Wire line. - Christmas tree, - Clean out and testing (incl. pumping, nitrogen, surface equipment, …), - Well stimulation - Other, if required	OMFED		X	
Equipment storage and security	OMFED		X	
Additional drilling equipment list and supplier	OMFED		X	
Wells geological prognosis	OMFED		X	
Detailed drilling program as per work scope requirement	OMFED		X	
Detailed completion program as per work scope requirement	OMFED		X	

Tubular: Selected supplier final detailed technical proposal and quality control plan (as to be attached to order placed by CONTRACTOR)	PROC		X	
Wellhead: Selected supplier final detailed technical proposal and quality control plan (as to be attached to order placed by CONTRACTOR)	PROC		X	
Completion equipment: Selected supplier final detailed technical proposal and quality control plan (as to be attached to order placed by CONTRACTOR)	PROC		X	
Tubular certificates and documentation issued by supplier and third party inspection report	PROC	X		
Wellhead certificates and documentation issued by supplier and third party inspection report	PROC	X		
Completion equipment certificates and documentation issued by supplier. Factory inspection/tests reports.	PROC	X		
As built well pad layout and construction drawings	CONS	X		For each well 15 days after well pad is built
Daily mud log / drilling data log / pressure log / gas log	CONS	X		daily when drilling
Detailed Daily Operations Report	CONS	X		daily
Daily Cost Report	CONS	X		daily, for Middle Eocene Operations
Daily Progress Report (Time vs. Depth Chart)	CONS	X		
End-of-Well documentation package: - Wireline logs final digital and hard copies as per work scope requirements, - Final mud log / drilling data log / pressure log / gas log (hard copy and digital) as per workscope requirement mud log depth and time data bases, - Drilling /Completion End-of-Well report: ▪ Drilling and completion summary and data, ▪ As built detailed wellbore sketches and completion diagrams, ▪ Days versus depth chart, ▪ Casing and completion string tallies, ▪ Casing / tubing running reports, ▪ Casing cementing reports, ▪ Interpreted cement evaluation logs, ▪ Directional surveys – wellbore trajectories, ▪ Bit records, ▪ Drilling mud characteristics and composition, ▪ Completion fluids characteristics and composition, ▪ Record of evacuated wastes, ▪ Daily operations reports, ▪ Initial detailed drilling and completion programs including additional procedures issued, - Mud logging report - Geological End-Of-Well Report: ▪ Drilling / casing phases summary, ▪ Formation well tops (real vs. predicted), ▪ Well logging operations report, ▪ Coring operations report,	CONS		X	

▪ A composite log covering all sections with logging data available, ▪ Mud logging summary with cuttings description, ▪ Core description if applicable depending on the core handling and conservation procedure applied. - Clean out / well testing report: ▪ Clean out / well testing operation sequence, ▪ Surface data acquisition and onsite analyses, ▪ Bottom-hole pressure/temperature data, ▪ Bottom sampling and samples transfer operations. - Records of all tests and checks performed showing that: ▪ A gas leak free path has been established from sand face to surface thru production casing shoe and its cementing, production packer tubing and wellhead, ▪ A leak free secondary containment has been established by the production casing, ▪ The Christmas tree is fully functional and pressure tested.				

9. WORK SPECIFIC REQUIREMENTS GENERAL

9.1. HSE Management

The CONTRACTOR shall comply with all applicable Georgian regulations applicable and in accordance to international oil and gas standards as well as best practices.

The CONTRACTOR shall put in place a project specific HSE Management System and shall formally appoint a site based HSE advisor with a direct link to site staff.

Unless otherwise stated, CONTRACTOR personnel means from itself and also from all sub-contractors.

9.2. Safety Induction

All CONTRACTOR personnel employed on the WORKSITE shall be required to attend CONTRACTOR'S safety induction course. This course shall be comprehensive and must be attended prior to CONTRACTOR personnel entering the WORKSITE. The cost of the non-productive time for CONTRACTOR personnel attending such course is deemed to be included in CONTRACTOR'S price for carrying out the WORK. No claim for additional money will be entertained in this matter.

9.3. Working Hours

Working hours shall be at the CONTRACTOR'S discretion but within applicable (local) laws, regulations and provisions of authorities.

9.4. Minimum standards for PPE

CONTRACTOR shall supply all personal protective equipment and safety equipment for CONTRACTOR personnel.

Employees are required to wear the PPE all where on site. The selection of PPE is adequate to carry out the works safely and contents as a minimum: safety shoes, helmet, safety glasses, anti-static and flame-resistant protective workwear, protective gloves and ear protection on noise-intensive workplaces.

9.5. Smoking Policy

Smoking is prohibited in all areas except in designated authorized smoking areas.

9.6. Office Accommodation for the OWNER

CONTRACTOR shall provide office accommodation & facilities for the OWNER's sole use at CONTRACTOR's temporary accommodation at site, for the duration of the CONTRACT, as follows:

Two temporary Offices (Minimum 30m² each), for 5 persons each with desks / chairs for 5 persons. These offices shall be equipped with Telephone & Secure Internet Connection, Heating / Air-conditioning / Lighting & Power.

9.7. Temporary Supplies

CONTRACTOR shall be responsible for providing & maintaining all necessary temporary supplies required to execute the WORK, and of their demobilization.

9.8. Clean-up Safety

The CONTRACTOR shall at all times keep its WORK area in a neat, clean and safe condition and remove from the vicinity and properly dispose of all debris and rubbish caused by the CONTRACTOR'S operations. Upon COMPLETION of the WORK, the CONTRACTOR shall promptly return unused materials furnished by the OWNER and remove from the OWNER'S premises all of the CONTRACTOR'S equipment, material, scaffolding and like items, leaving the OWNER'S premises and the vicinity clean, safe and ready for use.

In the event the CONTRACTOR shall fail to maintain its WORK area as described above and in a manner satisfactory to the OWNER, or to effect such cleanup or removal immediately after receipt of written notice to do so, the OWNER shall have the right without further notice to oblige the CONTRACTOR to perform such cleanup and remove such items on behalf of, at the risk of and at the expense of the CONTRACTOR.

If upon COMPLETION of the WORK the CONTRACTOR fails to clean up its WORK area as described above and in a manner satisfactory to the OWNER, or to effect such cleanup or removal immediately after receipt of written notice to do so, the OWNER shall have the right without further notice to oblige the CONTRACTOR to perform such cleanup and remove such items on behalf of, at the risk of and at the expense of the CONTRACTOR. The OWNER may store items removed at a place of its choosing on behalf of the CONTRACTOR and at the CONTRACTOR'S risk and expense. The OWNER will promptly notify the CONTRACTOR of such place of storage. The CONTRACTOR shall promptly reimburse the EMPLOYER for the costs of such cleanup, removal and storage.

9.9. Contractor Personnel

The CONTRACTOR shall ensure that CONTRACTOR Personnel provided for performance of the WORK are suitably qualified. If, in OWNER's opinion, the conduct or performance of any of CONTRACTOR Personnel is unsatisfactory in any way, OWNER may so advise the CONTRACTOR and CONTRACTOR, at CONTRACTOR'S sole cost and expense, shall replace such person or persons with CONTRACTOR Personnel suitably qualified.

All CONTRACTOR personnel has to have a personnel safety logbook on site. It resides with CONTRACTOR to check also sub-contractors. OWNER personnel is entitled to spot-check personal safety logbooks.

