THE REPUBLIC OF KENYA
GEOTHERMAL DEVELOPMENT COMPANY (GDC)

The Project for Capacity Strengthening for Geothermal Development in Kenya

PROJECT COMPLETION REPORT

February 2020

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

WEST JAPAN ENGINEERING CONSULTANTS, INC.

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Abbreviations and Acronyms

Abbreviations	English
ABI	Acoustic Borehole Imager
AFD	French Development Agency
AfDB	African Development Bank
C/P	Counter Part
CPS	Corporate Planning & Strategy Department of GDC
DDR	Daily Drilling Report
EIB	European Investment Bank
GDC	Geothermal Development Company
GEOSTEP	GEOSTEP Consulting and Services Ltd
GOE	Geothermal Engineering Co., Ltd.
GRA	Geothermal Resource Assessment Department of GDC
GRM	Geothermal Resource Management Department of GDC
GSL	Global Synergy Link Limited
HSE	Health Environment & Safety
H/R	Human Resource Development Department
IADC	International Association of Drilling Contractors
In-SAR	Interferometric Synthetic Aperture Radar
IPP	Independent Power Producer
JCC	Joint Coordinating Committee
JICA	Japan International Cooperation Agency
JICS	Japan International Cooperation System
JRI	The Japan Research Institute, Limited
KCS	Kenya Chemical Society
KENAS	Kenya Accreditation Service
KENGEN	Kenya Electricity Generating Company Limited
KES	Kenya Shilling
KIC	Kyushu Electric Power International Co. Inc.
KPI	Key Performance Indicator
KYUDEN	Kyushu Electric Power Industry Co., Inc.
LCPDP	Least Cost Development Plan
LIDAR	Light Detection and Ranging. A digital 3-D mapping method that measures distance to a target by illuminating the target with laser light and measuring the reflected light.
MEQ	Micro Earthquake Monitoring
MMTEC	Mitsubishi Materials Techno Corporation
MOEP	Ministry of Energy and Petroleum
MRI	Mitsubishi Research Institute Inc.
MT	Magnetotellurics
MW	Megawatt
NMCC	Nittetsu Mining Consultants Co. Ltd.
O&M	Operation and Maintenance
OJT	On the Job Training
PDM	Project Design Matrix
PO	Plan of the Operation
PPA	Power Purchase Agreement
RIMBase	Drilling operation and materials reporting system designed by IADC for integrating data from the several different drilling operation
ROP	Rate of Penetration
SHE	Safety, Health & Environment of GDC
SKE	SK Engineering Co., Ltd.
SMBC	Mitsui Sumitomo Banking Corporation

Abbreviations	English
SREP	Scaling Up Renewable Energy in Low Income Countries Program
SSA	Steam Supply Agreement
Thermaprime	Thermaprime Drilling Co.
TDC	Teiseki Drilling Co., Ltd
TOR	Terms of reference
USAID	United States Agency for International Development
USTDA	United States Trade and Development Agency
VBA	Visual Basic
WB	World Bank
WEST JEC	West Japan Engineering Consultants Inc.
YEC	Yokogawa Electric Corporation

CHAPTER 1 The Overall Project Description

1.1 Background

Power generation capacity in Kenya was 1,593 MW, in which 48% of the power was generated using hydro-power as of June 2011. However, while the peak power demand in March 2011 was 1,294 MW and in January 2012 was 1,211.9 MW, the actual power supply was 1,194 MW, owing to a shortage of water. According to the "Least Cost Power Development Plan (LCPDP)," which is an electricity development plan of the Republic of Kenya, the peak power demand in Kenya is estimated to increase up to 12,738–22,985 MW in 2030. Power demand in Kenya is increasing at a rate of 8% annually, and about 50% of the total power generation capacity in Kenya relies on hydro-power generation, which is susceptible to climatic / weather conditions. Therefore, the Kenyan government plans to invest in developing the country's abundant geothermal resources to supplement the base load, with an aim to increase the installed capacity to 5,530 MW by 2030, in accordance with the LCPDP (2011-2031).
Under the above-mentioned circumstances, the Kenyan government established the Geothermal Development Company (GDC) in 2009 in order to accelerate geothermal development. GDC is mandated, in principle, to develop all the geothermal resource in the nation. Currently they are engaged in development programs such as production drilling through supervision of drilling contracts in Olkaria; exploration, appraisal drilling and development drilling in the Menengai area (located approximately 150 km northwest from Nairobi) as well as in the Paka/Silari fields located north of Lake Baringo and elsewhere in the country. The project funding has been supported by the Government of Kenya and development partners including: the French Development Agency (AFD), African Development Bank (AfDB), World Bank (WB), European Investment Bank (EIB), SREP, United States Trade and Development Agency (USTDA), United States Agency for International Development (USAID) among others. However, despite sufficient financing provided by the Development Partners to GDC, the capacity of GDC proved insufficient in identifying potential drilling targets, striking drilling targets, evaluating geothermal resources, etc.. Thus, GDC's aim is to reduce these risks through building-up their capacity.
Given this background, the Government of Kenya requested the Project for Capacity Strengthening for Geothermal Development in Kenya (hereinafter referred to as "the Project"). The Government of Japan approved the Project for implementation in 2013.

1.2 Outline of the Project

The Project is currently implemented based on the PDM Version 2, which was revised and approved in April 2018. The PDM is shown in Annex 2.

I) Project Duration:
From September 2013 to December 2019 (6 years and 3 months)
2) Project Site:
Nairobi, Nakuru, Naivasha and Menengai geothermal fields.
3) Overall Goal:
GDC will be able to properly provide steam to power generation utilities.
4) Project Purpose:
To enhance human resources of GDC, which will contribute to technical risk mitigation in geothermal development
5) Outputs:
1. Training program for GDC staff will be established.
2. Capacity in developing conceptual models of reservoirs and siting of successful drilling targets will be improved.
3. Capacity to strike drilling targets will be improved.
4. Capacity in interpreting wellbore data, establishing calibrated reservoir models and evaluating geothermal resources will be improved.
5. Capacity to prepare economically and environmentally viable business plans as a steam provider will be enhanced.
6. Capacity in implementing projects of multi-purpose use of geothermal energy will be enhanced.
7. GDC's internal mechanism to improve and continue their training program will be established.

1.3 Activity Overview

【Activities related to Objective 1】:

1-1 : To investigate the present ability of GDC's Human resource development plan and their ability
1-2 : To abstract GDC's challenges and improving programs
1-3 : To propose and to determine the training program to the GDC executives
1-4 : To devise plans for the training program
1-5 : Elaborate the training materials
1-6 : To manipulate the check lists of technical abilities required in geothermal development, and results of evaluation for GDC staff.
1-7 : To identify the baseline and to set the goal level of training.

【Activities related to Objective 2】:

2-1 : Training for the development of conceptual models
2-2 : Training for selecting drilling targets

【Activities related to Objective 3】:

3-1 : Training for drilling operations.
3-2 : Training for procurement of drilling equipment and logistics management
3-3 : Training for the Health Safety Environment (HSE)
3-4 : Training for theories of well drilling.

【Activities related to Objective 4】:

4-1 : Training for the well data analysis
4-2 : Training for the reservoir evaluation
4-3 : Training for the development and management for the database

【Activities related to Objective 5】:

5-1 : Training for the environmental monitoring and environmental program
5-2 : Training for the plant engineering
5-3 : Training for the development of Public-private partnership scheme
5-4 : Training for the consensus formation and negotiation with the IPPs
5-5 : Discussion with the power operators (Temporary Label for activity)

【Activities related to Objective 6】:

6-1 : Determination of Kenya's prospect geothermal areas and the applicable geothermal multiple use programs
6-2 : Training relating the pilot project
6-3 : Training for the execution of the pilot program

【Activities related to Objective 7】:

7-1 : Abstract the challenges of the created training materials and the program
7-2 : The revision of the training materials and the improvement of the raining program
7-3 : The revised training program and its definition for the top managements and the review of the objective of the human resource development program of GDC
7-4 : The integration of the human development program of the training program

1.4 Basic Policy of the project implementation

The responsibility for GDC is to clarify the possibility of utilization of geothermal resources in Kenya, such as power generation, and execute actual exploitation. When geothermal fluid become available, other institutions including the IPP would be able to convert the energy to electrical power, and to use the heat for other industrial use. The goal of this project is intended so that GDC would be able to execute its responsibility steadily, by improving GDC`s capacity to explore, evaluate and exploit the geothermal resource and to manage the economic risk as much as possible, and to continue supplying geothermal fluids to comply with the contracts agreed with the fluid user.

For the technical transfer training in this project will be carried out as mainly OJT, so that GDC personnel will definitely be able to acquire the capability needed, and for not to cause significant delay in their survey activity.

According to the TOR issued by JICA, the following 7 items are the expected achievement of the project.

- Objective1: Training programs for capacity building for GDC personnel are worked out.

- Objective 2: GDC enhances its ability to develop the conceptual models and select drilling targets.
- Objective 3: GDC improves its drilling ability to reach the selected targets.
- Objective 4: GDC improves its abilities to analyze well data, to develop/calibrate reservoir models, and to assess and evaluate the reservoir.
- Objective 5: As a steam supplier GDC improves its business implementation ability while increasing business profitability and protecting environment.
- Objective 6 : GDC improves its ability relevant to practice of multi-purpose use projects of geothermal energy
- Objective 7: GDC establishes a continuous, in-house self-training system for its staff.

If the 7 items were to be roughly categorized as works and technical fields, it is categorized to 5 categories.

① Establishment of training program. (Objective 1)
② Preliminary study of geothermal resource, and evaluation techniques training (Objective 2)
③ Geothermal well drilling technique training (Objective 3)
④ Geothermal resource development training regarding every other technical field (Objective 4,5,6)
⑤ The establishment of a structure for continuous improvement and maintaining of ability.(Objective 7)

To accomplish the project implementation of the above as effective and efficient, as possible, the technical implementation is as shown below. Furthermore, the general operation of the management is presented at the end. As a reference, the project concept and flow chart are presented in the Annex 6 (“Work concept of capacity building project for geothermal development in Kenya” and “Conceptual flow for the capacity building project for geothermal development in Kenya”).

(1) Establishment of the training program (relating to objective 1)

In order to understand GDC`s capacity and responsibility under the Kenyan Government`s energy and natural resource policy, an interviews with the GDC management, human resources, and managers of each technical division will be held. The objectives of the exchange of opinions, these interviews, it is the backbone to improve the action plan to get the 2-6 outcome proposed in this proposal. Decided that from time to time implemented through the entire project period of four years, and each time evaluating the results and program of training, exchange opinions and information with the GDC upper part, to be able to modify the program as necessary. Based on the result of this activity, a plan for the whole project shall be created and revised, including that for the audio-visual aids and for the teaching materials program required activities in accordance with the 2-6 outcome. At the end of the project, GDC shall be in capacity to educate its human resources of the next generation and to be able self-grow through the efforts of its scientists and engineers.

(2) Pre-feasibility study, evaluation techniques training for geothermal resource (Relating to objective 2)

The priority for the capacity building for GDC is to raise the success rate for drilling the production and reinjection wells, and optimizing the fluid transporting system by surface installations, and reducing the steam and hot water cost. For this, it is believed there will be 2 approaches to adequately selecting drilling targets, one will be to obtain the best sub-surface conditions for the drilling targets, and second, to select the best location to drill from to the drilling target (for a geothermal well there is a technology for directional drilling which the drilling pad does not always have to be at the top of the target.). For the approach 1, it is necessary to accurately estimate and create a model from the integrating all the data (information) (data acquired during the preliminary survey) of the sub-surface. For the approach 2, the knowledge such as natural conditions (for the possibility of the influence from the future construction), topographic conditions, existing infrastructures, existing superficial risks mapping (such as landslides and volcanic activities) are necessary. If the fundamental conditions of the sub surface and the developable surface is revealed, evaluation for the wells production and reinjection characteristics and preliminary power generating potential can be estimated, as well as the project scale, project cost, and evaluation for economic and finance is possible. If these skills are acquired, GDC will be possible to select drilling targets and drilling points that can minimize the cost increase the success rate. If GDC is acquires such a capability, it can be applied to evaluate other numerous geothermal points is possible, and prioritization of the development of the geothermal development plan throughout Kenya is possible.

For the objective of result 2 the OJT is fundamentally planned to be exercised within Kenya. The training which fundamentally is an OJT will be implemented in two geothermal fields, will be

accomplished 2 terms each year being 2 years. The first term includes lectures that emphasize the geothermal survey, evaluation skills, and in the second term most of the activity will be the monitoring to see if GDC is sufficiently applying the skills acquired in the first term. Though the OJT was planned to take place in the geothermal fields of Silali and Susuwa, it was not realized because of the security and social issues occurred in these fields. In stead, Menegai was used as the OJT field. At the early stages of the training in the first term, the method to train and exercise the OJT was to hold a lecture about the objective and activity regarding the training, and then conduct the survey of each profession to collect the necessary data and acquire the techniques to gather high quality data. Once the GDC personnel become capable to conduct the activities in the field, the later work was intended to be carried out by GDC. As the field work and the collecting of samplings ends, the experts return to Kenya and the training would be conducted for building a geothermal conceptual model from the integration of the analyzed data, selecting the most promising drilling targets and drilling points, and then estimating the potential of the plants in orders to estimate the development cost. On the second term training the same training program was repeated, although the survey, data analysis and evaluation will be led by the GDC engineers and the expert was there to supervise the training. By the repetition of this training, it was aimed that the skills instructed during the first term would become settled.

(3) Training for the geothermal well drilling techniques (Relating to objective 3)

One of the important technical requirements in the geothermal development is to drill well accurately. In other words, to drill accurately and efficiently to the target while minimizing the drilling risks such as collapsing of the walls or stuck pipes, to ensure safety, and to minimize drilling time and the materials and fuels required for the drilling. The training topics related to the drilling work is wide spread such as the completion plan of the well, procurement and maintenance of necessary equipment and spare parts, drilling crew structure plan, drilling plan, safety and sanitation of the work area, environmental management and so on. The principal training method was by the OJT while the lectures and the training via discussion between the experts and the GDC engineers and managers were also held in the Nakuru office. The drilling OJT is basically planned to be exercised in the Menengai field.

The technical training included the introduction of knowledge such as adequate use of equipment, techniques to retrieve equipment inside the well (fishing techniques), maintenance of sensors and recorders for acquisition of various types of data, the establishment of safety programs, directional drilling and the latest drilling techniques. Among them, one of the priorities in terms of the technical transfer was to improve the foam drilling method (use of water with surfactant as the circulation media). As it showed inadequate rock cutting removal from the well. The project team introduced the mud drilling. For this purpose, JICA donated advanced mud additives and implemented training on mud engineering, solid control system and practical session to prove effectiveness of the mud drilling technique. The mud drilling was very successful. What is also important that through the training GDC drillers realized how importance the well cleaning is and the way to do it.

(4) Training for each profession relating to the feasibility of the geothermal resource development (relating to objectives 4, 5 and 6)

According to the TOR, the objectives 4, 5, 6 was made to train GDC personnel so that they improve their technical capacity in delineating the geothermal resource potential if it is feasible to proceed for the further development, the generation technology for minimum impact on the reservoir, the capability to decide the geothermal fluid supply cost, economic and financials including the multiple use of geothermal energy. The purpose for capacity building relating to the negotiations with the IPP and SSA is for GDC to be able to sustain and maintain the reservoir and the gathering systems for at least for 30 years and at the same time profit to continue on their geothermal development.

Furthermore, it would be possible to get extra income if GDC acquire capacity in the direct use of the geothermal heat. In the project, the activities related to the objective 4 was carried out for both the first and second term. On the other hand, the activities related to the objective 5, 6, some were implemented only during the first term.

The training program for the reservoir evaluation (related to the objective 4) was classified in two types of activities.

The first one was the OJT to acquire a high quality well data from the existing Menengai field or the drilling wells. The second activity was the training implemented in Japan where the reservoir

evaluation techniques (3-D simulation analysis) was taught to construct the geothermal numerical modeling with the data acquired in the Menengai field. The conceptual model which was the basis for creating the numerical model was based on the data acquired through the activities of 2 and 3 of the project in the Menengai field. For the reservoir evaluation training, various different simulation scenarios to select the adequate development and schedule were taught. In this case, the training for selecting adequate development scenario was done in Japan. Furthermore the training in Japan covered such subjects as the techniques of reservoir evaluation, the geothermal fluids transport engineering, various types of the power plant and generation technologies which would cause different impacts to the reservoir.

The activities for the objective 5 included the environmental conservation and the plant engineering, the business administration of the public steam supplier and the steam supply agreement.

It was an urgent requirement for GDC to acquire knowledge and know-how regarding SSA (steam supply agreements) and PPA and the negotiation capacity associated with such agreements. For this, GDC had to enhance understanding in the various types of generating technologies, skills in the steam supply cost analysis, in the financial and economic assessment and in the strategic settings for the steam price. Therefore the main training related to the subjects was implemented during the early stage of the first term of the project.

The main activity related to the objective 6 'the multi-purpose use of geothermal resources) was implemented during the first term. Further training was continued thorough the 2nd term. Through the project, it was intended to produce business plan for a pilot project for multi-purpose use of the geothermal brine so that GDC trainees would be able to carry out their own Pre-F/S level projects by themselves.

(5) Building continuous and sustained the capacity building (relating to objective 7)

Among the activity related to the objective 7, it included improvement and development of the training program and training materials. The effectiveness of the technical transfer and the contributions to the results were to be monitored. Under the mid-term review, the training progress and achievement was evaluated especially on the objectives 2, 3 and 4. In the mid-term review, recommendations for the second term were provided.

The objective 7 also addressed the following activities.

a) Organize the tasks of the training programs, training material which has become apparent through the execution and the results of the training.
b) Regarding the task of the above, improve and develop upon the considerations when GDC commences their own training.
c) The training material and training program were defined by consultations with the GDC executives.
d) All of the above outputs were integrated to the GDC human resource development program.

(6) Policy in the operational aspects of the overall operations

The overall training activity of this project was made to ensure the flexibility of the project not only during OJT in Kenya, but also by way of E-mails, telecommunications, and if necessary by video conference between Kenya and Japan. The establishment of close contact between the project team and its counterpart in GDC made the project expert aware of GDC`s activity plans and its development plan so that they responded timely for adjusting the training program.

The training activity was in principle based on the OJTs, For the OJT implementation, the project training experts were not expected and did not do the actual physical work. Especially on the training related to the objectives 2, 3 and 4, extensive model exercises were carried out by the project experts during first term. On the other hand, for the second term, there were many occasions where GDC trainer conducted the training to their colleague.

Many equipment, materials, tools, software and services were donated under the project. They were divided in terms of the procurement process in such a way that the equipment worth more than ¥15 million were handled directly by JICA with the technical support from the project experts.

1.5 Method of implementing the operation

The procedure in which operation will is presented in the Annex 6," Work Plan Flow Chart (First Term)" and "Work Flow Chart (second term) ". For the implementation method of the project, there are 7 expected result items and its relating activities presented in the TOR. However for the details of the method for the training program was developed based on the consultations with GDC and the basic structure was decided based on the results of objective 1, which had been subject to revision as the project progressed.

(1) Activities relating to the establishment of the training program(objective 1)

The figure "Objective 1 flow chart" in Annex 6 presents the details of the activities of this training program. This activity is mainly accomplished from the start if the first term until the second works in Japan of this project.

◆ Activity 1-1: GDC`s task and improvement plan.

It is essential to review and evaluate the inner structure of GDC`s responsibility in order to establish a training program that matches GDC`s needs. The objective for the review and evaluation is to confirm the prospect of the project scope for the next few years by interviewing mainly the energy minister and the high management of GDC.

◆ Activity 1-2: Current situation of GDC

The study which is the base for the information of the current situation of the GDC personnel, its equipment and capacity has already been done at the "Technical transfer and cooperation for the geothermal development detail planning study project" (in short " Technical transfer detail planning study project") and it shall be re-studied. During the re-study will be based on the survey evaluating the GDC personnel structure (categorizing the construction personnel / engineer, education level, special training, years of experience, organization chart, between groups and the infrastructures and there conditions that will support the activity (library, special equipment, analysis/ laboratory, repair shops, spear parts of computers and there logistics.) In this study (survey) the information will be collected by interviewing each different ranks within GDC regarding each field that relates to the objectives 2~6.

1-2.1 GDC executives: the objective and necessity of the reinforcement of the personnel and infrastructure.
1-2.2 Geological survey: Personnel capacity and infrastructure for conceptual modeling and drilling target selection.
1-2.3 Geophysical survey: Personnel capacity and infrastructure for conceptual modeling and drilling target selection.
1-2.4 Geochemical survey: Personnel capacity and infrastructure for conceptual modeling and drilling target selection.
1-2.5 Drilling crews' capacity and infrastructure on the drilling work.
1-2.6 Well testing, reservoir evaluation and management: Logging, well testing, reservoir numerical simulation personnel and infrastructure.
1-2.7 Two phase transportation installations: capacity of the personnel and infrastructure of installation construction, operation from the production well to the generating installations and from the separator to the reinjection well
1-2.8 Power plant: the capacity of personnel and infrastructure for monitoring and instructing the various types of power plants operation and maintenance
1-2.9 Social environmental considerations: the capacity of personnel and infrastructure for the monitoring of impacts to the surrounding environment during the geothermal development and Environmental Impact Assessment.
1-2.10 Economy and investment plan: the capacity of personnel and infrastructure for activity planning, estimation for installation cost, steam, hot water supply cost and its economic financial evaluation.
1-2.11 Steam supply and power purchasing agreements: the capacity of personnel and infrastructure for negotiating with the IPP regarding the steam, hot water supply and power vending to the grid.
1-2.12 Databases: the capacity of personnel and infrastructure regarding the accumulation of records and data regarding GDC operations.
1-2.13 Multi-use of geothermal fluid: the capacity of personnel and infrastructure for the planning of industrial to enrich the local residents economically by studying the local needs.

With the results of the survey of above, meetings will be held with the GDC personnel to organized and improve upon the issues regarding of above.

◆ Activity 1-3: Establishment for the baseline evaluation and target level

With the understanding of the above, determine the present situation of GDC, establish the target level of the improvement plans that includes the creation of the educational materials and provision of equipment. For these operations, the check list and evaluation sheet made in activity 1-4 will the

reference. In addition, a preliminary draft for the training program will be made to aim the target level achievement.

- Activity 1-4: the adjustment for the GDC executives
  After the activity 1-2, an exchange of opinions and adjustments regarding the direction of the training to propose the target level and training program to the GDC executives. During this, a confirmation of the plan for development of human resource will be done to the executive and human resource division.

- Activity 1-5: creation of the training program
  All the information gathered during the activity of above will be integrated and the final version of the training program summarized. This training program will be presented to JICA as a work plan.

- Activity 1-6: creation of the check list and evaluation sheet.
  Check lists and evaluation sheets monitoring the advancement and results of the training program will be created. The evaluation sheet shall be able to evaluate quantitatively the capacity of each geothermal development relating divisions starting from the technical service division of GDC. For the moment a radar chart is planned to be created, although this will be finally decided with talks with GDC.

- Activity 1-7: creation of educational materials for the training.
  As an educational material for the training, handbooks for the each training module were created that are compatible to the training program. Some of the handbooks are based on the presentation (lectures) materials. In addition, videos training materials were prepared for the educational material. These materials had gone through continuous revision and completed at the end of the project.
  Although 15 of different technical handbooks were planned, they expanded to 41 volumes when they were delivered at the end of the project as shown in Annex 12.

- Activity 1-8: procurement of equipment.
  For the activity 1-2 of the above, a list will be created for the drilling and survey equipment, analysis equipment and software thought to be required for this project and its priorities shall be determined by talks with GDC as equipment for donation. Depending on the donated equipment, its procurement will commence. For the donated equipment, spare parts will be in consideration in order for GDC to be able to maintain and manage after the end of the project.

(2) Activities relating to capacity improvements of reservoir conceptual modeling and drilling target selection (objective 2)

"Objective 2 flow chart" in Annex 6 presents the details of the activities of the training for the conceptual modeling, drilling target selection, geothermal resource potential`s preliminary evaluation and priorities of the development. The Activity numbers used blow can be referred in this flowchart.

As explained in 1.4 (2), for the training 2, series of various technical elements were untended to be carried out initially in 2 selected fields as for the designated OJT area. The first of this training is carried out in the first term of the project, which included lectures and model exercises, and the second of this training was done in the second term which is mainly GDC`s hands on training with the characteristics of repetitive training. For the activity relating to objective 2, is somewhat close to a Pre-feasibility study, in which through this a preliminary resource potential evaluation and economic and financial evaluation of the development project would be carried out. GDC carried out investigations such as this in all of the geothermal area with concession to prioritization its development. For the result of this survey, in order to estimate the cost for the development of this geothermal fluid (Drilling depth, transportation of fluids) the selection of drilling target will be essential. On this training activity, the aim was to build GDC`s capacity to determine the target underground and where to locate the drilling rig on the surface. Therefore it was necessary to know not only the underground but also the conditions of the surface. Unfortunately because of the security situation of the northern fields where GDC is exploiting and where we planned to carry out the OJT in the second term, we had to use again the Menengai field for the OJT training.

- The underground conditions are determined by the integration of the conceptual model created form the

results of the superficial survey (such as geology, geophysical, geochemical, activity 2-1.1, and especially 2-1.1.1~ 2-1.1.3). The resource study incorporating various geo-scientific methods such as in geological subject are satellite image analysis, general geology exploration, hydrothermal alteration zone research and rock dating, etc., for geochemical subject, hot spring water chemistry research and fumarole gas chemistry surveys and soil gas surveys, in geophysical subject which can be divided into electromagnetic survey, magnetic survey, gravity and electrical survey, in which these require knowledge and a paramount technical capacity, and the experience to use these knowledge and combine them.

- The objective of the geothermal conceptual model (Figure "Example of Conceptual Model" in Annex 6) is to conceptually clarify by representing the most adequate area of the geothermal fluid by integrating all the study results of the sub-surface. (activity 2-1.1.4)
- The results for the superficial conditions is determined by the integration of the topographical study (activity 2-1.1.1) environmental study (activity 2-2.1.2) existing infrastructures study (activity 2-1.1.4), natural hazard study (activity 2-2.1.5). From this the safe location for the construction for the power plant, well pads, geothermal fluid transporting installations is determined. (Activity 2-2.1.6).
- With the integration of the results of the above, the drilling pads and drilling targets are determined. (Activity 2-1.1.5) (See figure "Example of drilling site selection" in Annex 6)

With all these combined, GDC geoscientists became able to estimate the generating capacity (by volumetric method, such as the application of the Monte Carlo method), and to summarize it as a report. (Activity 2-1.1.6 and 2-1.1.7). At this stage of this the project experts attended meetings where decisions were made whether the development should advance and would be able to give instructions and advises (activity 2-3). GDC will acknowledge on trainings for the location of the power plant (activity 2-3.1), analyzing by implementing the Monte Carlo method for the estimation of production, reinjection well`s capacity and number, and based on this, actualize the conceptual plans for the power plant and its preliminary estimation cost (activity 2-3.3) and a preliminary economical evaluation (activity 2-3.4). The training included the preparation of the compiled database for easy access of the data acquired during the exploration.

- The training in this activity was focused on building up GDC capacity on the basic and standard technology adopted in the concurrent geothermal development. However the geothermal reservoir structure of Menengai is difficult to delineate because it is highly heterogenic and deep seated. The geoscientific data in the eastern part of the Menengai field were less concentrated as compared with those in the caldera center. When the well MW-18A located in the eastern part found a good prospect which was overlain by massive cold lava, JICA-GDC-MOEP decided to carry out extensive study by collecting more geoscientific data. The project team proposed to apply advanced technology such as the bore hole imaging log (ABI), In-SAR, Lidar and/or bore hole coring in addition to the standard geoscientific methods. Through the application of these new technologies, the training for the GDC geoscientists was provided. All the survey/study results were integrated and reflected in the Steam Report.
- It should be noted that during the geological and geochemical training, data analysis for the rock dating and isotopic composition analysis of water was done in Japan, which with the equipment that GDC owns is not capable on analyzing them.

(3) Activity for improving the capacity to drill to the drilling target (objective 3)

The figure "Objective 3 flow chart" in Annex 6 presents the details for training activity relating the drilling technique. Success or failure of the drilling for the geothermal development which accede a considerable amount of budgets will have a significant impact on the financial management on GDC.

In the beginning of the project, GDC owned 4 drilling rigs and they added 3 drilling rigs for the drilling operations in Menengai. As the number of rigs increased, GDC employed drilling personnel most of whom had little experience in the drilling work. Challenges were observed on the personnel capacity and drilling equipment conditions such as improper specification and/or poor asset management and maintenance implementation. These resulted in inducing the loss time, the low ROP or delays in the drilling progress. To improve the situation, not only capacity build-up for the drilling personnel but also improvement on the command/responsibility structure of the drilling organization was thought necessary. Since the experts from the project were mere trainer and did not have any authority to have direct command in any kinds of drilling activity, the project team kept policy that the sole purpose for the training is to educate and establish an educational program for the GDC personnel, and not to interfere with the drilling management structure. The training was initially intended to capacity of the drilling engineers regarding the engineering subjects related to the drilling design, maintenance, asset management and logistics. In addition, trainings for Health, Safety, and Environment (HSE) on the drilling sites with special emphasis on 5S was carried out. As the project progressed, the needs to train much wider scope of drilling personnel were thought necessary and the

training program was adjusted to extend the training to most of the drilling personnel. Upon With this understanding, the training for the drilling technology was carried out in four modes.

First one is the OJT at the wellsite regarding the operation, maintenance, safety and/or any relevant topics pertaining to the drilling activity. Furthermore, JICA will be involved and planning to provision the necessary drilling equipment, provide assistance to the GDC procurement organization and structure through the procurement process. The main training targets are the engineers and the shift leaders (operation, maintenance, logistics, safety, etc.). But eventually it was extended to any drilling personnel in the drilling site.

The second mode of training is the classroom session. It was held in 2016 and 2018, each for about 5 months. The training targets were the engineers, shift leaders, technicians such as mechanics and electricians and safety personnel.

The third one is the bi-weekly meeting with the drilling engineers and the managers where the operational challenges and topics noted by the experts were reviewed. Based on these topics, it was intended to provide trainings to the engineers and managers of the drilling personnel

The fourth training mode is the training program in Japan. The Japan training program is to supplement the OJT in Menegai and in Polo classroom. The program consisted of lecture on the drilling theory by the Japanese geothermal drilling experts, the drilling site visit in order to learn the advance drilling operation, visit to the bit and wellhead valve factories, the well control training at JOGMEC`s Kashiwazaki facility using state of art drilling simulator. They were also provided with the mud engineering training in the mud manufacturer's laboratory. HSE training was also well provided such as "Lifting and Rigging". All of the GDC trainees were officially accredited on this certificate recognized by the Japanese government. They also went through emergency respiration training by the Fukuoka City Fire fighting authority. The training targets are the engineers, shift leaders, technicians such as mechanics and electricians. Each training mission consisted of 6 trainees and each training course was programmed for about 1 month. Two missions a year for 4 years were held. Thus total 48 GDC personnel were trained in Japan.

The drilling OJT was planned to be implemented in the drilling sites was in Menengai. Initially a team consisting of four Japanese drilling advisers was planned to be sent on their available winter time. They would work in rotation of 28 days for 3 months. This drilling OJT campaign was planned for three years. In each year during the three months on OJT, it was assumed that one complete cycle of drilling operation (rig up, spud-in, drilling completion and rig down) would be covered. Thus for the total of three year campaign, three complete drilling cycles would be covered.

It was soon realized that this plan were not realistic because one cycle of drilling operation was taking much more and frequent and long interruption of the drilling operation was experienced. The revision in the drilling expert team was made so that no seasonal limitation would be imposed and longer OJT period per campaign can be achieved. In addition more consistent technical policy was thought necessary in terms of the teaching side. Considering the language factor as well, the experts from a single drilling company was thought preferred. Thus instead of the experts consisting all Japanese, the majority of the drilling experts was changed to those from Thermaprime Drilling of Philippines since late 2015..

(4) The activity for improving the capacity of reservoir evaluation (objective 4)

The details for the training of reservoir evaluation is presented o figure "Objective 4 flow chart " in Annex 6.

GDC`s main business is to supply steam and hot water to the IPP operators which converts steam energy for generating power. It is a requirement for GDC to create sufficient incomes to continue the geothermal develop in other geothermal fields within Kenya by selling the steam ad hot water with the previously developed fields. The price of the steam and hot water is determined by the potential of the reservoir and the sustainability of the development, although this depends on the amount and quality of data, also by using this data, the techniques to predict the impact on the reservoir during the development. Also, a geothermal development form depends on the geothermal power generation system (the types of power plant). The training regarding these will be accomplished throughout the first term and second term, in Kenya and in the training course in Japan. The training course in Japan is planned once every year (total of 4 times) and 6 trainees are invited.

The general description of the theory of reservoir evaluation will be accomplished in the first term,

then through the training course in Japan by using data from Menengai an analysis and evaluation OJT will be accomplished. These trainings can be divided into three main technical fields; acquisition of well data (activity 4-1), reservoir simulation by numerical modeling (activity 4-2) reservoir operations and management (activity 4-3).

◆ Activity 4-1: Acquisition of well data and analysis

The training regarding the acquisition of well data is assembled as well logging, well testing after accomplishing drilling, well production test (activity 4-1.1 and 4-1.2). In addition the results of these data acquired will be integrated in to the geothermal conceptual model (activity 4-1.3)

◆ Activity 4-2: Reservoir simulation by numerical modeling

The most crucial training course in Japan generally is the consideration of the generating system types for the optimization of the reservoir development (Activity 4-2, a ~ k), in which should be combined with a part of the activity relating to the objective 5 (training for plant engineering and consensus building/negotiation with the IPP).

With this training GDC will be able to estimate the numbers of production and reinjection wells needed for the reservoirs under the development period. In addition, with the practical use and the creation of the geothermal numerical model (simulation analysis) and by learning how to estimate the costs for the superficial installations and fluid transporting installations, it is possible to develop a technically and financially optimal development scenario. As a training, reports are to be elaborated by the GDC technicians, and training for how to make decision making for the project plan will take place.

◆ Activity 4-3: Reservoir operations and management. (O&M)

After the commencement the power plants operation a geothermal reservoir does not always fluctuate as the numerical simulation predicts in practicality, therefore during the operation and management of the reservoir, training for the methods and data analysis techniques of monitoring will be accomplished (Activity 4-3 a ~ d).

◆ Activity 4-4: Development and management of database

Data from each well testing and monitoring data, furthermore data relating for the development of numerical models will be considerable. Therefore a data base is necessary which can be used effectively during the reservoir O&M stage by creating an efficient sorting and storage. With this training, an overall study of data relations and evaluation is possible by executing lectures and exercises for the development of the data base. The software used for the data base will be based upon GDC`s designation such as GD Manager, Steam-Field Manager and surfer, although other software can be used if necessary. In addition, the software theory and manipulating capacity on the generic database technique has been addressed so that GDC personnel can adapt to rapidly evolving database software environment.

(5) Activity relating to the improvement of the capacity to develop an adequate project plan (objective 5)

The figure “Objective 5 flow chart” in Annex 6 presents the details of the training regarding the environmental monitoring and environmental preservation plan, plant engineering, the establishment of Public-private partnership scheme (PPP) and negotiations with the IPP

GDC has an obligation to supply steam and hot water to the power producers (IPP), therefore GDC is required to understand the needs of their private partners in order to establish a fair and mutually win-win relation for selling and buying of steam. This training can be divided into 3 categories, environmental planning (activity 5-1), plant engineering (activity 5-2), and IPP-PPP scheme (activity 5-3). These training will be accomplished predominantly during the first term, although depending on GDC`s demand and the advancement of GDC`s project, it can be considered to execute using the second term. For the general description of theory and concept will be lectured in a short period in the first term in Kenya. For the activity 5-2, reservoir evaluation (relating to objective 4), will be accomplished in the training course in Japan using the data acquired from Menengai as an OJT.

◆ Activity 5-1: Environmental monitoring and environmental preservation plan

At the environmental monitoring and planning training, the points required to be considered in the plant construction stage (activity 5-1.1) and operation stage (activity 5-1.2) , and further the points relating to environmental management planning (activity 5-1.3) will be considered. These concepts

regarding the EIA of the IPP and the geothermal fluid transporting installations EIA should be picked up in detail. In this training, lectures are planned that relates to the guidelines of each social environmental consideration for the acquisition of financial support from donating agencies and obtaining of carbon credits.

◆ Activity 5-2: Plant engineering,

The training for plant engineering will be structured with the lectures relating to the activity of objective 2 (selection of drilling location) in addition to the consideration of conditions for the location of superficial installation construction, plant type selection (activity 5-2.1), the selection and concept design of the geothermal fluid gathering system (activity 5-2.2) and regulations of the interface with the plants(geothermal fluid/power/conditions of the instrumental and control signals). The training relating to the selection of plant type an understanding of the characteristics and a compare and contrast about back-pressure turbine, single flash, double flash, hot water binary, steam and hot water binary, combined cycle binary. All these must be considered for the future based on the predictable hydrodynamics and chemical properties of the geothermal fluid. On the training course in Japan, as in relations to the optimization of the reservoir (activity 4-2), a compare and contrast of each plant types for each designated geothermal fields will be accomplished. By the results of activity 4-2 and 5-2, it will be possible to estimate the geothermal resource development cost and the numbers of production and reinjection wells needed to operate the reservoir depending on the power generation type. That is to say, by acknowledging the training for the estimation of the initial cost and economic-financial evaluation, it will contribute greatly to GDC`s Internal Rate of Return (IRR) and at the same time it would be the base knowledge for the activity 5-3 below, the training relating to the establishment of IPP-PPP scheme under conditions of constraints of the strategic SSA.

◆ Activity 5-3: establishment of Public-private partnership scheme (PPP) and negotiations with the IPP

The activity 5-3 is to train the capacity of GDC, by maintaining the developing situation of investments from the IPP, be able to negotiate and contract the steam supply agreements between the IPP for a sustainable business.

Therefore a technical transfer of basic financial theory and project economical evaluation method will be accomplished. The technical transfer for project evaluation method, an economical evaluation model for the geothermal power generation project will be established, and study the benefits of the project in various conditions. In addition, considering in an economical evaluation model in a geothermal generating project consists from 2 operators, (GDC and IPP), intent to establish a model which both would be beneficial. (Refer to figure “Flow of Steam & Power Sales Price settings and its necessary knowledge and capacity” in Annex 6) Furthermore, the consensus building with the IPP, would be considered through interviews and exchange of opinions with the demands from the IPP and other candidate entities.

(6) Activity for capacity building of Geothermal Energy multi-purpose use (Objective 6)

The figure “Objective 6 flow chart in Annex 6” presents the details for the capacity building training activity for Geothermal Energy multiple-purpose use.

GDC recognizes the potential of geothermal energy being used besides power generation and has a team which studies the possibility for multiple-purpose use for local industries. There is floriculture as an example of multiple-purpose use of geothermal resource, which Kenya takes the leadership of the world in this field together with the possibility of direct-use of geothermal resource.

To build these capacities for the geothermal multiple-purpose use in the first term of this project (Activity 6-1), a market survey and analysis (screening) together with GDC of the industries that produces the competitive products will be carried out. To accomplish this, an abstraction of promising heat-using projects, shall be matched with its necessary heat with the surplus heat depending on the plant type being used (activity 5-2; the selection of plant type). Based on this information a Pilot-project will be planned by choosing the most promising business. For these pilot projects, training regarding the necessary facilities and estimate of project cost and evaluation of economy and finance (Active 6-2) will be accomplished. In addition to accomplish this pilot project, lectures for the necessary resources and personnel will be given.

(7) Establishment of the architect of continuous and sustainable training program (Objective 7)

Monitoring for the preliminary results are necessary during the activities relating to the objective 2,3,4,5 and 6. The monitoring results and is issues needed to be improved are as flows.

(a). Organize the issues of the training program and the training materials which became evident through the training and its results.
(b). Revision and improvement with consideration of the above in order so GDC will be able to establish their own training program.
(c). Propose the training program to the GDC executives for reviews and opinions regarding the human resource development policy, and determine the training program and training materials based on it.
(d). Combine and integrate all of the above to the human resource development of GDC.

- Abstraction of challenges of the established training materials and programs

Be aware of the new needs and challenges during the training. Evaluate if there are possibilities of solving the challenges during the program and determine if these challenges should be solved by GDC in the future. Revision of training materials and improvement of training programs

- Revision of training materials and improvement of training programs

GDC`s engagement is of a long term, and is necessary to train their geoscientific engineer and engineers at the same level as the training accomplished during this project. During the training period review the training materials (textbooks and video materials) in order for the trainee to understand the concept as effectively to be able to pass on to the next generation of engineers.

- Proposal revised training programs for top GDC executives and reconfirmation of the policy of human resource development.

After the training, through exchanges of opinions with the GDC executives regarding the training program that can be used continually and elaborate the training materials.

- Integration of training programs into the programs of human resource development.

Through the reconfirmation of the proposal and goals, after the training program, it will be determined if to continue or to improve the training program, and will be integrated to GDC`s human resource development program.

1.6 Other activities and attentions

(1) Trends of other support systems

Geothermal energy development and support its promotion in Kenya will be carried out or planned by various donors. Therefore information regarding the trend during the project period shall be gathered and if necessary share the information and consult with JICA.

(2) Cooperation with experts stationed in Nairobi.