9.10. Minimum Requirements for Crew Training and Instruction

The CONTRACTOR has to prepare risk assessment for all work carried out. Bases on that all CONTRACTOR personnel must be specific instructed before starting with work.

If work with higher risk potential will be carried, the CONTRACTOR shall instruct the personnel in pre job safety meeting (i.e. for cementing jobs, casing/tubing run, make-up / lay-down heavy BHA components, wireline logging, well testing...).

Shift meetings with description of the daily planned specific work shall be held before the employees starting with work.

Kick training and evacuation training shall be made with every CONTRACTOR shift twice a month.

The CONTRACTOR documented all done trainings and instructions with date of action, name of the trainer/instructor, exact contents and names as well as signatures of all participants.

10. Appendices

Appendix 1: Overall Description of the Work

Appendix 2: Structural and Location maps

Appendix 3: Raw Drilling Program EXP-1

Appendix 4: Raw Drilling Program EXP-2

Appendix 5: Raw Program – Well-Head equipment of EXP-1 and EXP-2

1. Location

The location of the two appraisal wells lies in Georgia about 30 km east of Tbilisi.

Appendix 2 provides several location maps:

1. Field location maps and regional cross-section,
2. Wells location map (Top Middle Eocene reservoir depth map),
3. Wells location map (surface satellite view).

The 2 wells are planned to be vertical. Coordinates are given in the table below for the two wells:

	Easting*	Northing*	Ground level elevation **
EXP-1	505 941	4 613 892	620 m
EXP-2	508 479	4 614 533	750 m

* Reference system: WGS 1984, UTM Zone 38N.

** Above sea level.

2. Preliminary Geological Profile

The following preliminary profile is assumed for the basic well design.

Table 1 - Stratigraphy and main lithology

Stratigraphy	Main lithology	EXP-1 Depth* of Top [m TVD]	EXP-2 Depth* of Top [m TVD]
Agchagil	Sands, clay & conglomerate	0	0
Oligocene	Interbeds of sandstones, siltstones and claystones	118	161
Upper Eocene	Interbeds of sandstones, siltstones, claystones and marls	1,050	1,156
Middle Eocene	Volcanic sedimentary fractured deposit: tuffs, tuffites and tuff-breccia	2,268	2,192
Planned Total Depth	-	2,468	2,442

*Depth estimated from ground level elevation at each well location.

Comment: Uncertainty of the Top Middle Eocene depth (target reservoir) is +/-50m.

3. Potential Geological Drilling Hazards

Table 2 - Geological drilling hazards

Stratigraphy	Drilling Hazards
Agchagil	Washouts, shallow gas, hole stability
Oligocene	Washouts, shallow gas, hole stability, swelling clays, cavings
Upper Eocene	Washouts, shallow gas, hole stability, swelling clays, cavings
Middle Eocene	High risk of total mud losses (sub-hydrostatic reservoir pressure), differential sticking

4. Pore Pressures and Formation Integrity

The following pore pressure and fracture gradients can be assumed for the basic well design.

Table 3 - Pore pressure gradients and fracture gradients

Formation	Pore Pressure Gradient	Fracture Gradient *	MW of offset well *
Agchagil	-	-	1.06 - 1.08 SG
Oligocene	-	LOT @403 m EMW 1.51	1.08 - 1.33 SG
Upper Eocene		FIT @1600m EMW 1.60	1.30 - 1.35 SG
Middle Eocene	0.082 to 0.088 bar/m **	-	1.05 SG (water)

*Information based on the well JSD 1 (latest well drilled in SSD structure in 2013).

** Corresponding to 200 bar at the depth of the original oil-water contact at 1650 m (from sea level) or 2400 m (from ground level at the center of the structure)

The bottom-hole temperature of the reservoir at vertical depth of 2,200 m from ground level is 110 °C.

5. Reservoir structural map

The structural depth map provided in Appendix 2 (e) is derived from 3D seismic interpretation and from existing wells data for the Top Middle Eocene. Due to uncertainties related to the 3D seismic processing, wells data provide the main contribution to the delineated structure for the Samgori South Dome field.

The uncertainty in the depth of the top of Middle Eocene reservoir at the planned wells locations is +/-50 m.

6. Scope of Work of the future CDIW Contract

The CONTRACTOR and its subcontractors will deliver the WORK including but not limited to the following works:

1. Detailed well engineering and drilling program, as per section 3.4.
2. Construction of the rig site including access roads, camp site and renaturation of the temporary site areas,
3. The complete provision of drilling and related works from the mobilization of the drilling rig with

the relevant equipment and personnel to the transport, rig up, well construction, rig down and demobilization.

4. The provision of all necessary equipment and works necessary for the wells construction and data acquisition according to the detailed drilling and completion programmes, namely:
   - Casings, casing accessories, casing running,
   - Coring (incl. core handling at surface and core shipping to a laboratory potentially in western Europe),
   - Mud logging (incl. sampling and description),
   - Drill bits and BHA (incl. directional drilling),
   - Drilling fluids incl. solids control and waste management,
   - Cementing,
   - Wireline logging,
   - Well testing (incl. bottom-hole fluid sampling and samples shipping to a European fluid analysis laboratory),
   - Well stimulation (acidizing),
   - Well completion equipment (tubings and completion accessories), completion running,
   - Fishing,
   - Wellhead equipment,
   - Consumables (gasoil),
   - Water supply,
   - Wellsite geologist.
5. Provision of containers and disposal of any waste arising as a result of the drilling and related works (hazardous waste, lubricants, excrement, sewage, household, etc.).
6. The works mentioned above have to be planned and coordinated by the CONTRACTOR.

7. Raw Drilling Program and Data Acquisition Program

An overview of the raw drilling programs and the data acquisition programs is given in Appendix 3 (for well EXP-1) and Appendix 4 (for well EXP-2).

During drilling of the reservoir total losses are expected. A sufficient water supply during this phase needs to be ensured.

8. Well Site, Access Roads

The well site will be constructed by the CONTRACTOR or its Subcontractor(s) in accordance with the equipment of the CONTRACTOR/Subcontractor and the following specifications for well site.

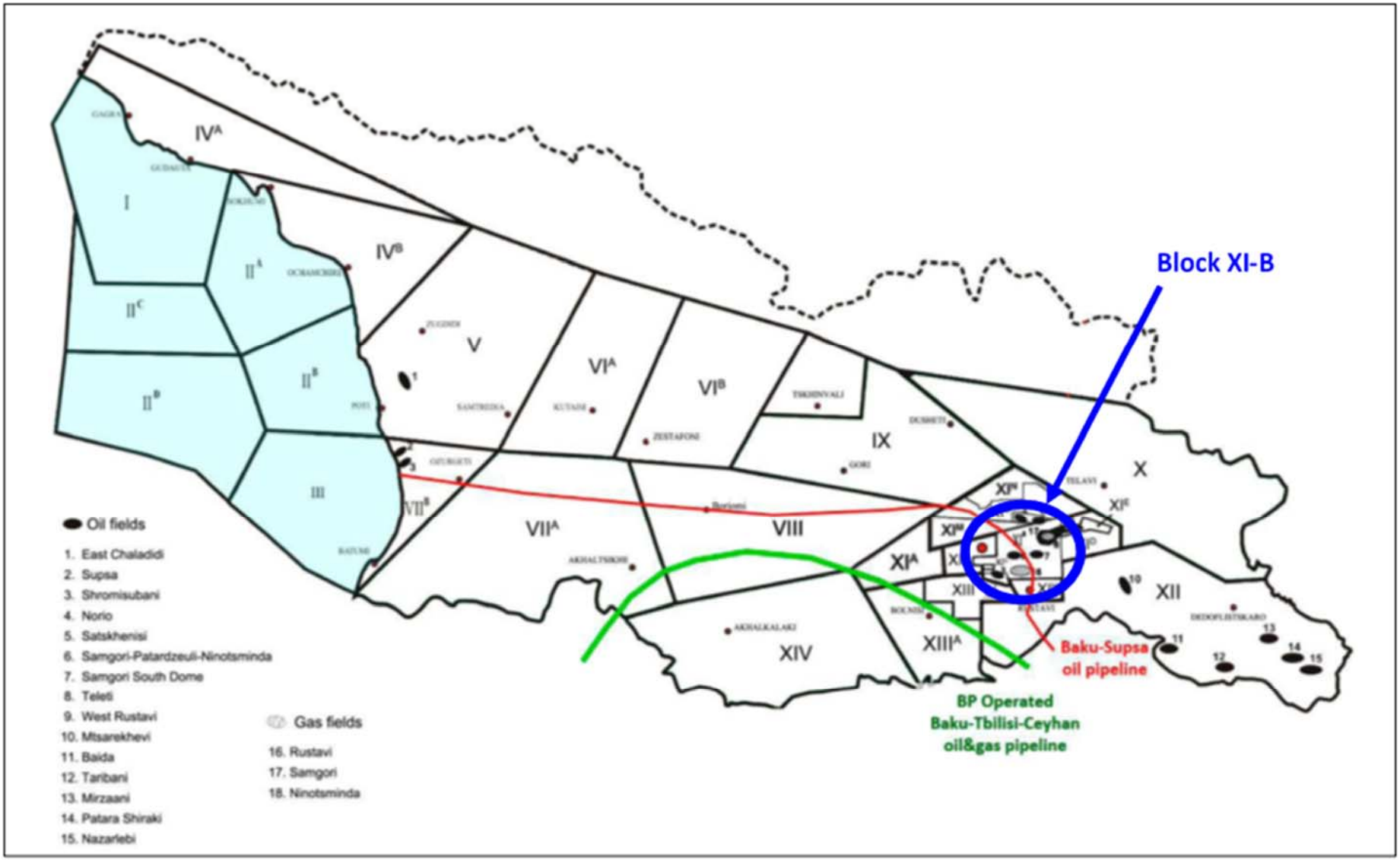
The planned well site will consist of a permanent central area (70 m x 45 m), which will be temporarily extended to 120 m x 80 m during drilling operations. The whole well site needs to be accessible by all necessary vehicles, shall be drained and constructed to local Georgian standards.

The construction work includes the setting of the conductor pipe, construction of the cellar and the foundations for the rig as well as the necessary access roads. It is also planned to have a camp site setup in a distance of

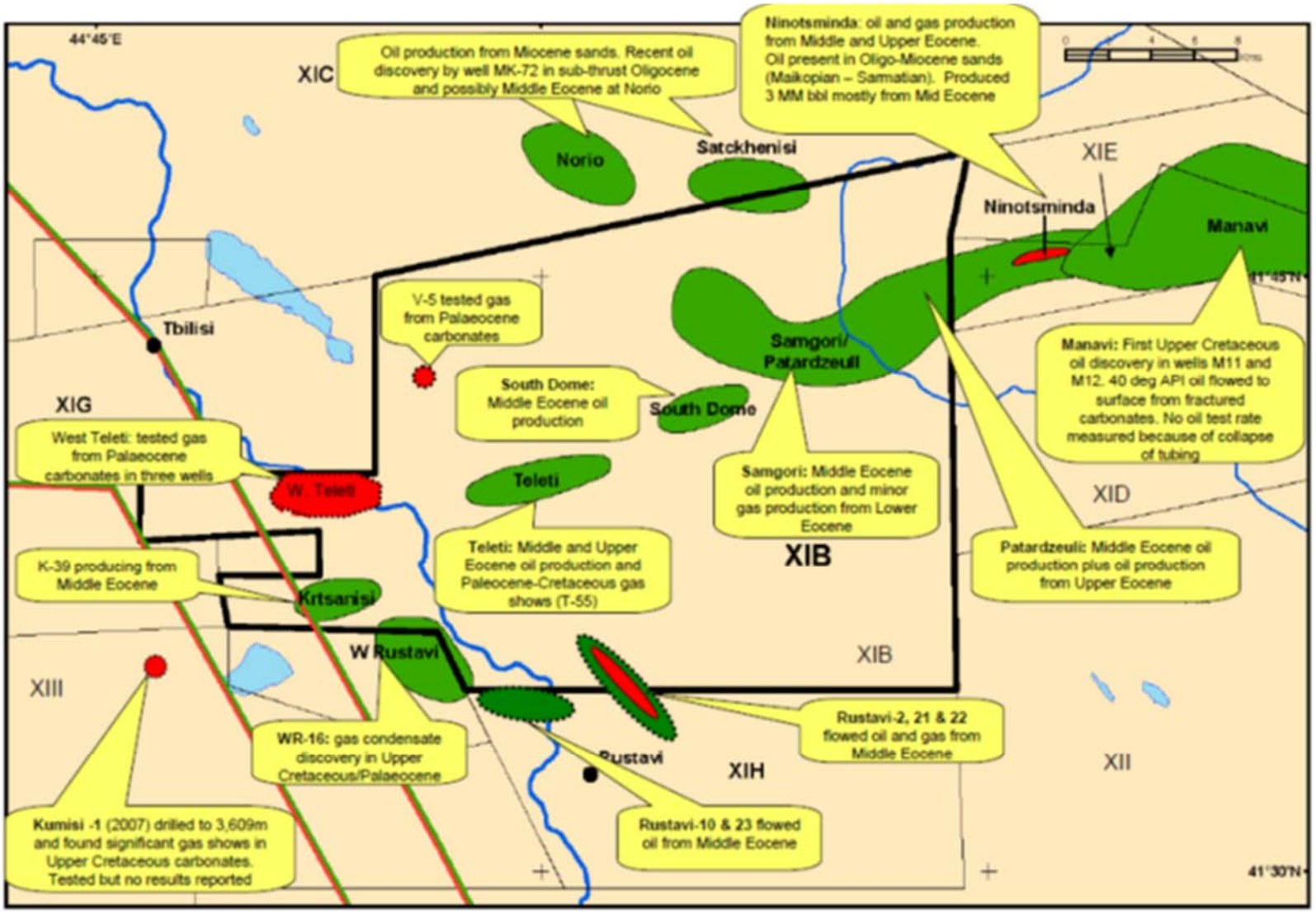
about 50 m to the closest edge of the well site drilling area. The temporary areas including the camp site shall be renatured after rig down and demobilization of drilling and ancillary equipment.

All work and equipment has to comply with Georgian laws and regulations.