In relations with this project, information shall be exchanged attentively by means such as emails with experts separately sent by JICA to Nairobi from September in 2011 during the field work and in Japan in order to coordinate the activities with the trends with other donors and GDC.

(3) Investigation geothermal energy development master plan in Kenya

The development project relating to the “PROJECT FOR REVIEWING GDC'S GEOTHERMAL DEVELOPMENT STRATEGYIN THE REPUBLIC OF KENYA” was conducted in parallel with the OJT of this project. The coordination and synergy or the two projects went very well. The product quality produced from the “PROJECT FOR REVIEWING GDC'S GEOTHERMAL DEVELOPMENT STRATEGYIN THE REPUBLIC OF KENYA” helped to enhance mutual trust between GDC and the JICA project team.

(4) Cooperation with the evaluation survey of the project

In the mid project and the terminal project review and evaluation were conducted in reference to and based on Project Design Matrix (PDM). The revised Plan of Operation (PO) was made in the Joint Coordinating Committee (JCC) held in April 2018. JCCs were organized with the elaboration of the Minutes of Meeting (M/M).

(5) Publicity Activities of this project

To make both the public and donors in both countries to widely understand the purpose of the activities and results of this project, JICA will not only cooperate with publicity activities but also

promote actively for each initiatives. At the moment considerations are made for these activities such as ① Making a motion picture medium of the project activities ② Contribute to lectures and presentations to various geothermal energy and other academic and international meetings and conference, submit to various magazines.

1.7 Summary of the Training Activities

The training activities are easily described according to the output from 2 to 7 defined in the PDM in Annex 2. In a different perspective, it is worthwhile mentioning that some of the training programs were conducted in Japan.

Though the details of the project activities are described in 1.5 and 1.6 above, it is worth mentioning that the use of advanced equipment, software, materials and/or services donated by JICA, the list of which is shown in the Annex 13. These donation equipment and services contributed to major part of the training programs for the modules such as the geoscientific, drilling, environment monitoring and plant engineering. Training involving the donation equipment was not just limited to its use but also extended to the O&M for these assets.

Summary of the training activities is shown in the Table 1-1. The activities are categorized according to the corresponding Output, technical subjects, name of the experts, total number of man-days and trips made by the experts.

Table 1-1 Summary of Training Activities during Phase 1(February 2014 ~ November 2015)

Output	Technical Subject		Trainee qualification	Name of the JICA Expert	Accumulative Experts man-days assigned to OJT and trips made
2	Geology	Geology	Geoscientist/Technician in GRA	Soeda, Yoshiyama	112 days/6 trips
		Hazard Mapping (a Civil Engineering)	Geoscientist/Engineer/Technicians from the relevant Departments	Oishi	21 days/1 trip
	Geophysics	MT	Geoscientist/Technician in GRA	Honda	65 days/4 trips
		Gravity	Geoscientist/Technician in GRA	Saitoh	40 days/3 trips
		MEQ	Geoscientist/Technician in GRA	Onacha	44 days/2 trips
	Geochemistry	Geochemistry	Geoscientist/Engineer in GRA	Matsuda, Uchiyama	105 days/7 trips
		Laboratory, sampling	Laboratory technician in GRA	Ino	105 days/ 4trips
3	Drilling	Wellsite OJT	Drilling Personnel (i.e. Engineer, various level of technicians, mechanic, electrician, etc.)	Ikeda, Wada, J.Sasaki, Komatsu, Kiyono, Takahashi, Shinozaki, Minami, Kikuchi, Toyota, Tsuyoshi Abe, Ikenomoto, Fujinuki, Nakano, Tomoki Abe, Cruz, Suasin, Del Valle, Arrieta II, Baena, Genis, Astorga, Canete, Augusto, Mission, Dela Cruz, Jereza, Barile, Cabrillas,	1148 days/ 49 trips
		Class Room Session			
		Biweekly Meetings	Drilling Engineers and managers		
	Procurement		Personnel in the Supply Chain Dept.	Ishigaki	82 days/5 trips
4	Database		Engineers/technician in GRA	Fukuoka	60 days/3 trips
	Reservoir Modelling		Geoscientist/engineers in GRM	Fukuoka, Lima	97 days/6 trips
	Well Siting		Geoscientist/engineers in GRM	Akasako, Lima	99 days/7 trips
	Well Logging		Well logging technician and engineers	Hatanaka	57 days/3 trips
	Well Testing		Well testing Engineers and technicians	Shiotsuka	20 days/1 trip
5	Economic Evaluation		Officer, accountant, engineers in CPS, Finance and the other relevant Departments	Kaneko	51 days/4 trips
	Business Administration		Officer, accountant, engineers in CPS, Finance and the other relevant Departments	Hirose, Owada	90 days/6 trips

	Steam Purchase Agreement Promotion		Officer, accountant, engineers in CPS, Finance and the other relevant Departments	Tajima	45 days/4 trips
	Social and Environment Consideration	Social Consideration (EMS and RAP)	Engineers/technicians in the Environment Dept. and Social Relation Dept.	Yoshimura, Teramoto	76 days/5 trips
		Environment Monitoring	Engineers/technicians in the Environment Dept.	Iri	8 days/1 trip
	Plant Engineering		Engineers/technicians in GRM, SHE and the other relevant Departments	Yamamoto, Higo, Matsuo	134 days/8 trips
6	Multi-Purpose Use of Geothermal Energy		Engineer/Technician in Direct Use Department and the other relevant departments	Shigetomi	123 days/5 trips

Table 1-2 Summary of Training Activities carried out in Japan during Phase 1(Feb. 2014~Nov. 2015)

Output	Technical Subject	The training content	Trainee qualification	Number of Trainee	Number of training days in Japan
3	Drilling	1st training course for drilling technology	Drilling Personnel (i.e. Engineer, shift leader, mechanic, electrician)	6 people	31 days
		2nd training course for drilling technology		6 people	31 days
		3rd training course for drilling technology		6 people	31 days
		4th training course for drilling technology		6 people	31 days
4	Reservoir Engineering	1st and 2nd training course for reservoir engineering	Geoscientist/engineers in GRM	5 people	19 days
		3rd training course for reservoir engineering		4 people	39 days

Table 1-3 Summary of Training Activities during the Phase 1I (April 2016 ~ December 2019)

Output	Technical Subject		Trainee qualification	Name of the JICA Expert	Accumulative Experts man-days spent for OJT
2	Geology	Geology	Geoscientist/Technician in GRA	Soeda, Yoshiyama, Fujii	41 days/9 trips
	Geophysics	MT	Geoscientist/Technician in GRA	Honda	79 days/7 trips
		Gravity	Geoscientist/Technician in GRA	Saitoh	56 days/5 trips
		MEQ	Geoscientist/Technician in GRA	Onacha	42 days/4 trips
	Geochemistry	Geochemistry	Geoscientist/Engineer in GRA	Matsuda, Uchiyama	102 days/9 trips
		Laboratory, sampling	Laboratory technician in GRA	Ino	77 days/5 trips
3	Drilling	Wellsite OJT	Drilling Personnel (i.e. Engineer, various level of technicians, mechanic, electrician, etc.)	Ikeda, Wada, S.Sasaki, Komatsu, Iwaya, Kobayashi, Tsuyoshi Abe, Nakano, Cruz, Suasin, Day, Baena, Genis, Canete, Dela Cruz, Barile, Dela Cruz	1349 days/46 trips
		Class Room Session			
		Biweekly Meetings	Drilling Engineers and managers		
		HSE	Drilling Personnel (i.e. Engineer, various level of technicians, mechanic, electrician, etc.)	Abanilla	34 days/1 trip
		Mud Engineering	Drilling Personnel (i.e. Engineer, various level of technicians, mechanic, electrician, etc.)	Ishikawa	43 days/3 trips
		Directional Drilling	Drilling engineers and technicians designated to the directional drilling	Castillo	28 days/3 trips
		Plasma Arc Cutting	Drilling and Infrastructure Personnel (i.e. Engineer, various level of technicians)	Icabales	9 days/ trip

	Procurement		Personnel in the Supply Chain Dept.	Ishigaki	24 days/3 trips
4	Database		Engineers/technician in GRA	Takazono	56 days/4 trips
	Reservoir Modelling		Geoscientist/engineers in GRM	Hatanaka, Lima	94 days/10 trips
	Well Siting		Geoscientist/engineers in GRM	Akasako, Yoshiyama, Lima	116 days/9 trips
	Well Logging		Well logging technician and engineers	Hatanaka	18 days/2 trips
	Well Testing		Well testing Engineers and technicians	Hatanaka	17 days/2 trips
5	Economic Evaluation		Officer, accountant, engineers in CPS, Finance and the other relevant Departments	Kaneko	29 days/2 trips
	Business Administration		Officer, accountant, engineers in CPS, Finance and the other relevant Departments	Hirose	24 days/3 trips
	Project Management	Project Management	Officer, accountant, engineers in CPS, Finance and the other relevant Departments	Danno	16 days/2 trips
		Project Finance	Officer, accountant, engineers in CPS, Finance and the other relevant Departments	Chivers	8 days/1 trip
		Internal Control	GM class personnel from various departments of GDC	De Castro	8 days/1 trip
	Social and Environment Consideration	Social Consideration	Engineers/technicians in the Environment Dept. and Social Relation Dept.	Teramoto	53 days/4 trips
		Environment Monitoring	Engineers/technicians in the Environment Dept.	Iri	54 days/4 trips
	Plant Engineering		Engineers/technicians in GRM, SHE and the other relevant Departments	Yamamoto, Hayashi, Matsuo, Thomas, Mohamed Saeed	136 days/12 trips
6	Multi-Purpose Use of Geothermal Energy		Engineer/Technician in Direct Use Department and the other relevant departments	Shigetomi	24 days/3 trips

Table 1-4 Summary of Training Activities carried out in Japan during Phase II (Apr. 2016~Dec. 2019)

Output	Technical Subject	The training content	Trainee qualification	Number of Trainee	Number of training days in Japan
3	Drilling	5th training course for drilling technology	Drilling Personnel (i.e. Engineer, shift leader, mechanic, electrician)	6 people	31 days
		6th training course for drilling technology		6 people	30 days
		7th training course for drilling technology		6 people	33 days
		8th training course for drilling technology		6 people	33 days
4	Reservoir Engineering	1st reservoir engineering, Phase 2	Geoscientist/engineers in GRM	6 people	41 days
		Conceptual Modeling Seminar		7 people	16 days
		Reservoir Engineering Seminar		6 people	46 days

CHAPTER 2 Progression of PDM during the Project

A revision of the PDM was done once in April, 2018, 4 years after the project had started. The revision was necessitated because of the following reasons.

2.1 Challenges encountered in implementing the original PDM

According to the initial business plan of GDC as shown in the table and the figure below, they planned to commission the first full scale geothermal power plant by 2015 and many other commissioning would follow every two years up to the one named Menengai VI. This business plan was regarded as an important source when considering the content of the original PDM. Thus the overall goal was defined as “GDC will be able to

properly provide steam to power generation utilities". The corresponding "Objectively Verifiable Indicators" was defined as the "Number of steam purchase contracts signed between power generation utilities and GDC". However, after the project had started, this plan was found to be unrealistic to achieve, mainly because of the resource limitations of the Menengai field. Consequently though the "overall goal" itself remained as it was, the revision of its "verifiable indicators" and "means of verification" was thought necessary and changed so that it was focused on GDC's capacity to develop steam supply. (Refer to Annex 2)

Table 2-1 GDC's 10 year Geothermal Development Plan presented in 2010

Column1	PLANT SIZE	TOTAL WELLS NO.	Rigs	2009 / 10	2010 / 11	2011 / 12	2012 / 13	2013 / 14	2014 / 15	2015 / 16	2016 / 17	2017 / 18	2018 / 19
OLKARIA IV	140	18	hired 1&2	6	10	2	Com.						
OLKARIA I	140	23	Hired 3		5	8	10	Com.					
MENENGAI I	140	41	GDC 1,2		8	15	15	3		Com.			
MENENGAI II	140	40	GDC 1,2,3					12	15	13		Com.	
MENENGAI III	140	40	GDC 1-3							2	15	15	8
MENENGAI IV	140	40	GDC 1-3										7
MENENGAI V	140	40	GDC 1-3										
MENENGAI VI	140	40	GDC 1-3										
SILALI I	140	41	GDC 4,5			14	15	12		Com.			
SILALI II	140	40	GDC 4,5					3	15	15	7		Com.
SILALI III	140	40	GDC 4,5								8	15	15
SILALI IV	140	40	GDC 4,5										
PAKA I	140	41	GDC 6,7			8	15	15	3		Com.		
PAKA II	140	40	GDC 6,7						12	15	13		Com.
PAKA III	140	40	GDC 6,7								2	15	15

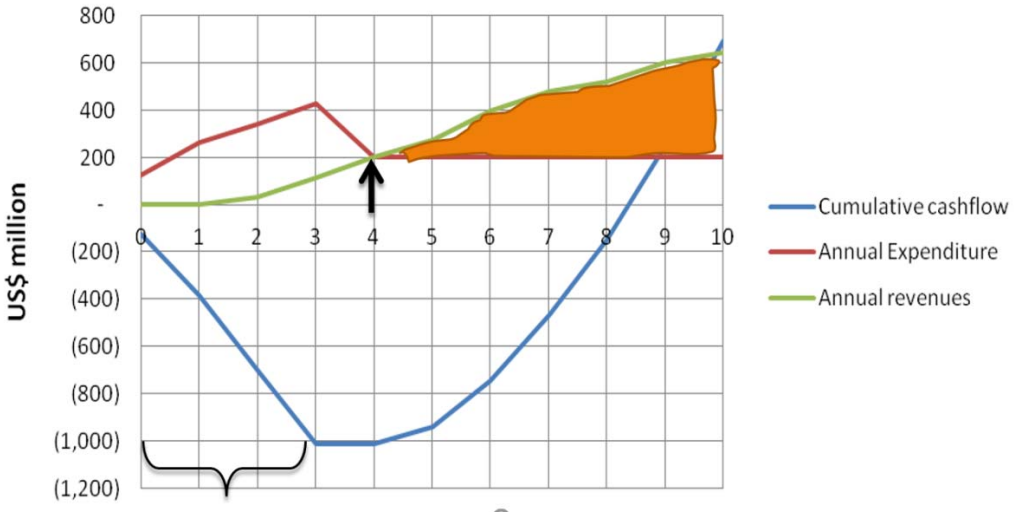


Figure 2-1 GDC's Cash flow forecast presented in 2010

Source："GDC 10 year Business Plan", April, 2010, Ngugi,P. GDC

2.2 Revised to more objectively verifiable indicators

Upon determining the original PDM, there was difficulty to find consensus between the project team and JICA when determining the objectively verifiable indicators for its goals, purposes and outputs. The situation was in a way understandable, considering the fact that this capacity building project would handle the complicated technical and commercial themes while the GDC organization and its capacity was not fully understood yet. It was very challenging to define numerically verifiable indicators. Therefore some of the original PDM contents were considered temporal and were expected to be amended as the project progresses when the parties would

gain better picture on it. The amendment of PDM finally took place in the spring of 2018. While the "Overall Goal", "Project Purpose", "Outputs" and "Activities" mostly remained as they were (except for few minor modifications), the revision of the indicators and their means were changed as found in the appendix. In the amended PDM, the verifiable indicators were defined in numerically simple and straightforward expression. It helped making the concerned parties understand the project achievement objectively and more easily.

CHAPTER 3 Record of the Joint Coordinating Committees (JCC)

There were three Joint Coordination Committees held under this project. The exerpts of three JCCs are shown from Annex 3 to Annex 5.

3.1 1st JCC for the mid-term evaluation

The 1st JCC was held when the mid-term evaluation was conducted. In the JCC, the project period, revision of PDM and PO and dispatch of additional experts were discussed and approved.

1) Date held：April 27, 2016
2) Agenda：
   1. Recognition of the mid-term review report
   2. Project period
   3. Finalization of draft revised Project Design Matrix(PDM) and revised Plan of Operation (PO)
   4. Possibility of dispatching additional area of experts
3) Discussion excerpts
   1. Approved the mid-term review report
   2. Project period was extended to the end of March 2018.
   3. Need for PDM and PO revision was agreed. The Objectively Verifiable Indicators in the draft revised PDM need to have numbers defined as target value. More tangible indicators shall be added for the Outputs to clarify the efforts made through the training programs
      The revised PDM should be endorsed in the 2nd JCC or agreed on through Minutes of Meetings signed by both sides by the end of October 2016
   4. In the 2nd phase of the Project, the JICA team will concentrate more on the training of trainers to enhance GDC's capacity to sustainably conduct internal trainings within GDC. It might be necessary to provide additional inputs to harmonize the JICA team's technical training efforts and GDC's existing monitoring system.

   Both sides confirmed that JICA shall 1) monitor the Project's activities well and hold close discussions with GDC, and 2) consider the necessity of additional inputs for the Project with the objective of improving GDC's internal training /human resource Development system.

3.2 2nd JCC

The 2nd JCC was held to review the work progress and the proposed revision of the PDM including the project period and the activity.

1) Date held : April 20, 2018
2) Agenda :
   1. Explanation of the Work Progress
   2. Presentation of further Work Plan
   3. Presentation of draft revised PDM and draft revised PO
   4. Proposal to amend the Record of Discussions
   5. Discussion on challenges and necessary actions to be taken for improvement of the project implementation
3) Discussion excerpts
   1. Project progress in respect to PDM was presented.
      As for expected outputs, Eng. Ole Nchoe expressed his concerns that GDC's capacity for targeting and drilling is stil limited. He then requested JICA to dispatch resident experts for more accurate targeting and drilling respectively. Also, he requested JICA to create a masterplan for greater Menengai that includes outside of the caldera. JICA responded that they

would need further information in order for them to consider the request

2. (a) As for further Work Plan, Terminal Evaluation is scheduled from beginningo f January to beginning of February 2019.
   (b) The Project period is proposed to be extended by 5 months until end of August 2018. Regarding this issue, Dr. Eng. Njoroge told GDC to submit the request letter on the project period extension and Eng. Ole Nchoe agreed to it.
3. The revision regarding the project period, PDM and PO was approved for the Record of Discussions (last amended on April 26, 2017).
4. Proposal to amend the Record of Discussions
   1. "9.Duration. Article .11 OUTLlNE OF THE PROJECT" of the R/D shall be amended as follows:
      9. Duration
      The Proiect duration will be 71 (Seventyone) months, until the end of August 2019 commencing after the first arrival of JICA Experts in Kenya.
   2. The PDM and PO of the R/D (April 2017) shall be amended.
5. (a)Recommendation of introducing new technology such as ABI (Acoustic Borehole Imager) and coring for the resource evaluation in the project was explained
   (b) For the drilling performance improvement, introduction of mud drilling and 5S (a workplace organization method consisting of basic tasks such as "Sort", "Set In order", "Shine", "Standardize" and "Sustain") was explained..

3.3 3rd JCC for the terminal evaluation

The 3rd JCC was held when the terminal evaluation was conducted. In the JCC, Dr. Eng. Joseph Njoroge, PS, Ministry of MOEP started the committee followed by remarkes by Eiji Wakamatsu, Senior Deputy Director, Team 2, Energy and Mining Group, JICA HQ regarding JICA's commitment to the Kenya's effort in the geothermal developmentand the overall achievement of the project. In JCC, the fidings and recommendations for the future work presented in the terminal evaluation work were discussed and approved.

1) Date held：September 20, 2019
2) Agenda：
   1. Introductions & Opening remarks
   2. Presentations by representatives of GDC, Joint JICA-GDC Evaluation team and the West JEC Projecvt leader regarding the project achievement
   3. Way forward
   4. Closing remarks

3) Discussion excerpts
   1. Introductions & Opening remarks
      1. Dr. Eng. Joseph Njoroge, PS, MOE as the chairperson welcomed all members to the meeting and let the members introduce themselves.
      2. Mr. Eiji Wakamatsu, Senior Deputy Director, Team 2, Energy and Mining Group, JICA HQ made speech about their contribution to the geothermal development in general and presented the overall project achievement. He further requested PS and GDC management to increase training budget by pointing out that it has been declining in the recent years.
      3. PS noted that his office would take up the matter on the training budget. The chairman then handed over to the Chief Geologist to be the Chair.
   2. Presentations
      1. Dr. George Muia, General Manager, SRI, GDC presented on Project Outline and Progress while sharing the challenges faced and the possible opportunities for future support.
      2. The Joint JICA-GDC Evaluation team shared the findings of the evaluation and the recommendations.
      3. The WEST-JEC Project leader shared the schedule for the remaining period (October-December 2019)
   3. Way forward
      1. It was noted that the way forward was agreed on.

2. The joint evaluation report was signed by Mr. Eiji Wakamatsu (JICA) and Mr. Ahmed Fankey (GDC).

4. Closing remarks

   Before closing the session, Mr. Wakamatsu made a speech on the importance of sustainability of the training effort and Dr. Muia made speech on the achievement of the project and his commitment to the future training. In return, Mr.Chrispin, Chair expressed the training need for the ministry personnel, he closed the session.

5. The excerpts of the Terminal Evaluation is shown in the Annex 5 (**Excerpts of the 3rd JCC for the Terminal Evaluation**)

CHAPTER 4 Activities after Final Evaluation

4.1 Remaining OJTs (Internal Control, Procurement, MEQ)

4.1.1 Internal Control

The seminar was conducted from October 29 to 31. Prior to holding the seminar, the JICA expert and GDC HR carefully studied its content and the choice of lecturer. 25 GDC managers attended the seminar and made vivid interactions with the lecturer as well as among themselves. The overall perception on the seminar was very positive, as it provided rare opportunity for this class of managers to gather and exchange opinion on common theme related to implementation of their duties.

The list of the GDC participants is shown in the table titled as "Output 5 Related - Internal Control and Risk Management Seminar" in Annex 10,

The time table for the seminar schedule is shown in the Table 6-1.

Table 6-1 Internal Controls Risk Management & Governance Process Training

DATE	8.15 – 10. 30	10.30-11.00	11. 00 – 1.00	1.00-2.00	2. 00– 4. 30		4.30
Oct. 29	• Opening remarks • Introduction to Governance and Internal Controls	TEA BREAK	Aligning strategy to risk management and internal controls	LUNCH	COSO Framework for risk management and control		NETWORKING TEA
Oct. 30	Organizational structure for effective risk and management – The three lines of defence model		Red flags for control failures in the public sector and appropriate risk management strategies		2.00-3.00 pm Corruption Risk Management (UN Compact)	3.00-5.00 pm PPDA 2005 & Public Procurement Regulations of 2006	
Oct. 31	Project Risk Management		Link between lifestyle and control lapses in the public sector		The Mwongozo Code of Governance and the PFM Act & Regulations		

4.1.2 Procurement OJT

This session of the training program was completed when the last OJT was held during the last week of October 2019.

During the last OJT session, some of the pending issues presented in the last JCC (Terminal Evaluation) was addressed as it was found that

1. Currently, budget allocation for maintenance of equipment and license renewal fee for software are inadequate.
2. The project experienced an inappropriate storage of equipment provided by JICA during project implementation.
3. Significant improvement in terms of the logistics management is required as there is loss time incurred in this area. It was requested to review the inventory, maintenance, and logistics plans to better manage external risks and unexpected events.

1) O&M plan for the JICA donation equipment

Regarding equipment donated by JICA, the maintenance and license sustainace fee for coming five years is surveyed and it was requested to GDC to take necessary action to secure budget for the required maintenance. (refer to Annex 14 and 15). While preparing the plan, the project team strongly recommended GDC to take it seriously on planning the maintenance of equipment and software and securing the necessary budget for it.

Among the equipment which drew close attention, the GDC personnel in charge confirmed that the Purchase Order for the 18 months maintenance service contract was issued to the local agent in Kenya in the late November, which is for nenewing the exiting one for the instrument managed by GRA, while adding the Gas Chromatograph (Shimadzu GC-8AT).

2) Better drilling management

Drilling Department is in a position to manage large inventory for the equipment and materials. In

the past, implementation of the proper inventory management was inadequate for those handed over to the department from the supply chain. In the training, the project team taught the asset management by showing a good practice adopted by the advanced drilling contractors and we proposed an inventory/maintenance combined policy to the Drilling department. It is

① To make inventory list for all the tangible equipment including tubular goods with their identification such as GDC's proprietary code with adequate serial number. The identification code and serial number is stamped on the appropriate place of the equipment body.

② Once the individual equipment is equipped with I.D., the corresponding maintenance record should be made. This inventory record must go together when the equipment is transferred from one rig to the other.

In return, according to the GDC drilling operation manager, they plan to implement quarterly inventory of all the equipment used in the rigs (including JICA supplied equipment). The Project team requested the Department to share the information on the finding of the physical inventory survey with the Supply Chain department. The manager promised that they would do so through SAP (GDC official inventory system) for individual identification of the equipment.

4.1.3 MEQ

This session of the training program was the last OJT held in the last week of November 2019. The handbook is made and finalized during the last OJT session. Both softcopy and hardcopy of the handbook is available.

4.2 Steam Report 2

A study on the steam resource structure of the Menengai field was conducted under the project. Formation of the geothermal reservoir inside the Menengai caldera is relatively young, giving the delineation of the Menengai geothermal reservoir very challenging. The highly heterogenic and deep seated reservoir has made it difficult to delineate its accurate figure. Additional data acquisition in the eastern part of Menengai field including those of the advanced technology was implemented to help understanding the reservoir and delineating it. The delivery of the additionally acquired data took time, which also caused delay on finalization of the steam report.

4.3 Hand book, software and visual aid finalization

Various handbooks have been produced under the project including the MEQ module which is under the final drafting process. The total 38 subjects are covered. They are compiled in 41 volumes of books whose pages exceeds 7,000 pages.

The visual training aid is produced based on the 48 different drilling lectures mainly from the classroom lectures. The total data size of the lecture video amounts nearly 1 Terabytes. In addition, about 7~8 minutes corporate promotion video for GDC is produced to be used for advertising GDC's activity in various domestic and international events.

In the project, software codes are also produced for the training purpose. The majority is related to the database training module. Others are EXCEL macro produced under the economic evaluation module. (detail list is shown in Annex 12).

4.4 Certificate finalization

The total number of certificate issued under the project is more than 500, out of which 76 certificates are for those trained in Japan and 25 are issued by the Horizon Business Solutions who conducted the Internal Control seminar. For some of the training seminar which did not fulfill GDC rule for issuance of certificate, the certificate of attendance were issued.

4.5 Finalization of the Sustainable Training Program

VISION program which is a sustainable training program linked to the career development for the drilling personnel is proposed to GDC. The training program is made to address the training for the drilling personnel from the new recruit until the promotion to "Driller" encompassing about 13~15 years.

The basic structure of the training is to make curriculum for the required competencies for each level of the drilling personnel such as Roustabout, Floorman, Motorman, Derrickman, Driller, etc. Before setting curriculum, it is necessary to define the functional role of each level of the drilling personnel. Taking the average number of years required for promotion to the next step and the number of years to complete the required competencies, the training program is determined.

The training itself is parimarilly based on OJT. In the other words the trainer is essentially the trainee's peer. Because of such decentralized training structure, monitoring and control regarding the training quality is very important. Let alone the monthly training report and annual merit rating, the occasional seminars where the trainees with similar seniority or similar job function gather are another important to tool to monitor their performance and to control and standardize the training quality.

GDC has been studying the sustainable training program linked to the career and their provisional plan was similar to the proposal. The proposal made by the project team reinforced their idea with provision of competency list for each level of drilling personnel and also with provision of means for reporting/monitoring/ controlling the OJT. Since the training is closely linked with the human management which includes the factors other than just training, the proposed training program/structure will be implemented while carefully studying the factors.

The project believe implementation of the program is easiest for the drilling personnel. Once the programs proves to be successful, the training methodology can be applied to the other career path in GDC departments (define 1), worker level, 2), career path, 3, list of competencies for each level, 4, make detail training program and curriculum). The full report on this is shown in the ANNEX 16.

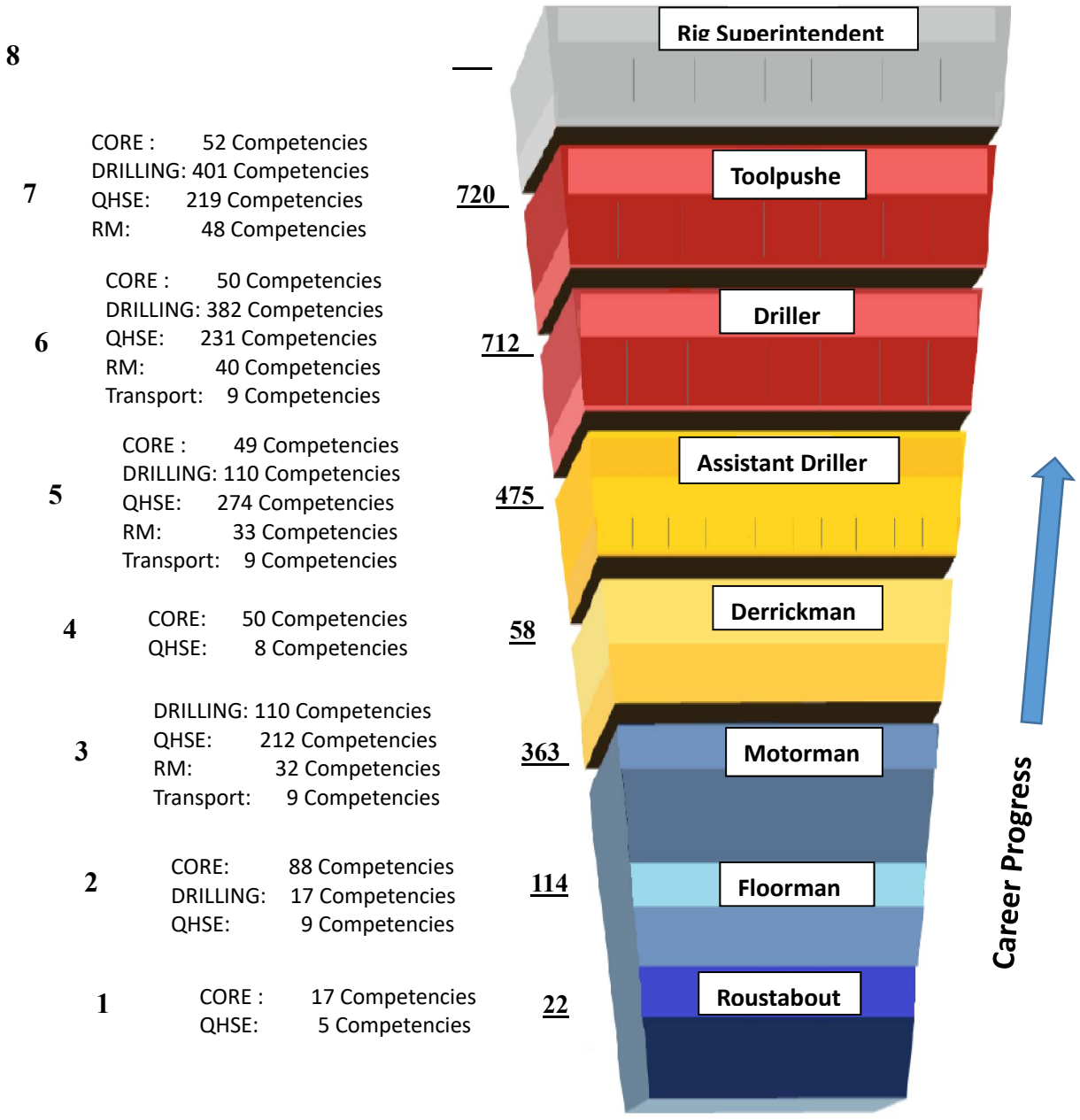


Figure 4-1 Competency build-up with career progress

CHAPTER 5 Recommendations

In the minutes of the meeting released from the last JCC for the final evaluation, number of recommendations and a list of "Lesson Learned" are described and most of the significant points are well addressed. The project team would like to add some more inputs while avoiding repetition of the said minutes.

<For GDC>

(1) Handbooks

One of the most important products produced in the project is the handbooks, visual training aid and software codes. Most of them have been prepared based on the OJT and the contents are tailor made reflecting the current GDC capacity and/or problems/issues GDC people face.

Because of this reason, though, the content of the handbooks must be continuously revised as the GDC capacity improves. In order to make sure that the revision of the handbooks will take place regularly, it is recommended to put it as a company policy to mandate annual revision for them. Physically revision of the handbooks is easy since all the handbooks are available in the softcopy.

(2) Proper maintenance program on the equipment and/or software maintenance and allocation of adequate budget

As described in the section 4.2.1, 1) above, the advance equipment and/or instrument are useless without regular maintenance and calibration. In case of the special software used for the geoscientific, drilling, environment or in other application would be outdated without updating the versions. Each department which uses such equipment/instrument/software, they have to plan proper maintenance plan inclusing the budget. And they have to make sure the plan is implemented properly.

The project team made and proposed the maintenance plan for the JICA donated equipment. The corresponding GDC department should plan their annual maintenance program while referring to the proposal.

(3) Improvement is necessary in the line of command

Especially noticeable in the drilling work where urgent decision is required anytime through the 24 hours a day and 365 days a year continuous operation, the line of command is not clear. Speaking about the drilling organization, starting from the field, the personnel under the drilling department alone are divided in three, operation, maintenance and logistics. In addition, the personnel from the Supply Chain Department and from the Infrastructure Department are involved in the day-to-day O&M and the logistics. Looking at the organigram under the drilling operation group alone, which we believe most responsible for the drilling operation, the mandate, responsibility and/or level authority of the shift leader and the drilling engineer doesn't seem well defined. As a result, it has been often witnessed nobody understand who takes initiative and the direct/final responsibility of each operation or series of operation to address the challenge.

The engineers are often directly from the universities and tend to lack experience in managing subordinates or in coordinating with the other people. I yet believe they should be given more responsibility and authority over the drilling operation, maintenance and/or requisition of goods and service. First of all, they should be stationed more close to the wellsite. Consequently their employment package should be made to meet their responsibility.

(4) Good record keeping and communication between the different technical groups

The drilling is important source for the geoscientific study. In certain way, the well provides ultimate answer to what the various surface study had estimated.

The DDR (daily drilling report) in particular, the project team have repetitively instructed the relevant GDC people to include necessary parameters and maintain a good record keeping. The report provides essential information in order to understand the well condition not only serving for the drilling perspective but also serving for the reservoir delineation. Unfortunately it hasn't come to their routine yet.

We recommend again to measure and report the following parameters in the DDR.

a. Amount of Fillings (the rock debris left in the hole which could not be lifted out of hole by mud circulation. It would cause drill pipe stuck, resulted in fishing work)
b. Water Loss (It provides information of the permeability of the reservoir, its depth. The information will help to design cementing work (primary and cement plug) and also help understanding reservoir structure in shallow and deep depth.
c. Mud temperature in and out (this is a good indicator of the reservoir static temperature and presence of permeable bed)
d. Natural water level (It provides information of the reservoir pressure at the current well depth).

The drilling personnel are updated on the geoscientific data during the drilling operation which is reflected to

the decision on the drilling plan. In this case, lack of recording of the drilling parameters described above implies there is lack of understanding on the proper use of the drilling information. It is highly recommended that both drilling and geoscientific group review what sort of the drilling information should be acquired and reported.

The RIMBASE software developed by IADC which was donated under the project, provides appropriate platform in terms of the format where the relevant drilling parameters are included and in terms of the network adaptability for communication and integration of the drilling data between the relevant parties. We recommend that GDC drilling, geoscientific and the other functions should use this tool for better decision making communication.

(5) Asset management and Supply chain

We recognize that the difficulty of the asset management especially for the drilling related equipment. This is mainly because the Chinese manufactures did not provide the operation and maintenance manuals with standard quality. For example, no meaningful diagram is found in the manuals, which makes it almost impossible to locate the part number. It imposes very high challenge to both operation and maintenance point of view. Despite of such challenges they have to face, there is room for improvement in the asset management as recommended by the procurement expert. The supply chain has accumulated knowhow in the asset management and they should help the drilling department in regards to the asset management policy such as ways to set serial number and to set policy on manifest for logistics and maintenance purpose attached to each of the relevant equipment.

(6) Recommendation made on the geophysics(MT and gravity)

General:

1) There is need that managers improves their cultivation of teamwork among GRA, GRM and drilling teams. The resource team of JICA got the impression that the work function independently and there is a lot of room for teamwork improvement.
2) Rotation of the people should be encourage so that GRA, GRM and driller get the field touch and experience of what the other teams are doing and to appreciate the importance of what own expertise contributes to the total geothermal development.
3) It is from now that GDC managers and young geoscientists/engineers will be exposed to the operation and maintenance of geothermal reservoirs and this will be the ultimate experience where people will test the accuracy and level of their exploration skills. All people shall be exposed to the results, good or bad so the learning will be completed.

Geophysics:

General Recommendations

1) GDC geophysicists should obtain other geo-scientific information (geological information, geochemical information, well information, etc.) when they perform data interpretation of geophysical survey results. For this purpose, frequent meetings with geologists, geochemists and well test engineers are highly recommended.
2) Only a handful of GDC geophysicists sufficiently understood the content of the training in detail. Therefore, JICA experts hope for the participants who sufficiently understood the training content, to spread the knowledge and technical skills to other technicians and geophysicists who will join GDC in the future. Thus, GDC geophysicists who have already acquired the above-mentioned technical skills should recognize that it will be necessary to conduct internal training inside GDC's office for the geophysical technicians and inexperienced geophysicists using the training manuals.
3) GDC geophysicists should study leading-edge technology/information concerning geophysical surveys for geothermal exploration by themselves in future, and improve their own skills for examining geothermal structures.

Particular Recommendations

1) It is recommended that GDC purchase second gravimeter as a spare equipment, since GDC owns only one gravimeter, and thus gravity field survey shall be suspended when the gravimeter is malfunctioning.
2) It is recommended that GDC geophysicists conduct measuring locations and elevations of gravity stations by using differential GPS, instead of handy GPS, since accuracy of handy GPS is not enough for terrain correction.
3) It is recommended that GDC geophysicists maintain the high-spec computer which can be utilized

for three-dimensional MT inversion with careful cleaning, because the high-spec computer gets out of control caused by dust.

Geochemistry:

General recommendations:

1) Knowledge of geochemists should be shared to laboratory technicians to improve the analytical data quality.
2) Periodical seminar in house should be held to understand the principle of geochemistry and to accumulate knowledge though the interchange of experience.
3) Program and secure budget to maintain the sampling and laboratory equipment and software. Do not depend on donations, GDC must do themselves.

Particular recommendations:

1) To construct the reservoir geochemical model, the physical properties (enthalpy, measured temperature, etc.) of well fluids shall also be taken into the consideration.
2) The published papers and libraries related to geochemistry should be made available to all in the laboratory's bookshelves in order to pre-comprehend the main and sub chemical reaction occurred by the unknown sample analysis.
3) The periodical inspection for laboratory equipment and the assurance of the purchase of spare parts to reduce the un-operating or maintenance period for the replacement of deterioration parts.
4) The attendance to the meetings and/or trainings supported by the Kenya Chemical Society (KCS), the Kenya Accreditation Service (KENAS) or other organizations is recommended.
5) The design of sampling intervals and the monitoring parameters in the production test of a well should be reviewed according to the production test program and the flow conditions.

Well Engineering:

General recommendations:

1) Improve the quality of data acquisition by judging the reasonableness of the data acquired by the field team and making them to re-do when the data does not represent physical situations.
2) The checking of the reasonableness of the information should be done in collaboration of the other sections of GRA and GRM
3) Program and secure budget to maintain the equipment and software. Do not depend on donations, GDC must do themselves.

Particular recommendations:

1) Carry out spinner test
2) Carry out multi well test
3) Report mass and power capacity of wells referred to a common wellhead pressure (say 10 bara, as this is the most probable wellhead pressure during operation)
4) Keep the wellbore logging instruments calibrated to secure high quality of information.
5) For Menengai, the physical situation may be above the specifications of the equipment so plan the logging of data to protect the equipment.

(7) Recommendation made on the environment monitoring

a. Though the systematic training scheme is proposed as explained in 4.5 above, the environment monitoring team made their own internal training plan. As for the other training program, we recommend the necessary budget secured to implement the program.
b. Conduct a monthly environmental monitoring in Menengai and Baringo (H_2S, Noise and Water quality). Also it is important to discuss the results within the group and the relevant department.
c. Every monitoring equipment should be inspected and maintained annually. It is necessary to secure a maintenance budget such as purchasing of calibration solutions and supplementary sensors. Create a record and administrate the usage status of all monitoring equipment in the management book.

(8) Nourishing mutual trust between the trainer and trainee.

Though the similar issue was pointed out in the terminal evaluation, some supplemental comments on this topics is worth mentioning. It is about the communication between the project team and GDC counterpart. Especially during the initial stage of the project, when the relationship between the individual Project team member and GDC trainee has not been established, the JICA team experienced number of embarrassing situations where they experienced poor attendance of GDC trainees onto their lecture, because they had the job duty and could

not be not fully dedicated to the training. The awkward situation subsided as the project progressed and the both team understood each other better.

Before the project started, the rapid improvement on the GDC capacity was urgent issue, thus we understand that the rapid deployment of the full scale project team was requested and perhaps it was right decision because GDC may not be existing now otherwise. However in terms of efficient deployment of the project, it may have been better if we started with some limited and smaller scope.