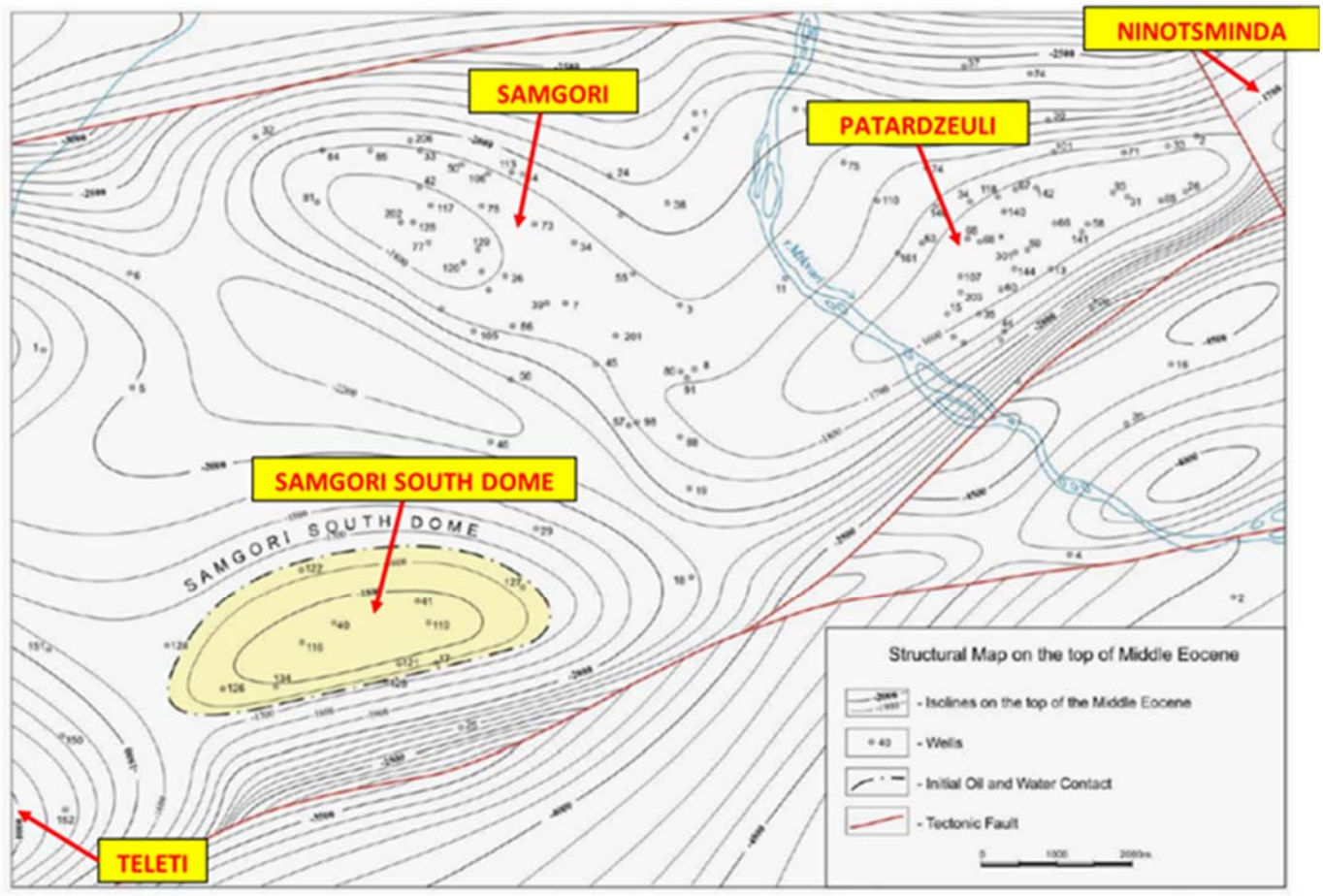
a. Location map at Georgia's scale



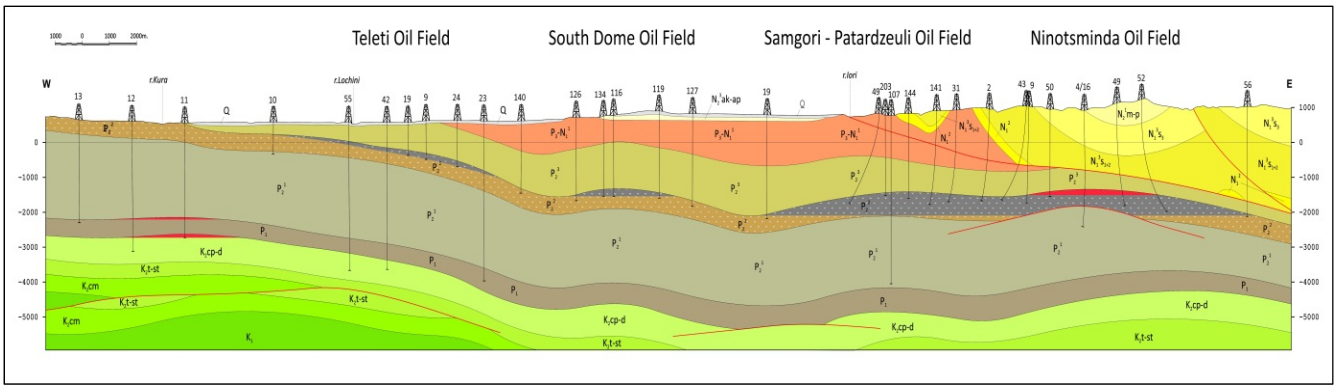
b. Location map at Block XI-B scale



c. Structural depth map of the area.

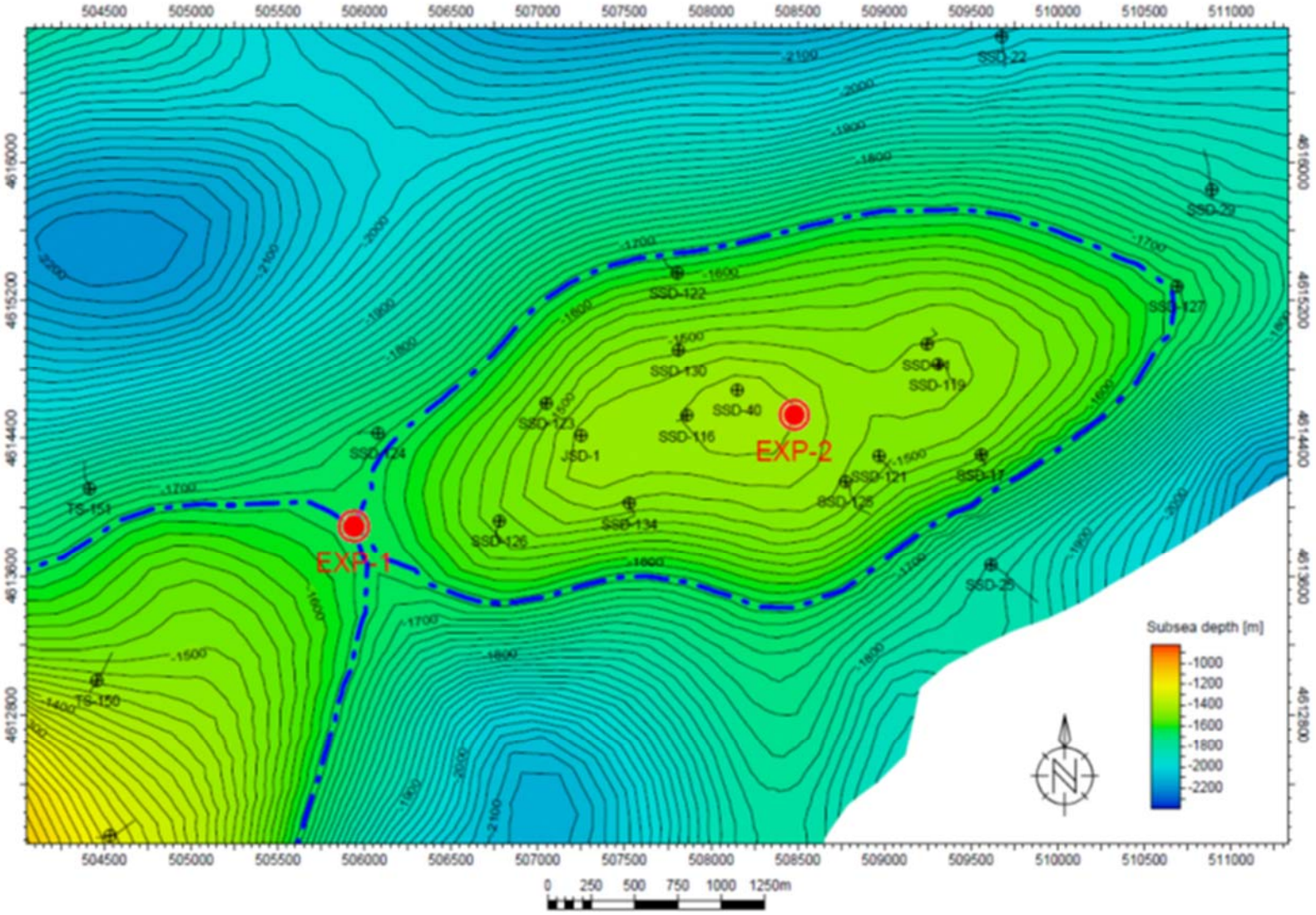


d. West-East schematic cross-section showing the four Middle Eocene hydrocarbon fields in SSD area

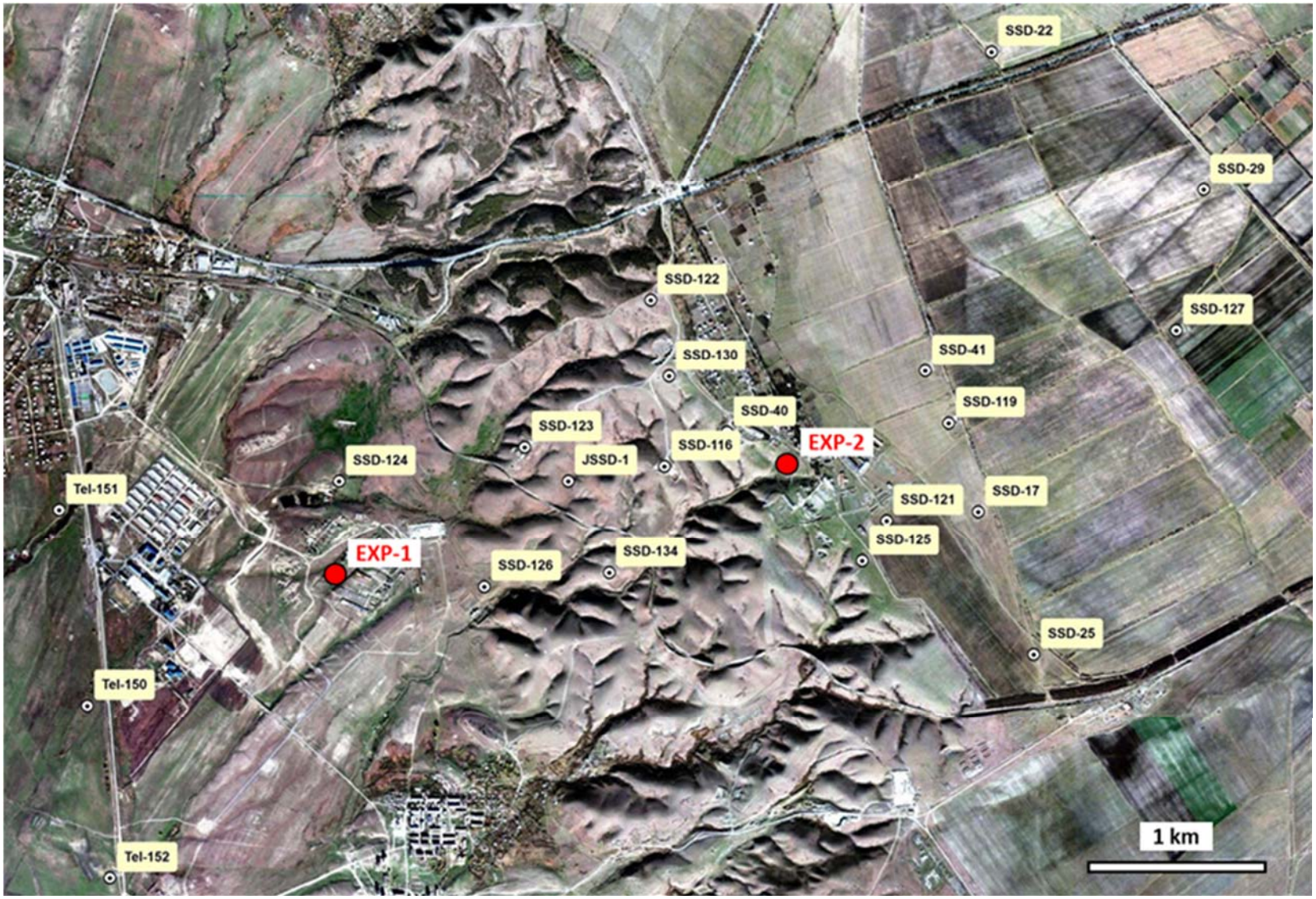


e. Structural depth map of Samgori South Dome field with planned appraisal wells positions (EXP-1 and EXP-2)

The dotted blue line represents the original Oil-Water-Contact in SSD field corresponding to the most likely depth for the western spill point