<For JICA>

(1) From the Resource Team:

General Resource Team

1) If future similar training projects are planned let the training be part of actual development projects not a make the objective of a project be training alone.
2) Since once of the most important element in the success of geothermal is the just in time supply of needs to every operation of the development and the total coordination of all activities, JICA should pursue to assist countries and institution in the total management of the project with teams of highly qualified general managers with proven experience in the running of geothermal projects from exploration to operation and maintenance of underground and surface infrastructure including technical, supply chain and administration.

Geophysics

1) Regarding the training for geophysical work (MT and gravity), training from planning of the survey to data interpretation, including data acquisition, data correction, data analysis and verifying geophysical interpretation results and well information together with GDC geophysicists and JICA team geophysicists is highly recommended to improve GDC's ability for checking data quality, performing data analysis, examining geothermal structure and so on.

Geochemistry

1) Related to donation of new equipment and software, these should be targeted to the institution itself in order to secure central budget for spare parts, maintenance and/or annual license fees.

Well Engineering

1) In geothermal, the most challenging phase is after the power plant is commissioned, it is when the actual reservoir reveals itself. So, JICA training project should span after the plant is commissioned. In case of GDC, the GRA and GRM people shall be participants of the O&M of reservoir and steam supply surface facilities, for them to understand the difference of the geoscience and engineering prior and after to commissioning the power facilities. It is only when we geoscientist and engineers learn the value and accuracy of the methods applied when exploration is the goal.

(2) Training by showing good practice

The training program was made to narrow the gap between the required capacity and the capacity of GDC both at the individual and the organizational level. We think there are two ways to address the training needs. One is the one the project mostly adopted where the training program consisted of lecture and advice thorugh OJT in response to the gaps in knowledge and defective practices and/or equipment. In this way, however, we experienced certain dilemma where the experts had to allow GDC working under poor working condition especially in regards to issues related to the safety.

Another way is that the experts conduct a model project as much as on their own. And though carrying out the model project, training is provided to the relevant GDC trainee in regards to how to carry out project in a proper way. It may require cost and preparation time as the equipment test and necessary refurbishment before training will be necessary. But in the second way, the training experts are more used to the work and they would have been able to guide the training much better and may render better results. This method is not just for the drilling but also applicable to the geoscientific subjects.

(3) Too big to handle the project

The project encompassed training of GDC personnel in the variety of subjects. This imposed several difficult situation in terms of the project management. Unfortunately the organization capacity of GDC was weaker, there are many issues which can't be solved by the project team. Each of the challenges occurred was unique and addressed separately. The time allocated for the individual expert was limited, what the chief advisor can do also has limitation. Another point is that no company has resource on their own to handle all the subjects of

this scale. Thus we had to ask for help on the appropriate experts to the relevant companies. Though it sounds nice when we say All Japan Team, there are some negative aspects in this formation. It could have been easier if the project is carried out in some smaller and well-focused teams.

(4) Recommendation made on the geophysics (MT and gravity)

The training plan starting from the planning of the survey to data interpretation, which encompasses series of activities such as data acquisition, data correction, data analysis and verifying geophysical interpretation results and well information should have been made together with GDC geophysicists and JICA team geophysicists. It would serve better to improve GDC's ability for checking data quality, performing data analysis, examining geothermal structure and so on.

(5) Recommendation made on the geochemistry

Relating to the donation of new equipment and software, it should be confirmed to the target institute for securing the budget for the future operation or annual license.

(6) Flexible assignment of the expert

Though the issue was already raised in the terminal evaluation, we would like to address this as lesson learned. The Project flexibly adjusted the dispatch of experts according to the changes of GDC's needs and progress of capacity development. For example, at the beginning of the project, it was intended to deploy drilling experts consisting only of Japanese nationals. Because of the challenges experienced in the language barrier and their availability during winter only, it was soon changed to a mixture of Japanese and other foreign experts, which rendered a very successful outcome.

The dispatch of extra-experts regarding the directional drilling, the plasma arc welding, the mud drilling, the various experts from the manufactures (wellhead valve: TIX, I&C: Yokogawa,) and the external experts(the project finance expert from Mitsui-Sumitomo Bank or the project management expert from Nippon Research Institute).

Speaking about the training module, the project management was brought in to respond to GDC's requests and/or needs, which were not originally planned. Also, both sides decided to modify the R/D in order to include production of Steam Reports 1 and 2 in order to facilitate the IPP's decision.

In this line, the Project sought expert resources not only in Japan but also in other countries. Thanks to this arrangement, the Project was enabled to make effective inputs.

(7) Flexible adaptation of services in accordance with changes of needs and conditions

Again the issue was already raised in the terminal evaluation, we would like to raise this topics as lesson learned.

The Menengai field consists of the highly heterogenic and deep seated reservoir, which makes its interpretation a big challenge. When the new geothermal prospect was found in the eastern part of the Menengai caldera by the well MW-18A, it resulted in necessity to make detail study in that area. As part of the study, ABI (acoustic borehole imager) and coring was thought to provide useful information on the reservoir. Eventually ABI logs in three wells and coring in one well were carried out showing another case of flexibly of the project.

Another example of project flexibility is the use of the local consultants. In the beginning of the project, we did not predict its need and had no information about who are available. As the project progresses and understood more about the needs and the availability of the local consultants, JICA was adapted flexibly to the needs found along the project progress as requested by the project team and hired appropriate experts. The local consultants subcontracted are on the environmental training, on the national procurement law or on the internal control subject.

Annexes

ANNEX 1: Original PDM
ANNEX 2: Revised PDM
ANNEX 3: Excerpts of the 1st JCC (Mid-term evaluation)
ANNEX 4: Excerpts of the 2nd JCC
ANNEX 5: Excerpts of the 3rd JCC for the Terminal Evaluation
ANNEX 6: Project Flow chart
ANNEX 7: Plan of Operation
ANNEX 8: Project Manning Chart
ANNEX 9: List of Dispatched Experts
ANNEX 10: List of Trainings, Training Counterparts and Certificates Issued
ANNEX 11: List of Trainings in Japan and Their Participants
ANNEX 12: List of Products (Handbooks, Visual Aid and Software)
ANNEX 13: List of Donation Equipment
ANNEX 14: O&M status of Donated Equipment (GRA, GRM and Environment related)
ANNEX 15: O&M status of Donated Equipment (Drilling related)
ANNEX 16: Sustainable Training Program Building a Competency Development Program

ANNEX

1：Original PDM

ANNEX 1: Original PDM

Project Design Matrix (PDM) ver.2 (19 June, 2013)

Project Name: The Project for Capacity Strengthening for Geothermal Development in Kenya

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal GDC will be able to properly provide steam to power generation utilities.	Number of steam purchase contract signed between power generation utilities and GDC	Copy of steam purchase contracts	
Project Purpose To enhance human resources of GDC which contribute to technical risk mitigation in geothermal development	Success rate of steam development Reduction in work period required for steam development	GDC's drilling reports GDC's work reports	● Geothermal resources suitable for power generation exist in planned development areas.
Outputs 1. Training program for GDC staff will be established.	1-1. Development of check lists and assessment sheet for GDC's staff capacity 1-2. Development of training materials and programs	1-1. Check lists 1-2. Training materials	● Necessary amount of water for drilling will be mobilized
2. Capacity in developing conceptual models of reservoirs and siting successful drilling targets will be improved.	2-1. Number of GDC's staff who accomplished the target level in the capacity checklist for necessary skills in conceptual modeling 2-2. Number of GDC's staff who accomplished the target level in the capacity checklist for necessary skills in well siting	2-1. Capacity checklist for necessary skills in conceptual modeling. 2-2. Capacity checklist for necessary skills in well siting	
3. Capacity to strike drilling targets will be improved.	3-1. Number of GDC's staff who accomplished the target level in the capacity checklist for necessary skills in drilling operation	3-1. Capacity checklist for necessary skills in drilling operation	
4. Capacity in interpreting wellbore data, establishing calibrated reservoir models and evaluating geothermal resources will be improved.	4-1. Number of GDC's staff who accomplished the target level in the capacity checklist for necessary skills in wellbore data analysis 4-2. Number of GDC's staff who accomplished the target level in the capacity checklist for necessary skills in reservoir evaluation	4-1. Capacity checklist for necessary skills in wellbore data analysis 4-2. Capacity checklist for necessary skills in reservoir evaluation	

5. Capacity to prepare economically and environmentally viable business plans as a steam provider will be enhanced.	5-1. Number of GDC's staff who accomplished the target level in the capacity checklist for necessary knowledge and skills in environmental and social safeguard 5-2. Number of GDC's staffs who accomplished the target level in the capacity checklist for necessary knowledge and skills in plant engineering 5-3. Number of GDC's staff who accomplished the target level in the capacity checklist for necessary knowledge and skills in public/private scheme	5-1. Capacity checklist for necessary knowledge and skills in environmental and social safeguard 5-2. Capacity checklist for necessary knowledge and skills in plant engineering 5-3. Capacity checklist for necessary knowledge and skills in public/private scheme	
6. Capacity in implementing projects of multi-purpose use of geothermal energy will be enhanced.	6-1. Number of GDC's staff who accomplished the target level in the capacity checklist for necessary knowledge in planning and implementation of multi-purpose use of geothermal energy	6-1. Capacity checklist for necessary knowledge in planning and implementation of multi-purpose use of geothermal energy	
7. GDC's internal mechanism to improve and continue training program will be established.	7-1. Number of training materials revised by GDC staff 7-2. Number of training programs conducted by GDC staff	7-1. Revised training materials 7-2. Training programs conducted by GDC	
	Inputs		
Activities 1-1. Assessment of GDC's human resource development plan and staff capacity 1-2. Abstracting challenges GDC has and compiling measures to improve 1-3. Suggesting to GDC top-management and determining the direction of training program 1-4. Planning training programs 1-5. Developing training materials 1-6. Developing checklist and assessment sheet of GDC's staff capacity in necessary skills required for geothermal development	Japan *Experts* ● Chief Advisor/ Geothermal Development Planning ● Well Siting ● Geologist ● Geochemist ● Geophysicist ● Data Integration ● Reservoir Simulation ● Drilling Operation Management	Kenya Counterparts ● Coordinator ● Geologists ● Geochemists ● Geophysicists ● Drilling Engineers ● Well Logging Engineers ● Production Test Engineers ● Reservoir Simulation Engineers ● Economic Evaluation	

1-7. Identifying base-line of GDC's staff capacity and setting targets 2-1. Training in conceptual modeling 2-2. Training in well siting 3-1. Training in drilling operation 3-2. Training in procurement and logistics management for drilling related equipment 3-3. Training in health, safety and environment (HSE) 3-4. Training in theory of drilling techniques 4-1. Training in wellbore data analysis 4-2. Training in reservoir evaluation 4-3. Training in theory of reservoir engineering 4-4. Training in database development and management 5-1. Training in environmental planning & monitoring 5-2. Training in plant engineering 5-3. Training in public/private scheme planning 5-4. Training in structuring agreement and negotiating with IPPs 5-5. Workshop with power generating utilities for exchanging views 6-1. Identifying multi-purpose uses of geothermal energy applicable in Kenyan geothermal prospects 6-2. Training in planning pilot projects of multi-purpose use of geothermal energy 6-3. Training in implementing pilot projects of multi-purpose use of geothermal energy 7-1. Abstracting faults in training materials and programs 7-2. Improving training materials and programs 7-3. Suggesting revised training programs to GDC top-management and reconfirming GDC's human development policy 7-4. Integrating training programs into GDC's human resource development programs	● Drilling Supervisor ● Reservoir Evaluation ● Wellbore Survey ● Discharge Testing ● Economic Evaluation ● Business Administration/ Finance ● Partnership with Power Utilities ● Environmental and Social Safeguard ● Power Plant Engineering ● ● Multi-purpose Use of Geothermal Energy ● Project Coordinator *Machinery/ Equipment* *Training in Japan* ● Drilling Techniques ● Reservoir Evaluation	● Business Administration ● Environmental and Social Safeguard ● Power Plant Engineering ● Finance ● Multi-purpose Use of Geothermal Energy Machinery/ Equipment ● Laboratories ● Drilling Rigs ● MT equipment ● Project office and office equipment.	Apart from the above, the following issues exist. These issues to be confirmed at JCC and necessary coordination will be made towards solving issues. ● Some of GDC's equipment is not compatible with other makers' equipment or spare parts as they are not adopting international standards ● GDC lacks some equipment necessary for transferring appropriate technology In addition, if there is a need for interacting with the geothermal policy or development plan, issues will be dealt with in collaboration with Geothermal Development Master Plan Project which will be implemented concurrently.

ANNEX

2：Revised PDM

ANNEX 2: Revised PDM

Project Design Matrix: PDM_2

Project Name: The Project for Capacity Strengthening for Geothermal Development in Kenya
Duration of the Project: 6 years and 3 months (September 2013- December 2019)
Project Site: Nairobi, Nakuru and Menengai geothermal field
Target group: GDC staff
Version.2: 20 April, 2018

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal GDC will be able to properly provide steam to power generation utilities.	Available steam at surface(MW worth) Actual generation capacity in MW	Copy of steam report Copy of steam purchase contracts Press release	
Project Purpose To enhance human resources of GDC which contributes to technical risk mitigation in geothermal development	Success rate of steam development (Well targeting) (No. of wells discharging successfully improved by at least 10 points (~2014 vs. 2015~)) Success rate of steam development (Well drilling) (No. of wells reaching target depth improved by at least 10 points (~2015 vs. 2018)) Improvement in the speed of drilling rate (Gross ROP improved at least by 15% (2015 vs 2018)) At least 50% Reduction on the foreign drilling experts in the Rig Crew (~2015 vs. 2018)	GDC reports GDC's drilling reports GDC's drilling reports GDC reports	● Geothermal resources suitable for power generation exist in planned development areas. ● Sufficient budgetary allocation secured to sustain operation
Outputs 1. Training program for GDC staff will be established. 2. Capacity in developing conceptual models of reservoirs and siting successful drilling targets will be improved. 3. Capacity to strike drilling targets will be improved.	1-1. Development of checklists and assessment sheet for GDC's staff capacity 1-2. Development of training materials and programs 2-1. Target level in the capacity checklist for necessary knowledge and skills realized in constructing geoscience elements to integrated conceptual models 2-2. Target level in the capacity checklist for necessary knowledge and skills realized in the capacity to site wells 2-3. Conceptual model developed / improved by GDC staff based on this training knowledge 3-1. Number of GDC's training staff who accomplished the target level (At least 80% of GDC's trainees completed training and received certificate) 3-2. Downtime reduction due to the equipment failure (At least 15% or more reduction on Wait on Repair time over the total drilling time (2015 vs 2018)) 3-3. Number of accident	1-1. Checklists 1-2. Training materials 2-1. Evaluation table for each of the geoscience 2-2. Evaluation table for each of the geoscience 2-3. GDC reports 3-1. Training Reports 3-2 GDC drilling report 3-3 GDC Safety Department report	● Necessary amount of water for drilling will be mobilized

	(At least 15% reduction on the number of major accident per total drilling operating time(2015 vs. 2018))		
	3-4. Implementation of logistics management (At least 15% reduction on the total waiting time related to logistics (2015 vs 2018))	3-4 GDC drilling report	
	3-5. Timely delivery of drilling materials (At least 15% reduction on the total waiting time related to equipment delivery (2015 vs 2018))	3-5 GDC drilling report	
4. Capacity in interpreting wellbore data, establishing calibrated reservoir models and evaluating geothermal resources will be improved.	4-1. Target level in the capacity checklist for necessary knowledge and skills realized in the capacity to analyze wellbore data	4-1 Evaluation table	
	4-2. Target level in the capacity checklist for necessary knowledge and skills realized in the capacity for reservoir evaluation	4-2. Evaluation table	
	4-3. Reservoir evaluation report consulted by the Project	4-3. Steam report	
	4-4. Carried out reservoir assessment and update reservoir model	4-4. Steam report	
	4-5. Developed Numerical model for Menengai field	4-5. Steam Report + GDC report	
5. Capacity to prepare economically and environmentally viable business plans as a steam provider will be enhanced.	5-1. Target level in the capacity checklist for necessary knowledge and skills realized in the environmental and social safeguard	5-1. Evaluation table	
	5-2 Environmental and social safeguard handbooks are developed	5-2 Evaluation table	
	5-3. Target level in the capacity checklist for necessary knowledge and skills realized in the plant engineering	5-3. Evaluation table	
	5-4. Target level in the capacity checklist for necessary knowledge and skills realized in the public/private scheme	5-4. Evaluation table	
	5-5. Target level in the capacity checklist for necessary knowledge and skills realized in the Economic Analysis	5-5. Evaluation tablet	
	5-6. Target level in the capacity checklist for necessary knowledge and skills realized in the Public Corporate Business Administration/ Finance	5-6. Evaluation table	
6. Capacity in implementing projects of multi-purpose use of geothermal energy will be enhanced.	6-1. Target level in the capacity checklist for necessary knowledge and skills realized in the planning and implementation of multi-purpose use of geothermal energy	6-1. Evaluation table	
	6-2. Produced a business plan for multi-purpose use of geothermal energy	6-2. Evaluation table + GDC report	
7. GDC's internal mechanism to improve and continue training program will be established.	7-1. Number of training sessions/programs conducted by GDC staff (At least one session per each module)	7-1. JICA report	
	7-2. GDC's internal trainer's development program is established	7-2. JICA report / GDC report	
	7-3. Number of training materials revised by GDC staff (At least one program per each module)	7-3. JICA report	
	7-4. Established guideline for the training certificate in GDC	7-4. GDC HR	
	7-5. Established system to link and reflect training development to the career development program.	7-5. GDC HR	

<table>
<tr><td></td><td colspan="2"><u>Inputs</u></td><td></td></tr>
<tr><td rowspan="2"><u>Activities</u>
1-1. Assessment of GDC’s human resource development plan and staff capacity
1-2. Abstracting challenges GDC has and compiling measures to improve
1-3. Suggesting to GDC top-management and determining the direction of training program
1-4. Planning training programs
1-5. Developing training materials
1-6. Developing checklist and assessment sheet of GDC’s staff capacity in necessary skills required for geothermal development
1-7. Identifying base-line of GDC’s staff capacity and setting targets
2-1. Training in conceptual modeling
2-2. Training in well siting
3-1. Training in drilling operation
3-2. Training in procurement and logistics management for drilling related equipment
3-3. Training in health, safety and environment (HSE)
3-4. Training in theory of drilling techniques
4-1. Training in wellbore data analysis
4-2. Training in reservoir evaluation
4-3. Training in theory of reservoir engineering
4-4. Training in database development and management
5-1. Training in environmental planning & monitoring
5-2. Training in plant engineering
5-3. Training in public/private scheme planning
5-4. Training in structuring agreement and negotiating with IPPs</td><td>Japan
Experts
● Chief Advisor/ Geothermal Development Planning
● Well Siting
● Geologist
● Geochemist
● Geophysicist
● Data Integration
● Reservoir Simulation
● Drilling Operation Management
● Drilling Supervisor
● Reservoir Evaluation
● Wellbore Survey
● Discharge Testing
● Economic Evaluation
● Business Administration/ Finance
● Partnership with Power Utilities
● Environmental and Social Safeguard
● Power Plant Engineering
● Multi-purpose Use of Geothermal Energy
● Project Coordinator
● Geothermal Development Promotion Advisor
● Project Management
● Geothermal Training System Enhancement

Machinery/ Equipment

Training in Japan
● Drilling Techniques
● Reservoir Evaluation
● Conceptual Modeling</td><td>Kenya
Counterparts
● Coordinator
● Geologists
● Geochemists
● Geophysicists
● Drilling Engineers
● Well Logging Engineers
● Production Test Engineers
● Reservoir Simulation Engineers
● Economic Evaluation
● Business Administration
● Environmental and Social Safeguard
● Power Plant Engineering
● Finance
● Multi-purpose Use of Geothermal Energy

Machinery/ Equipment
● Laboratories
● Drilling Rigs
● MT equipment
● Project office and office equipment.</td><td></td></tr>
<tr><td>Apart from above, following issues exist. These issues to be confirmed at JCC and necessary coordination will be made towards solving issues.
● Some of GDC’s equipment are not compatible with other makers’ equipment or spare parts as they are not adopting international standards
● GDC lacks some equipment necessary for transferring appropriate technology
In addition, if there is a need for interacting with geothermal policy or development plan, issues will be dealt in</td></tr>
</table>

5-5. Workshop with power generating utilities for exchanging views 6-1. Identifying multi-purpose uses of geothermal energy applicable in Kenyan geothermal prospects 6-2. Training in planning pilot projects of multi-purpose use of geothermal energy 6-3. Training in implementing pilot projects of multi-purpose use of geothermal energy 7-1. Identifying deficiencies in training materials and programs 7-2. Improving training materials and programs 7-3. Suggesting revised training programs to GDC top-management and reconfirming GDC's human development policy 7-4. Integrating training programs into GDC's human resource development programs			collaboration with Geothermal Development Master Plan Project which will be implemented concurrently.

ANNEX

3：Excerpts of the 1st JCC (Mid-term evaluation)

ANNEX 3: Excerpts of the 1st JCC (Mid-term evaluation)

JCC description	Date	Attendants	Agenda	Discussion excerpts
Mid-term evaluation	27/04, 2016	<Japanese team> Mr. Hiroyuki KOBAYASHI (Team Leader) Deputy Director General, and Group Director for Energy and Mining Industrial Development and Public Policy Department, JICA Dr. Katsuya KUGE (Deputy Team-Leader) Acting Director for Energy and Mining Industrial Development and Public Policy Department, JICA Ms. Chiyoko MIYATA (Cooperation Planning) Special Advisor, JICA Mr. Takayuki KURITA (Evaluation Analysis) Senior Consultant, ICONS Inc. <Kenya Team> Mr. Joseph Kitilit (Oversight role) Deputy Manager, Corporate Planning & Strategy (CPS), GDC Ms. Lucy Mukiri (Leader, Kenyan side) Chief Officer, PS, GDC Ms. Beatrice Kipchumba (Evaluation member) Officer III, CPS, GDC Mr. Happana Galgallo (Evaluation member) Planning Officer (Statistician), CPS, GDC	1. Recognition of the mid-term review report 2. Project period 3. Finalization of draft revised Project Design Matrix(PDM) and revised Plan of Operation (PO) 4. Possibility of dispatching additional area of experts	1. Approved the mid-term review report 5. Project period was extended to the end of March 2018. 6. Need for PDM and PO revision was agreed. The Objectively Verifiable Indicators in the draft revised PDM need to have numbers defined as target value. More tangible indicators shall be added for the Outputs to clarify the efforts made through the training programs The revised PDM should be endorsed in the 2nd JCC or agreed on through Minutes of Meetings signed by both sides by the end of October 2016 4. In the 2nd phase of the Project, the JICA team will concentrate more on the training of trainers to enhance GDC's capacity to sustainably conduct internal trainings within GDC. It might be necessary to provide additional inputs to harmonize the JICA team's technical training efforts and GDC's existing monitoring system. Both sides confirmed that JICA shall 1) monitor the Project 's activities well and hold close discussions with GDC, and 2) consider the necessity of additional inputs for the Project with the objective of improving GDC' s internal training /human resource Development system.

ANNEX

4：Excerpts of the 2nd JCC

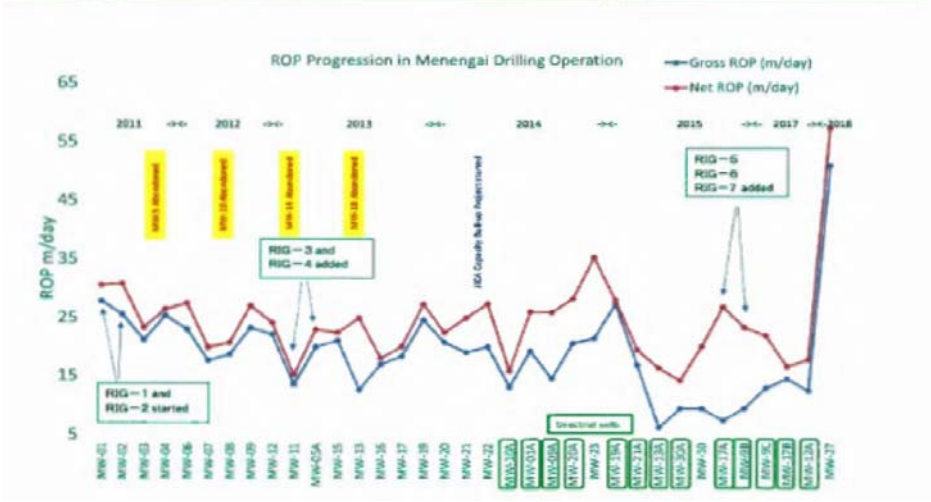
ANNEX 4: Excerpts of the 2nd JCC

<table>
<tr>
<td>2nd JCC</td>
<td>20/04, 2018</td>
<td>Ministry of Energy
Dr. Eng. Joseph K.Njoroge,
CBS Principal Secretary
Mr. Crispin O. Lupe

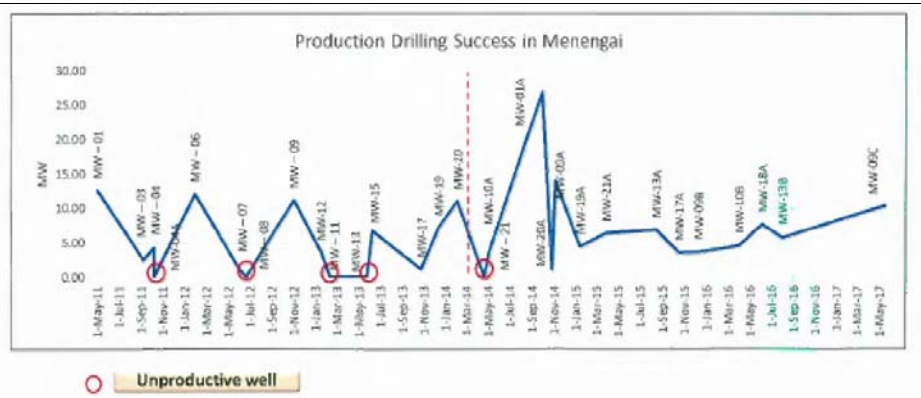
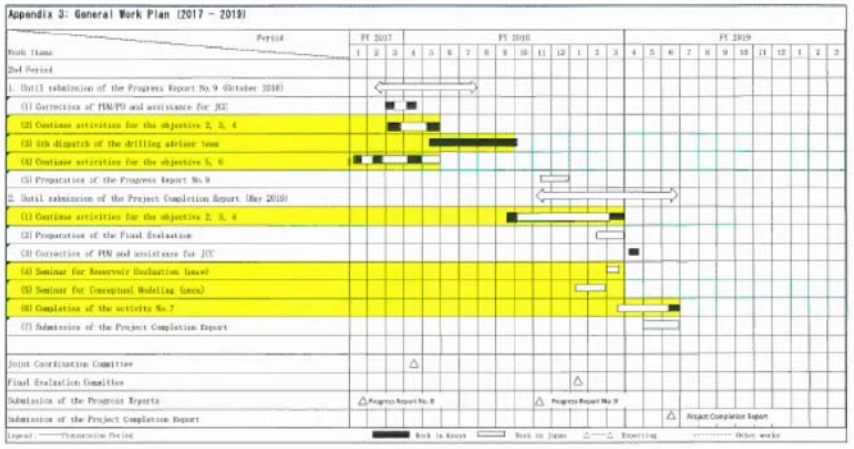
Chief Geologist, Geothermal and Geotechnical
Mr. Richard Mavisi Lahona
Senior Principal Superintendent Geologist, Geothermal

Geothermal Development Company (GDC)
Eng. Johnson P .Ole Nchoe
Managing Director and CEO (Project Director)
Dr. George Muia
General Manager, Strategy, Research and Innovation (Project Manager)
Mr. Cornel Ofwona
General Manager, Geothermal Resource Development
Ms. Rosemary Njenga
Officer, Corporate Planning and Strategy Dept./ (Project focal for JICA)

JICA Expert team
Dr. Naotsugu Ikeda
Chief Advisor for the Project
Mr. Enrique Lima Lobato
Deputy Chief Advisor for the Project
Eng. Laban Kariuki
Coordinator for West-JEC team
Ms. Chiyoko Miyata
Geothermal training system enhancement expert

JICA Head Office
Mr. Eiji Wakamatsu
Deputy Director, Energy and Mining group</td>
<td>1. Explanation ofthe Work Progress</td>
<td>The project achivementa were presented, some of which are shown here.
Staff Trained
<table>
<tr><th>#</th><th>Areas of Training</th><th>No of Staff Trained</th><th>Department</th><th>% Trained</th></tr>
<tr><td>1</td><td>Geosciences and Reservoir Engineering</td><td>76</td><td>GRA (85)
GRM (39)</td><td>60%</td></tr>
<tr><td>2</td><td>Drilling</td><td>155</td><td>Drilling Operations (237)</td><td>65%</td></tr>
<tr><td>3</td><td>Environment and Social Consideration</td><td>44</td><td>Environment (24)
Community Relations (25)</td><td>90%</td></tr>
<tr><td>4</td><td>Plant Engineering</td><td>28</td><td>GRM, Projects, QA and Safety</td><td>Cross - cutting</td></tr>
<tr><td>5</td><td>Direct Use</td><td>11</td><td>DU (11)</td><td>100%</td></tr>
<tr><td>6</td><td>Business Development</td><td>144</td><td>CPS, ARC, DU, DPL, Finance, PMT, Legal, CPM, Supply Chain, QA&S</td><td>Cross - cutting</td></tr>
<tr><td>7</td><td>Project Management & Finance</td><td>17</td><td>PMT, CPS, Infra, DO, GRM, Legal</td><td>Cross - cutting</td></tr>
</table>
Drilling Success
 

Drilling Success</td>
</tr>
</table>

		Mr. Takayoshi Miyazaki Special Advisor, Energy and Mining group JICA Kenya Office Ms. Kana Tamura Representative in charge of energy sector Mr. Evanson Njenga In-house consultant for energy sector	2. Presentation of further Work Plan	 (a) As for expected outputs, E ng.OleN choe expressed his concerns that GDC's capacity for targeting and drilling is stil limited.H e then requested JICA to dispatch resident experts for more accur剖etargeting and drilling respectively. Also, h e requested JICA to create a masterplan for greater Menengai that includes outside of the caldera. JICA responded that they would need further information in order for them to consider the request. (a) As for further Work Plan, Terminal Evaluation is scheduled from beginningo f January to beginning of Fe bruary 2019 (b) The Project period is proposed to be extended by 5 months until end of August 2018. Regarding this issue, Dr.Eng.Njoroge told GDC to submit the request letter on the project period extension and Eng.Ole Nchoe agreed to it **Integral Schedule of the Work Ahead** 

			3. Presentation of draft revised PDM and draft revised PO	The revision regarding the project period, PDM and PO was approved for the Record of Discussions (last amended on April 26, 2017).
			4. Proposal to amend the Record of Discussions	1. "9.Duuration. Article .11 OUTLlNE OF THE PROJECT" of the R/D shall be amended as follows: 9.Duration The Proiect duration will be 71 (Seventy) months, u ntilth e end of Auqust 2019 commencinq after the first arrival of JICA Exoerts in Kenva. 2. The PDM and PO of the R/D (April 2017) shall be amended as attached
			5. Discussion on challenges and necessary actions to be taken for improvement of the project implementation	(a)Recommendation of introducing new technology such as ABI (Acoustic Borehole Imager) and coring for the resource evaluation in the project was explained. (b) For the drilling performance improvement, introduction of mud drilling and 5S (a workplace organization method consisting of basic tasks such as "Sort", "Set In order", "Shine", "Standardize" and "Sustain") was explained..

ANNEX

5：Excerpts of the 3rd JCC for the Terminal Evaluation

ANNEX 5: Excerpts of the 3rd JCC for the Terminal Evaluation

<table>
<tr>
<td>Terminal Evaluation</td>
<td>26/09, 2019</td>
<td>Ministry of Energy
Dr. Eng. Joseph K. Njoroge, CBS, Principal Secretary
Mr. Crispin O. Lupe
Chief Geologist

Geothermal Development Company(GDC)
Dr. George Muia
General Manager, Strategy, Research and Innovation (Project Manager)
Mr. Stephen Busieney
General Manager, Finance
Mr. Ahmed Fankey
Deputy Manager, Corporate Planning and Strategy Dept.
(GDC Evaluation team leader)
Ms. Rosemary Njenga
Officer, Corporate Planning and Strategy Dept.
(Project focal for JICA/ GDC Evaluation team member)
Ms. Diana Waringa
Officer, Corporate Planning and Strategy Dept.
(GDC Evaluation team member)
Ms. Martha Ngugi
Officer, Human Resource Development Dept.
(GDC Evaluation team member)

JICA Expert team
Dr. Naotsugu Ikeda
Chief Advisor for the Project
Eng. Laban Kariuki
Coordinator for West-JEC team
Ms. Chiyoko Miyata

Geothermal training system enhancement expert

JICA Head Office
Mr. Eiji Wakamatsu
Senior Deputy Director, Team 2,</td>
<td>JCC agenda.
Introductions & Opening remarks

Presentations

Way forward

Closing remarks

1. Excerpts of the Joint Terminal Evaluation Report

Evaluation Methodology

Members of the Joint Terminal Evaluation Team</td>
<td>

Dr. Eng. Joseph Njoroge, PS, MOE as the chairperson welcomed all members to the meeting and let the members introduce themselves.
Mr. Eiji Wakamatsu, Senior Deputy Director, Team 2, Energy and Mining Group, JICA HQ made speech about their contribution to the geothermal development in general and presented the overall project achievement. He further requested PS and GDC management to increase training budget by pointing out that it has been declining in the recent years.
PS noted that his office would take up the matter on the training budget. The chairman then handed over to the Chief Geologist to be the Chair.

Dr, George Muia, General Manager, SRI, GDC presented on Project Outline and Progress while sharing the challenges faced and the possible opportunities for future support.
The Joint JICA-GDC Evaluation team shared the findings of the evaluation and the recommendations.
The WEST-JEC Project leader shared the schedule for the remaining period (October- December 2019)

It was noted that the way forward was agreed on.
The joint evaluation report was signed by Mr. Eiji Wakamatsu (JICA) and Mr. Ahmed Fankey (GDC).

Before closing the session, Mr. Wakamatsu made a speech on the importance of sustainability of the training effort and Dr, Muia made speech on the achievement of the project and his commitment to the future training. In return, Mr.Chrispin, Chair expressed the training need for the ministry personnel, he closed the session.

Method of Evaluation
The Terminal Evaluation was conducted in accordance with the latest JICA Guidelines for Project Evaluations issued in May 2014. Current project status and outcomes were assessed from the aspects of the five criteria of relevance, effectiveness, efficiency, impact, and sustainability.
The Joint Terminal Evaluation Team (hereinafter referred to as “the Team”) composed of JICA and GDC representatives conducted surveys at the Project sites by conducting interviews and questionnaires to the Project counterpart personnel, other related organizations, and the JICA experts involved in the Project to evaluate the Project.

Japanese side
<table>
<tr><th>Name</th><th>Title</th><th>Position and Organization</th></tr>
<tr><td>Dr. Toru Kobayakawa</td><td>Leader of the evaluation team</td><td>Senior director, Energy and Mining Group, Industrial Development and Public Policy Department, Japan International Cooperation Agency (JICA)</td></tr>
<tr><td>Mr. Eiji Wakamatsu</td><td>Deputy leader of the evaluation team</td><td>Senior Deputy Director, Team 2, Energy and Mining Group, Industrial Development</td></tr>
</table>
</td>
</tr>
</table>

		Energy and Mining group (JICA Evaluation team member) Mr. Jun Totsukawa Evaluation Consultant -JICA contracted (JICA Evaluation team member) JICA Kenya Office Mr. Satoshi Sugimoto Senior Representative Mr. Yukio Takahashi Representative in charge of energy sector	Schedule of the Joint Terminal Evaluation	<table><tr><td></td><td></td><td>and Public Policy Department, JICA</td></tr><tr><td>Mr. Kazuki Seki</td><td>Cooperation Planning</td><td>Staff, Team 2, Energy and Mining Group, Industrial Development and Public Policy Department, JICA</td></tr><tr><td>Mr. Jun Totsukawa</td><td>Evaluation Analysis</td><td>Director, SANO Planning Co., Ltd</td></tr></table> Kenyan Side <table><tr><th>Name</th><th>Title</th><th>Position and Organization</th></tr><tr><td>Mr. Ahmed Fankey</td><td>Leader of the evaluation team</td><td>Corporate Planning and Strategy, GDC</td></tr><tr><td>Ms. Phyllis Runyiri</td><td>Deputy leader of the evaluation team</td><td>Human Resource Development, GDC</td></tr><tr><td>Ms. Rosemary Njenga</td><td>Member</td><td>Corporate Planning and Strategy, GDC</td></tr><tr><td>Ms. Diana Waringa</td><td>Member</td><td>Corporate Planning and Strategy, GDC</td></tr><tr><td>Ms. Martha Ngugi</td><td>Member</td><td>Human Resource Development, GDC</td></tr></table> The Terminal Evaluation was conducted during the period between the 11th of September and the 26th of September, 2019
		Achievements of the Project Records of Inputs Japanese Side Kenyan Side	The following are the achievements of inputs by the time of the Terminal Evaluation by both Japanese side and Kenyan side. 1) Assignment of Experts Since the beginning of the Project, a total of 107 experts were dispatched as of the Terminal Evaluation on a short-term basis. The details are shown in Annex 6. 2) Training in Japan Seventy one (71) persons in total participated in the training course in Japan. The details are shown in Annex 8. 3) Provision of Equipment Major equipment provided includes, mud additives, various measurement equipment, software, and a project car. The details are shown in Annex 10. 4) Operational Cost Japanese side has covered approximately 77,820 thousand JPY in total as local expenses. 1) Kenyan Counterparts Kenyan side assigned the Project Director responsible for the overall administration and implementation of the Project, and the Project Manager as well as the Project coordinator. 2) Operational cost Kenyan side allocated the following necessary costs, approximately 67,645 thousand Kenya Shilling for the Project.
		Results of the Activities and Achievement of the Outputs	Achievement status of the each Output is as follows: **Output 1: Training program for GDC staff will be established.**

Indicators	Activities and Achievement Level
1-1. Development of checklists and assessment sheet for GDC's staff capacity	Indicator 1-1 was achieved. The Project conducted a baseline survey on capacity of GDC staff and produced checklists and assessment sheets that show the skills gaps comparing the baseline status and requirement level for their tasks. The Project has been monitoring how much the targeted GDC staff have upgraded their technical skills by using the checklist.
1-2. Development of training materials and programs	Indicator 1-2 was achieved. Training materials and programs were prepared for each technical field based on the capacity gap analysis in 2014. The Project set the goal of training in two phases as follows: 1) In the first two years of the Project, JICA experts conduct trainings of GDC staff on technical topics necessary for geothermal development; and 2) In the latter phase of the Project, GDC internal trainers take primary roles as trainers to train its staff on the technical topics. After the development of training textbooks, they have been reviewed from time to time and modified in parallel with training progresses.
Overall Assessment: The Project has achieved Output 1. Based on the thorough baseline survey of the GDC staff's technical knowledge and skills, the Project team elaborated existing training programs and materials or developed new ones where it didn't already exist for each technical field. The programs and materials were continuously upgraded during the project period.	

Output 2: Capacity in developing conceptual models of reservoirs and siting of successful drilling targets will be improved.	
Indicators	Activities and Achievement Level
2-1. Target level in the capacity checklist for necessary knowledge and skills is realized in constructing geoscience elements to integrated conceptual models.	Indicator 2-1 was almost fulfilled. Since the start of the project, the Project team has carefully monitored its progress of GDC staff's capacity development. In this Output 2 category, the team assessed the baseline, target line and present status of fundamental skills to construct reservoir conceptual models in the areas of geology, geochemistry, and geophysics. As Table 1 below shows, the present total score of assessment result is 180 against target score, 187, reaching 96% of the target. The reason for this slightly lower score is that part of trainings had not yet been finished. For example, scores on geophysics are relatively lower than the others because training on Micro-Earthquake were delayed compared to the original schedule.
2-2. Target level in the capacity checklist for necessary knowledge and skills realized in the	Indicator 2-2 was almost fulfilled. As in indicator 2-1, the Project has carefully monitored its progress of capacity development activities since the Project started. As it is shown in Table 2, the total score of assessment result is 178 against target score,

capacity to site wells.	185, reaching 96% of the target line. Reasons of current status and expectation on geophysics are the same as in indicator 2-1. * Most of the necessary knowledge and skills to develop conceptual models and to site wells are identical. Therefore, the number of target technical items and accordingly target scores are almost the same.
2-3. Conceptual model developed / improved by GDC staff based on this training knowledge.	Indicator 2-3 was fulfilled. Geothermal Resource Assessment group of GDC improved the conceptual model of Menengai through a series of data analysis on geology, geochemistry and geophysics. Major improvements on the model can be identified as follows: 1) location and dispersion of heat sources are shown on the basis of information analysis on geology and geophysical exploration results; 2) distribution of cap rocks is now visible; and 3) estimation of geological structure is much more accurate due to introduction of Acoustic Borehole Image data.
Overall Assessment: The Project has almost achieved Output 2 as the last training program on micro-earthquake observation has been completed in November. As achievement status of the respective indicators shows, the majority of technical items that are indispensable to develop conceptual models and to site wells reached the target level. Application of ABI well logging and familiarity with high specification software, the training for which was supplemented in the middle of the project, enhanced the technical capacity of GDC to develop conceptual models and to site wells.	