f. Satellite view of Samgori South Dome Area with well heads positions



GEOSTOCK ENTREPOSE

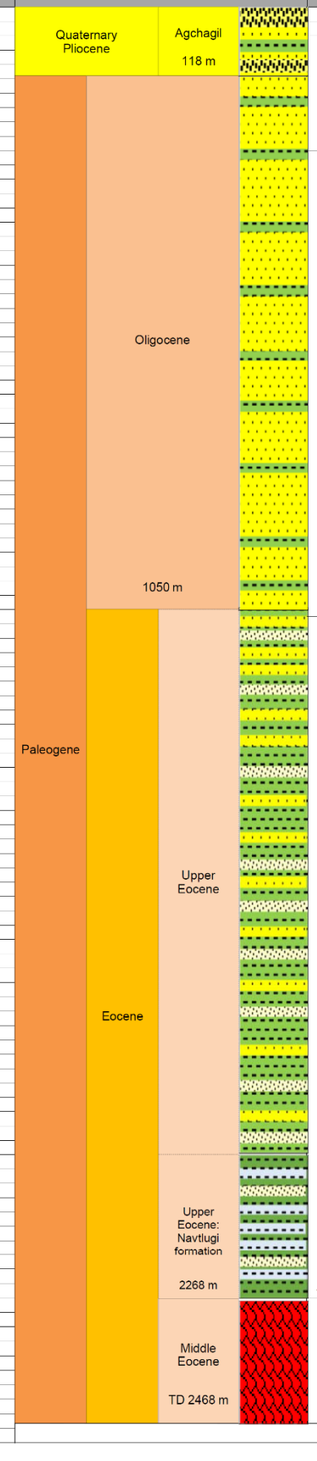
RAW DRILLING PROGRAM FOR WELL EXP-1

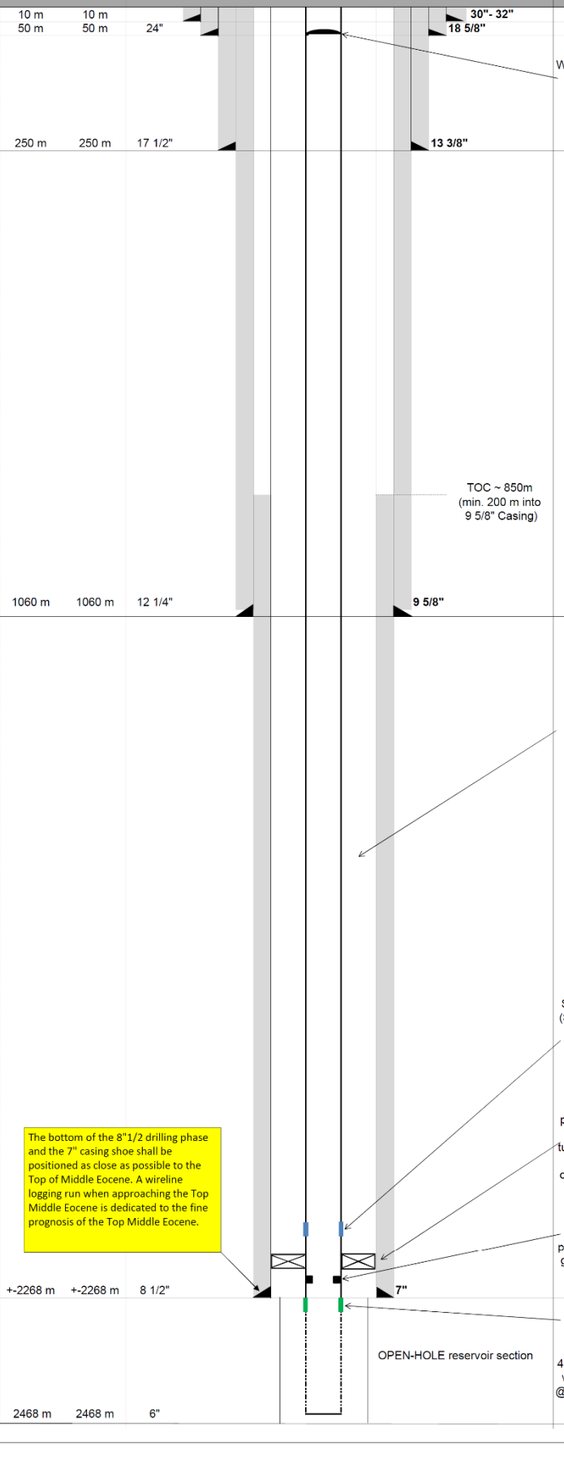
Comment: schematic not to scale

Surface location :
N 4.613.892
E 505.941
GL: 620 m

Drillers target: (tolerance radius 50m)
N 4.613.892
E 505.941
TVD: 2268 m

Legend:
Volcanic-sedimentary deposits
Sand/Sandstone
Silt/Siltstone
Claystone/Shale
Claystone/Argilite
Marl
Conglomerat





Depth m MD	Temporary Completion	BHA	Drilling Fluid	BOP	Casing	Cementing	Logging	Testing	Comments / Hazards
10 m / 10 m	-	Installed during Construction		None	30-32" Conductor	Construction Cement	-----		-----
50 m / 50 m / 24"	-	Bit-DC-Stab-DC	Spud Mud SG 1.05	None	18 5/8" Casing.	Tail Class-G 16.5 SG	Caliper, Azimuth and Inclination, GR, Sonic		Washout
	Wireline retrievable SSSV (@ ~50 m)	Pendulum Rotary BHA	WBM SG 1.10-1.20 KCL	Diverter Two Flarelines min ID 4"	13 3/8" Surface Casing to be set @ +- 250m 54,5 ppf, J-55	Stab In Cement Job	Open Hole: Caliper, Azimuth & Inclination, GR, Sonic		Washout Shallow Gas Hole Stability
250 m / 250 m / 17 1/2"					First gas shows in JSD-1 observed @ 259 m	Tail Class-G SG 1.9			
	4 1/2" Tubing 17 ppf, N80	Directional Motor BHA (AKO)	WBM SG 1.20-1.30 KCL	3000 PSI Annular 2x RAM Type 1x Total	9 5/8" Intermediate Casing to be set +-10 m below top of Upper Eocene 43.5 ppf, J-55	Stab In Cement Job Lead: Class-G SG 1.5 Tail: Class-G SG 1.9 Spacer: SG 1.4	Open Hole: Caliper (min. 4 arms), Azimuth & Inclination, GR, Resistivity (Deep, Shallow, Micro), Spontaneous Potential, Cross-Dipole Sonic (compressional and shear), Spectral GR, Neutron Porosity, Litho-Density (incl. PhotoElectric Factor). Cased-Hole 9 5/8": CBL-VDL		Washout Shallow Gas Hole Stability Swelling Clays Cavings
1060 m / 1060 m / 12 1/4"									
	anti-corrosive packer fluid (SG alap)								
	4 1/2" Tubing 17 ppf, N80	Directional Motor BHA (AKO)	WBM SG 1.20-1.35 KCL	3000 PSI Annular 2x RAM Type 1x Total	7" Production Casing to be set ~20-30 m above top Middle Eocene 20 ppf, N-80 Gas-tight premium connections	Plug Cement Job Lead: Class-G SG 1.5 Tail: Class-G SG 1.9 Spacer: SG 1.4	Open Hole: Caliper (min. 4 arms), Azimuth & Inclination, GR, Resistivity (Deep, Shallow, Micro), Spontaneous Potential, Cross-Dipole Sonic (compressional and shear), Spectral GR, Neutron Porosity, Litho-Density (incl. PhotoElectric Factor), Borehole Imager log (300 m at bottom of the section), Formation pressure (20 pts) and fluid sampling (6 pts) with MDT type tool. Additional wireline logging run (GR, Res, SP) when approaching the bottom of the caprock in order to refine prognosis of the Top Middle Eocene formation. Cased Hole 7": CBL-VDL, Ultrasonic log (USIT type tool), MFC (Multi-FInger Caliper)		Washout Shallow Gas Hole Stability Swelling Clays Cavings
	Sliding Side Door (SSD) (as close to the packer as possible)								
	Retrievable production packer (connection to tubing via polished bore receptacle or overshot tubing seal divider)								
	Landing Nipple profile for pressure gauges and plugs	**Coring BHA to core 40 m at the base of the Navtlugi caprock formation**							
+-2268 m / +-2268 m / 8 1/2"									
	Releasing Tool	Pendulum Rotary BHA/ Packed Assembly (Due to the expected Pressure Differential, and expected losses it is recomended to use a BHA with the ability to pump coarse LCM)	WBM SG 1,05	5000 PSI Annular 2x RAM Type 1x Total	Open-hole	None	Open Hole: Caliper (min. 4 arms), Azimuth & Inclination, GR, Resistivity (Deep, Shallow, Micro), Spontaneous Potential, Cross-Dipole Sonic (compressional and shear), Spectral GR, Neutron Porosity, Litho-Density (incl. PhotoElectric Factor), Nuclear Magnetic Resonance, Fracture Imager Log (FMI type tool).	After well completion, a memory pressure gauge will be set at the landing nipple bottom-hole, in order to record interferences with production testing and drilling (mud losses) in well EXP-2.	High risk of total losses & Differential Sticking (especially during any coring operations). Given the need to avoid formation damage to potential reservoir intervals, any LCM that may be required to ensure well integrity must be acid soluble. It is recognised that ultimately cement may need to be used if the well bore or well integrity is under threat.
4 1/2" Slotted Liner with Tubing Shoe @ +-15m above TD									
2468 m / 2468 m / 6"									

The bottom of the 8"1/2 drilling phase and the 7" casing shoe shall be positioned as close as possible to the Top of Middle Eocene. A wireline logging run when approaching the Top Middle Eocene is dedicated to the fine prognosis of the Top Middle Eocene.

GEOSTOCK ENTREPOSE

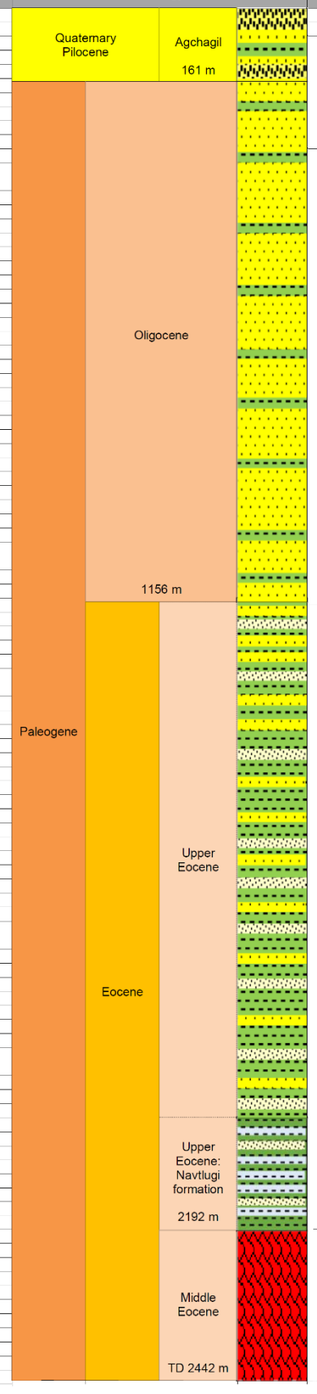
RAW DRILLING PROGRAM FOR WELL EXP-2

Comment: schematic not to scale

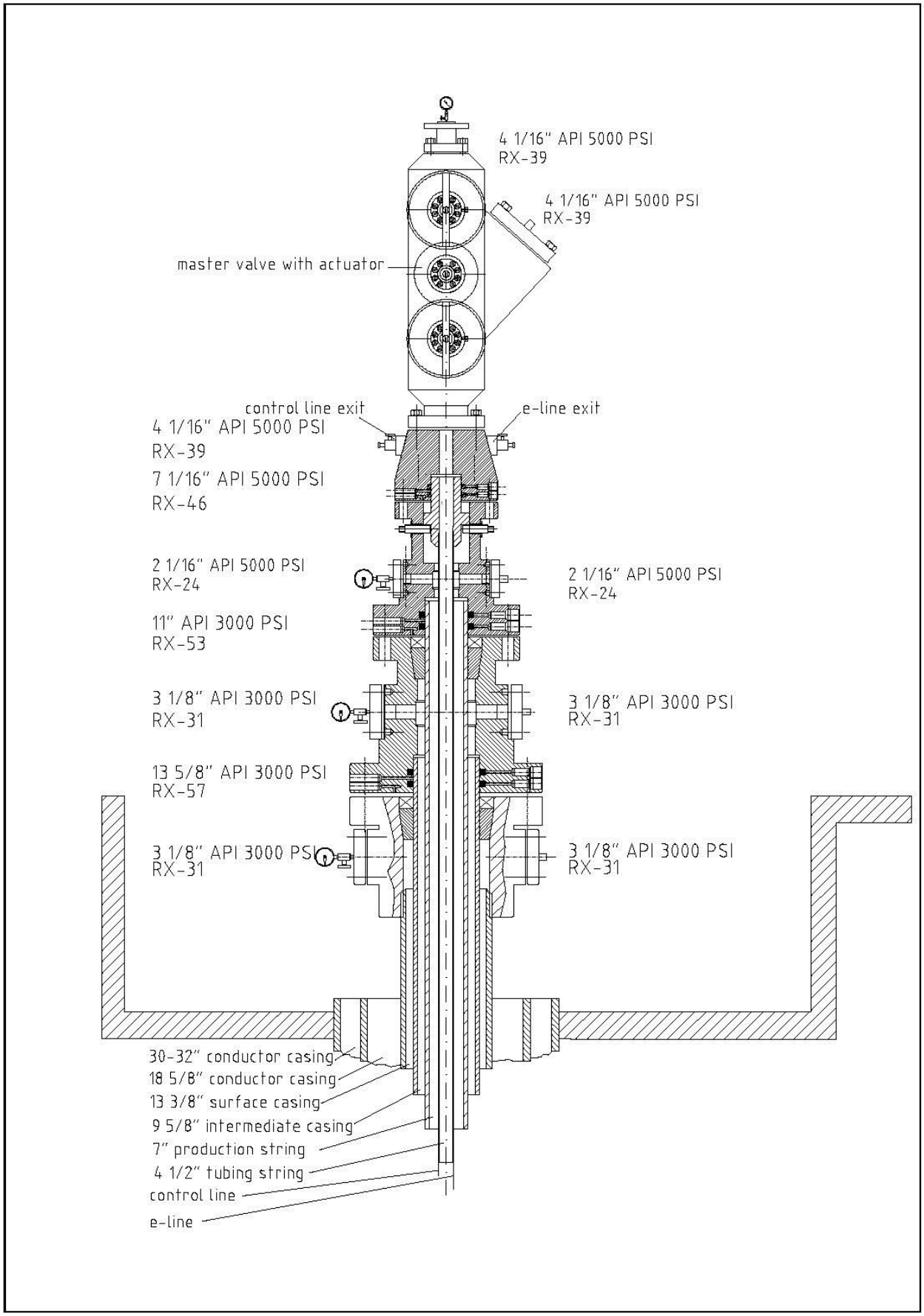
Surface location : N 4.614.533 E 508.479 GL: 750 m

Drillers target: (tolerance radius 50m) N 4.614.533 E 508.479 TVD: 2192 m

Legend: Volcanic-sedimentary deposits; Sand/Sandstone; Claystone/Shale; Marl; Silt/Siltstone; Claystone/Argilite; Conglomerat