Table 1, Achievement status of capacity development regarding reservoir conceptual model (Indicator 2-1)

Field	Number of topics	Technical items	Target score	Present score	Achievement % on score
Geology	6	25	57	58	100
Geochemistry	3	18	36	36	99
Geophysics	3	18	54	48	89
Conceptual model and siting wells	1	10	40	39	96
Total/average	-	71	187	180	96

Table 2, Achievement status of capacity development regarding siting wells (Indicator 2-2)

Field	Number of topics	Technical items	Target score	Present score	Achievement % on score
Geology	6	25	57	58	100
Geochemistry	3	18	34	34	99

Geophysics	3	18	54	48	89
Conceptual model and siting wells	1	10	40	39	96
Total/average	-	71	185	178	96

Output 3: Capacity to strike drilling targets will be improved.

Indicators	Activities and Achievement Level
3-1. Number of GDC' s training staff who accomplished the target level (At least 80% of GDC's trainees completed training and received certificates)	Indicator 3-1 was fulfilled. Training record of Output 3 is as follows. More than 80% of the staff accomplished the target level. Certificates will be offered to them by the end of the Project. Out of 247 accumulative staff members who attended the drilling classroom sessions held in 2016 and 2018, 172 managed the minimum required attendance (7 sessions or more). And 88% (161 staff members) completed the sessions (test score 50% or more). 48 staff members participated in trainings in Japan, and all of them completed the trainings. Eight (8) staff members received trainings on operation and maintenance of a plasma cutter and 100% completed the training. Therefore a total of 228 drilling staff members completed drilling OJT and classroom sessions.

Table 3, Training record in drilling

Trainings	Year	Number of trainees satisfying the minimum attendance requirement	Target rate of certificate given	Rate of trainees receiving certificate (certificate holders / trainees satisfied minimum attendance)
Drilling OJT classroom session	2016	76	80%	86% (65 trainees)
	2018	96	80%	100% (96 trainees)
Trainings in Japan (on drilling)	-	48	80%	100% (48 trainees)
Operation and maintenance of	-	8	80%	100% (8 trainees)

				plasma cutter				
				Total		228	80%	94%
			3-2.Downtime reduction due to the equipment failure (At least 15% or more reduction on Wait on Repair time over the total drilling time (2015 vs. 2018))	Indicator 3-2 is not fulfilled. The percentage of days waiting for repair against total drilling days adversely increased from 2015 to 2018. Primary reason is that drilling works at MW19B in 2018 requested to purchase rotary table bearings after their failures, but it required almost 60 days until their arrival from overseas. This event influenced the indicators' percentage. If a spare part procurement plan had existed and/or been improved with consideration of possible repairs that reflect the current equipment condition and their original lifetime, this kind of loss time might have reduced. Table 4, Loss time due to equipment breakdown and wait for repair				
					Wells completed in 2015	Wells completed in 2018		
				Total days of drilling	1,403.8	513.4		
				Days waiting for repair	123.9	66.4		
				Percentage of days waiting for repair against total days of drilling	8.9%	12.9%		
				Wells completed in 2015: MW19A, MW-21A, MW13A, MW10, MW30A, MW17A, MW09B Wells completed in 2018: MW18B, MW-27, MW19B, MW15A				
			3-3. Number of accidents (At least 15% reduction on the number of major accidents per total drilling operating time (2015 vs. 2018))	The indicator 3-3 was fulfilled. There was only one major accident in 2018, which clearly shows significant improvement against 11 accidents in 2015. Total drilling operation days per major accident improved by more than 400%. Table 5, Number of major accidents per total drilling operating days				
					Wells completed in 2015	Wells completed in 2018		
				Total days of drilling	1,403.8	513.4		
				Number of major accidents	11	1		

				Drilling operation days per major accident	127.7 days/accident	513.4 days/accident
				Major accidents per drilling operation days	0.0078	0.0019
				Wells completed in 2015: MW19A, MW-21A, MW13A, MW10, MW30A, MW17A, MW09B Wells completed in 2018: MW18B, MW-27, MW19B, MW15A		
			3-4. Implementation of logistics management (At least 15% reduction of the total waiting time related to logistics (2015 vs 2018))	Indicator 3-4 is not fulfilled. Improvements in reducing loss time related to logistic management were not realized between 2015 and 2018, although both of them are not so significant (figures such as 2.9% in 2015 and 3.7% in 2018). One of the major reasons for loss time was delay in fuel supply at Menengai due to belated budget disbursement.	
				Table 6, Loss time due to logistic management :		
					Wells completed in 2015	Wells completed in 2018
				Total days of drilling	1,403.8	513.4
				Loss time due to logistic management (days)	41.3	18.8
				Percentage of waiting days due to logistics management against total days of drilling	2.9%	3.7%
				Wells completed in 2015: MW19A, MW-21A, MW13A, MW10, MW30A, MW17A, MW09B Wells completed in 2018: MW18B, MW-27, MW19B, MW15A		
			3-5. Timely delivery of drilling materials (At least 15% reduction of the	Indicator 3-5 was fulfilled. Procurement and delivery processes are more efficient than before. Waiting time due to equipment delivery against total drilling days improved significantly, (from 7.1% in 2015 to 1.9% in 2018). The timely delivery improved by more than 370%.	

total waiting time related to equipment delivery (2015 vs 2018))

Table 7, Loss time due to equipment delivery :

	Wells completed in 2015	Wells completed in 2018
Total days of drilling	1,403.8	513.4
Loss time due to delay in delivery of materials (days)	100	9.7
Loss time / total days of drilling	7.1%	1.9%
Wells completed in 2015: MW19A, MW-21A, MW13A, MW10, MW30A, MW17A, MW09B Wells completed in 2018: MW18B, MW-27, MW19B, MW15A		

Overall Assessment:
The Project has almost achieved Output 3.
Technical capacity on drilling has been steadily developing through a series of trainings. As the indicators show, 1) the number of major accidents per drilling time and 2) total waiting time due to equipment delivery are showing significant improvements. On the other hand, 3) wait on repair time and 4) total waiting time related to logistics management could not satisfy the target level.
Although half of the indicators were not achieved, it can be added that other crucial factors for drilling works such as speed of drilling rate and occupancy rate of foreign experts in rig crew[2] are also showing improvements, which are placed as another indicator of the Project purpose.
Considering these facts, it can be concluded that Output 3 is almost achieved.

[2] The speed of drilling is as follows: 10.8m/day in 2015, 18.3m/day in 2018; and the number of foreign drilling experts in a rig crew: 1-2 experts/rig crew in 2015, none in 2018.

Output 4: Capacity in interpreting wellbore data, establishing calibrated reservoir models and evaluating geothermal resources will be improved.

Indicators	Activities and Achievement Level
4-1. Target level in the capacity checklist for necessary knowledge and skills realized in	Indicator 4-1 was almost fulfilled. In the same manner as other technical categories, the Project assessed the baseline, target line and present status of GDC staff regarding necessary technical items to analyze wellbore data.

the capacity to analyze wellbore data.

The present total score is 23 against the target score, 24, which is satisfying 96% of the target.

Table 8,: Achievement status of capacity development regarding analysis of wellbore data

Technical item	Baseline	Target line	Present status
Planning of wellbore test	4.0	4.0	4.0
Management of measurement equipment	4.0	4.0	4.0
Data procurement	4.0	4.0	4.0
Data integration	3.0	4.0	4.0
Evaluation of data quality	3.0	4.0	4.0
Data analysis	3.0	4.0	3.0

4-2. Target level in the capacity checklist for necessary knowledge and skills realized in the capacity for reservoir evaluation

Indicator 4-2 was almost fulfilled.
In the same manner as other technical categories, the Project assessed the baseline, target line and present status of GDC staff regarding necessary technical items to evaluate reservoir.
The present total score is 23 against the target score, 24, which is satisfying 96% of the target.

Achievement status of capacity development regarding reservoir evaluation

Technical item	Baseline	Target line	Present status
Basic theory	3.0	4.0	4.0
Volumetric reservoir evaluation	3.0	4.0	4.0
Manipulation of 3D numerical grid	3.0	4.0	4.0
Natural state calibration	2.0	4.0	4.0
Natural state calibration	2.0	4.0	4.0
Forecasting simulation	1.0	4.0	3.0

4-3. Reservoir evaluation report

Indicator 4-3 has been progressing and is likely to be fulfilled by the end of the Project.

consulted by the Project	Reservoir evaluation report, the Steam Report 1, was elaborated in early 2018 mainly by the JICA expert team, applying the use of existing data collected until around 2017. GDC staff and JICA experts are now preparing the Steam Report 2 using new data of exploration and wellbore. Completion of the report is scheduled by November, 2019.
4-4. Carried out reservoir assessment and update reservoir model	Indicator 4-4 has been progressing and is likely to be fulfilled by the end of the Project. The Project developed the reservoir model of Menengai in the course of the Steam report elaboration. The model is now under updating with application of new data. The new reservoir model changed permeability dispersion and boundary condition. Owing to the change, the new model enables to reproduce temperature and pressure of new wellbores.
4-5. Developed numerical model for Menengai field	Indicator 4-5 has been progressing and is likely to be fulfilled by the end of the Project. The numerical model for Menengai field was developed at the time of elaborating the Steam report 1. Since then, under the Project, the model has been updated through development of the Steam report 2. One of the features of the update is to employ dual porosity model, which can reproduce enthalpy of spouting fluid.
Overall Assessment: The Project has achieved Output 4 as the achievement level of the Output has been higher as compared with that at of the Terminal evaluation. Capacity in interpreting wellbore data, establishing calibrated reservoir models and evaluating geothermal resources have been strengthened. The result of capacity assessment shows that most of technical items were satisfied to the target level. The Steam report 2 is prepared, which includes updating the reservoir model and reservoir numerical model. .	

Output 5: Capacity to prepare economically and environmentally viable business plans as a steam provider will be enhanced	
Indicators	Activities and Achievement Level
5-1. Target level in the capacity checklist for necessary knowledge and skills realized in the area of environmental and social safeguards.	Indicator 5-1 is already fulfilled. In the same manner as other technical categories, the Project assessed the baseline, target line and present status of GDC staff regarding technical items, which are necessary for tasks regarding environmental and social safeguards. The present total score is 71 against the target score, 68, which surpassed the target as shown in the Table 3-15.

			5-2. Environmental and social safeguard handbooks are developed.	Indicator 5-2 has been fulfilled as the handbook is developed and endorsed by relevant GDC experts.
			5-3. Target level in the capacity checklist for necessary knowledge and skills realized in the plant engineering	Indicator 5-3 is already fulfilled. In the same manner as other technical categories, the Project assessed the baseline, target line and present status of GDC staff regarding technical items, which are necessary for plant engineering. The status of capacity development was assessed at the time of each training opportunity. The target levels were all cleared at each time. 1) Training on plant engineering (1st training) The first training focused on fundamental technical items to plan steam supply facilities. Target trainees were from entry level staff to middle class technicians, 20 in total. As the below Table shows, the average score surpassed the target. Table 9, Capacity assessment on plant engineering for the 1st training (February, 2015) 2) Training on plant engineering (in construction period)

Technical items	Number of questions	Rate of correct answers (before training)	Rate of correct answers (after training)
Entry level knowledge on plant engineering	13	65%	97%
Geothermal power plant	13	44%	94%
Steam gathering system (basic)	8	44%	70%
Selection of locations of well pads and power plant	6	48%	82%
Selection of type, capacity, admission pressure of power plant	6	38%	65%
Technical issues to be considered in SSA	9	44%	80%
Total/Average	55	48%	84%
Target			80%

The training focused on necessary technical items before/during construction period. These technical items also cleared the target level.

Table 10, Capacity assessment on plant engineering (February, 2015)

Technical items	Number of questions	Rate of correct answers (before training)	Rate of correct answers (after training)
Contract management	13	54%	78%
Safety management	13	70%	100%
Process control	8	78%	98%
Approval process of design	6	61%	95%
Operation test and quality test	6	43%	83%
Total/Average	55	60%	91%
Target			80%

3) Training on plant engineering (2nd training)
Training was conducted by internal trainers of GDC in May 2018. All the necessary steps on training implementation such as setup of training schedule, elaboration of training materials, coordination of training venues, development and implementation of exams were done by two (2) GDC internal trainers. The result of the training also passed the target level.

Table 5-1: Capacity assessment on plant engineering for the 2nd training (May, 2018)

Technical items	Rate of correct answers (after training)
Fundamental knowledge of geothermal	94%
General outline of geothermal plant	96%
Conceptual Design of steam gathering system	68%
Design of electricity facilities	79%
Wellhead generator	72%
Average	82%
Target	80%

5-4. Target level in the	Indicator 5-4 is almost fulfilled.

			capacity checklist for necessary knowledge and skills realized in the public/private scheme.	In the same manner as other technical categories, the Project assessed the baseline, target line and present status of GDC staff regarding technical items, which are necessary for public/private schemes. The status of capacity development was assessed at the time of each training opportunity. The number of trainees was 13 GDC staff members each time, and most of them continued to participate in all of the trainings. Only the technical items of financial agreements at the third training session did not reach the target level, though the other items were successfully cleared. It should be considered that the third training session required a higher level of knowledge compared with the previous two sessions.
			5-5. Target level in the capacity checklist for necessary knowledge and skills realized in the Economic Analysis	Indicator 5-5 was almost fulfilled. In the same manner as other technical categories, the Project assessed the baseline, target line and present status of GDC staff regarding technical items, which are necessary for economic analysis. The status of capacity development was assessed at the time of each training opportunity. The number of trainees was 29 GDC staff for the first training and 21 for the second one. Most of technical items for the basic course cleared the target level while there were some difficulties in the advanced course such as VBA and depreciation. The reason for the lower score is its requirement level itself, and the fact that some of the trainees without participating in the basic course dragged down the average score. In this technical category, it is specially noted that two (2) staff members successfully upgraded their knowledge and skills to the level which can apply at actual business field. They turned to be internal trainers in the economic analysis field as well. Table 12, Basic course on economic analysis

Technical item	Baseline	Target line	Present stat
Economic evaluation methodology	2.1	4.0	4.9
Accounting	4.2	4.0	4.4
Finance	3.9	4.0	4.6
Power generation (general)	2.8	4.0	2.9
Excel	2.7	4.0	3.9

Table 13, Advanced course on economic analysis

Technical item	Baseline	Target line	Present status
Free cash flow	2.5	4.0	4.8
IDC: Interest during construction	0.5	4.0	3.8
Depreciation	3.0	4.0	3.5
Annual balance	1.4	4.0	3.8
VBA (Excel): Visual Basic	0.0	4.0	2.5

5-6. Target level in the capacity checklist for necessary knowledge and skills realized in the Public Corporate Business Administration/ Finance	Indicator 5-6 is fulfilled. In the same manner as other technical categories, the Project assessed the baseline, target line and present status of GDC staff regarding technical items, which are necessary for public corporate business administration/ finance. The status of capacity development was assessed at the time of each training opportunity between before and after. Trainings were conducted twice respectively in public corporate business administration as well as corporate finance, inviting 14 GDC staff members. The result of assessment shows that all of the technical items of both training courses cleared the target level.
Overall Assessment: The Project has achieved Output 5. Although there were some technical items where the average score could not reach the target, as a whole, it can be evaluated that GDC staff successfully enhanced their technical capacity. The goal of this Output is to enhance technical knowledge and skills in order to enable GDC to prepare economically and environmentally viable business plans with an eye to SSA and PPA with IPP. In this line, the technical knowledge and skills developed in this Output helped GDC to conduct smooth bidding and contract negotiation with IPP for Menengai in 2016. Some of the counterparts worked on the negotiation as the working group. This is evaluated as one of the evidences of capacity development regarding this Output.	

Table 14, Achievement status of capacity development regarding environmental and social safeguards

Field	Number of topics	Technical items	Target score	Present score	Achievement % on score
Hydrogen sulfide	1	5	20	21.8	109
Noise	1	4	16	16.4	103
Water quality	1	4	16	16.6	104
Scoping	1	4	16	16.2	101

Total/Average		17	68 80%	71 83%	104% (beyond the target score)		

Output 6: Capacity in implementing projects of multi-purpose use of geothermal energy will be enhanced.	
Indicators	Activities and Achievement Level
6-1. Target level in the capacity checklist for necessary knowledge and skills realized in the planning and implementation of multipurpose use of geothermal energy.	Indicator 6-1 is almost fulfilled. The status of capacity development was assessed at the time of each training opportunity between before and after. Trainings were conducted twice in planning and implementation of multi-purpose use of geothermal energy. Among all the 13 technical items, most of the items met the target level.
6-2. Produced a business plan for multi-purpose use of geothermal energy.	Indicator 6-2 is fulfilled. Through analysis of the multi-purpose facility in Menangai and market survey on social needs related with geothermal resources use, the business model for small scale wellhead generator was developed.
Overall Assessment: The Project has achieved Output 6. Capacity in implementing projects of multi-purpose use of geothermal energy was strengthened. In the course of development of a business model as well as a series of training sessions, GDC staff accumulated technical knowledge and skills regarding multi-purpose use of geothermal energy such as conceptual design, project cost estimation, selection of appropriate geothermal wells for multi-purpose use, and analysis of added value by installation of multi-purpose use facilities.	

Output 7: GDC's internal mechanism to improve and continue training programs will be established.	
Indicators	Activities and Achievement Level
7-1. Number of training sessions /programs conducted by GDC staff (At least one session per each module)	Indicator 7-1 is already fulfilled. The following Table shows the number of training sessions and/or programs by GDC staff.

Table 15, Number of training sessions/programs by GDC staff

Output	Technical items	Number of training	Number of

						sessions conducted by GDC staff	training programs conducted by GDC staff
				Output 2	Geology, Geochemistry, Geophysics	19	
				Output 3	Drilling	8 (Classroom session)	
				Output 4	Reservoir evaluation	5	
				Output 5	Environmental monitoring, Environmental and social safeguard, Plant engineering, Economic analysis	28 (Environmental monitoring: 5, Environmental and social safeguard: 1, Plant engineering : 6, Economic analysis: 4)	1 (Plant engineering)
				Output 6	Multi-purpose use	12	1 (Planning of pilot project)
				Note: Training session means a short period training (1-2 days); and training program refers to a long period of training (mostly about 1 week).			
			7-2. GDC's internal trainer's development program is established	The major component of the internal trainer's development program is human resource (trainer), training materials (handbooks, visual aid and the others) and methodology. The number of GDC's internal trainers is steadily growing from less than 10 personnel before the Project to 39 as of now, and the list of the trainers has already been created and updated by the Human Resource Department of GDC. In terms of training materials, nearly 7,000 pages of handbooks and a few hundred Giga Bytes of video footage and a few Giga Bytes of software code for training purpose have been created. The handbooks include Power Point files and the texts which can be used in the corresponding training seminars. Although a solid "program" to develop GDC's internal trainers is not presented in a tangible form, which may differ greatly depending on the trainer's work subject (Geoscientist, Lab technician, Driller, Drilling Engineers, Administrators, etc.), the trainers developed though the project can apply their OJT experience to their own program as the other resources are available.			

				In addition, the model training program for the drillers based on OJT linked to the career development is developed in the project and accepted by GDC.
			7-3. Number of training materials revised by GDC staff (At least one program per each module)	Indicator 7-3 has been fulfilled. Eighteen (18) types of handbooks are completed. All the handbooks were produced by JICA experts and GDC staff through mutual consultation. The following handbooks are expected: 1) Geochemistry, 2) Geology, 3) Geophysical exploration, 4)Conceptual modeling and siting of well targets, 5) Drilling, 6) Maintenance of drilling equipment, 7) Drilling (Health, Safety, Environment), 8)Environmental monitoring, 9) Environmental and social safeguards, 10)Databases, 11) Well testing, 12) Reservoir evaluation, 13) Plant engineering, 14) Public corporation and finance, 15) Direct use, 16) Steam supply, 17) Project management, 18) Economic analysis.19) Internal Control, 20) Procurement, 21) MEQ
			7-4. Established guidelines for training certificates in GDC.	Indicator 7-4 has been fulfilled by the end of the Project. By the end of the Project certificates of training are awarded on the basis of criteria developed by JICA experts and GDC. The criteria can be regarded as a guideline for training certificates.
			7-5. Established system to link and reflect training development to the career development program.	The Project has mostly achieved indicator 7-5. In fact, the training program which the Project team proposed has a similar basis as the one GDC H/R has been contemplating. There is substantial chance that GDC management adopts a good part of the training program. However, career development is a core policy of the company and many factors have to be taken into account. No matter how good or useful the training program is, it may take time to implement the program and integrate it into the current HR policy.
			Overall Assessment: The Project has been progressing towards achievement of Output 7; however, progress on some of the indicators has been delayed. Training programs at GDC were obviously enriched through the Project implementation. Development of handbooks and the addition of many more GDC internal trainers are recognized as one of the highlights of the Project's outputs. On the other hand, the implementation of the system linked between the training program and career development program as well as internal trainers' development program must be completed by GDC HR and the implementing department together. Although the basic direction or outline of both systems has been already shared within the Project, it has not reached the "establishment" stage yet.	
		Achievement of Project Purpose		
			Project Purpose: To enhance human resources of GDC which contribute to technical risk mitigation in geothermal development.	

Indicators	Activities and Achievement Level
1. Success rate of steam development (Well targeting) (No. of wells discharging successfully improved by at least 10 points (before 2014 vs. after 2015))	The Project has already fulfilled indicator 1. The number of wells successfully discharged was 11 of 29 wells drilled before the end of 2014, which is a 38% success ratio. It has improved to 10 of the 22 wells drilled since 2015, which is a 45%.success ratio. The percentage of success ratio improved by 18%. * 45%/38%=118%
2. Success rate of steam development (Well drilling) (No. of wells reaching target depth improved by at least 10 points (before 2015 vs. 2018))	The Project has almost fulfilled indicator 2. The number of wells reaching target depth before 2015 was 31 of 36 wells drilled, which is 86%. This improved to 14 of 15 wells drilled from 2016 to 2018, which is 93%. The percentage of successful rate improved by 8%. * 93%/86%=108% Looking at only the four (4) wells completed in 2018, all wells reached their target depth.
3. Improvement in the speed of drilling rate (Gross ROP improved at least by 15% (2015 vs. 2018))	The Project has already fulfilled indicator 3. The speed of drilling in 2018 was 18.3 meters per day, which is a 69% improvement against the 10.8 meters per day in 2015. It is noted that drilling in 2015 was performed and/or assisted by international drilling experts while drilling in 2018 was performed only by GDC staff.
4. At least 50% reduction of foreign drilling	The Project has already fulfilled indicator 4. In 2015, one (1) or two (2) foreign drilling experts from overseas (the

Table 16, Speed of drilling rate

	Wells completed in 2015	Wells completed in 2018
Total days of drilling	1,403.8	513.4
Drilling depth	15,227m	9,382m
Speed of drilling	10.8m/day	18.3m/day
Targeted Wells in 2015: MW19A, MW-21A, MW13A, MW10, MW30A, MW17A, MW09B Targeted Wells in 2018: MW-27,MW-15A,MW-20B, MW-34		

			experts in the rig crew (~2015 vs. 2018)	Philippines and Indonesia) were assigned to each working shift for each rig. Directional drilling works were also handled by external professional companies. In clear contrast, in 2018, none of the rig crews have foreign drilling experts. Also, directional drilling works are handled by GDC national staff.
			Overall Assessment: The Project has achieved the Project purpose. Capacity development of GDC was successfully realized not only in drilling and resource evaluation but also in many technical fields such as economic/financial analysis, environmental and social monitoring/safeguards, plant engineering, and multi-purpose use of geothermal resources. The Project covered nearly all the necessary technical fields for geothermal development. It can be evaluated that the current technical capacity of GDC meets the Project purpose, which is "GDC has human resources who contribute to technical risk mitigation in geothermal development".	
		Achievement Prospect of Overall Goal	Overall goal: GDC will be able to properly provide steam to power generation utilities.	
			Indicators	Activities and Achievement Level
			1. Available steam at surface (MW worth)	Since an exact target figure is not set, it is difficult to forecast the possibility to fulfill the goal; however, steam supply itself is expected to be highly possible. As of the time of the Terminal evaluation, the construction of power plants at Menengai is expected to commence soon. GDC plans to supply steam for these plants which is worth a total of 105 MW. The steam test shows 151.6 MW supply volume. Steam report 1 has confirmed that steam will be sufficient for the three IPPs during the life of the projects (25 years).
			2. Actual generation capacity in MW	Since an exact target figure is not set, it is difficult to forecast the possibility to fulfill the goal; however, power generation itself is highly expected.
			Achievement Prospect: It may be possible to achieve the Overall goal within three to five years after the Project completion. Not only the contract with IPP but also the facility construction is nearly ready to start steam supply business at the time of the Terminal evaluation.	
		Implementation Process of the Project Communication	Communication among each technical field improved as the project progressed and became almost sufficient. In the drilling OJT, however, where initially the JICA drilling experts consisted of only the Japanese experts, the language barrier posed serious problem to the training project orientation phase during which they had to acquire	

			the trainee's trust, understand and diagnose the situation and if necessary to adopt appropriate measures in terms of project implementation. This language problem was solved by adding the experts from Themaprime Drilling. Necessary information was shared at the necessary timing within each technical field. Challenges were observed regarding communication between JICA experts and the management strata of GDC in Nairobi. Since most of the work venues were concentrated in Nakuru, as well as the fact that many of the management personnel were busy and frequently out of office/country, difficulties were encountered finding communication opportunities. Crucial information was shared as a result of bridging efforts by the long term expert stationed in Nairobi, though, challenges to keep close communications between the parties has to be pointed out as one of the challenges in the Project.
		Monitoring	Monitoring aspect has to be considered from two aspects; (a) monitoring within each technical field and (b) monitoring on the progress of the project from project management viewpoint. Firstly, the monitoring on each technical field has been well conducted among the JICA experts and Kenyan counterparts. As above described in each Output achievement, the Project carefully monitored capacity development status at all the technical fields. Secondly, the monitoring of the Project from project management perspective was rather insufficient. The Project has produced progress reports every year for monitoring purpose, but there were fewer opportunities to confirm the contents of the reports with all the Project related persons. JICA projects normally require hold a Joint Coordination Committee (JCC) at least once a year. However, the Project had done only twice until the Terminal evaluation in spite of the 6 years project period. In addition, the Project has not kept tracking their activities and progress in the context of PDM and PO as a tool of project management. In other words, PDM and PO have not been paid enough attention, which may have turned to be one of the reasons for some activities delayed such as ones in Output 7.
		Evaluation by Five Criteria Relevance Consistency with the policy of the Kenyan Government	Each criterion is evaluated using the following five rankings: "high", "relatively high", "moderate", "relatively low" and "low". Relevance of the Project is high. The Project is consistent with the priority of development policies of Kenya, the needs of the key stakeholders/counterparts, and Japan's Official Development Assistance policy The Kenyan mid-long term national development policy, Vision 2030, sets the goal for Kenya to become a middle-income country by 2030. The policy emphasizes the importance to develop electric power resources which can enhance industrial competitiveness through reduction of energy cost and stable energy supply. In this regard, geothermal development is placed as one of the prioritized energy sources. The National Energy Policy in 2014 shows the detailed development goal of geothermal power generation by 2030, which aims at increasing the capacity to 5,500 MW from 200 MW in 2011. The policy stresses the importance of the GDC's role in order to realize this goal. Capacity development of GDC is placed as one of the most important strategies in the policy. In this context, the Project, whose purpose is to develop technical capacity of GDC, is exactly in line with the Kenyan governmental policies.

		Consistency with Japanese ODA policy/plan	The Country Assistance Policy (CAP) for Kenya in 2012 sets the primary goal, which is to "promote sustainable economic and social development" in alignment with Vision 2030. The policy stresses the significance to assist infrastructure development including energy sector and notes that Japan pays particular attention on developing infrastructure that can be effective for climate change mitigation such as geothermal power. The rolling plan attached to the policy also shows the assistance direction, which is to promote stable power supply for economic development. In the development issue category, the Project is placed as one of the key projects in the "power access improvement" issue. The consistency with the Japanese assistance policy is confirmed in this context.
		Consistency with the needs	On the basis of the governmental policy direction, geothermal development in the country was expected to be promoted further with the key organization, GDC. However, at the time before the Project started, GDC had faced difficulties to satisfy such technical requirements/expectations. For example, GDC had technical challenges on how to site proper drilling targets; how to strike drilling targets; how to evaluate geothermal resources, and others. The Project aims at strengthening technical capacity of GDC from various aspects in a comprehensive manner. It is evaluated the Project is in line with the needs of GDC and the Kenyan government.
		Effectiveness	**Effectiveness of the Project is high.** Capacity development of GDC on nearly all the necessary technical fields for geothermal development was successfully realized. The effectiveness is evaluated as high.
		Progress of Project purpose	The Project purpose, which is "to enhance human resources of GDC which contribute to technical risk mitigation in geothermal development", has been achieved as of the Terminal Evaluation. The Project covered nearly all the necessary technical fields towards achievement of the Project purpose, which comprise not only drilling and geothermal resource evaluation but also the fields such as economic/financial analysis, environmental and social monitoring/safeguard, plant engineering, and multipurpose use of geothermal resources in the framework of each Output within PDM. Achievement status of capacity development was well confirmed by capacity assessment exercises at each technical field as well as data/figures showing improvement of operation efficiency such as drilling speed. Moreover, if some remaining activities such as establishment of internal mechanism on human resource development completes, the achievement status of the Project purpose would be much higher.
		Contribution factors	The Project has been progressing owing to these contribution factors. 1) Flexible assignment of experts in accordance with changes of needs and condition The Project flexibly adjusted dispatch of experts according to the changes of GDC's needs and progress of capacity development. For example, the Project dispatched experts on directional drilling, mud drilling and project management in response to GDC's requests and/or needs, which were not originally planned. Also, both sides decided to modify the R/D in order to include production of Steam Reports 1 and 2 in order to facilitate the IPP In this line, the Project sought expert resources not only in Japan but also in other countries. Owing to these arrangement efforts, the Project enabled to make effective inputs. 2) Synergy effects with another project There was another project implemented at the same time with almost the same counterparts, "Project for Reviewing GDC's Geothermal Development" from November 2014 to June 2017 in northern area. The counterparts engaged in geothermal resource survey, economic analysis, development of business model and others in the project, which means that they had chances to apply what they learned in the Project into the actual field. Such double opportunities enhanced

			the effectiveness of the Project's trainings. 3) Working together with a long term expert stationed in Kenya The Project dispatched a long term expert in Kenya in addition to the expert team. The long term expert enhanced bridging information and relationship between the counterparts and the expert team, and contributed to improving management and follow-up of the Project activities. 4) Coordination by the Project coordinator and a local coordinator The Project assigned a project coordinator by Kenyan side, and the JICA expert team employed a local coordinator for preparation and coordination of trainings. The coordination works by both of them enhanced smooth implementation of the Project activities.
		Inhibition factors	1) Coordination with original job assignment and the Project activities Counterparts sometimes faced difficulties to participate in trainings due to conflict with their original job assignment. As a result, there were some cases where they were unable to fulfill the minimum requirements to attend trainings. 2) Suspension of the Project activities due to presidential election For safety reasons related to presidential election campaign, the Project had suspended dispatching JICA experts for several months in 2017. As a result, the Project activities in Kenya were suspended. For example, in the case of drilling OJT, they were delayed for nearly one year. 3) Delay in budget disbursement The budget of GDC was sometimes not disbursed at necessary timing especially at Menengai. It caused suspension of fuel supply for drilling works and accordingly, the drilling OJT timing was delayed. It led to belated collection of data on geothermal
		Efficiency Japanese side	Japanese side dispatched experts on various technical fields corresponding to targeted techniques and skills of the Project (Annex 2). The performance as an expert team was effective for achievement of the expected Outputs and the Project purpose. It is especially noted that flexible assignment corresponding to the needs is highly evaluated. On the other hand, there were some challenges observed as follows. The Project dispatched 107 experts in total during the Phase 1 and Phase 2[3]. The Project faced challenges in monitoring and management of such significant number of experts. In addition, it brought administrative burden on contract management among JICA expert team, JICA headquarters and Kenyan office for such huge number of expert assignment. As a result, there were some cases that expert dispatch could not be in time for the scheduled and/or necessary timing. In this relation, the Project could not present the expert dispatch schedule in advance, then, Kenyan side could not make prior arrangements for training attendance. It resulted in some counterparts' absence from trainings. Considering the character of the Project contents, it is understandable to require various and many experts; however, this point should be raised as a part of lessons learned from the Project.
		Kenyan side	Kenyan side has assigned relevant personnel from respective department according to the Project activities. The fact that a large number of internal trainers were adequately trained is evidence that counterpart assignment was quite appropriate. On the other hand, the counterparts faced difficulties in coordinating original job assignment and the Project activities. It gave negative influence on efficiency The Project procured a variety of equipment related to field activities and analysis tools including software (Annex 10).

		Equipment/Facility	They are evaluated as reasonable inputs for the Project implementation in terms of volume, specification and usability.
		Training in Japan	The Project sent a variety of counterparts in training courses in Japan mainly from drilling and reservoir assessment and management field. The training provided the opportunities not only to gain technical knowledge but also to enhance cooperative works such as development of reservoir evaluation model with GRA and GRM. Its co-work during stay in Japan enhanced the quality of reservoir numerical model. As for the drilling field, trainings contents covered technical issues as well as provided chances to visit mud additives supplier. Trainings were well integrated and effectively contributed to enhancing capacity development.
		Budget	Budget disburse influenced on the Project activities schedule. The details are described in “inhibition factor”.
		Impact	Impact of the Project is high. Overall goal “GDC properly provides steam to power generation utilities” is possible to be achieved. Not only is the contract with IPP but also facility construction aspect nearly ready to start. A ripple effect occurred in organizational aspect is observed. In this line, the impact is evaluated high.
		Positive impact	The following ripple effects by the Project are observed. □ Promotion of Geothermal Center of Excellence and positioning Kenya as a leading country of geothermal development in East Africa
		Organizational aspect	GDC established the Geothermal Center of Excellence in 2017 and started to provide trainings to neighboring countries in East Africa. Most of trainers at the Center are the same personnel of the internal trainers developed through the Project activities. Reputation and highly recognized performance of the Center has pushed forward Kenya as a leading country of geothermal development in the region. GDC staffs made presentation at international conferences.
		Negative impact	There are no negative impacts observed.
		Sustainability	Sustainability of the Project is moderate. It is likely for Kenyan government to continuously stress importance on geothermal development. The policy aspect has high sustainability. Sustainability of organizational and technical aspects also gives positive prospect. GDC has now many internal trainers with handbooks covering nearly all the necessary technical fields. On the other hand, sustainability of financial aspect is a big challenge. Budget of training for GDC staffs is actually dependent on external support. The budget in 2019 is much more severe than previous years. Considering these aspects, sustainability is evaluated moderate.
		Policy aspect	It is likely for Kenyan government to continuously place importance on geothermal development in the country, considering the importance to develop electric power resources that can enhance industrial competitiveness through reduction of energy cost and stable energy supply. The sustainability of policy aspect is evaluated as high.
		Organizational and Technical aspect	Sustainability of organizational and technical aspect is almost ensured. GDC already has many internal trainers at various technical fields, which counts to 39 personnel as of the Terminal

		Financial aspect	evaluation. Eighteen (18) types of handbooks are also prepared that are applicable to training purpose as well as practical working fields. They can be functioned as a technical backstop in GDC4. The sustainability on this aspect would be even higher if internal trainers' development program and a system to link trainings and career development program are established. Financial sustainability is a concern. Reserving budget for training purpose in GDC has been tougher for these years, and at last the fiscal year of 2019 could not gain promising budget for training. The current situation is depending on external support and/or internal budgetary arrangement in GDC. The budget for software license renewal and for calibration of equipment is also crucial to ensure the quality of works. Measurement equipment for water quality and noise has been calibrated by GDC's own budget. However, calibration for air monitoring has not been done because it needs higher cost to do so.
		Conclusion	This Project targeting capacity development of GDC through a series of integrated trainings is a significantly important project for Kenya. The Project meets with the Kenyan policy and the needs of the government and GDC. The relevance is therefore evaluated as high. The Project purpose "human resource development of GDC contributing to technical risk mitigation in geothermal development" has been achieved. There has been marked improvement of drilling efficiency and quality of works such as reservoir evaluation and others. Therefore the effectiveness is evaluated as high. Efficiency is evaluated as moderate. Japanese side dispatched experts on various technical fields corresponding to targeted techniques in the Project. In addition, flexible arrangement of expert assignment has resulted in acceleration of the Project activities. However, due to immense number of experts dispatched, the Project sometimes faced challenges in managing and monitoring. Kenyan side has assigned resourceful personnel from respective department. But they occasionally had challenges in reserving time to attend trainings. Delays in budget disbursement also negatively affected

Figure 1, Actual expense on training in GDC

Table 17, Actual expense on training in GDC

Fiscal year	Expense on training (Kenya shilling)
2013	116,701,527
2014	87,805,640
2015	54,980,776
2016	51,402,520
2017	70,583,493
2018	25,285,349
2019	6,010,929

Source: GDC

			the schedule of the Project activities. Impact is observed in organizational aspect. The Project contributed to promoting the Geothermal Center of Excellence from the viewpoint of trainers' development and training contents. The possibility of achievement of Overall goal is also expected within 3-5 years after the Project completion. The impact is evaluated high. Sustainability is moderate. There are no significant concerns on the policy, organizational and technical aspects. On the other hand, it is difficult to confirm the financial sustainability based on the current budgetary situation. Overall, it is concluded that the Project has successfully achieved the Project purpose with joint efforts by JICA expert team and GDC counterparts. Capacity development of GDC was successfully realized not only in drilling and resource evaluation but also in many technical fields such as economic/financial analysis, environmental and social monitoring/safeguard, plant engineering, and multi-purpose use of geothermal resources. On the other hand, there is a challenge in sustainability especially on financial aspect. It is highly crucial for GDC to reserve budget for continuous capacity development actions in GDC.
		Recommendations During the Project Period 1) Remaining activities during the Project period 2) Career development program (Output 7) 3) Continuous improvement of drilling management	Based on the evaluation and analysis above, the Team put forward the following recommendations for the Project team, for GDC, and for JICA for further improvement <For both GDC and JICA expert team> During the Terminal Evaluation, the Project team agreed on the actions to be taken in the last three months of the Project: (a) handbook finalization process, (b) finalizing the Steam Report 2, (c) finalizing the draft memo for upgrading the HR system, (d) training on internal control, procurement, and micro-earthquake analysis, (e) presentation of the Project Completion Report. Considering that the project is closing in end of December, the Project team should closely monitor the progress and communicate among its members so that none of the activities are delayed. <For both GDC and JICA Project team> Establishing a system to link and reflect training development to the career development program (indicator 7-5) has not yet completed. This indicator is especially important in order to assure that the project outcomes are sustained. As explained above, the JICA expert team has proposed a draft version of a system that links necessary training components aligning to career development program in the drilling section. The Team recommends that the GDC HR team consider how they can incorporate the proposed system to their existing HR system. The JICA expert team will have one last opportunity to visit Kenya to discuss with the HRD and counterparts. The evaluation team recommends that before the next visit of the JICA experts, the GDC HR team develop a draft memo of how they intend to incorporate the proposed system into their existing HR system. During the JICA expert's visit, the Project team can make final revisions to the draft memo to be included in the Project Completion Report. < For GDC and JICA expert team > The Project has made significant improvements in the key indicators for drilling management. For example, the drilling rate has increased by around 70%, from a baseline of 10.8 meters per day in 2015 to 18.3 meters per day in 2018. This has significant implications for reduction of drilling cost, saving millions of USD per well. Another important achievement is that frequency of major accidents has drastically reduced from a baseline of one accident per around 128 days in 2014 to one accident per around 513 days in 2018. This has major implications for reducing the cost due to downtime, not to mention protecting GDC's most valuable assets from tragic accidents. Although these are significant achievements, there is still room for improvement. Some other indicators, such as waiting on repair and waiting on logistics management has actually worsened. The increase in waiting time will have implications

			for increase of cost per well. Also, because GDC aims to become an international player, it must further reduce the waiting time, which will be viewed as project and financial risk to project owners. Although there were external factors that affected this outcome, maintenance and logistics plans could be reviewed to better manage external risks. The evaluation team recommends the Project team to review the inventory, maintenance, and logistics plans to better manage external risks and unexpected events, and to reflect the results in the Final Completion Report.
		4) Planning for equipment maintenance and software license renewal	< For GDC and JICA expert team > As stated in the report, the budget for software license renewal and for calibration of equipment is crucial to ensure the quality of analysis. Currently, it has been observed that the budget allocation for maintenance of equipment and license renewal fee for software are inadequate. Also, the project experienced an inappropriate storage of equipment provided by JICA during project implementation The evaluation team recommends the JICA expert team to work together with its GDC counterparts to do the following: (a) The Project team should produce a plan for the coming five years specifying the cost, frequency, and expected schedules for periodical maintenance and license renewals and include the proposed schedule in the Project Completion Report. (b) The Project team should discuss how GDC's inventory management could be improved. The results of the discussion should be reported in the Project Completion Report.
		5) Handbooks (Output 7)	<For GDC > The eighteen types of handbooks developed in the Project is an important asset to GDC. As an important asset of GDC, the Team recommends that the handbooks to be properly stored, managed, and updated. Preferably, the handbooks should be available to GDC staff whenever and wherever they need to access it. It recommends that for example, GDC uploads the latest handbooks to its intranet so that the staff can access it from their PCs.
		After Project completion	1) Securing the training budget (after completion) < For GDC > The training budget seems to be on a downward trend since 2013. This is a serious concern to the sustainability of the Project outcomes. In order not to reverse the progress made during the Project, the team strongly recommends GDC management and the Kenyan government to revisit the importance of capacity development. The team considers the brilliant success of Kenya's geothermal development was thanks to the government's continued commitment to human resources development over a long period of time. Kenya is now the region's leading country not only in terms of installed capacity, but also in terms of human resources. The Team considers the benefits of its capacity development as follows. The Steam Report 1 that contributed to acceleration of the IPPs process in Menengai would not have been possible without training of the GDC staffs. Also, GDC staff's capacity to site wells have significantly improved through training. This contributed to success rate of borehole drilling to improve. Also, skills for drilling management as well as drilling technique improved, which contributed to more successful wells, less external input, less serious accidents, and more efficient drilling. More efficiency and successful wells means that GDC was able to reap considerable benefits in financial terms. But these benefits cannot be sustained if GDC's investments in human resource development is not sustained at adequate levels. The Team therefore recommends GDC to calculate the financial benefits of training to its operations and to discuss with the management on its importance. 2) Geothermal Center of Excellence and Academia (after completion)

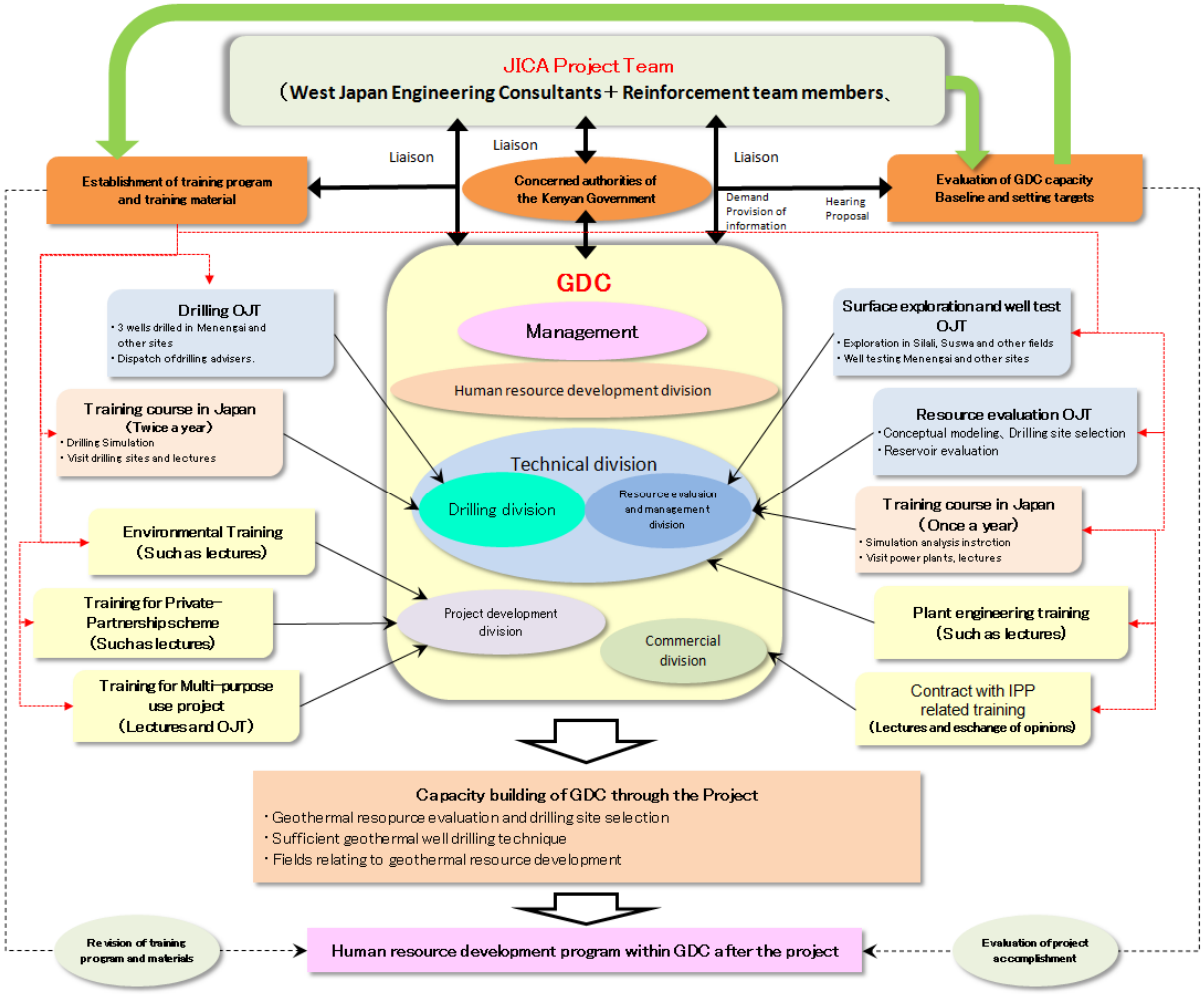
			<For GDC> GDC has so far made important and significant contributions to capacity development of geothermal human resources not only in Kenya but in East Africa. It has also made important contributions to the academic community. The Team recommends that GDC continues on this trajectory and utilize its knowledge assets to the fullest extent to expand its influence in this area. 3） Environment Management System (EMS) <For GDC> The JICA expert team trained the GDC Environment team on Environment Management System (EMS) based on GDC's request to acquire an EMS certification. The Project team also developed an implementation schedule to introduce EMS. Acquiring EMS certification is crucial if GDC aims to become an international player in geothermal development. The Team recommends GDC to secure necessary budget for certification and to complete the EMS certification process after Project completion.
		Lessons Learned	
		Importance of holding an annual JCC	Holding an annual JCC is more than a formality. It is an opportunity for high-level persons from the Kenyan government, GDC management, and JICA to take stock of the progress as well as to discuss major issues regarding the project. Considering the complexity of the project and strategic and political importance of the project, the JCC should have been held at least once a year. This may have prevented some activities such as Output 7 from being delayed. Also, it would have given an opportunity for high level participants to exchange views on the budgetary issues. In the future projects, project managers of implementing agencies and JICA experts should be given clear responsibility to arrange the JCC at least once a year.
		Challenge of managing projects from two different locations	The project locations were divided between Nakuru and Nairobi. Most of the project activities were implemented in Nakuru, but major decisions were made in Nairobi. There was a challenge in sharing the same level of information in the two locations. The long term expert visited Nakuru frequently, and made a detailed report of her findings to the management in Nairobi. This may have improved the flow of information between the two locations. JICA experts could have made a habit of stopping by in Nairobi to report to GDC management after each visit so that the information gap between the two locations could be minimized.
		Management of expert teams	Due to a large volume of JICA experts, the JICA expert team and JICA headquarters struggled with contract management. Future projects could consider implementing projects in smaller manageable phases, or cutting down on the number of experts to a manageable size. Utilization of third country experts, such as from the Philippines, proved to be very effective. Similar projects can consider this as an option to enable JICA to respond more effectively to the needs of the counterpart organizations.
		Flexibility to meet changing needs of GDC	JICA exercised maximum flexibility to respond to the changes in GDC's needs and progress of capacity development. For example, the Project dispatched additional experts on directional drilling and mud drilling. The new inputs allowed the Project to reach the key performance indicator of the project objective. The success rate of discharging wells improved by 18% (from a baseline of 38% to 45%). The rate of wells reaching target depth improved by 8% (from a baseline of 86% to 93%). It should be noted that 100% of the four wells drilled in 2018 reached the target depth.

			Similarly, both sides decided to modify the R/D in order to include production of Steam Reports 1 and 2 in order to facilitate the IPP. This input was especially important for the Project to achieve the overall goal after project completion, which says “GDC will be able to properly provide steam to power generation utilities.” Lessons learned is that the Project should exercise maximum flexibility taking into careful consideration the effect of the changes to the overall goals and project objectives.
		(5) PDM based management	In addition, the Project has not kept tracking their activities and progress in the context of PDM and PO as a tool of project management. In other words, PDM and PO have not been paid enough attention, which may have turned to be one of the reasons for some activities delayed such as ones in Output 7. Lessons learned is that future project should make sure that the projects are conducted and reported based on the mutually agreed PDM and PO on a periodical basis. If the reporting is delayed, then both JICA and the implementing agency, as well as the representatives of the JCC, should make sure that the Project submits the reports without delay. As suggested earlier, JCC should be held more than once a year to in order to confirm the progress of the projects based on PDM and PO

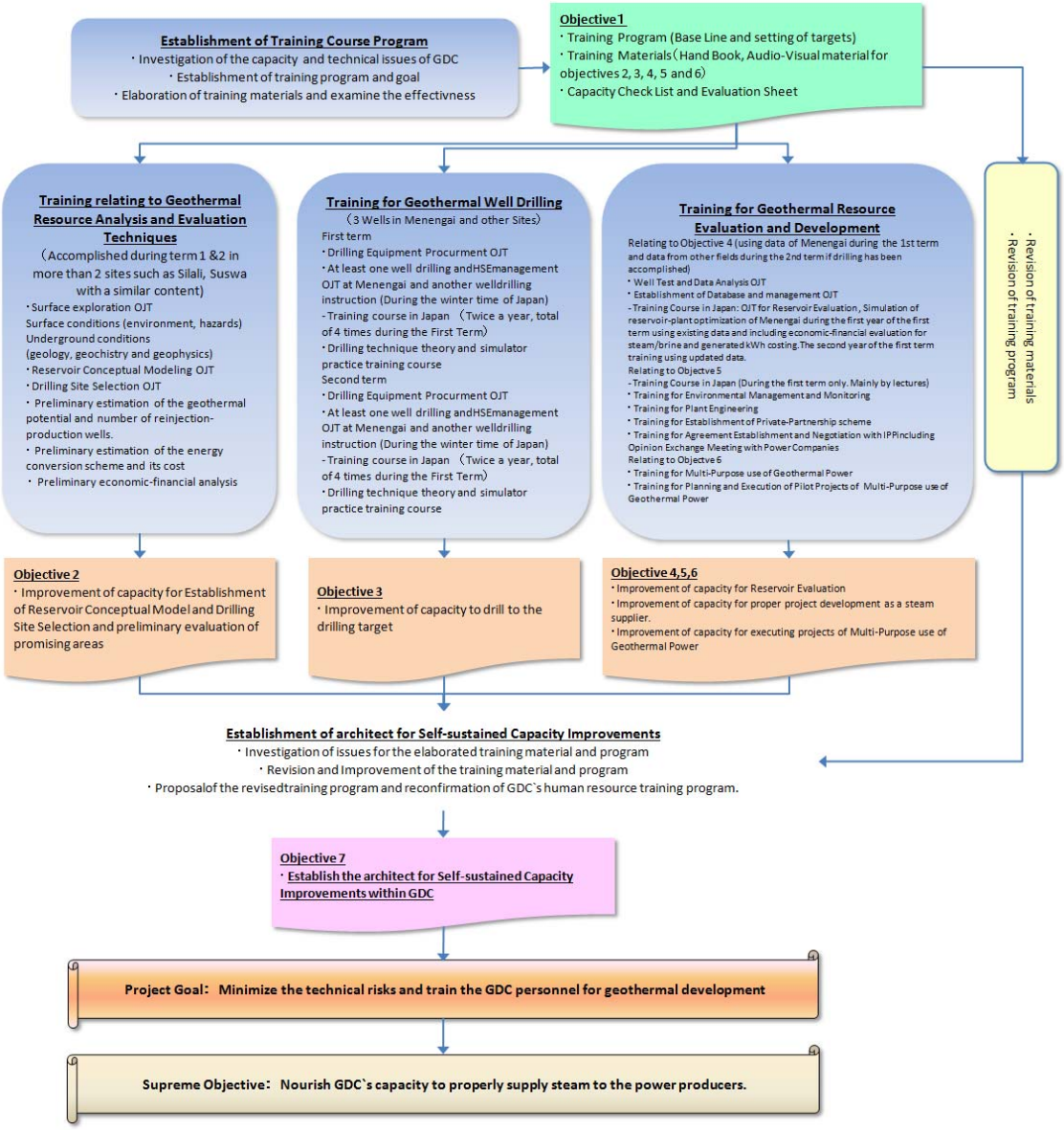
ANNEX

6：Project Flow Chart

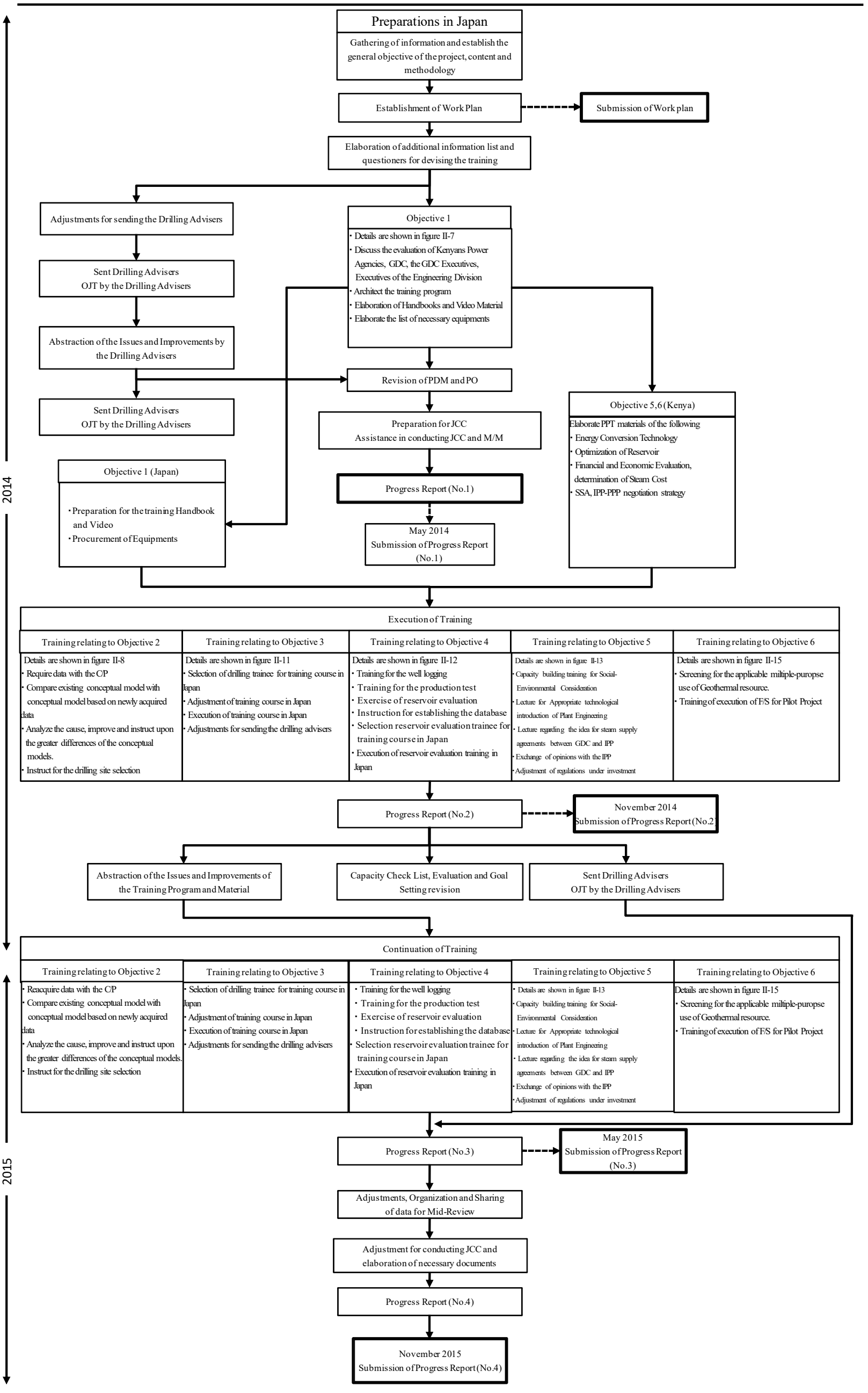
ANNEX 6: Project Flow Chart



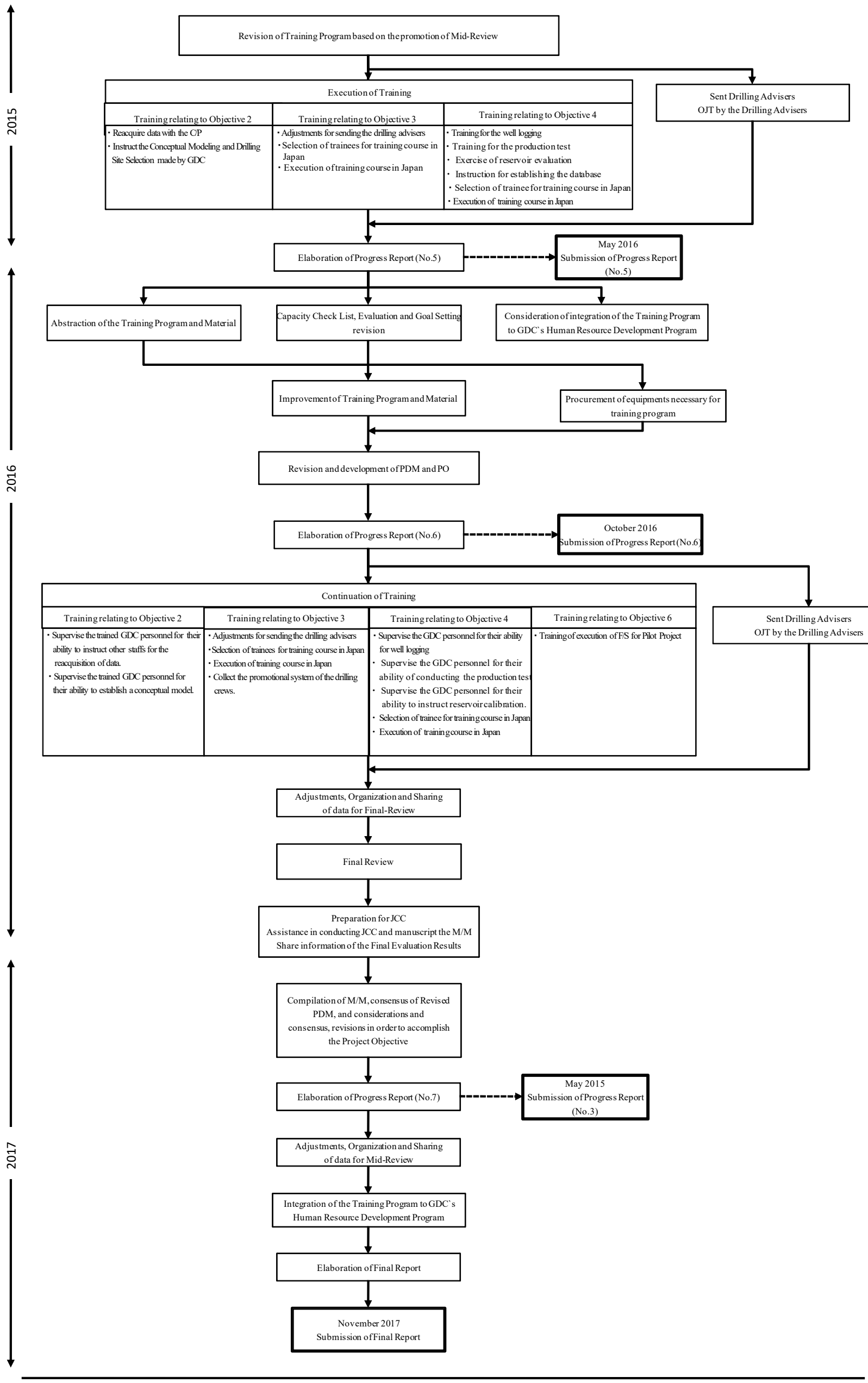
Work concept of capacity building project for geothermal development in Kenya



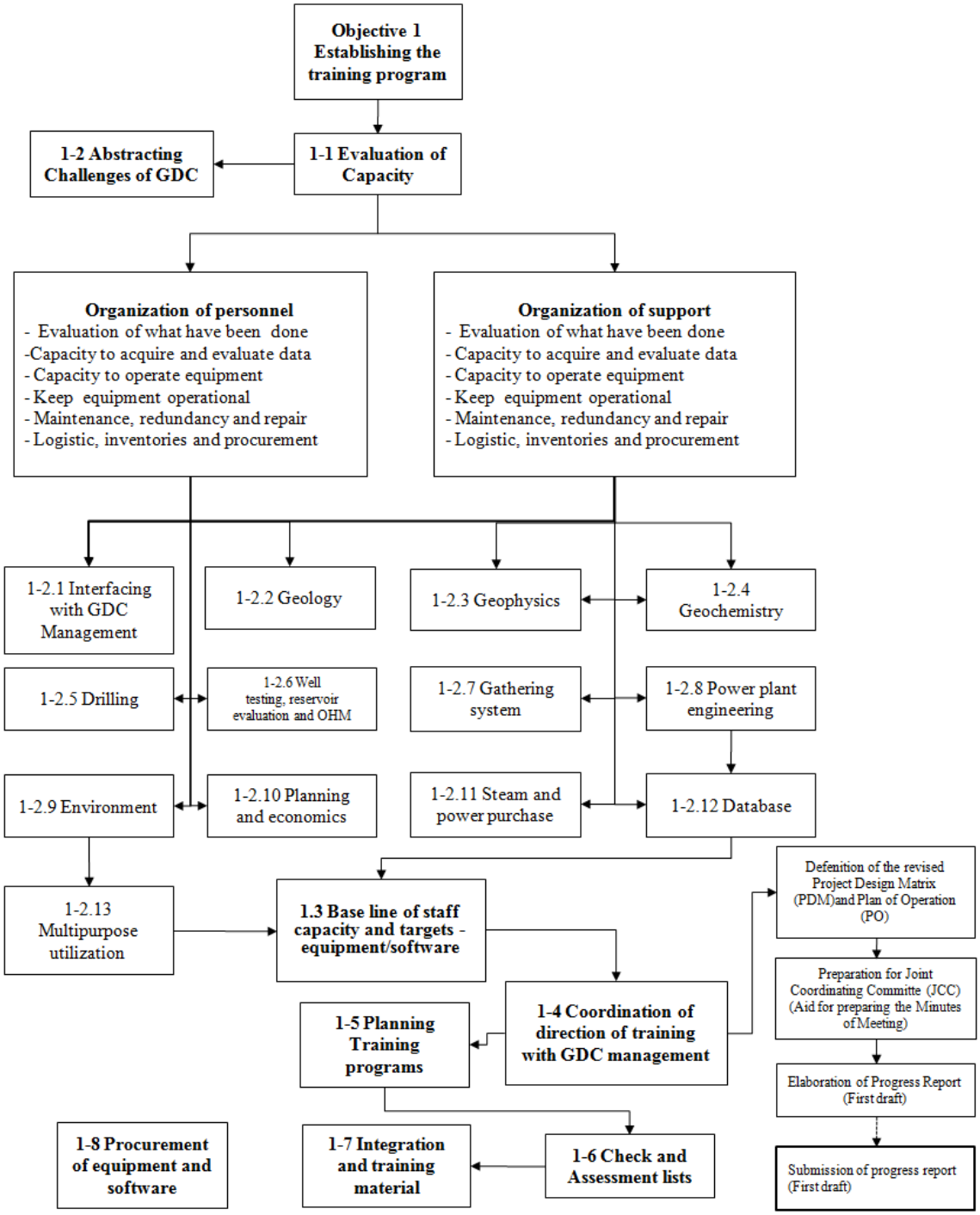
Conceptual flow for the capacity building project for geothermal development in Kenya



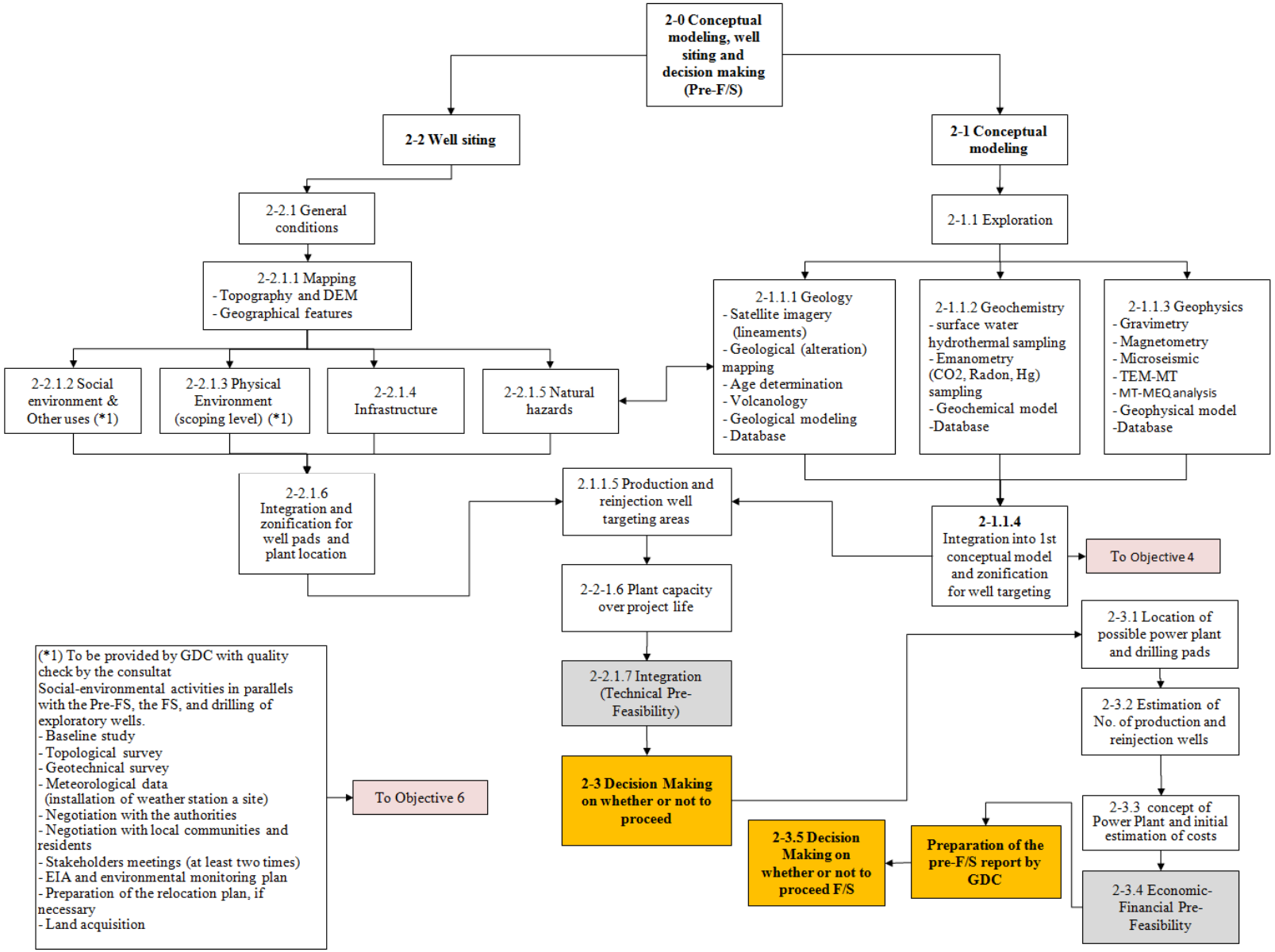
Work Plan Flow Chart (First Term)



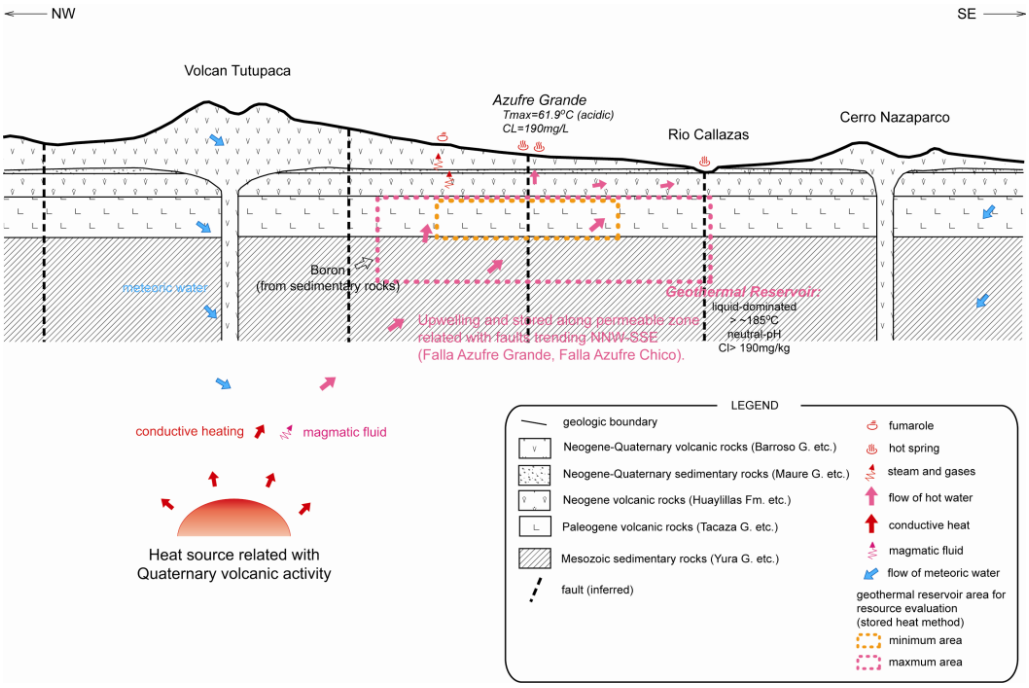
Work Plan Flow Chart (Second Term)



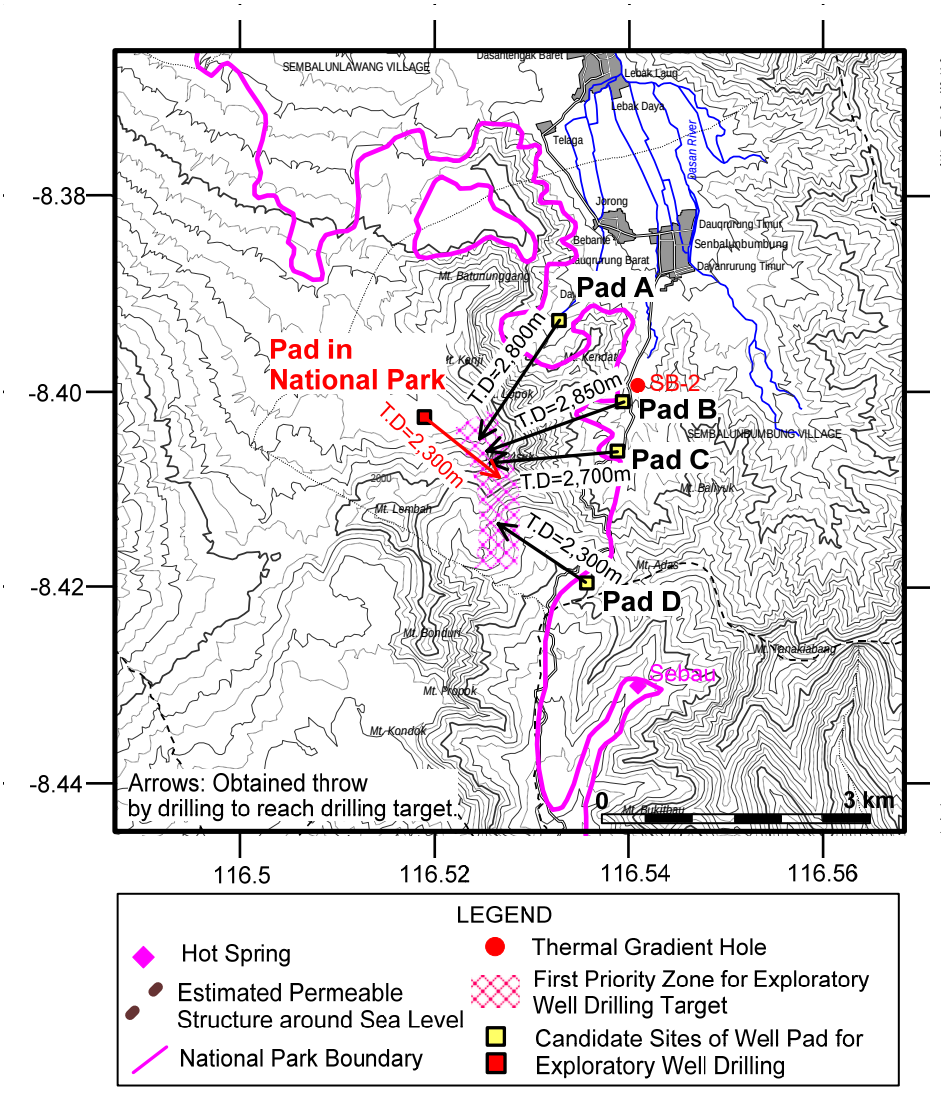
Objective 1 flow chart



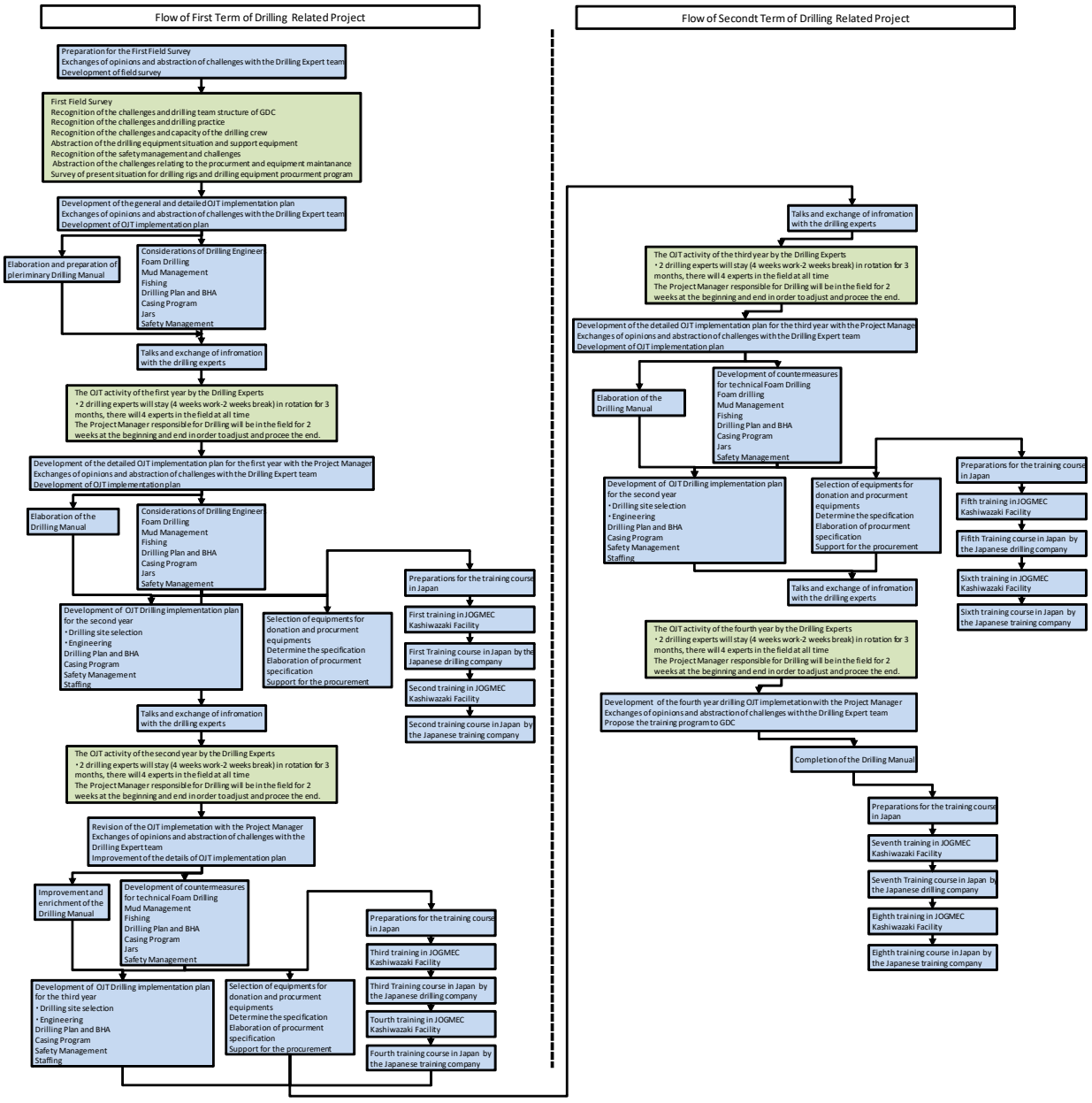
Objective 2 flow chart



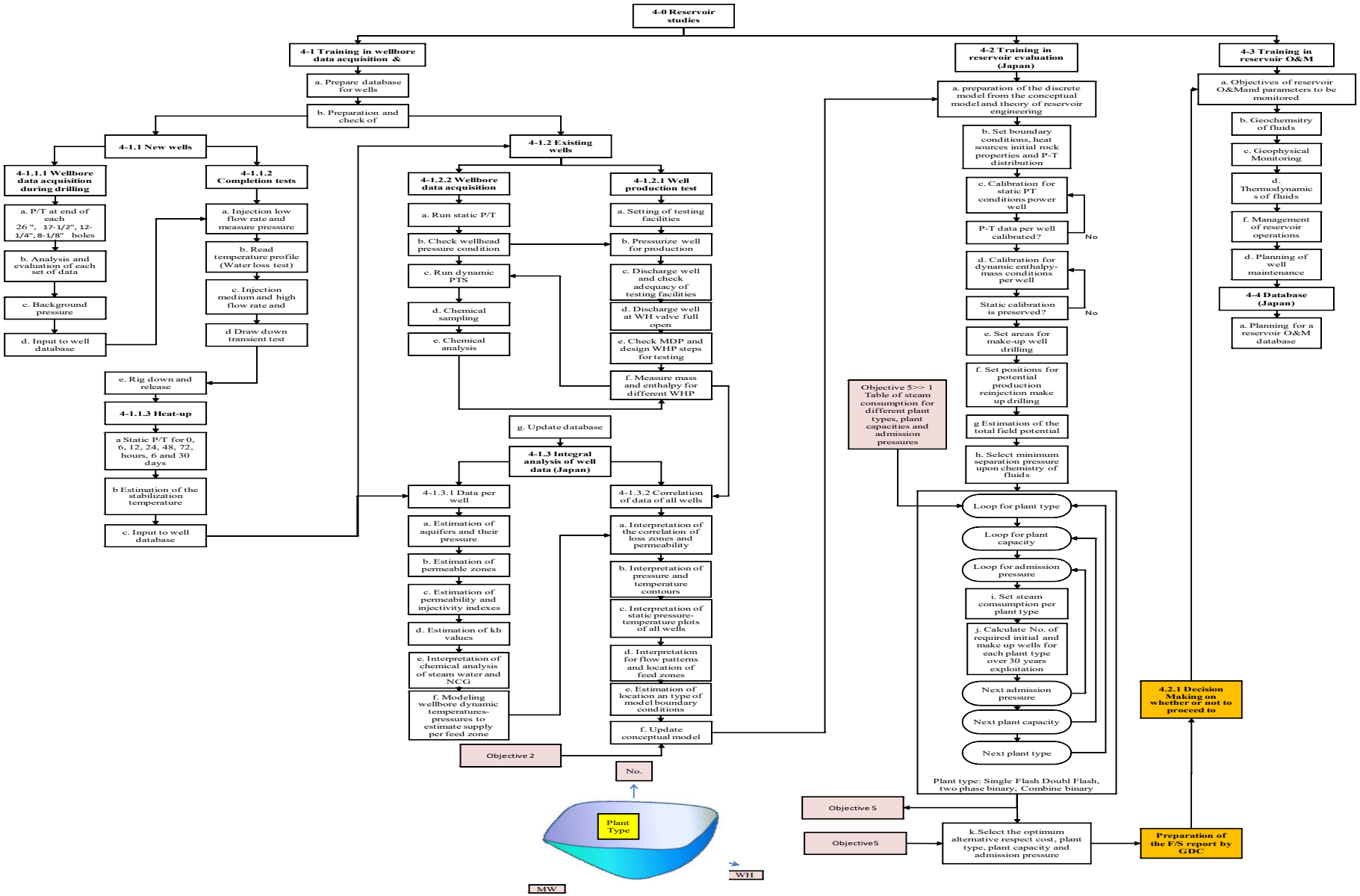
Example of Conceptual Model（Geothermal field in Peru：JICA, 2012）