Depth m MD	Geology	m MD	m TVD	Bit Size	Casing Schematic	Casing Size	Temporary Completion	BHA	Drilling Fluid	BOP	Casing	Cementing	Logging	Testing	Comments/ Hazards
25	Quaternary Pilocene / Aghagil 161 m	10 m	10 m			30"- 32"	-	Installed during Construction		None	30-32" Conductor	Construction Cement	-----		-----
50		50 m	50 m	24"		18 5/8"	-	Bit-DC-Stab-DC	Spud Mud SG 1.05	None	18 5/8" Casing.	Tail Class-G 16.5 SG	Caliper, Azimuth and Inclination, GR, Sonic		Washout
75															
100							Wireline retrievable SSSV (@ ~50 m)	Pendulum Rotary BHA	WBM SG 1.10-1.20 KCL	Diverter Two Flarelines min ID 4"	13 3/8" Surface Casing to be set @ +- 250m 54,5 ppf, J-55	Stab In Cement Job	Open Hole: Caliper, Azimuth & Inclination, GR, Sonic		Washout Shallow Gas Hole Stability
125											First gas shows in JSD-1 observed @ 259 m	Tail Class-G SG 1.9			
150															
175															
200															
225															
250		250 m	250 m	17 1/2"		13 3/8"									
275															
300	Oligocene														
325															
350															
375															
400															
425															
450															
475															
500															
525															
550															
575															
600								Directional Motor BHA (AKO)	WBM SG 1.20-1.30 KCL	3000 PSI Annular 2x RAM Type 1x Total	9 5/8" Intermediate Csg. to be set +-10 m below top of Upper Eocene 43.5 ppf, J-55	Stab In Cement Job Lead: Class-G SG 1.5 Tail: Class-G SG 1.9 Spacer: SG 1.4	Open Hole: Caliper (min. 4 arms), Azimuth & Inclination, GR, Resistivity (Deep, Shallow, Micro), Spontaneous Potential, Cross-Dipole Sonic (compressional and shear), Spectral GR, Neutron Porosity, Litho-Density (incl. PhotoElectric Factor), Rotary Sidewall Coring (10 pts), Formation pressure (20 pts) and fluid sampling (6 pts) with MDT type tool. Cased Hole 9 5/8": CBL-VDL		Washout Shallow Gas Hole Stability Swelling Clays Cavings
625															
650															
675															
700							4 1/2" Tubing 17 ppf, N80								
725															
750															
775															
800															
825															
850						TOC ~ 850m (min. 200 m into 9 5/8" Casing)										
875															
900															
925															
950															
975															
1000															
1025															
1050	1156 m	1166 m	1166 m	12 1/4"		9 5/8"									
1075															
1100															
1125															
1150															
1175															
1200															
1225															
1250															
1275															
1300	Paleogene														
1325															
1350															
1375															
1400															
1425															
1450															
1475															
1500	Eocene / Upper Eocene						anti-corrosive packer fluid (SG alap)								
1525															
1550							4 1/2" Tubing 17 ppf, N80								
1575															
1600							Sliding Side Door (SSD) (as close to the packer as possible)	Directional Motor BHA (AKO)	WBM SG 1.20-1.35 KCL	3000 PSI Annular 2x RAM Type 1x Total	7" Production Casing to be set ~20-30 m above top Middle Eocene 20 ppf, N-80 Gas-tight premium connections	Plug Cement Job Lead: Class-G SG 1.5 Tail: Class-G SG 1.9 Spacer: SG 1.4	Open Hole: Caliper (min. 4 arms), Azimuth & Inclination, GR, Resistivity (Deep, Shallow, Micro), Spontaneous Potential, Cross-Dipole Sonic (compressional and shear), Spectral GR, Neutron Porosity, Litho-Density (incl. PhotoElectric Factor), Borehole Imager log (300m at bottom of the section), Rotary Sidewall Coring (10 pts), Formation pressure (20 pts) and fluid sampling (6 pts) with MDT type tool. Additional wireline logging run (GR, Res, SP) when approaching the bottom of the caprock in order to refine prognosis of the Top Middle Eocene formation. Cased Hole 7": CBL-VDL, Ultrasonic log (USIT type tool), Multi-Finger Caliper	Wireline Micro-Fracture tests using wireline dual-packer testing tool: 3 points at the bottom of the Navtlugi caprock formation, with interpretation.	Washout Shallow Gas Hole Stability Swelling Clays Cavings
1625															
1650							Retrievable production packer (connection to tubing via polished bore receptacle or overshot tubing seal divider)								
1675															
1700															
1725															
1750															
1775															
1800															
1825															
1850															
1875															
1900															
1925															
1950															
1975															
2000	Upper Eocene: Navtlugi formation 2192 m						Landing Nipple profile for pressure gauges and plugs	**Coring BHA to core 40m at the base of the Navtlugi caprock formation**							
2025															
2050															
2075															
2100															
2125															
2150															
2175		+-2192 m	+-2192 m	8 1/2"		7"									
2200	Middle Eocene TD 2442 m						Releasing Tool	**Coring BHA: Coring over 100 meters (minimum requirement) in the upper part of the Middle Eocene reservoir**	WBM SG 1,05	5000 PSI Annular 2x RAM Type 1x Total	Open-hole	None	Open Hole: Caliper (min. 4 arms), Azimuth & Inclination, GR, Resistivity (Deep, Shallow, Micro), Spontaneous Potential, Cross-Dipole Sonic (compressional and shear), Spectral GR, Neutron Porosity, Litho-Density (incl. PhotoElectric Factor), Nuclear Magnetic Resonance, Fracture Imager Log (FMI type tool).	1. In upper part of Middle Eocene reservoir: DST test with nitrogen lifting (with an inner lifting string or coiled tubing). Bottom-hole pressure recording and bottom-hole fluid samping. 2. After drilling Middle Eocene section: Wireline formation tests using wireline dual-packer testing tool (3 points with fluid sampling). Optional depending on success of bottom-hole fluid sampling during DST test.	High risk of total losses & Differential Sticking (especially during any coring operations). Given the need to avoid formation damage to potential reservoir intervals, any LCM that may be required to ensure well integrity must be acid soluble. It is recognised that ultimately cement may need to be used if the well bore or well integrity is under threat.
2225															
2250															
2275															
2300					OPEN-HOLE reservoir section		4 1/2" Slotted Liner with Tubing Shoe @ +-15m above TD								
2325															
2350															
2375															
2400															
2425															
2450		2442 m	2442 m	6"											


4 1/16" API 5000 PSI
RX-39
4 1/16" API 5000 PSI
RX-39
master valve with actuator
control line exit
e-line exit
4 1/16" API 5000 PSI
RX-39
7 1/16" API 5000 PSI
RX-46
2 1/16" API 5000 PSI
RX-24
2 1/16" API 5000 PSI
RX-24
11" API 3000 PSI
RX-53
3 1/8" API 3000 PSI
RX-31
3 1/8" API 3000 PSI
RX-31
13 5/8" API 3000 PSI
RX-57
3 1/8" API 3000 PSI
RX-31
3 1/8" API 3000 PSI
RX-31
30-32" conductor casing
18 5/8" conductor casing
13 3/8" surface casing
9 5/8" intermediate casing
7" production string
4 1/2" tubing string
control line
e-line

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TVA FR84434023032 – SAS au capital de 1 500 000 €

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