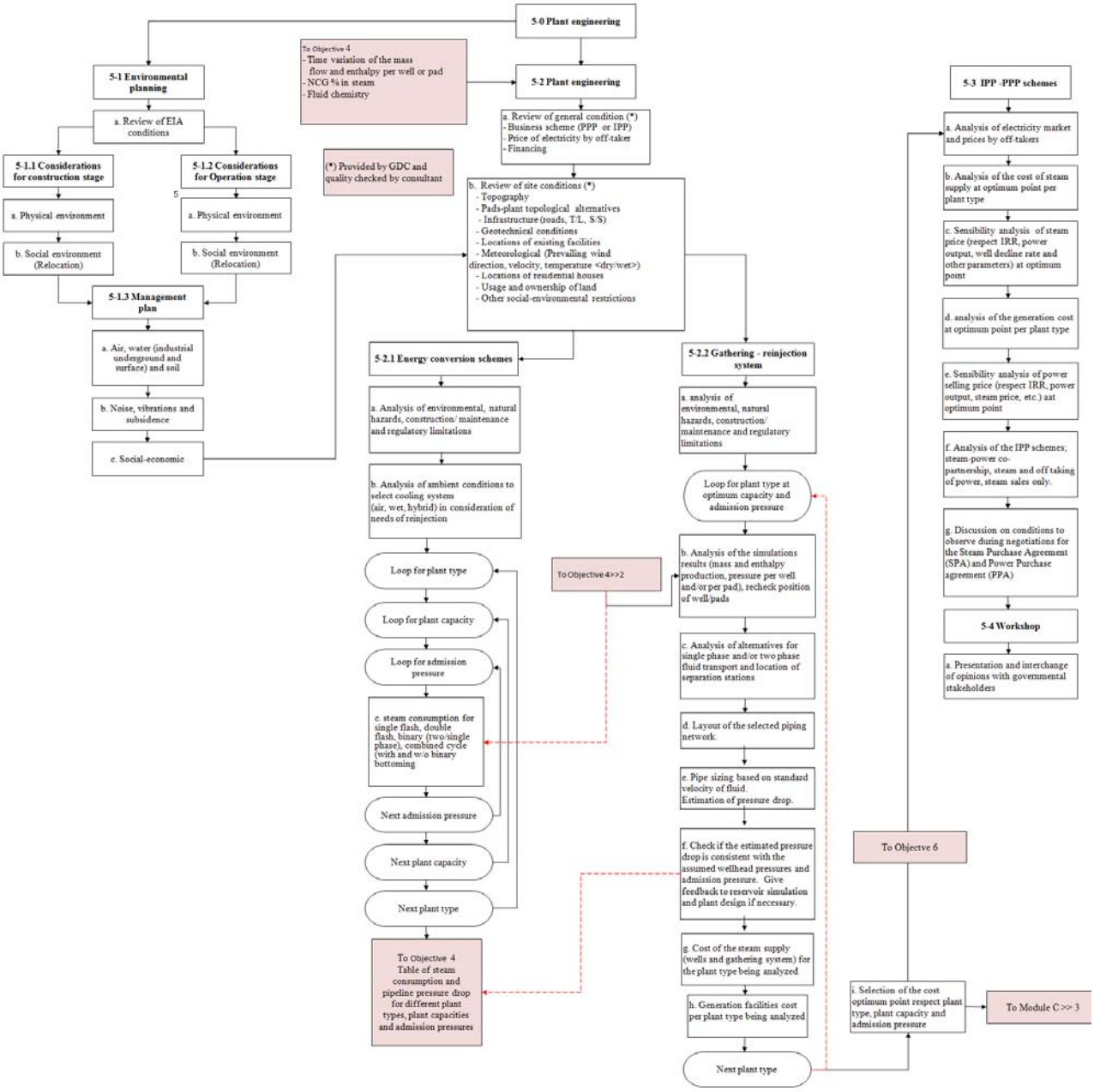
Example of drilling site selection (Geothermal field in Indonesia：JICA, 2011



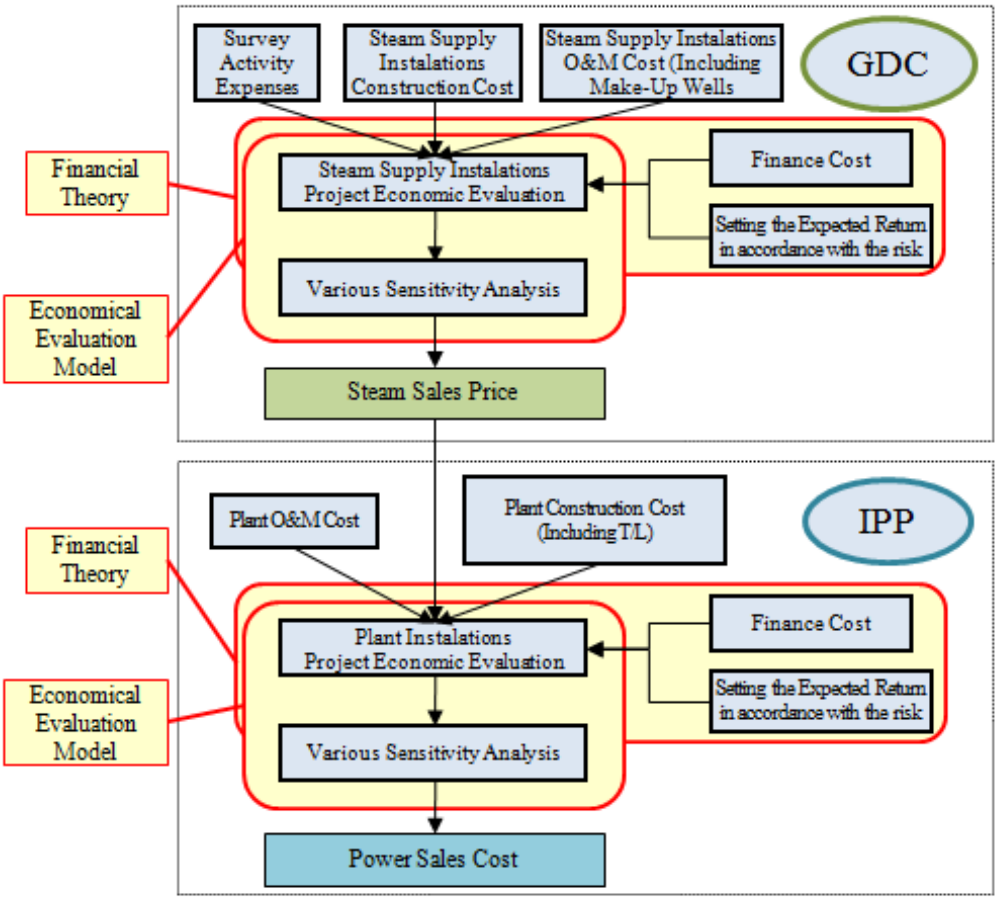
Objective 3 flow chart



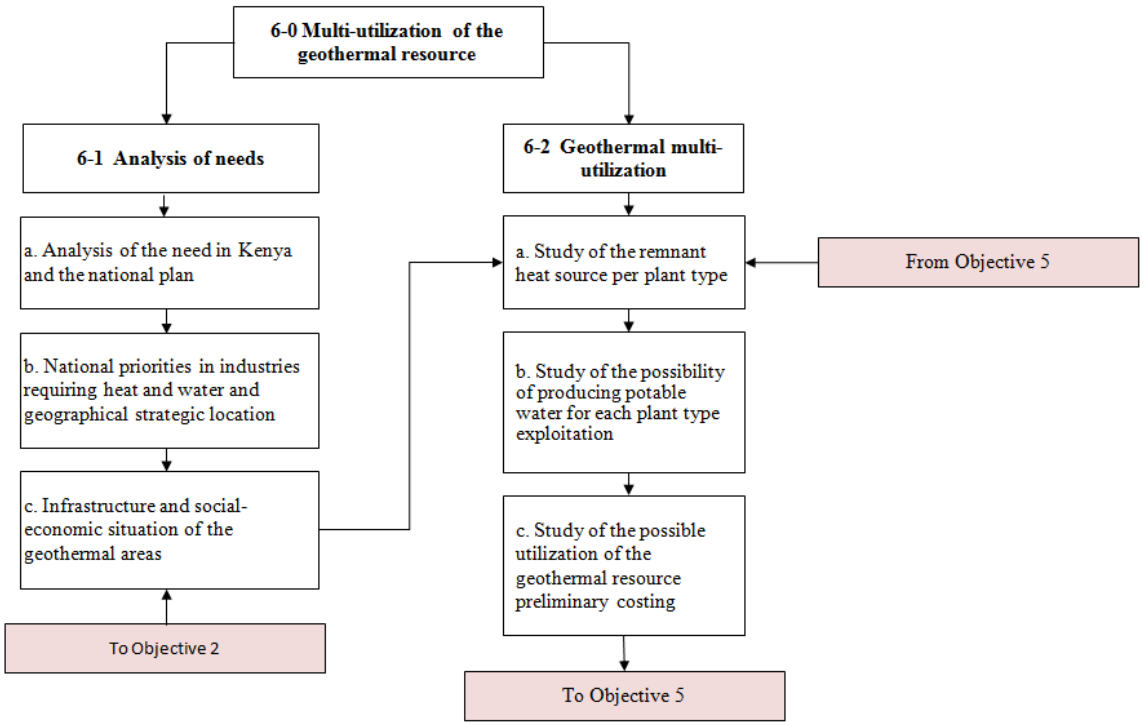
Objective 4 flow chart



Objective 5 flow chart



Flow of steam & power sales price settings and its necessary knowledge and capacity

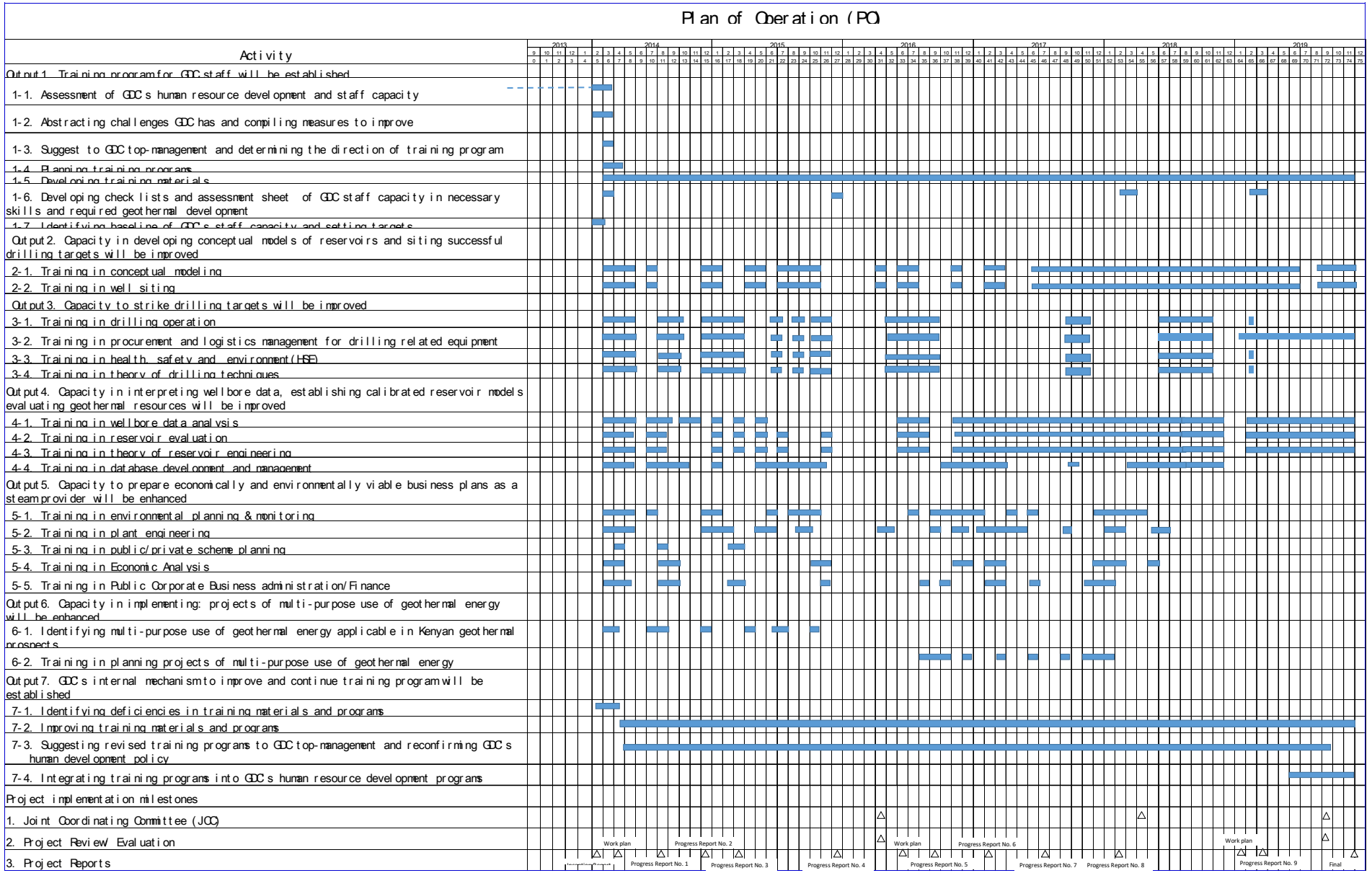


Objective 6 flow chart

ANNEX

7：Plan of Operation

ANNEX 7: Plan of Operation

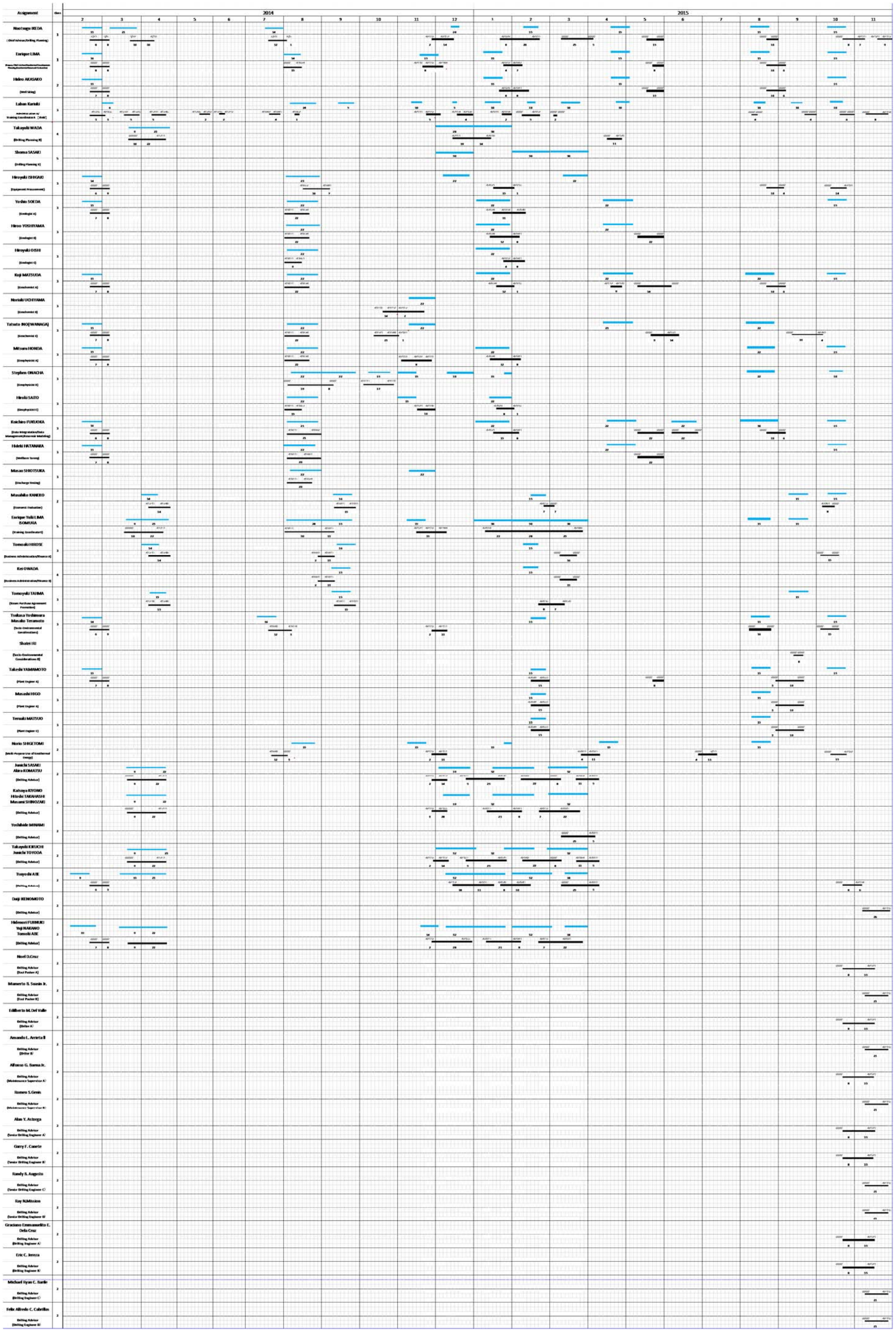


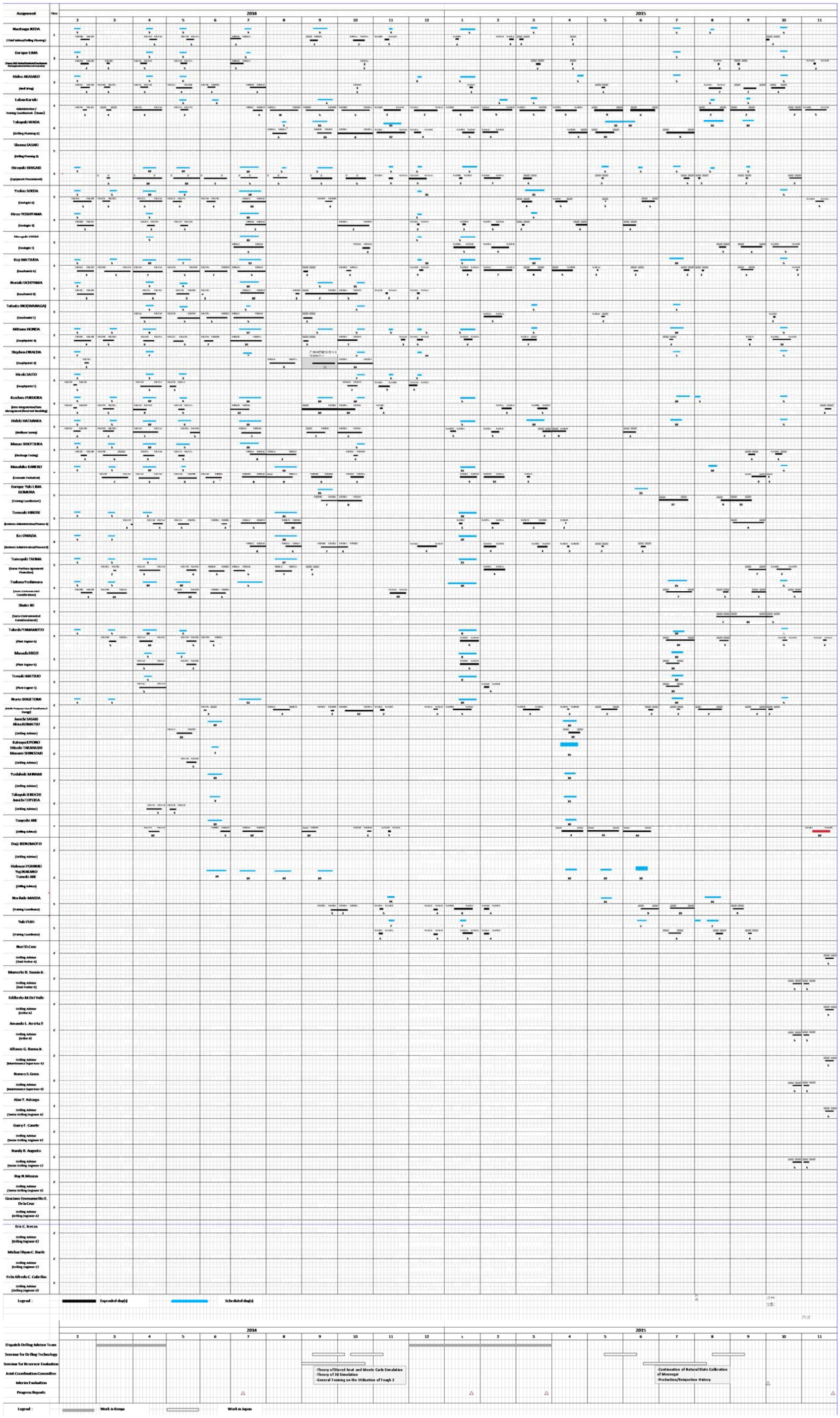
ANNEX

8：Project Manning Chart

ANNEX 8: Project Manning Chart

Manning Schedule for Phase 1 (in this page: field assignment, in the next page: domestic assignment)




Assignment
Dispatch Drilling Advisor Team
Seminar for Drilling Technology
Seminar for Reservoir Evaluation
Joint Coordination Committee
Interim Evaluation
Progress Reports
-Theory of Stored-heat and Monte Carlo Simulation
-Theory of 3D Simulation
-General Training on the Utilization of Tough 2
-Continuation of Natural State Calibration of Menengai
-Production/Reinjection History
Legend :
Expended day(s)
Scheduled day(s)
Work in Kenya
Work in Japan

Manning Schedule for phase 2

	Assignment	Name	Affiliation	Class
Work in Kenya	Chief Advisor/Drilling Planning A	Naotsugu IKEDA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	1
	Deputy Chief Advisor/Geothermal Development Planning/Geothermal Reservoir Evaluation	Enrique LIMA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	1
	Well Siting	Hideo AKASAKO Hiroo YOSHIYAMA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	2
	Administration A/Training Coordinator A	Laban Kariuki	Global Synergy Link	3
	Training Coordinator B	Takayuki WADA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Drilling Planning B	Shoma SASAKI	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	5
	Equipment Procurement	Hiroyuki ISHIGAKI	Japan International Cooperation System (JICS)	3
	Geologist A	Yoshio SOEDA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Geologist B	Hiroo YOSHIYAMA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Geologist C	Yuki FUJII	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	5
	Geochemist A	Koji MATSUDA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Geochemist C	Tatsuto INO	LOVE EARTH 21CO., INC	3
	Geophysicist A	Mitsuru HONDA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Geophysicist B	Toshiyuki TOSHA	Japan Oil, Gas and Metals National Corporation(JOGMEC)	3
	Geophysicist C	Hiroki SAITO	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Data Integration/Data management	Tomohiro TAKAZONO	TROPS Co.,Ltd.	3
	Wellbore Survey/Discharge Testing/Reservoir Modeling A	Hideki HATANAKA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Economic Evaluation	Masahiko KANEKO	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	2
	Training Coordinator C	Enrique Yuki LIMA ISOMURA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	5
	Drilling Advisor A	Akira KOMATSU Masashi IWAYA	SK Engineering Co., Ltd.	5
	Drilling Advisor B	** **	** **	5
	Drilling Advisor C	Teruaki KOBAYASHI	Beta Co., Ltd.	5
	Drilling Advisor D	Winston R. Castillo	ThermaPrime-TP	5
	Drilling Advisor E	Tsuyoshi ABE	Beta Co., Ltd.	5
	Drilling Advisor F	Yuji NAKANO	Nittetsu Mining Consultants Co., Ltd.	5
	Toolpusher A	Noel D.Cruz	ThermaPrime-TP	5
	Maintenance Supervisor A	Romeo S.Genis	ThermaPrime-TP	5
	Senior Drilling Engineer A	Michael Evan C. Barile	ThermaPrime-TP	5
	Toolpusher B	Masserto B.Suasin Jr.	ThermaPrime-TP	5
	Maintenance Supervisor B	Alfonso G.Baena Jr. Randy S.Day	ThermaPrime-TP	5
	Senior Drilling Engineer B	Garry F. Canela Graciano Emmanuelle E. Dela Cruz III Conrado Jr. M. Abanilla	ThermaPrime-TP	5
	Mud Engineer	Yoshitaka ISHIKAWA	Telnite Co., Ltd.	4
	Drilling Engineer	Edralin C.Icabalos	ThermaPrime-TP	5
	Project Management A	Kazuki TAKEUCHI Takuji OKAMURA Andres DE CASTRO	Japan International Cooperation System (JICS) Japan International Cooperation System (JICS) WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	2
	Project Management B1	Yutaka MIKI	The Japan Research Institute, Limited	3
	Project Management B2	Koichiro DANNO	The Japan Research Institute, Limited	4
	Project Management C	Yoko CHIVERS	Sumitomo Mitsui Banking Corporation	3
	Multi-purpose Use of Geothermal Energy A	Norio SHIGETOMI	Mitsubishi Research Institute Inc.	2
	Business Administration/Finance A	Tomoaki HIROSE	Mitsubishi Research Institute Inc.	3
	Environmental and Social Safeguard A	Mamiko TERAMOTO	Nippon Koei Co., Ltd.	3
	Environmental and Social Safeguard B	Shatei IRI	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Power Plant Engineering A	Takeshi YAMAMOTO	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Power Plant Engineering B	Tatsunari HAYASHI	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Power Plant Engineering C	Teruaki MATSUO	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Power Plant Engineering D1	Tijo John Thomas	Yokogawa Electric Corporation	5
	Power Plant Engineering D2	Rami Sultan Mohamed Saeed	Yokogawa Electric Corporation	5

	Assignment	Name	Affiliation	Class
Work in Japan	Chief Advisor/Drilling Planning A	Naotsugu IKEDA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	1
	Deputy Chief Advisor/Geothermal Development Planning/Geothermal Reservoir Evaluation	Enrique LIMA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	1
	Well Siting	Hideo AKASAKO Hiroo YOSHIYAMA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	2
	Administration A/Training Coordinator A	Laban Kariuki	Global Synergy Link	3
	Administration B	Tetsu IKEDA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Training Coordinator B	Takayuki WADA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Drilling Planning B	Shoma SASAKI	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	5
	Equipment Procurement	Hiroyuki ISHIGAKI	Japan International Cooperation System (JICS)	3
	Geologist A	Yoshio SOEDA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Geologist B	Hiroo YOSHIYAMA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Geologist C	Yuki FUJII	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	5
	Geochemist A	Koji MATSUDA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Geochemist B	Noriaki UCHIYAMA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Geochemist C	Tatsuto INO	LOVE EARTH 21CO., INC	3
	Geophysicist A	Mitsuru HONDA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Geophysicist B	Toshiyuki TOSHA	Japan Oil, Gas and Metals National Corporation(JOGMEC)	3
	Geophysicist C	Hiroki SAITO	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Geophysicist D	Haruhiro INAGAKI	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	5
	Data Integration/Data management	Tomohiro TAKAZONO	TROPS Co.,Ltd.	3
	Wellbore Survey/Discharge Testing/Reservoir Modeling A	Hideki HATANAKA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Reservoir Modeling B	Norihide MAEDA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	5
	Economic Evaluation	Masahiko KANEKO	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	2
	Training Coordinator C	Enrique Yuki LIMA ISOMURA	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	5
	Drilling Advisor A	Akira KOMATSU Masashi IWAYA	SK Engineering Co., Ltd.	2
	Drilling Advisor B	** **	** **	2
	Drilling Advisor C	Teruaki KOBAYASHI	Beta Co., Ltd.	2
	Drilling Advisor D	Winston R. Castillo	ThermaPrime-TP	2
	Drilling Advisor E	Tsuyoshi ABE	Beta Co., Ltd.	2
	Drilling Advisor F	Yuji NAKANO	Nittetsu Mining Consultants Co., Ltd.	2
	Toolpusher A	Noel D.Cruz	ThermaPrime-TP	2
	Maintenance Supervisor A	Romeo S.Genis	ThermaPrime-TP	2
	Senior Drilling Engineer A	Michael Evan C. Barile	ThermaPrime-TP	2
	Mud Engineer	Yoshitaka ISHIKAWA	Telnite Co., Ltd.	4
	Project Management A	Kazuki TAKEUCHI Takuji OKAMURA Andres DE CASTRO	Japan International Cooperation System (JICS) Japan International Cooperation System (JICS) WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	2
	Project Management B1	Yutaka MIKI	The Japan Research Institute, Limited	3
	Project Management B2	Koichiro DANNO	The Japan Research Institute, Limited	4
	Project Management C	Yoko CHIVERS	Sumitomo Mitsui Banking Corporation	3
	Multi-purpose Use of Geothermal Energy A	Norio SHIGETOMI	Mitsubishi Research Institute Inc.	2
	Multi-purpose Use of Geothermal Energy B	Takayoshi KITADA	Mitsubishi Research Institute Inc.	3
	Business Administration/Finance A	Tomoaki HIROSE	Mitsubishi Research Institute Inc.	3
	Business Administration/Finance B	Makiko YAMAZOE	Mitsubishi Research Institute Inc.	3
	Environmental and Social Safeguard A	Mamiko TERAMOTO	Nippon Koei Co., Ltd.	3
	Environmental and Social Safeguard B	Shatei IRI	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Power Plant Engineering A	Takeshi YAMAMOTO	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Power Plant Engineering B	Tatsunari HAYASHI	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Power Plant Engineering C	Teruaki MATSUO	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	3
	Drilling Training Coordinator B Drilling Training Coordinator C Drilling Training Coordinator D Drilling Training Coordinator E Drilling Training Coordinator A	Tetsu IKEDA Takayuki WADA Shoma SASAKI Koji TSUNEKAWA Yohei ITO	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	5 5 5 5 6
	Reservoir Training Coordinator A	Yohei ITO	WEST JAPAN ENGINEERING CONSULTANTS, INC. (WEST JEC)	6

Legend:
- Expended day(s)
- Scheduled day(s)
- Work in Kenya
- Work in Japan

Dispatch Drilling Advisor Team
Seminar for Drilling Technology
Seminar for Reservoir Evaluation
Conceptual Modeling Training
Joint Coordination Committee
Interim/Final Evaluation
Progress Reports
Project Completion Report

ANNEX

9：List of Dispatched Experts

ANNEX 9: List of Dispatched Experts

First Phase

Name		Assignment	Period	Dispatched Days	M/M	Office affiliated
Naotsugu	IKEDA	Chief Advisor / Drilling Planning A	2014/2/21 ~ 2014/3/8	16days	0.53M/M	West JEC
			2014/3/22 ~ 2014/4/10	20days	0.67M/M	
			2014/7/20 ~ 2014/8/6	(13days)	0.43M/M	
			2014/11/29 ~ 2014/12/14	16days	0.53M/M	
			2015/1/24 ~ 2015/2/20	28days	0.93M/M	
			2015/3/7 ~ 2015/4/5	30days	1.00M/M	
			2015/5/16 ~ 2015/5/30	15days	0.50M/M	
			2015/8/22 ~ 2015/8/31	10days	0.33M/M	
			2015/10/24 ~ 2015/11/7	15days	0.50M/M	
			2015/11/21 ~ 2015/11/29	9days	0.30M/M	
Enrique	LIMA	Deputy Chief Advisor	2014/2/21 ~ 2014/3/8	16days	0.53M/M	West JEC
			2014/8/2 ~ 2014/8/23	(15days)	0.50M/M	
			2014/11/22 ~ 2014/12/6	(8days)	0.27M/M	
			2015/1/28 ~ 2015/2/7	11days	0.37M/M	
			2015/5/23 ~ 2015/5/30	8days	0.27M/M	
			2015/8/22 ~ 2015/9/6	16days	0.53M/M	
Hideo	AKASAKO	Well Siting	2014/2/22 ~ 2014/3/8	15days	0.50M/M	West JEC
			2015/1/24 ~ 2015/2/8	16days	0.53M/M	
			2015/5/16 ~ 2015/5/30	15days	0.50M/M	
			2015/8/22 ~ 2015/9/6	16days	0.53M/M	
Laban	KARIUKI	Local Project Coordinator/OJT Coordinator A	2014/2/26 ~ 2014/3/3	6days	0.20M/M	GSL
			2014/3/24 ~ 2014/3/28	5days	0.17M/M	
			2014/4/10 ~ 2014/4/17	(5days)	0.17M/M	
			2014/5/27 ~ 2014/5/28	2days	0.07M/M	
			2014/6/6 ~ 2014/6/7	2days	0.07M/M	
			2014/7/22 ~ 2014/7/25	4days	0.13M/M	
			2014/8/11 ~ 2014/8/11	1days	0.03M/M	
			2014/11/25 ~ 2014/11/29	5days	0.17M/M	
			2014/12/16 ~ 2014/12/30	(4days)	0.13M/M	
			2015/1/29 ~ 2015/1/30	2days	0.07M/M	
			2015/2/8 ~ 2015/2/17	(5days)	0.17M/M	
			2015/3/6 ~ 2015/3/7	2days	0.07M/M	
			2015/8/9 ~ 2015/8/12	4days	0.13M/M	
			2015/9/27 ~ 2015/9/30	4days	0.13M/M	
			2015/10/23 ~ 2015/10/31	(6days)	0.20M/M	
			2015/11/9 ~ 2015/11/26	(8days)	0.27M/M	
Takayuki	WADA	Training Coordinator B	2014/3/22 ~ 2014/4/22	32days	1.07M/M	West JEC
			2014/12/13 ~ 2015/1/14	33days	1.10M/M	
			2015/4/16 ~ 2015/4/26	11days	0.37M/M	
Hiroyuki	ISHIGAKI	Equipment Procurement	2014/2/23 ~ 2014/3/9	15days	0.50M/M	JICS
			2014/8/16 ~ 2014/9/7	23days	0.77M/M	
			2015/1/17 ~ 2015/2/1	16days	0.53M/M	
			2015/8/22 ~ 2015/9/4	14days	0.47M/M	
			2015/10/11 ~ 2015/10/24	14days	0.47M/M	
Yoshio	SOEDA	Geologist A	2014/2/22 ~ 2014/3/8	15days	0.50M/M	West JEC
			2014/8/2 ~ 2014/8/23	22days	0.73M/M	
			2015/1/20 ~ 2015/2/13	(11days)	0.37M/M	
Hiroo	YOSHIYAMA	Geologist B	2014/8/2 ~ 2014/8/23	22days	0.73M/M	West JEC
			2015/1/20 ~ 2015/2/8	20days	0.67M/M	
			2015/5/9 ~ 2015/5/30	22days	0.73M/M	
Hiroyuki	OISHI	Geologist C	2014/8/2 ~ 2014/8/10	9days	0.30M/M	West JEC
			2015/1/28 ~ 2015/2/8	12days	0.40M/M	
Koji	MATSUDA	Geochemist A	2014/2/22 ~ 2014/3/8	15days	0.50M/M	West JEC
			2014/8/2 ~ 2014/8/23	22days	0.73M/M	
			2015/1/20 ~ 2015/2/1	13days	0.43M/M	
			2015/5/9 ~ 2015/6/7	(14days)	0.47M/M	
			2015/8/22 ~ 2015/9/6	16days	0.53M/M	
			2015/4/18 ~ 2015/4/26	9days	0.30M/M	
Noriaki	UCHIYAMA	Geochemist B	2014/10/18 ~ 2014/11/9	(16days)	0.53M/M	West JEC
Tatsuto	IWANAGA	Geochemist C	2014/2/22 ~ 2014/3/8	15days	0.50M/M	KYUDEN.
			2014/8/2 ~ 2014/8/23	22days	0.73M/M	
			2014/10/11 ~ 2014/11/1	22days	0.73M/M	
			2015/5/23 ~ 2015/6/14	23days	0.77M/M	
			2015/9/12 ~ 2015/10/4	23days	0.77M/M	
Mitsuru	HONDA	Geophysicist A	2014/2/22 ~ 2014/3/8	15days	0.50M/M	West JEC

			2014/8/2 ~ 2014/8/23	22days	0.73M/M	
			2014/11/2 ~ 2014/11/23	(8days)	0.27M/M	
			2015/1/20 ~ 2015/2/8	20days	0.67M/M	
Stephan	Onacha	Geophysicist B	2014/8/4 ~ 2014/9/8	(27days)	0.90M/M	GEOSTEP
			2014/10/3 ~ 2014/10/27	(17days)	0.57M/M	
Hiroki	SAITO	Geophysicist C	2014/8/2 ~ 2014/8/16	15days	0.50M/M	West JEC
			2014/11/15 ~ 2014/11/30	16days	0.53M/M	
			2015/1/24 ~ 2015/2/1	9days	0.30M/M	
Koichiro	FUKUOKA	Data Integratation/ Data Management/ Reservoir Modeling	2014/2/21 ~ 2014/3/8	16days	0.53M/M	West JEC
			2014/8/4 ~ 2014/8/31	(21days)	0.70M/M	
			2015/1/17 ~ 2015/2/8	23days	0.77M/M	
			2015/5/9 ~ 2015/5/30	22days	0.73M/M	
			2015/6/6 ~ 2015/6/27	22days	0.73M/M	
			2015/8/22 ~ 2015/9/6	16days	0.53M/M	
Hideki	HATANAKA	Wellbore Survey	2014/2/22 ~ 2014/3/8	15days	0.50M/M	West JEC
			2014/8/4 ~ 2014/8/30	(20days)	0.67M/M	
			2015/5/9 ~ 2015/5/30	22days	0.73M/M	
Masao	SHIOTSUKA	Discharge Testing	2014/8/4 ~ 2014/8/23	20days	0.67M/M	West JEC
Masahiko	KANEKO	Economic Evaluation	2014/4/6 ~ 2014/4/19	14days	0.47M/M	West JEC
			2014/9/13 ~ 2014/9/27	15days	0.50M/M	
			2015/2/22 ~ 2015/3/7	14days	0.47M/M	
			2015/10/4 ~ 2015/10/11	8days	0.27M/M	
Enrique Yuki	LIMA ISOMURA	Training Coordinator C	2014/3/22 ~ 2014/4/22	32days	1.07M/M	West JEC
			2014/8/2 ~ 2014/9/13	43days	1.43M/M	
			2014/11/15 ~ 2014/12/6	(15days)	0.50M/M	
			2015/1/10 ~ 2015/3/25	75days	2.50M/M	
Tomoaki	HIROSE	Business Administration/Finance A	2014/4/6 ~ 2014/4/19	14days	0.47M/M	MRI.
			2014/8/30 ~ 2014/9/13	15days	0.50M/M	
			2015/3/7 ~ 2015/3/22	16days	0.53M/M	
			2015/10/3 ~ 2015/10/17	15days	0.50M/M	
Kei	OWADA	Business Administration/Finance B	2014/8/30 ~ 2014/9/13	15days	0.50M/M	MRI.
			2015/3/9 ~ 2015/3/23	15days	0.50M/M	
Tomoyuki	TAJIMA	Steam Purchase Agreement Promotion	2014/4/5 ~ 2014/4/19	15days	0.50M/M	KIC.
			2014/9/13 ~ 2014/9/27	15days	0.50M/M	
			2015/2/21 ~ 2015/3/7	15days	0.50M/M	
Tsukasa	YOSHIMURA	Socio-Environmental Considerations	2014/2/23 ~ 2014/3/9	15days	0.50M/M	NIPPON KOEI CO., LTD.
			2014/7/20 ~ 2014/8/3	15days	0.50M/M	
			2014/11/29 ~ 2014/12/13	15days	0.50M/M	
Masako	TERAMOTO	Socio-Environmental Considerations	2015/8/7 ~ 2015/8/22	16days	0.53M/M	NIPPON KOEI CO., LTD.
			2015/10/3 ~ 2015/10/17	15days	0.50M/M	
Shatei	IRI	Socio-Environmental Considerations	2015/9/12 ~ 2015/9/19	8days	0.27M/M	West JEC
Takeshi	YAMAMOTO	Plant Engineering A	2014/2/22 ~ 2014/3/8	15days	0.50M/M	West JEC.
			2015/2/14 ~ 2015/2/28	15days	0.50M/M	
			2015/5/23 ~ 2015/5/30	8days	0.27M/M	
			2015/8/29 ~ 2015/9/19	22days	0.73M/M	
Masashi	HIGO	Plant Engineering B	2015/2/14 ~ 2015/2/28	15days	0.50M/M	West JEC.
			2015/8/29 ~ 2015/9/19	22days	0.73M/M	
Teruaki	MATSUO	Plant Engineering C	2015/2/14 ~ 2015/2/28	15days	0.50M/M	West JEC.
			2015/8/29 ~ 2015/9/19	22days	0.73M/M	
Norio	SHIGETOMI	Multi-purpose Use of Geothermal Energy	2014/7/20 ~ 2014/8/3	15days	0.50M/M	MRI.
			2014/11/29 ~ 2014/12/13	15days	0.50M/M	
			2015/3/28 ~ 2015/4/11	15days	0.50M/M	
			2015/6/27 ~ 2015/7/11	15days	0.50M/M	
			2015/10/11 ~ 2015/10/25	15days	0.50M/M	
Jun-ichi	SASAKI	Drilling Advisor	2014/3/23 ~ 2014/4/22	31days	1.03M/M	SKE.
Akira	KOMATSU	Drilling Advisor	2014/11/29 ~ 2014/12/14	16days	0.53M/M	SKE.
			2014/12/27 ~ 2015/1/25	30days	1.00M/M	
			2015/2/7 ~ 2015/3/8	30days	1.00M/M	
			2015/3/21 ~ 2015/4/5	16days	0.53M/M	
Katsuya	KIYONO	Drilling Advisor	2014/3/23 ~ 2014/4/22	31days	1.03M/M	GOE.
			2014/11/29 ~ 2014/12/28	30days	1.00M/M	
Hitoshi	TAKAHASHI	Drilling Advisor	2015/1/11 ~ 2015/2/8	29days	0.97M/M	GOE.
Masami	SHINOZAKI	Drilling Advisor	2015/2/22 ~ 2015/3/22	29days	0.97M/M	GOE.
Yoshihide	MINAMI	Drilling Advisor	2015/3/7 ~ 2015/4/5	30days	1.00M/M	TDC
Takayuki	KIKUCHI	Drilling Advisor	2014/3/23 ~ 2014/4/22	31days	1.03M/M	MMTEC
			2014/11/29 ~ 2014/12/14	16days	0.53M/M	
			2014/12/27 ~ 2015/1/25	30days	1.00M/M	
Jun-ichi	TOYODA	Drilling Advisor	2015/2/7 ~ 2015/3/8	30days	1.00M/M	MMTEC
			2015/3/21 ~ 2015/4/5	16days	0.53M/M	
Tsuyoshi	ABE	Drilling Advisor	2014/2/23 ~ 2014/3/3	9days	0.30M/M	Bets Limited

			2014/12/14 ~ 2015/1/11	29days	0.97M/M	
			2015/1/24 ~ 2015/2/10	18days	0.60M/M	
			2015/3/7 ~ 2015/4/5	30days	1.00M/M	
			2015/10/24 ~ 2015/11/6	14days	0.47M/M	
Daiji	IKENOMOTO	Drilling Advisor	2015/11/3 ~ 2015/11/28	26days	0.87M/M	Bets Limited
Hidenori	FUJINUKI	Drilling Advisor	2014/2/22 ~ 2014/3/8	15days	0.50M/M	NMCC.
Yuji	NAKANO	Drilling Advisor	2014/3/23 ~ 2014/4/22	31days	1.03M/M	NMCC.
			2015/1/11 ~ 2015/2/8	29days	0.97M/M	
			2015/2/22 ~ 2015/3/22	29days	0.97M/M	
TOMOKI	ABE	Drilling Advisor	2014/11/29 ~ 2014/12/28	30days	1.00M/M	NMCC.
Noel D.	Curz	Tool Pusher A	2015/10/24 ~ 2015/11/15	23days	0.76M/M	ThermaPrime.
Mamerto B.	Suasin Jr.	Tool Pusher B	2015/11/8 ~ 2015/11/28	21days	0.70M/M	ThermaPrime.
Edilberto M.	Del Valle	Driller A	2015/10/24 ~ 2015/11/15	23days	0.76M/M	ThermaPrime.
Amando L.	Arrieta ll	Driller B	2015/11/8 ~ 2015/11/28	21days	0.70M/M	ThermaPrime.
Alfonso G.	Baena Jr.	Maintenance Superintendant A	2015/10/24 ~ 2015/11/15	23days	0.76M/M	ThermaPrime.
Romeo S.	Genis	Maintenance Superintendant B	2015/11/8 ~ 2015/11/28	21days	0.70M/M	ThermaPrime.
Alan Y.	Astorga	Senior Drilling Engineer A	2015/10/24 ~ 2015/11/15	23days	0.76M/M	ThermaPrime.
Garry F.	Canete	Senior Drilling Engineer B	2015/10/24 ~ 2015/11/15	23days	0.76M/M	ThermaPrime.
Randy B.	Augusto	Senior Drilling Engineer C	2015/11/8 ~ 2015/11/28	21days	0.70M/M	ThermaPrime.
Ray N.	Mission	Senior Drilling Engineer D	2015/11/8 ~ 2015/11/28	21days	0.70M/M	ThermaPrime.
Graciano Emmanuelito	E. Dela Cruz	Drilling Engineer A	2015/10/24 ~ 2015/11/15	23days	0.76M/M	ThermaPrime.
Eric C.	Jereza	Drilling Engineer B	2015/10/24 ~ 2015/11/15	23days	0.77M/M	ThermaPrime.
Michael Ryan	C. Barile	Drilling Engineer C	2015/11/8 ~ 2015/11/28	21days	0.70M/M	ThermaPrime.
Felix Alfredo	C. Cabrillas	Drilling Engineer D	2015/11/8 ~ 2015/11/28	21days	0.70M/M	ThermaPrime.
			Total	2827days	94.19M/M	

Second Phase

Name		Assignment	Period			Dispatched Days	M/M	Office affiliated
Naotsugu	IKEDA	Chief Advisor/Drilling Planning A	2016/4/23	~	2016/5/8	16days	0.53M/M	West JEC
			2016/6/19	~	2016/7/7	19days	0.63M/M	
			2016/7/28	~	2016/8/11	15days	0.50M/M	
			2016/8/29	~	2016/9/18	21days	0.70M/M	
			2016/11/12	~	2016/11/20	9days	0.30M/M	
			2018/3/21	~	2018/3/25	5days	0.16M/M	
			2018/4/15	~	2018/4/22	8days	0.27M/M	
			2018/6/2	~	2018/6/15	14days	0.47M/M	
			2018/7/21	~	2018/8/5	16days	0.53M/M	
			2018/8/22	~	2018/9/6	16days	0.53M/M	
			2018/10/13	~	2018/10/29	17days	0.57M/M	
			2019/2/3	~	2019/2/13	11days	0.37M/M	
			2019/6/9	~	2019/6/16	8days	0.27M/M	
Enrique	LIMA	Deputy Chief Advisor/Geothermal Development Planning/Geothermal Reservoir Evaluation	2016/4/20	~	2016/4/24	5days	0.16M/M	West JEC
			2016/7/23	~	2016/7/30	8days	0.27M/M	
			2016/11/12	~	2016/11/20	9days	0.30M/M	
			2017/2/12	~	2017/2/19	8days	0.27M/M	
			2017/4/22	~	2017/4/29	8days	0.27M/M	
			2017/9/23	~	2017/9/30	8days	0.27M/M	
			2018/3/10	~	2018/3/24	15days	0.50M/M	
			2018/4/15	~	2018/4/22	8days	0.27M/M	
			2018/8/18	~	2018/8/26	9days	0.30M/M	
			2019/6/8	~	2019/6/16	9days	0.30M/M	
Hiroo	YOSHIYAMA	Well Siting	2017/2/4	~	2017/2/19	16days	0.53M/M	West JEC
			2018/3/10	~	2018/3/24	15days	0.50M/M	
			2019/6/8	~	2019/6/17	10days	0.33M/M	
KARIUKI	Laban	Local Project Coordinator/OJT Coordinator A	2016/4/27	~	2016/4/30	4days	0.13M/M	GSL
			2016/5/2	~	2016/5/7	6days	0.20M/M	
			2016/5/9	~	2016/5/10	2days	0.07M/M	
			2016/5/26	~	2016/5/28	3days	0.10M/M	
			2016/5/30	~	2016/6/1	3days	0.10M/M	
			2016/6/7	~	2016/6/9	3days	0.10M/M	
			2016/6/15	~	2016/6/18	4days	0.13M/M	
			2016/6/21	~	2016/6/22	2days	0.07M/M	
			2016/7/12	~	2016/7/16	5days	0.16M/M	
			2016/7/18	~	2016/7/20	3days	0.10M/M	
			2016/8/1	~	2016/8/5	5days	0.16M/M	
			2016/8/22	~	2016/8/27	6days	0.20M/M	
			2016/8/29	~	2016/8/31	3days	0.10M/M	
			2016/9/8	~	2016/9/10	3days	0.10M/M	
			2016/9/12	~	2016/9/17	6days	0.20M/M	
			2016/10/10	~	2016/10/14	5days	0.17M/M	
			2016/10/25	~	2016/10/27	3days	0.10M/M	
			2016/11/14	~	2016/11/18	5days	0.16M/M	
			2016/12/5	~	2016/12/7	3days	0.10M/M	
			2016/12/8	~	2016/12/9	2days	0.07M/M	
			2016/12/12	~	2016/12/16	5days	0.17M/M	
			2017/1/9	~	2017/1/13	5days	0.17M/M	
			2017/1/23	~	2017/1/27	5days	0.17M/M	
			2017/1/30	~	2017/1/31	2days	0.07M/M	
			2017/2/6	~	2017/2/9	4days	0.13M/M	
			2017/2/11	~	2017/2/18	8days	0.27M/M	
			2017/2/21	~	2017/2/22	2days	0.07M/M	
			2017/3/6	~	2017/3/10	5days	0.17M/M	
			2017/3/22	~	2017/3/24	3days	0.10M/M	
			2017/4/3	~	2017/4/5	3days	0.10M/M	
			2017/5/17	~	2017/5/20	4days	0.13M/M	
			2017/9/18	~	2017/9/22	5days	0.17M/M	
			2017/9/26	~	2017/9/29	4days	0.13M/M	
			2017/12/4	~	2017/12/7	4days	0.13M/M	
			2018/1/10	~	2018/1/13	4days	0.13M/M	
			2018/1/14	~	2018/1/18	5days	0.17M/M	
			2018/3/7	~	2018/3/8	2days	0.07M/M	
			2018/3/13	~	2018/3/17	5days	0.17M/M	
			2018/3/27	~	2018/3/27	1days	0.03M/M	
			2018/4/27	~	2018/4/28	2days	0.07M/M	
			2018/5/9	~	2018/5/10	2days	0.07M/M	
			2018/5/14	~	2018/5/16	3days	0.10M/M	
			2018/5/22	~	2018/5/26	5days	0.17M/M	
			2018/5/30	~	2018/5/31	2days	0.07M/M	
			2018/6/1	~	2018/6/1	1days	0.03M/M	
			2018/6/4	~	2018/6/7	4days	0.13M/M	
			2018/6/9	~	2018/6/13	5days	0.17M/M	

			2018/6/16	~ 2018/6/20	5days	0.17M/M	
			2018/6/26	~ 2018/6/28	3days	0.10M/M	
			2018/7/4	~ 2018/7/6	3days	0.10M/M	
			2018/7/17	~ 2018/7/18	2days	0.07M/M	
			2018/7/29	~ 2018/7/29	1days	0.03M/M	
			2018/8/1	~ 2018/8/4	4days	0.13M/M	
			2018/8/20	~ 2018/8/25	6days	0.20M/M	
			2018/10/23	~ 2018/10/25	3days	0.10M/M	
			2019/4/11	~ 2019/4/12	2days	0.07M/M	
			2019/6/10	~ 2019/6/11	2days	0.07M/M	
Takayuki	WADA	Training Coordinator B	2016/7/1	~ 2016/7/30	30days	1.00M/M	West JECc
Shoma	SASAKI	Drilling Planning B	2018/7/14	~ 2018/8/12	30days	1.00M/M	West JEC
Hiroyuki	ISHIGAKI	Equipment Procurement	2016/5/28	~ 2016/6/4	8days	0.27M/M	JICS
			2018/6/7	~ 2018/6/15	9days	0.30M/M	
Yoshio	SOEDA	Geologist A	2017/2/12	~ 2017/2/19	8days	0.27M/M	West JEC
			2017/9/23	~ 2017/9/30	8days	0.27M/M	
			2018/3/10	~ 2018/3/24	15days	0.50M/M	
			2018/8/18	~ 2018/8/26	9days	0.30M/M	
			2019/2/3	~ 2019/2/13	11days	0.37M/M	
			2019/6/2	~ 2019/6/17	16days	0.53M/M	
Hiroo	YOSHIYAMA	Geologist B	2016/7/23	~ 2016/8/6	15days	0.50M/M	West JEC
			2016/11/12	~ 2016/11/26	15days	0.50M/M	
Yuki	FUJII	Geologist C	2019/2/3	~ 2019/2/13	11days	0.37M/M	West JEC
Koji	MATSUDA	Geochemist A	2016/7/23	~ 2016/8/6	15days	0.50M/M	West JEC
			2016/11/12	~ 2016/11/26	15days	0.50M/M	
			2017/2/12	~ 2017/2/19	8days	0.27M/M	
			2017/4/22	~ 2017/4/29	8days	0.27M/M	
			2017/9/23	~ 2017/9/30	8days	0.27M/M	
			2018/3/10	~ 2018/3/24	15days	0.50M/M	
			2018/8/18	~ 2018/8/26	9days	0.30M/M	
			2019/6/2	~ 2019/6/17	16days	0.53M/M	
Tatsuto	INO	Geochemist C	2017/1/7	~ 2017/1/22	16days	0.53M/M	LOVE EARTH 21CO., INC
			2017/5/13	~ 2017/5/27	15days	0.50M/M	
			2018/1/20	~ 2018/2/4	16days	0.53M/M	
			2018/8/18	~ 2018/9/2	16days	0.53M/M	
			2019/5/5	~ 2019/5/18	14days	0.47M/M	
Mitsuru	HONDA	Geophysicist A	2016/7/23	~ 2016/8/6	15days	0.50M/M	West JEC
			2017/2/12	~ 2017/2/19	8days	0.27M/M	
			2017/9/23	~ 2017/9/30	8days	0.27M/M	
			2018/3/10	~ 2018/3/24	15days	0.50M/M	
			2018/8/18	~ 2018/8/26	9days	0.30M/M	
			2019/6/2	~ 2019/6/17	16days	0.53M/M	
Toshiyuki	TOSHA	Geophysicist B	2018/3/10	~ 2018/3/18	9days	0.30M/M	KUMAMOTO UNIVERSITY
			2019/2/23	~ 2019/3/3	9days	0.30M/M	
			2019/6/2	~ 2019/6/16	15days	0.50M/M	
Hiroki	SAITO	Geophysicist C	2016/7/23	~ 2016/8/6	15days	0.50M/M	West JEC
			2017/9/23	~ 2017/9/30	8days	0.27M/M	
			2018/8/18	~ 2018/8/26	9days	0.30M/M	
			2019/6/2	~ 2019/6/17	16days	0.53M/M	
Tomohiro	TAKAZONO	Data Integration/Data management	2016/11/12	~ 2016/11/20	9days	0.30M/M	TROPS Co.,Ltd.
			2017/1/21	~ 2017/2/5	16days	0.53M/M	
			2018/3/10	~ 2018/3/24	15days	0.50M/M	
			2018/8/18	~ 2018/9/2	16days	0.53M/M	
Hideki	HATANAKA	Wellbore Survey/Discharge Testing/Reservoir Modeling	2017/2/4	~ 2017/2/18	15days	0.50M/M	West JEC
			2017/9/23	~ 2017/9/30	8days	0.27M/M	
			2018/3/10	~ 2018/3/24	15days	0.50M/M	
			2018/8/18	~ 2018/8/26	9days	0.30M/M	
			2018/9/10	~ 2018/9/16	7days	0.23M/M	
			2019/3/12	2019/3/22	11days	0.37M/M	
			2019/6/2	~ 2019/6/17	16days	0.53M/M	
Masahiko	KANEKO	Economic Evaluation	2018/1/21	~ 2018/2/4	15days	0.50M/M	West JEC
			2019/5/13	~ 2019/5/26	14days	0.47M/M	
Yuki	Lima Isomura	Visual training material	2016/5/5	~ 2016/6/23	50days	1.67M/M	West JEC
			2016/8/8	~ 2016/9/1	25days	0.83M/M	
			2018/3/10	~ 2018/3/24	15days	0.50M/M	
			2018/6/24	~ 2018/7/20	27days	0.90M/M	
			2018/8/18	~ 2018/9/16	30days	1.00M/M	
Akira	KOMATSU	Drilling Advisor A	2016/5/28	~ 2016/6/23	27days	0.90M/M	SKE
Masashi	IWAYA	Drilling Advisor A	2018/6/24	~ 2018/7/20	27days	0.90M/M	SKE
Teruaki	KOBAYASHI	Drilling Advisor C	2018/6/2	~ 2018/6/29	28days	0.93M/M	BETS Co.
			2018/9/3	~ 2018/10/28	56days	1.87M/M	
Winston R.	CASTILLO	Drilling Advisor D	2018/7/24	~ 2018/8/8	14days	0.47M/M	ThermaPrime.
			2018/8/25	~ 2018/9/2	7days	0.23M/M	
			2018/9/29	~ 2018/10/7	7days	0.23M/M	
Tsuyoshi	ABE	Drilling Advisor E	2016/5/1	~ 2016/5/27	27days	0.90M/M	BETS Co.
			2016/6/25	~ 2016/7/22	28days	0.93M/M	
Yuji	NAKANO	Drilling Advisor F	2016/7/27	~ 2016/9/18	54days	1.80M/M	NMCC.

Noel D.	CRUZ	Toolpusher A	2016/4/30	~ 2016/5/31	30days	1.00M/M	ThermaPrime.
			2016/6/25	~ 2016/7/26	30days	1.00M/M	
			2016/8/20	~ 2016/9/18	28days	0.93M/M	
			2018/6/2	~ 2018/7/1	28days	0.93M/M	
			2018/7/24	~ 2018/8/25	31days	1.03M/M	
			2018/9/23	~ 2018/10/27	33days	1.10M/M	
Romeo S.	GENIS	Maintenance Supervisor A	2016/4/30	~ 2016/5/31	30days	1.00M/M	ThermaPrime.
			2016/6/25	~ 2016/7/26	30days	1.00M/M	
			2016/8/20	~ 2016/9/18	28days	0.93M/M	
			2018/6/2	~ 2018/7/1	28days	0.93M/M	
			2018/7/24	~ 2018/8/25	31days	1.03M/M	
			2018/9/23	~ 2018/10/27	33days	1.10M/M	
Michael Ryan	C. BARILE	Senior Drilling Engineer A	2016/4/30	~ 2016/5/31	30days	1.00M/M	ThermaPrime.
			2016/6/25	~ 2016/7/26	30days	1.00M/M	
			2016/8/20	~ 2016/9/18	28days	0.93M/M	
			2018/6/2	~ 2018/7/1	28days	0.93M/M	
			2018/7/24	~ 2018/8/25	31days	1.03M/M	
			2018/9/23	~ 2018/10/27	33days	1.10M/M	
Mamerto B.	SUASIN Jr.	Toolpusher B	2016/5/28	~ 2016/6/28	30days	1.00M/M	ThermaPrime.
			2016/7/23	~ 2016/8/23	30days	1.00M/M	
			2018/6/28	~ 2018/7/27	28days	0.93M/M	
			2018/8/22	~ 2018/9/26	34days	1.13M/M	
Alfonso G.	BAENA Jr.	Maintenance Supervisor B	2016/5/28	~ 2016/6/5	8days	0.27M/M	ThermaPrime.
Randy. S.	DAY	Maintenance Supervisor B	2016/6/15	~ 2016/6/28	13days	0.43M/M	ThermaPrime.
			2016/7/23	~ 2016/8/23	30days	1.00M/M	
			2018/6/28	~ 2018/7/27	28days	0.93M/M	
			2018/8/22	~ 2018/9/26	34days	1.13M/M	
Garry F.	CANETE	Senior Drilling Engineer B	2016/5/28	~ 2016/6/28	30days	1.00M/M	ThermaPrime.
			2016/7/23	~ 2016/8/23	30days	1.00M/M	
Graciano Emmanuelito E.	DELA CRUZ Ⅲ	Senior Drilling Engineer B	2018/6/28	~ 2018/7/27	28days	0.93M/M	ThermaPrime.
Conrado Jr.	M. ABANILLA	Senior Drilling Engineer B	2018/8/22	~ 2018/9/26	34days	1.13M/M	ThermaPrime.
Yoshitaka	ISHIKAWA	Mud Engineer	2016/8/29	~ 2016/9/4	7days	0.23M/M	Telnite Co.
			2018/8/22	~ 2018/9/17	27days	0.90M/M	
			2018/10/21	~ 2018/10/29	9days	0.30M/M	
Edralin C.	ICABALES	Drilling Engineer	2016/7/28	~ 2016/8/7	9days	0.30M/M	ThermaPrime.
Yutaka	MIKI	Project Management B1	2016/9/10	~ 2016/9/17	8days	0.27M/M	JRI
Koichiro	DANNO	Project Management B2	2016/9/10	~ 2016/9/17	8days	0.27M/M	JRI
			2016/12/10	~ 2016/12/17	8days	0.27M/M	
Yoko	CHIVERS	Project Management C	2016/12/10	~ 2016/12/17	8days	0.27M/M	SMBC
Norio	SHIGETOMI	Multi-purpose Use of Geothermal Energy A	2016/10/8	~ 2016/10/15	8days	0.27M/M	MRI.
			2017/3/18	~ 2017/3/25	8days	0.27M/M	
			2017/9/16	~ 2017/9/23	8days	0.27M/M	
Tomoaki	HIROSE	Business Administration/Finance A	2016/10/22	~ 2016/10/29	8days	0.27M/M	MRI.
			2017/2/25	~ 2017/3/4	8days	0.27M/M	
			2017/12/2	~ 2017/12/9	8days	0.27M/M	
Masako	TERAMOTO	Environmental and Social Safeguard A	2016/9/4	~ 2016/9/17	14days	0.47M/M	Nippon Koei Co., Ltd.
			2016/11/20	~ 2016/12/9	20days	0.67M/M	
			2017/4/16	~ 2017/4/27	12days	0.40M/M	
			2018/1/14	~ 2018/1/20	7days	0.23M/M	
Shatei	IRI	Environmental and Social Safeguard B	2016/9/10	~ 2016/9/24	15days	0.50M/M	West JEC
			2016/11/19	~ 2016/11/27	9days	0.30M/M	
			2017/1/21	~ 2017/1/29	9days	0.30M/M	
			2018/1/7	~ 2018/1/20	14days	0.47M/M	
			2018/4/8	~ 2018/4/14	7days	0.23M/M	
Takeshi	YAMAMOTO	Power Plant Engineering A	2016/4/23	~ 2016/4/29	7days	0.23M/M	West JEC
			2016/11/27	~ 2016/12/10	14days	0.47M/M	
			2017/3/4	~ 2017/3/11	8days	0.27M/M	
			2018/1/27	~ 2018/2/10	15days	0.50M/M	
			2018/5/12	~ 2018/5/26	15days	0.50M/M	
Tatsunari	HAYASHI	Power Plant Engineering B	2016/11/27	~ 2016/12/10	14days	0.47M/M	West JEC
Teruaki	MATSUO	Power Plant Engineering C	2016/11/27	~ 2016/12/10	14days	0.47M/M	West JEC
			2017/3/5	~ 2017/3/11	7days	0.23M/M	
			2018/1/27	~ 2018/2/10	15days	0.50M/M	
			2018/5/12	~ 2018/5/26	15days	0.50M/M	
Tijo John	THOMAS	Power Plant Engineering D1	2018/1/28	~ 2018/2/2	6days	0.20M/M	YEC
Rami Sultan	MOHAMMED SAEED	Power Plant Engineering D2	2018/1/28	~ 2018/2/2	6days	0.20M/M	YEC
			Total		2878days	95.95M/M	

ANNEX

10：List of Trainings, Training Counterparts and Certificates Issued

ANNEX 10: List of Trainings, Training Counterparts and Certificates Issued

Team Leader
GDC Trainer

	FULL NAME		POSITION	DEPARTMENT
Output 2 Related - Geoscience (Geothermal Resource Assessment)				
1	Anthony	Wamalwa	Deputy Manager	Geothermal Resource Assessment (GRA)
Geology				
1	Tito	Lopeyok	Geologist	Geology Group, GRA, GDC
2	Loice	Kipchumba	Geologist	Geology Group, GRA, GDC
3	Peter	Mbia	Senior Geologist	Geology Group, GRA, GDC
4	Lucy	Njue	Senior Geologist	Geology Group, GRA, GDC
5	Geoffrey	Mibei	Geologist	Geology Group, GRA, GDC
6	Marietta	Mutonga	Geologist	Geology Group, GRA, GDC
7	Emily	Kahiga	Geologist	Geology Group, GRA, GDC
8	David	Mwai	Geologist	Geology Group, GRA, GDC
9	David	Oduor	Geologist	Geology Group, GRA, GDC
10	Fredrick	Mutua	Geologist	Geology Group, GRA, GDC
11	Noel	Ndombi	Geologist	Geology Group, GRA, GDC
12	Michael	Lokirima	Geologist	Geology Group, GRA, GDC
13	Evans	Kimaiyo	Geologist	Geology Group, GRA, GDC
14	Chebon	Chebet	Geologist	Geology Group, GRA, GDC
15	Sospeter	Msenya	Technician	Geology Group, GRA, GDC
Geochemistry				
1	George	Igunza	Geochemist	Geochemistry Group, GRA, GDC
2	Isaac	Kanda	Senior Geochemist	Geochemistry Group, GRA, GDC
3	Sylvia	Joan	Senior Geochemist	Geochemistry Group, GRA, GDC
4	Jeremiah	Kipng'ok	Geochemist	Geochemistry Group, GRA, GDC
5	Evans	Bett	Geochemist	Geochemistry Group, GRA, GDC
6	Lawrence	Ranka	Geochemist	Geochemistry Group, GRA, GDC
7	Leakey	Ochieng	Geochemist	Geochemistry Group, GRA, GDC
8	Shilla	Chepkemoi	Geochemist	Geochemistry Group, GRA, GDC
9	Fridah	Mwanyasi	Geochemist	Geochemistry Group, GRA, GDC
Geophysics				
1	Raymond	Mwakirani	Geophysicist	Geophysics Group, GRA, GDC
2	Joseph	Gichira	Geophysicist	Geophysics Group, GRA, GDC
3	Yussuf	Noor	Geophysicist	Geophysics Group, GRA, GDC
4	Deflorah	Kangogo	Geophysicist	Geophysics Group, GRA, GDC - Micro seismic
5	Fredrick	Ogada	Geophysicist	Geophysics Group, GRA, GDC
6	Robert	Mukiri	Technician	Geophysics Group, GRA, GDC
7	Peter	Mwarangu	Technician	Geophysics Group, GRA, GDC
8	Paul	Kiprono	Technician	Geophysics Group, GRA, GDC
9	David	Basweti	Technician	Geophysics Group, GRA, GDC
10	Fredrick	Mayoga	Technician	Geophysics Group, GRA, GDC
11	Magdalene	Kariuki	Technician	Geophysics Group, GRA, GDC
12	Rose	Nanjumbia	Technician	Geophysics Group, GRA, GDC
13	Mathew	Arthur	Senior Technician	Drilling Equipment Maintenance
Laboratories				
1	Jared	Nyamongo	Chief Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
2	Lyne	Wamani	Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
3	Timothy	Kinara	Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
4	Lorine	Isiba	Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
5	Rahel	Baya	Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
6	Judy	Hewa	Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
7	Lawrence	Nyakweba	Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
8	May	Mumba	Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
9	Nicholas	Kyalo	Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
10	Vincent	Osango	Lab Technician (Geology)	Geology Laboratory, GRA, GDC
11	Gerald	Njiru	Lab Technician (Geology)	Geology Laboratory, GRA, GDC

Class room session on 2016

	Surname	Given Name	GDC Designation	Designation
1	Keny	Fred Spencer	Engineer III, D.O	Shift Leader
2	Mburu	Stanley Muhia	Engineer III, Drilling Equipment Maintenance (Maintenance Engineer)	Maintenance Engineer
3	Musalia	Doughty Alunga	Engineer III, D.O	Shift Leader
4	Kabua	Geoffrey Kimani	Rig Maintenance Electrician	Electrician
5	Kihonge	George	Senior Driller	Driller
6	Kirui	Nancy Jeptoo	Engineer III – Planning and Logistics	Planning and Logistics
7	Mutahi	Peter Mbakwa	Senior Driller II	Driller
8	Zachariah	Eric Mumo	Senior Driller II	Driller
9	Onchiri	Dennis Mogaka	Senior Driller II	Driller
10	Mburu	Peter Muchendu	Driller	Driller
11	Sogomo	Elkana	Engineer III, Drilling Operations	Shift Leader
12	Ngeno	Jared Kiplangat	Engineer III, D.O	Shift Leader
13	Barkebo	Denis Chepchieng	Engineer III, Drilling Operations	Shift Leader
14	Kirui	Gilbert Kiplangat	Driller	Driller
15	Kipkemoi	Willy Mutai	RMT (Mechanical)	Mechanic
16	Mboya	Edwin	Derrickman I	Derrickman
17	Chege	James Njenga	Sr. Driller II	Driller
18	Ngure	Edward Kimani	Derrickman I	Derrickman
19	Sigei	Geoffrey Kipkoech	Rig Maintenance Mechanic	Mechanic
20	Bititi	Abraham Kirya	Derrickman IV	Derrickman
21	Muriithi	Patrick Muturi	Rig Maintenance Technician	TBD, EMT
22	Mwakisachi	Kennedy R. Mwaisaka	Senior Driller II	Driller
23	Mutuku	Paul	Derrickman I	Derrickman
24	Cheruiyot	Malel Ernest	Senior Driller	Driller
25	Mohamed	Abdirashid Muktar	Cementing Technician	Cementing Technician
26	Kamau	Martha Wairimu	Officer, Logistics	Planning and Logistics
27	Kiplagat	Rono	Rig Maintenance Mechanic	Mechanic
28	Kirui	Felix	Engineer III, Drilling Planning and Logistics	Planning and Logistics
29	Kipkurui	Kibor	Driller I	Driller
30	Mbaluka	Bernard Ngile	Senior Driller II	Driller
31	Makumi	Lawrence Karuga	Rig Maintenance Mechanic	Mechanic
32	Kiprono	Paul	Technician, Planning and Logistics	Planning and Logistics
33	Abdulrahman	Said Abdulrahim	Ag. Asst. Driller, Derrickman I	Derrickman
34	Ndichu	Daniel Mbguah	Driller I	Driller
35	Wafula	Cliffford Matto	Assistant Driller	Derrickman
36	Nyaga	Peter Muriuki	Rig Maintenance Mechanic	Mechanic
37	Nkanata	Paul Ndereba	Rig Maintenance Mechanic	Mechanic
38	Wanjala	Godfrey	Derrickman II	Derrickman
39	Njuguna	Simon	Technician, Cementing	Cementing Technician
40	Riungu	Michael	Rig Maintenance Electrician	Electrician
41	Wachira	Stanley	Derrickman I	Derrickman
42	Olweny	Maxwell Akech	Drilling Supervisor	Shift Leader
43	Nzuki	Patrick M.	Rig Maintenance Mechanic	Mechanic
44	Mutaki	Emmanuel Kundu	Driller I	Driller
45	Musyoka	Felix Ngui	Rig Maintenance Electrician	Electrician
46	Rob	Eric Cheruiyot	Rig Maintenance Mechanic	Mechanic
47	Lepapa	Stephen	Driller	Driller
48	Simiyu	Job	Senior Driller II	Driller
49	Omondi	Eugene	Snr Rig Technician	TBD, EMT
50	Wanyama	Charles	Derrickman II	Derrickman
51	Chobong	Robert	Ag. A. Driller, Derrickman IV	Derrickman
52	Petu	John Mrima	Cementing Technician	Cementing
53	Baraza	Ramadhan	Derrickman II	Derrickman
54	Kipyego	Elijah	Driller I	Driller
55	Otieno	Alvins	Derrickman II	Derrickman
56	Supeyo	Kilelu Rushano	Floorman	Floorman
57	Kithinji	Morris David	Derrickman II	Derrickman
58	Lukorito	Henry Wabwile	Rig Maintenance Technician	Mechanic
59	Simiyu	Dennis Mukunda	Rig Maintenance Mechanic	Mechanic
60	Makau	Joseph Muema	Rig Maintenance Electrician	Electrician
61	Wanjala	Benson	Derrickman I	Derrickman
62	Oyier	Kennedy Onyango	Rig Maintenance Mechanic	Mechanic
63	Njoroge	Joseph Njogu	Derrickman I	Derrickman
64	Ochieng	Dan Ochiel	Rig Maintenance Electrician	Electrician
65	Mathenge	Phyllis Gathoni	Engineer III, D.O	Shift Leader
66	Wanyonyi	Eric Wekesa	Driller I	Driller
67	Ondhoro	Joshua Agunda	Driller I	Driller
68	Kimetto	Charles	Cementing, Laboratory Technician	Cementing Technician
69	Musyoka	Pius	Derrickman	Derrickman
70	Otieno	Maureen Atieno	Technician – Planning and Logistics	Planning and Logistics
71	Oyomno	Francis Agot	Senior Drilling Supervisor	Shift Leader
72	Muliro	Elvis	Derrickman I	Derrickman
73	Miriti	Shem Ngichu	Rig Maintenance Technician	TBD, EMT
74	Torinke	Moses	Derrickman I	Derrickman
75	Mumo	Cyrus Kyalo	Senior Driller II	Driller
76	Bisbas	Saleh	Compressor man	Compressorman

Class room session on 2018

	Surname	Given Name, Middle Name	GDC Designation
1	Petu	John Mrima	Cementing Technician
2	Kamau	Martha Wairimu	Officer, Logistics
3	Njuguna	Simon Gichuhi	Technician, Cementing
4	Kimani	Edward Ngure	Derrickman
5	Mutahi	Peter Mbakwa	Senior Driller II
6	Mwanyasi	Fridah	Cementing Engineer
7	Musalia	Doughty Alunga	Engineer III, D.O
8	Mathenge	Phyllis Gathoni	Engineer III, D.O
9	Mburu	Peter Muchendu	Driller
10	Odongo	Dan Onyango	Cementing Truck Operator
11	Kirui	Gilbert Kiplangat	Driller
12	Gitu	Patrick Kanjuki	Safety Engineer
13	Kirui	Nancy Jeptoo	Engineer III – Planning and Logistics
14	Sigei	Geoffrey Kipkoech	Rig Maintenance Mechanic
15	Mburu	Stanley Muhia	Engineer III, Drilling Equipment Maintenance (Maintenance Engineer)
16	Chege	James Njenga	Sr. Driller II
17	Mutuku	Paul	Derrickman I
18	Waswa	Martin	Drilling Engineer
19	Kihonge	George	Senior Driller
20	Sogomo	Elkana Kipchirchir	Engineer III, Drilling Operations
21	Ongwae	Samson	Engineer II, DO
22	Kabua	Geoffrey Kimani	Rig Maintenance Electrician
23	Mbaluka	Bernard Ngile	Senior Driller II
24	Otieno	Maureen Atieno	Technician – Planning and Logistics
25	Wanyonyi	Eric Wekesa	Driller I
26	Ntabo	Dennis	Rig Maintenance Mechanic
27	Nkanata	Paul Ndereba	Technician
28	Kariuki	Peter Nguuri	Rig Maintenance Electrician
29	Zachariah	Eric Mumo	Senior Driller II
30	Nyanjong'	Yvonne Achieng'	Cementing Operator
31	Ohanya	Vincent	Engineer III
32	Mumo	Cyrus Kyalo	Senior Driller II
33	Onchiri	Dennis Mogaka	Senior Driller II
34	Kirongo	Eliud	Technician
35	Wango	John Paul Adero	Technician III
36	Makau	Joseph Muema	Rig Maintenance Electrician
37	Barkebo	Denis Chepchieng	Engineer III, Drilling Operations
38	Kirui	Felix	Engineer III, Drilling Planning and Logistics
39	Sitati	Mourice Mukhwana	Rig Maintenance Mechanic
40	Mwakisachi	Kennedy R. Mwaisaka	Senior Driller II
41	Mwadime	Hartwel	Derrickman IV
42	Wanjala	Godfrey	Derrickman II
43	Mambo	Kurtz Njue	Maintenance Engineer III
44	Kipyego	Elijah	Driller I
45	Simiyu	Job	Senior Driller II
46	Chobong	Robert	Ag. A. Driller, Derrickman IV
47	Wachira	Stanley	Derrickman I
48	Kipkurui	Kibor	Driller I
49	Miriti	Shem Ngichu	Rig Maintenance Technician
50	Wasike	Jeff Machyo	Maintenance Engineer
51	Takurit	Elijah	Technician
52	Mulanda	Frankline	Derrickman I
53	Mohamed	Abdirashid Muktar	Cementing Technician
54	Abdulrahman	Said Abdulrahim	Ag. Asst. Driller, Derrickman I
55	Kiprono	Paul Kimutai	Technician I (Tubulars)
56	Kimetto	Charles	Cementing, Laboratory Technician
57	Gathoni	Eudius	Electrician (Artisan IV)
58	Mwangangi	Francis	Derrickman IV
59	Mwangi	George Maina	Derrickman IV
60	Bititi	Abraham Kirya	Derrickman IV
61	Albano	Nickson Mwambere	Derrickman III
62	Toroitich	Austin Kipngetich	Rig Maintenance Engineer
63	Mboya	Edwin	Derrickman I
64	Ngeno	Jared Kiplangat	Engineer III, D.O
65	Aballa	Benson Ogolla	Derrickman
66	Omondi	Eugene Michael	Senior Rig Technician, Mechanic
67	Kithinji	Morris David	Derrickman II
68	Wesonga	Pascal	Senior Technician
69	Kiraison	Kasino Sankok	Derrickman II
70	Toroitich	Philip Kipruto	RMT (Electrical)
71	Kiplagat	Rono	Rig Maintenance Mechanic
72	Kosgei	Enock Cheruiyot	Senior Technician
73	Rotich	Martin Rohu	Drilling Engineer
74	Musyoka	Pius	Derrickman II
75	Kibicho	David Munene	Engineer III, D.O
76	Too	Geoffrey Kipkoech	RME (Mechanical)
77	Wafula	Cliffford Natto	Derrickman I
78	Kariuki	Peter Nganga	Rig Maintenance Engineer
79	Mwendwa	Joseph Muthama	Derrickman IV
80	Kipkoech	Patrick	AssistanT III, DPL
81	Magicho	Daniel	Drilling Engineer
82	Makumi	Lawrence Karuga	Rig Maintenance Mechanic
83	Kiambi	John Gikunda	Derrickman II
84	Rob	Eric Cheruiyot	Rig Maintenance Mechanic
85	Lukorito	Henry Wabwile	Rig Maintenance Technician
86	Cheruiyot	Malel Ernest	Senior Driller
87	Kiilu	Martin Jackson	Logistics Assistant (Tubulars)
88	Mwaura	Gideon Kiarie	Derrickman IV
89	Ogugo	Fredrick	Technician
90	Kanyi	Victor	Drilling Engineer
91	Juma	James	Technician
92	Keny	Fred Spencer	Engineer III, D.O
93	Awili	Billy	Drilling Engineer
94	Ondhoro	Joshua Agunda	Driller I
95	Githinji	David Wachira	Craftsman IV
96	Ng'ang'a	Eric	RMT (Mechanical)
97	Kenyo	Shadrach Kantai	Derrickman III

Plasma cutter training result

	NAME	Designation
1	ISAAC MAKUK	Drilling Engineer
2	PAUL NKANATA	Mechanical Technician
3	MOURICE SITATI	Mechanical Technician
4	BEN WANTOME	Welder
5	LAWRENCE WAMBUA	Rig Welder
6	CHRISTOPHER KITHOME	Rig Welder
7	DAVID MWANGI	Infrastructure Welder
8	JACKTONE ALELA	Infrastructure Welder

Team Leader
GDC Trainer

	FULL NAME		POSITION	DEPARTMENT
			Output 2 Related - Geoscience (Geothermal Resource Assessment)	
1	Anthony	Wamalwa	Deputy Manager	Geothermal Resource Assessment (GRA)
			Geology	
1	Tito	Lopeyok	Geologist	Geology Group, GRA, GDC
2	Loice	Kipchumba	Geologist	Geology Group, GRA, GDC
3	Peter	Mbia	Senior Geologist	Geology Group, GRA, GDC
4	Lucy	Njue	Senior Geologist	Geology Group, GRA, GDC
5	Geoffrey	Mibei	Geologist	Geology Group, GRA, GDC
6	Marietta	Mutonga	Geologist	Geology Group, GRA, GDC
7	Emily	Kahiga	Geologist	Geology Group, GRA, GDC
8	David	Mwai	Geologist	Geology Group, GRA, GDC
9	David	Oduor	Geologist	Geology Group, GRA, GDC
10	Fredrick	Mutua	Geologist	Geology Group, GRA, GDC
11	Noel	Ndombi	Geologist	Geology Group, GRA, GDC
12	Michael	Lokirima	Geologist	Geology Group, GRA, GDC
13	Evans	Kimaiyo	Geologist	Geology Group, GRA, GDC
14	Chebon	Chebet	Geologist	Geology Group, GRA, GDC
15	Sospeter	Msenya	Technician	Geology Group, GRA, GDC
			Geochemistry	
1	George	Igunza	Geochemist	Geochemistry Group, GRA, GDC
2	Isaac	Kanda	Senior Geochemist	Geochemistry Group, GRA, GDC
3	Sylvia	Joan	Senior Geochemist	Geochemistry Group, GRA, GDC
4	Jeremiah	Kipng'ok	Geochemist	Geochemistry Group, GRA, GDC
5	Evans	Bett	Geochemist	Geochemistry Group, GRA, GDC
6	Lawrence	Ranka	Geochemist	Geochemistry Group, GRA, GDC
7	Leakey	Ochieng	Geochemist	Geochemistry Group, GRA, GDC
8	Shilla	Chepkemoi	Geochemist	Geochemistry Group, GRA, GDC
9	Fridah	Mwanyasi	Geochemist	Geochemistry Group, GRA, GDC
			Geophysics	
1	Raymond	Mwakirani	Geophysicist	Geophysics Group, GRA, GDC
2	Joseph	Gichira	Geophysicist	Geophysics Group, GRA, GDC
3	Yussuf	Noor	Geophysicist	Geophysics Group, GRA, GDC
4	Deflorah	Kangogo	Geophysicist	Geophysics Group, GRA, GDC - Micro seismic
5	Fredrick	Ogada	Geophysicist	Geophysics Group, GRA, GDC
6	Robert	Mukiri	Technician	Geophysics Group, GRA, GDC
7	Peter	Mwarangu	Technician	Geophysics Group, GRA, GDC
8	Paul	Kiprono	Technician	Geophysics Group, GRA, GDC
9	David	Basweti	Technician	Geophysics Group, GRA, GDC
10	Fredrick	Mayoga	Technician	Geophysics Group, GRA, GDC
11	Magdalene	Kariuki	Technician	Geophysics Group, GRA, GDC
12	Rose	Nanjumbia	Technician	Geophysics Group, GRA, GDC
13	Mathew	Arthur	Senior Technician	Drilling Equipment Maintenance
			Laboratories	
1	Jared	Nyamongo	Chief Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
2	Lyne	Wamani	Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
3	Timothy	Kinara	Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
4	Lorine	Isiba	Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
5	Rahel	Baya	Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
6	Judy	Hewa	Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
7	Lawrence	Nyakweba	Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
8	May	Mumba	Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
9	Nicholas	Kyalo	Lab Technician (Chemistry)	Chemical Laboratory, GRA, GDC
10	Vincent	Osango	Lab Technician (Geology)	Geology Laboratory, GRA, GDC
11	Gerald	Njiru	Lab Technician (Geology)	Geology Laboratory, GRA, GDC

	Certificate of Merit	No.	Trainer	No.	Trainee
12-1	Economic Evaluation Training I,II&III, Phase I	1	Rosemary Njenga	3	Caroline Tele
		2	Diana Waringa	4	Shammah Kiptanui
				5	Joseph Mutahi
				6	Tunai Kinyanguk
12-2	Economic Evaluation Training I&II, Phase I			1	Solomon Sankaire
12-3	Economic Evaluation Training II&III, Phase I			1	Beatrice Kipchumba

	Certificate of Attendance		Trainer	No.	Trainee
12-4	Economic Evaluation Training II, Phase I			1	Dorothy Muriithi
				2	Bernard Rotich
12-5	Economic Evaluation Training III, Phase I (Corporate Model)			1	Jared Gekara
				2	Omar Ismail

	Certificate of Merit	No.	Trainer	No.	Trainee
12-6	Financial Modelling and Economic Evaluation Training (Basic)	1	Rosemary Njenga	3	Joseph Mutahi
		2	Diana Waringa		
12-7	Financial Modelling and Economic Evaluation Training (Basic&Advanced)			1	Albert Panga
				2	Ezekiel Kipyego
				3	Hapanna Galgallo
				4	Lydiah Khaemba
				5	Noel Mbashu
				6	Omar Ismail
				7	Grace Mwaniki
				8	Lucy Nyambura
				9	Sandra Soy
				10	Solomon Sankaire

	Certificate of Merit		Trainer	No.	Trainee
13-1	Business Administration & Finance I&II, Phase I			1	Lucy Mukiri
				2	Caroline Tele
				3	Rosemary Njenga
				4	Hassan Abdi
				5	Moses Kachumo
				6	Shammah Kiptanui
				7	Bernard Rotich
				8	Jacklyne Wakhungu

	Certificate of Attendance		Trainer	No.	Trainee
13-2	Business Administration & Finance I, Phase 1			1	Beatrice Kipchumba
				2	Sandra Soy
				3	Lydia Odhiambo
				4	Lydia Khaemba
				5	David Tanui
13-3	Business Administration & Finance II, Phase I			1	Dorothy Muriithi
				2	Michael Simiyu
				3	Benard Finch
				4	Albert Panga
				5	Noel Mbashu
				6	Nelly Kibor
				7	Omar Ismail
				8	Esther Nyambura
				9	Emmanuel Mwanthi

	Certificate of Merit	No.	Trainer	No.	Trainee
13-4	Business Administration & Finance I&II, Phase 2	1	Rosemary Njenga	3	Winfred Kinuthia
		2	Diana Waringa	4	Ezekiel Kipyego
				5	Cynthia Wanjiku
				6	Grace Murage
				7	Marc Wamayeku
				8	Jared Gakera
				9	Michael Simiyu
				10	Kevin Leyian
				11	Omar Ismail
				12	Joseph Mutahi
				13	Faish Muthodi
13-5	Business Administration & Finance I, Phase 2			1	Faith Mwangi
				2	Fathe Maimuna
				3	Shammah Kiptanui
				4	Henry Taabu
				5	CharlesBengo
				6	Bob Nkichabe
				7	Jack Kiruja
				8	Lucy Mukiri
				9	Martin Mwangi
				10	Valentine Odhiambo

	Certificate of Attendance	No.	Trainer	No.	Trainee
13-6	Business Administration & Finance III, Phase 2 (Train the Trainer)	1	Rosemary Njenga	3	Lucy Nyambura
		2	Diana Waringa	4	Hapanna Galgallo
				5	Dorothy Muriithi
				6	Mary Wanjiku
				7	Hanifa Abdullahi
				8	Noel Mbashu
				9	Peninah Nyawira
				10	Ibrahim Galo
				11	Lawrence Kiprono
				12	Benard Finch
				13	Isaac Kering

	Certificate of Attendance	No.	Trainee
14-1	Steam Supply Agreement Promotion Seminar I	1	Lucy Mukiri
		2	Caroline Tele
		3	Nixon Osundwa
		4	Patrick Oyugi
		5	Raphael Mailu
		6	Doris Kyaka
		7	Justus Muhambi
		8	Yussuf Hussein
		9	David Korinko
		10	Thomas Mburu
		11	Ezekiel Kipyego
		12	Janet Suwai
		13	Shammah Kiptanui
		14	Diana Lagat

14-2	Steam Supply Agreement Promotion Seminar II	1	Dorothy Muriithi
		2	Khalifa Said
		3	Diana Waringa
		4	Sandra Soy
		5	Moses Kachumo
		6	Michael Simiyu
		7	Esther Nyambura
		8	Joel Sutter
		9	Caroline Nkatha
		10	Rose Muhia
		11	Charity Zeron
		12	Patrick Kaptoo
		13	Mohammed Farah
		14	Michael Sembele Keter
		15	Hillary Mwawasi
		16	Arcadius Angalwa
		17	Edwin Odum

	FULL NAME			POSITION	DEPARTMENT
			Output 5 Related - Project management		
1	Michael		Simiyu	Chief Officer	Project Management
2	Shammah		Kiptanui	Officer	Project Management
3	Kevin		Leyian	Officer	Project Management
4	Hassan		Abdi	Engineer	Project Management
5	Hapanna		Galgallo	Officer	Corporate Planning & Strategy (CPS)
6	Rosemary		Njenga	Officer	Corporate Planning & Strategy (CPS)
7	Wellington		Kivure	Senior Engineer	Drilling Operations
8	Thomas		Miyora	Chief Engineer	Drilling Operations
9	Edwin		Odum	Senior Engineer	Geothermal Resource Management (GRM)
10	Arcadius		Angalwa	Engineer	Geothermal Resource Mangement (GRM)
11	Peter	Ole	Kachuma	Engineer	Infrustructure
12	Milka		Kairu	Chief Superitendant	Infrustructure
13	Grace		Obonyo	Senior Legal Officer	Legal Services
			Output 5 Related - Environmental and Social Considerations (H2S/ Noise and Water Quality)		
1	Beatrice	Nyairo		Scientist	Environment
2	Irene	Cheptum		Scientist	Environment
3	Frida	Nkatha		Scientist	Environment
4	Rose	Kiama		Scientist	Environment
5	Frashiah	Njoroge		Scientist	Environment
6	John	Mundui		Scientist	Environment
7	Henry	Wamalwa		Scientist	Environment
8	Emmah	Kashindi		Senior Technician	Environment
9	Daniel	Loumen		Senior Technician	Environment
			Output 5 Related - Environmental and Social Considerations (Environmental Management System (EMS))		
1	Ahmed	Fankey	Deputy Manager	Corporate Planning & Strategy	Environment
2	Anne	Wangui	Scientist	Environment	Environment
3	Francis	Opiyo	Scientist	Environment	Environment
4	Hockly	Simboyi	Scientist	Environment	Environment
5	Gabriel	Wetangula	Manager	Environment	Environment
6	David	Manyara	Scientist	Environment	Environment
7	Rose	Kiama	Scientist	Environment	Environment
8	Daniel	Loumen	Senior Technician	Environment	Environment
9	Selly	Koech	Officer	Community Relations	Environment
10	Hellen	Pembee	Officer	Community Relations	Environment
11	Emily	Leshao	Officer	Community Relations	Environment
12	Teresiah	Nguuri	Chief Officer	Geothermal Resource Assessment	Environment
13	Daniel	Kilelu	Area Administrator	South Rift	Environment
14	Allan	Njoroge	Database Administrator	Information Communication & Technology	Environment
15	Abel	Cheloti	Performance Analyst	Corporate Performance Manangement	Environment
16	Elisha	Omega	Engineer II	Infrustructure	Environment
17	Alfred	Onyango	Senior Assistant	Administration	Environment
18	Rachel	Wambui	Hospitality Attendance	Administration	Environment
19	Abraham	Khaemba	Senior Engineer	Drilling Operartions	Environment
20	Elijah	Takurit	Technician	Drilling Equipment Maintenance	Environment
			Output 5 Related - Environmental and Social Considerations (H2S Dispersion & Modelling)		
1	Beatrice	Nyairo		Scientist	Environment
2	Irene	Cheptum		Scientist	Environment
			Output 5 Related - Environmental and Social Considerations (Resettlement Action Plan)		
1	Francis	Opiyo		Scientist	Environment
2	Hockly	Simboyi		Scientist	Environment
3	Anne	Wangui		Scientist	Environment
4	Henry	Wamalwa		Scientist	Environment
5	Doreen	Nyanchoka		Assistant	Environment
6	Lawrence	Marcharpus		Officer	Community Relations
7	Hapanna	Galgallo		Officer	Corporate Planning & Strategy (CPS)
8	Rose	Muhia		Legal Officer	Legal Services
9	Charity	Zeron		Legal Officer	Legal Services
10	Michael	Simiyu		Chief Officer	Project Management
11	Rachel	Wambui		Hospitality Attendance	Administration
			Output 5 Related - Environmental and Social Considerations (Resettlement Action Plan)		
1	Martha		Mburu	Manager	Direct Use
2	Bernard		Rotich	Economist	Direct Use
3	Japheth		Towett	Engineer	Direct Use
4	Esther		Nyambura	Engineer	Direct Use
5	Laura		Jemutai	Scientist	Direct Use
6	Lawrence		Ranka	Geochemist	GRA
7	Paul		Kiguoya	Technician	Direct Use
8	Justus		Nyongesa	Technician	Direct Use
9	John		Mundui	Scientist	Safety, Health & Environment (SHE)
10	Peter		Mbia	Geologist	Geothermal Resource Assessment (GRA)

	FULL NAME		POSITION	ORGANIZATION
Module2 - Procurement: The Public Procurement Seminar (The Public Procurement and Asset Disposal Act, 2015)				
1	Eve	Wakhungu	Procurement Group, Supply chain	Nairobi
2	Alfred	Mbaka	Procurement Group, Supply chain	Central Rift
3	Samuel	Kimutai	Procurement Group, Supply chain	Central Rift
4	Nancy	Lomoto	Procurement Group, Supply chain	North Rift
5	Keddy	Jerop	Procurement Group, Supply chain	Central Rift
6	Patrick	Korir	Procurement Group, Supply chain	Nairobi
7	Irene	Moraa	Procurement Group, Supply chain	Nairobi
8	Oruma	Ibrahim	Procurement Group, Supply chain	Nairobi
9	Jacinta	Nasambu	Procurement Group, Supply chain	Central Rift
10	Fridah	Kinyua	Procurement Group, Supply chain	Nairobi
11	Anthony	Kithinji	Procurement Group, Supply chain	Central Rift
12	Mabel	Matama	Stores and Logistics Group, Supply chain	Central Rift
13	Joseph	Tenai	Stores and Logistics Group, Supply chain	Central Rift
14	Samuel	Wasike	Stores and Logistics Group, Supply chain	Central Rift
15	Agnes	Mwai	Stores and Logistics Group, Supply chain	Nairobi
16	Julias	M Gitangwa	Stores and Logistics Group, Supply chain	Central Rift
17	Johnstone	Kirui	Stores and Logistics Group, Supply chain	Central Rift
18	Evans	Nyamweya	Stores and Logistics Group, Supply chain	Central Rift
19	Duncun	Muiruri	Stores and Logistics Group, Supply chain	Central Rift

ANNEX

11：List of Trainings in Japan and Their Participants

ANNEX 11: List of Trainings in Japan and their Participants

Name	Position	Subject of training	Duration
Kabua Geoffrey Kimani	Maintenance Technician III, Drilling Operations	1st training course for drilling technology	2014/9/4 – 2014/10/4
Langat Dominic Mutai Kipkemoi	Maintenance Engineer, Drilling Operations		
Mogaka Denis Onchiri	Driller I, Drilling Operations		
Ochieno Bartholomew Ludasia	Drilling Engineer, Drilling Operations		
Mwakisachi Kennedy Renson Mwaisaka	Driller I, Drilling Operations		
Makau Joseph Muema	Driller I, Drilling Operations		
Ohanya Vincent Odhiambo	Rig Maintenance Technician, Drilling Operations	2nd training course for drilling technology	2014/10/9 – 2014/11/8
Kihonge George Ngugi	Drilling Superintendant, Drilling Operations		
Too Geoffrey Kipkoech	Rig Maintenance Technician, Drilling Operations		
Mumo Cyrus Kyalo	Drilling Engineer, Drilling Operations		
Simyu Job	Driller I, Drilling Operations		
Njue Kurtz Mambo	Driller I, Drilling Operations		
Kipyego Ezekiel Kiptoo	Reservoir Engineer, Geothermal Resource Management	1st training course for reservoir engineering	2014/10/13 – 2014/11/1
Suwai Janet Jelagat	Senior Scientist, Geothermal Resource Management		
Angalwa Arcadius Muhanji	Senior Scientist, Geothermal Resource Management	2nd training course for reservoir engineering	
Mwawasi Hilary Raphael Mwangeka	Senior Scientist, Geothermal Resource Management		
Sembele Michael Kipkoech Keter	Senior Scientist, Geothermal Resource Management		
WANYAMA Pascal Wesonga	Senior Driller, Geothermal Drilling Department	3rd training course for drilling technology	2015/7/2～2015/8/1
ERNEST Cheruiyot Malel	Senior Driller, Geothermal Drilling Department		
PETER Mbakwa Mutahi	Driller, Geothermal Drilling Department		
KIPKURUI Kibor	Driller, Geothermal Drilling Department		
PETER Muchendu Mburu	Driller, Geothermal Drilling Department		
BERNARD Ngihe Mbaluka	Senior Driller, Geothermal Drilling Department		
MURUNGI Lawrence Majau	Senior Engineer Cementing, Geothermal Drilling Department	4th training course for drilling technology	2015/8/20～ 2015/9/19
MOHAMED Abdirashid Muktar	Technician I Cementing, Geothermal Drilling Department		
ZAKARIA Eric Mumo	Senior Driller, Geothermal Drilling Department		
CHEGE James Njenga	Senior Driller, Geothermal Drilling Department		
KIRUI Gilbert Kiplangat	Senior Driller, Geothermal Drilling Department		
KIPYEGO Elijah Kiprop	Driller, Geothermal Drilling Department		
Suwai Janet Jelagat	Senior Scientist, Geothermal Resource Management	3rd training course for reservoir engineering	2015/6/30 – 2015/8/7
Kipyego Ezekiel Kiptoo	Reservoir Engineer, Geothermal Resource Management		
Angalwa Arcadius Muhanji	Reservoir Engineer, Geothermal Resource Management		
Mwawasi Hilary Raphael Mwangeka	Reservoir Engineer, Geothermal Resource Management		
Suwai Janet Jelagat	Chief Scientist, Geothermal Resource Management	1st Reservoir Engineering Phase 2	2016/9/19 - 2016/10/29
Mwawasi Hilary Raphael Mwangeka	Reservoir Engineer, Geothermal Resource Management		
Olando David Awori	Reservoir Engineer, Geothermal Resource Management		
Onyango Stephen Odhiambo	Reservoir Engineer, Geothermal Resource Management		
Shikanga Philip Burudi	Reservoir Engineer, Geothermal Resource Management		
Ayonga Joel Nyariki	Reservoir Engineer, Geothermal Resource Management		
KIMETTO Charles Kipkemoi	Cementing Technician, Drilling Operations	5th training course for drilling technology	2016/8/23 - 2016/9/22
ONDHORO Joshua Agunda	Driller, Drilling Operations		
OTIENO Maureen Atieno	Planning & Logistics Technician, Drilling Planning & Logistics		
WANYONYI Eric Wekesa	Driller, Drilling Operations		
MATHENGE Phyillis Gathoni	Engineer III, Drilling Operations		
MIRITI Shem Ngichu	Technician, Drilling Operations		
Keny Fred Spencer	Drilling Engineer, Drilling Operations	6th training course for drilling technology	2016/10/12 - 2016/11/10
Musalia Doughty Alunga	Drilling Engineer, Drilling Operations		
Petu John Mrima	Cementing Technician, Drilling Operations		
Lepapa Stephen Leshao	Driller, Drilling Equipment Maintenance		
Makumi Lawrence Karuga	Maintenance Technician, Drilling Operations		
Kiprono Paul Kimutai	Planning & Logistics Technician, Drilling Planning & Logistics		
Michael Kamau Mungai	Drilling Engineer, Drilling Operations	7th training course for drilling technology	2017/9/17 - 2017/10/19

Joseph W. Muyundo	Drilling Engineer, Drilling Operations	7th training course for drilling technology	2017/9/17 - 2017/10/19
Dennis Barkebo Chepchieng	Drilling Engineer, Drilling Operations		
Martin Kibiwott Rotich	Drilling Engineer, Drilling Operations		
Alois Cherop Kipchirchir	Drilling Engineer, Drilling Operations		
Daniel Mbugua Ndichu	Driller, Drilling Operations		
Joel Rutto Sutter	Drilling Engineer, Drilling Operations	8th training course for drilling technology	2017/10/16 - 2017/11/17
Elkana Kipchirchir Sogomo	Drilling Engineer, Drilling Operations		
Geoffrey Kipkoech Sigei	Drilling Engineer, Drilling Operations		
Francis Kinga Wanjohi	Drilling Engineer, Drilling Operations		
Simon Gichuhi Njuguna	Drilling Engineer, Drilling Operations		
Emmanuel Mutaki Kundu	Driller, Drilling Operations		
Mwakirani Raymond Delmas	Geophysicist, Geothermal Resource Assessment	Conceptual Modeling Seminar	2019/7/18 – 2019/8/2
Lopeyok Tito Plimo	Geologist, Geothermal Resource Assessment		
Muslusa George Igunza	Geochemist, Geothermal Resource Assessment		
Wamalwa Antony	Deputy Manager, Geothermal Resource Assessment		
Njue Lucy Muthoni	Senior Geologist, Geothermal Resource Assessment		
Jeremiah Kipngok	Geochemist, Geothermal Resource Assessment		
Mohamud Yussuf Noor	Geophysicist, Geothermal Resource Assessment		
Mwawasi Hilary Raphael Mwangeka	Reservoir Engineer, Geothermal Resource Management	Reservoir Engineering Seminar	2019/6/18 – 2019/8/2
Moses Chemeitoi Kilimo	Reservoir Engineer, Geothermal Resource Management		
David Awori Olando	Reservoir Engineer, Geothermal Resource Management		
Joel Nyariki Ayonga	Reservoir Engineer, Geothermal Resource Management		
Philip Burudi Shikanga	Reservoir Engineer, Geothermal Resource Management		
Stephen Odhiambo Onyango	Reservoir Engineer, Geothermal Resource Management		

ANNEX

12：List of Products (Handbook, Visual Aid and Software)

ANNEX 12: List of Products (Handbooks, Visual Aids and Software)

List of Handbooks

*Note: Column highlighted in yellow is under construction

Theme	pages
Geoscience	
GEOLOGY	103
HANDBOOK GEOCHEMICAL DATA ANALYSIS AND INTERPREPATION	80
HANDBOOK FOR SAMPLING, CHEMICAL ANALYSIS AND QUALITY CONTROL	86
HANDBOOK FOR MT(3D)/TEM DATA ANALYSIS AND INTERPRETATION	63
HANDBOOK GRAVITY	56
HANDBOOK ON MICROEARTHQUAKE DATA PREPARATION AND ANALYSIS IN THE GEOTHERMAL FIELD	66
CONCEPTUAL MODELING AND WELL SITING	53
Drilling	
HANDBOOK FOR DRILLING OPERATION	426
APPENDIX : 1 CLASS ROOM SESSION HANDOUTS VOLUME 1	630
APPENDIX : 1 CLASS ROOM SESSION HANDOUTS VOLUME 2	554
APPENDIX : 1 CLASS ROOM SESSION HANDOUTS VOLUME 3	448
APPENDIX : 1 CLASS ROOM SESSION HANDOUTS VOLUME 4	472
RIG BULLETINS	123
HANDBOOK FOR DRILLING FLUIDS	114
HANDBOOK FOR PLASMA ARC CUTTING	48
HANDBOOK FOR DRILLING HSE PUTTING 5S INTO ACTION	182
HANDBOOK FOR DRILLING EQUIPMENT MAINTENANCE	289
HANDBOOK FOR DRILLING ASSET MANAGEMENT	52
HANDBOOK FOR THE MANAGEMENT TRAINING	56
Reservoir Evaluation	
HANDBOOK FOR WELL TESTING	38
WELL LOGGING HANDBOOK FOR GDC	21
HANDBOOK FOR RESERVOIR EVALUATION	28
HANDBOOK for CONSTRUCTION OF GEOTHERMAL DATABASE MANAGEMENT SYSTEM	168
Environment, Plant Engineering, Corporate/Project Management, Steam Supply Agreement	
HANDBOOK FOR IMPLEMENTING ENVIRONMENTAL AND SOCIAL SAFEGUARDS FOR GEOTHERMAL POWER PROJECTS, GDC	77
ENVIRONMENTAL MONITORING HANDBOOK HYDROGEN SULPHIDE, NOISE AND WATER QUALITY	78
HANDBOOK ON GEOTHERMAL POWER PLANT ENGINEERING	239
HANDBOOK ON EVALUATION of NATURAL DISASTER RISK	118
HANDBOOK ON STEAM SUPPLY AGREEMENT PROMOTION PARTNERSHIP WITH POWER UTILITIES	178
HANDBOOK ON BUSINESS ADMINISTRATION AND FINANCIAL ANALYSIS	137
HANDBOOK ON MANAGEMENT STRATEGY AND BUSINESS PLANNING	99
HANDBOOK ON PROJECT MANAGEMENT	77
HANDBOOK ON INTERNAL CONTROL AND RISK ASSESSMENT	308
Economic Evaluation	
HANDBOOK FOR ECONOMIC EVALUATION OF PROJECT	399
LECTURE MATERIALS FOR ECONOMIC EVALUATION OF PROJECT	414
HANDBOOK FOR CREATING A FINANCIAL MODEL (VOLUME I)	92
LECTURE MATERIALS FOR CREATING A FINANCIAL MODEL (VOLUME I)	136
HANDBOOK FOR CREATING A FINANCIAL MODEL (VOLUME II)	143
LECTURE MATERIALS FOR CREATING A FINANCIAL MODEL (VOLUME II)	184
HANDBOOK FOR CREATING A FINANCIAL MODEL (EXCEL VBA BASICS)	83
LECTURE MATERIALS FOR CREATING A FINANCIAL MODEL (EXCEL VBA BASICS)	83
Geothermal Direct Use	
HANDBOOK FOR DIRECT USE OF GEOTHERMAL ENERGY	64

Content of the Visual Training Support Materials
Volume 1: Visual Training Aid (under construction)

	List of Topics for Drilling Lecture Video	Video Type
1	Basic Concepts of Geothermal Drilling	Lecture Video
2	Development of an Equipment Register	Lecture Video
3	Development of an Integrity and Reliability Maintenance Plan	Lecture Video
4	Knowing Your Rigs	Lecture Video
5	Machine Elements Clutches	Lecture Video
6	Machine Elements Shaft Coupling	Lecture Video
7	Machine Elements Gears	Lecture Video
8	Machine Elements Journal Bearings	Lecture Video
9	Machine Elements Rig Brakes	Lecture Video
10	Machine Elements Roller Bearings	Lecture Video
11	Machine Elements Roller Chain	Lecture Video
12	Machine Elements Shafts	Lecture Video
13	Machine Elements Sheaves	Lecture Video
14	Practical Rig Operations	Lecture Video
15	Drawworks - Preventive Maintenance - Inspection - Reconditioning	Lecture Video
16	Drawworks Operations	Lecture Video
17	Wire Rope, Drilling Line and Accessories	Lecture Video
18	Top Drive System Operations	Lecture Video
19	Mast API RP 4G Inspection	Lecture Video
20	Substructure API RP 4G Inspection	Lecture Video
21	Traveling and Crown Block Preventive Maintenance – Inspection - Reconditioning	Lecture Video
22	Drill Bits	Lecture Video
23	Drilling Tubulars	Lecture Video
24	Drilling Rig Rotating System- Operations	Lecture Video
25	Rotary Kelly Bushing	Lecture Video
26	Rotary Swivel	Lecture Video
27	Rotary Table	Lecture Video
28	Overpull Margin Explanation	Discussion Video
29	Basics of Drilling Fluids	Lecture Video
30	Mud Mixing (Demonstration by Telnite Mud Engineer)	Demonstration Video
31	Mud Tanks and Mud Cycle	Lecture Video
32	Mud Pumps Operation, Fluid End Preventive Maintenance – Inspection - Reconditioning	Lecture Video
33	Mud Pump - Power End Preventive Maintenance – Inspection - Reconditioning	Lecture Video
34	Solid Control System: Shale Shaker Preventive Maintenance – Inspection - Reconditioning Desander - Desilter - Preventive Maintenance – Inspection - Reconditioning Degasser - Preventive Maintenance – Inspection - Reconditioning Centrifugal Pump - Preventive Maintenance – Inspection - Reconditioning Cooling Tower - Preventive Maintenance – Inspection - Reconditioning	Lecture Video
35	Electric Motor PM, Inspection and Reconditioning	Lecture Video
36	Engine PM, Inspection and Recon	Lecture Video
37	Fuels and Lubricants	Lecture Video
38	Generator PM, Inspection and Recon	Lecture Video
39	Intro Rig Power Systems	Lecture Video
40	SCR Systems	Lecture Video
41	General Work Permit	Lecture Video
42	Critical Lift	Lecture Video
43	Hot Work	Lecture Video
44	Confined Space Entry	Lecture Video
45	Working at Heights	Lecture Video
46	LOTO (Look Out Tag Out)	Lecture Video
47	Excavation	Lecture Video
48	How ThermaPrime Manages HSE	Discussion Video

Volume 2: GDC's Corporate Advertisement for the International Event Display (under construction)

List of software produced for training purposes

	List of Software produced under the project	size
	Software for the Database Training	= 180 Mbyte
1	Set of software code written by Eclipse(32 bits) for database training	= 180 Mbyte
2	Set of software code written by Eclipse(64 bits) for database training	= 180 Mbyte
3	Set of software code written by Laravel (Web-Based Database Management GUI) for database training	~487 kbyte
4	Set of software code written by XAMPP(free and open-source cross-platform web server solution stack package)	~505 Mbyte
5	Set of utility software code written for operating GDMANAGER	~59 Mbyte
6	Set of application software related to Composer, JavaRuntimeEnvironment and Postgresql	~206 Mbyte
7	Set of utility software related to the database training	~6.26 Gbyte
	Software for the Economic Evaluation Training	
1	Macro_Basics_(ver2.0).xlsm	34 Kbyte
2	WJ_Geo_PriceModel_(ver10.1）.xlsm	812 Kbyte
3	Finance_Training_for_GDC(ver2.2rev20180126).xlsx	281 Kbyte
4	VBA_Basics_GDC2018(ver1.0).xlsm	323 Kbyte
5	Financial_Model_for_GDC(ver2.0).xlsm	39 Kbyte
6	Financial_Model_for_GDC_Macro_Training2018.xlsm	3,759 Kbyte
7	Finance_Training2_for_GDC_Simple_Model(ver2.0).xlsx	213 Kbyte
8	Finance_Training2_for_GDC_Full_Model(ver2.0).xlsx	568 Kbyte

ANNEX

13：List of Donation Equipment

ANNEX 13: List of Donated Equipment

JFY 2014 (Kenya Shilling)

11,926,419	Item	Unit Amount	Unit	Cost
February 28, 2015	Software Starter 4 (Golden Software)	66,923.37	3 Units	200,770.11
February 28, 2015	Software Voxler 3 (Golden Software)	63,173.07	5 Units	315,865.35
February 28, 2015	Software Global Mapper v15.2 (Blue Marble)	55,898.10	2 Units	117,796.20
February 28, 2015	Software Adobe Photoshop CS	44,423.10	1 Unit	44,423.10
February 28, 2015	Software MATLAB (Mathworks)	434,606.04	3 Units	1,303,818.12
February 28, 2015	Software Weerachai Siripunvaraporn's WS3DINVMT	3,246,933.07	1Unit	3,246,933.07
February 28, 2015	Software Reftek Interface (Trimble)	263,846.16	3 Units	791,538.48
February 28, 2015	Software Reftek COMPASS (Trimble)	163,846.17	3 Units	491,538.51
February 28, 2015	Software Wellsim (Gradient Geodata)	1,656,923.04	1 Unit	1,656,923.04
February 28, 2015	Software T2Pre/post (Edit)	536,303.07	1 Unit	536,303.07
February 28, 2015	Software TOUGH2 CORE (Lawrence Berkeley Laboratory)	562,013.37	1 Unit	562,013.37
February 28, 2015	HP Workstation Computer	308,423.07	1 Unit	308,423.07
February 28, 2015	Software AEROMOD View (Lakes Environmental)	206,798.04	1 Unit	206,798.04
March 30, 2015	Ultrasonic Bath (Daihan)	58,000.00	1 Unit	58,000.00
March 30, 2015	Centrifuge with Accessories (Hettich)	446,195.00	1 Unit	446,195.00
March 30, 2015	Gas Chromatograph with Accessories (Shimadzu)	1,639,080.00	1 Unit	1,639,080.00
Total (Shilling)				11,926,418.53

JFY 2015 (Kenya Shilling)

Date	Item	Unit Amount	Unit	Cost
October 16, 2015	Software RIM Base (Infosat system)	857,770.42	12 Units	10,293,245.08
October 16, 2015	Mud Test Kit (Fann Instrument)	1,187,332.79	1 Unit	1,187,332.79
October 16, 2015	Cutting Machine (Miller)	843,287.23	2 Units	1,686,574.47
October 16, 2015	Gas Monitoring Unit (Riken Keiki)	47,757.37	21 Units	1,002,904.71
October 16, 2015	Rotary Slip with Accessories (Dencon)	593,302.05	4 Units	2,373,208.20
January 22, 2016	Tong (BVM)	1,094,520.08	6 Units	13,134,240.90
October 16, 2015	Safety Clamp (Dencon)	519,135.66	4 Units	2,076,542.63
October 16, 2015	Casing Pipe Tong with Belt (Gearench)	1,707,020.42	2 Units	3,414,040.84
Total (Shilling)				35,168,089.62

JFY2014-2015 Hand Carried Equipment (Japanese Yen)

Date	ITEM	Unit Amount	Unit	Cost
	Funnel 150mm×1.5mm	¥44,000	2	¥88,000
	Funnel 300mm×1.6mm	¥66,000	1	¥66,000
	Tube 1000mm	¥73,000	1	¥73,000
	Tube 500mm	¥48,000	2	¥96,000
	Connector 50mm	¥15,000	4	¥60,000
	Elbow	¥66,000	1	¥66,000
	Teflon Tube 6mm×8mm	¥30,000	1	¥30,000
	Silicon Tube 8mm×10mm	¥6,000	2	¥12,000
April 23, 2014	Aster LB-1 Sat-Image	¥107,800	1	¥107,800
March 18, 2015	Band-it-tool	¥41,850	1	¥41,850
	Total			¥640,650

JFY 2016 (USD)

Date	Item	Unit Amount	Unit	Cost
November 28, 2016	Software (ISC- AERMOD View Version9.1, Lake Environmental)	1,700.00	2 Units	3,400.00
March 29, 2017	Toxic Gas Analyser (JEROME J605,Arizona Instrument)	21,960.00	2 Units	43,920.00
March 29, 2017	Water Analyser (YSI ProDSS)	9,931.00	1 Units	9,931.00
March 29, 2017	Sound Meter (RION, NL-42)	6,945.00	2 Units	13,890.00
March 1, 2017	Lug Jaw (pipe size 4 to 5-1/4inches) (BVM No.1372)	1,460.00	12 Units	17,520.00
March 1, 2017	Lug Jaw (pipe size 5 to 7-1/4inches) (BVM No.1373)	1,645.00	12 Units	19,740.00
March 1, 2017	Lug Jaw (pipe size 6-7/8 to 8-5/8inches) (BVM No.1374)	1,695.00	12 Units	20,340.00
Total (US$)				128,741.00

JFY 2017 (Kenya Shilling)

Date	Item	Unit Amount	Unit	Cost
January 13, 2018	pH Liquid	1,113.60	12 Units	13,363.20
March 21, 2018	Alkaline Agent (Caustic Soda)	138.00	8600kg	1,186,800.00
March 21, 2018	Flocculant (Rhino Lime)	28.00	1000kg	28,000.00
March 21, 2018	Sodium Bicarbonate (Sodium Bicarbonate)	56.00	2000kg	112,000.00
	Transport Cost for 3 Items Above			75,000.00
Total (Shilling)				1,415,163.20

JFY 2017 (USD)

Date	Item	Unit Amount	Unit	Cost
March 24, 2018	Viscosifier (TEL-POLYMER H)	223.61	400pack	89,443.00
March 24, 2018	Dispersant (G-500S, TELNITE)	276.62	75pack	20,747.00
March 24, 2018	Dispersant (TELNITE BX, TELNITE)	71.46	295pack	21,081.00
March 24, 2018	Deformer (Deformer No.15, TELNITE)	130.94	66pack	8,642.00
March 24, 2018	Viscosifier & Lubricant (EASY DRILL, TELNITE)	323.65	165pack	53,403.00
March 24, 2018	Forming Agent (TELFORMER 23L, TELNITE)	95,44	445pack	42,469.00
	Cargo Handling Pallets			846.00
	Freight, Transport, Insurance			41,346.00
Total (US$)				277,977.00

JFY 2017 (Japanese Yen)

Date	Item	Unit Amount	Unit	Cost
April 20, 2017	FCRS Simulation Software	411,900.00	1 Set	411,900
March 20, 2018	Extended Function Program	64,000.00	2 Units	128,000
Total (Yen)				539,900.00

Hand Carried Equipment (Japanese Yen)

Date	ITEM	Unit Amount	Unit	Cost
	pH/ORP Sensors	¥40,000	1 Set	¥40,000
Total (Yen)				¥40,000

JFY 2018 (Kenya Shilling)

Date	Item	Unit Amount	Unit	Cost
	Safety equipment			
	Goggles	348.00	24 Units	8,352.00
	Chemical Gloves	440.80	24 Sets	10,579.00
August 4, 2018	Chemical Apron	522.00	24 Units	12,528.00
	Face Shield	4,060.00	6 Units	24,360.00
	Dust Mask	116.00	200 Units	23,200.00
	Potable Eye Washer	75,000.00	2 Units	150,000.00
	Chemicals			
	Sulphuric Acid	1,299.28	1 Unit	1,299.28
	Phenolphthalein (indicator)	609.00	1 Unit	609.00
	Phenolphthalein (solution)	438.48	1 Unit	438.48
	Silver Nitrate	5,115.60	1 Unit	5,115.60
	Potassium Chromate	2,046.24	1 Unit	2,046.24
August 4, 2018	Sodium Hydroxide Pellets	552.16	1 Unit	552.16
	Edta Disodium Salt	535.92	1 Unit	535.92
	Hydrogen Peroxide	625.24	1 Unit	625.24
	Methylene Blue (powder)	276.08	1 Unit	276.08
	Methylene Blue (solution)	633.36	1 Unit	633.36
	Eriochrome Black T	584.64	1 Unit	584.64
	Buffer Solution	4,292.00	3 Units	12,876.00
Total (Shilling)				230,318.28

JFY 2018 (USD)

Date	Item	Unit Amount	Unit	Cost
October 12, 2018	Mud Pump Sets (NKZ3-D6, TURUMI PUMP)	10,989.75	4 sets	43,959.00
October 12, 2018	Cabtyre Cable（30m） (TOTAKU)	2,063.00	4 Units	8,251.00
October 21, 2018	Hoses Line Ace (Dia.150mm/20m) (TOTAKU)	4,691.50	4 Units	18,766.00
October 12, 2018	S-Color Nipple (150mm) (TOTAKU)	182.55	4 Units	730.00
October 12, 2018	Power Band (150mm) (TOTAKU)	50.19	16 Units	803.00
October 12, 2018	Hose Reducer (100 x 150mm, S-Color/Both sides) (TOTAKU)	127.75	4 Units	511.00
October 13, 2018	Victauric Joint S Type (100mm) (Victauric)	82,75	4 Units	331.00
October 13, 2018	Victauric Joint S Type (150mm) (Victauric)	164.90	10 Units	1,649.00
Total (Shilling)				75,000.00

JFY 2018 (Japanese Yen)

Date	Item	Unit Amount	Unit	Cost
July 20, 2018	LiDAR Data	574,074	1 Set	574,074
August 16, 2018	WellSim Perpetual License - Single User	148,124.00	1 Set	148,124
Total (Yen)				722,198.00

Hand Carried Equipment (Japanese Yen)

Date	ITEM	Unit Amount	Unit	Cost
	Wireline Parts			
	Cablehead Boot	¥1,056	5 Units	¥5,281
	Fishing Neck	¥11,164	1 Unit	¥11,164
	Rope Socket Cone	¥2,641	2 Units	¥5,282
	Contact Sub Assembly	¥8,283	2 Units	¥16,567
	Shipping Costs (USA-JPN)	¥16,730	1 Unit	¥16,730
	Total			¥55,023

ANNEX

14：O&M status of Donated Equipment (GRA, GRM and Environment related)

ANNEX 14: O&M status of Donated Equipment

Category	Name of goods	Manufacturer	Model	Qty	Procuring Agent	Remark (GRA, GRM, Environment)	Plan for a Periodical Maintenance (Cost, frequency, schedule)
Laboratory	Software	Golden Software	Starter 4	3	JICA Kenya Office	GRA	N/A
	Software	Golden Software	Voxler 3	5		GRA	N/A
	Software	Blue Marble Geographic	Global Mapper v15.2	2		GRA	N/A
	Software	Adobe	Adobe Systems Photoshop CS	1		GRA	Annual subscription fee 20,000Ksh/year
	Software	The MatWorks	MATLAB	3		GRA	Additional Lisence (4,000 US$) for next year
	Software	Dr. Weerachai Siripunvaraporn's	WS3DINVMT	1		GRA	N/A
	Software	Trimble	RefTek Interface ver 3.0	3		GRA	N/A
	Software	Trimble	RefTek COMPASS	3		GRA	N/A
	Software	Gradient GeoData	WellSim ver 4. 9.17	1		GRM	N/A (refer to Perpetual License)
	Software	Edit Co. Ltd.	T2Pre/Post	1		GRA	N/A
	Software	Lawrence Berkeley Laboratory	TOUGH2 CORE with EOS1 module	1		GRM	GRM needs additional license fee for EOS2 and EOS3 modules. EOS2 and EOS3 are installed TOUGH3. License fee for TOUGH3 is 20,000 US$.
	High-spec computer	HP	HP-Z230	1		GRM	N/A (GDC can manage maintenance by themselves)
	Software	Lakes Environmental	AEROMOD View	1		Environment	N/A
Laboratory	Ultra sonic vibrator	Daihan	WUC-A03H	1	JICA Kenya Office	GRA	N/A
	Centrifuge	HETTICH	ROTOFIX32A	1		GRA	N/A
	Gas Chromatograph	Shimadzu	GC-8AIT	1		GRA	4,000,000 Ksh for three years service contract
	Gas filter		221-05619-01	1			
	Data processing unit		C-R8A	1			
	Carrier gas tube		201-48067-05	1			
	Packed column		ZM-3	1			
	Packed column		ZP-18	1			
	Automatic voltage stabilizer	Yamabishi	TAC-5HS	1			
Laboratory	Funnel φ150mm JIS	Kyoei Rika	Order made	2	JICA HDQ (Equipment for expert)	GRA	N/A
	Funnel φ300mm JIS			1			
	Tube 1 inch×1000mm			1			
	Tube 1 inch×500mm			2			
	Connector 50mm			4			
	Elbow			1			
	Teflon Tube (6mm ×	Chiyoda	TF－8－20	1			
	Silicon Tube (8mm ×	As one	9－869-17	2			
Laboratory	Toxic Gas Analyser	Arizona Instrument	JEROME J605	2	JICA Kenya Office	Environment	Department has already allocated the budget for calibration (300,000Ksh).
	Water Analyser	YSI	ProDSS	1		Environment	N/A .
	Sound Meter	RION	NL-42	2		Environment	N/A GDC engineers can calibrate by themselves.
	Software	Lake Environmental	ISC- AERMOD View Version9.1	2		Environment	Department has already allocated the budget for 3 years licence (500,000Ksh).
	Software		FCRS Simulation Software	1	West Jec	GRM	N/A
	Software for Sound Meter	RION	NX-42 EX (Extended Function Program)	2		Environment	N/A
	pH/ORP sensors	YSI		1		Environment	N/A
	LiDAR Data			1		GRA	N/A
	WellSim Perpetual License			1		GRM	Department has already requested to purchase renewal lisence, US$ 5.000, for 3 years (2019 to 21) to HDQ.
	Aster LB-1 Sat-Image			1		GRA	N/A
						Total (5 years)	
						GRA	8,100,000 Ksh + 4,000 US$
						GRM	10,000 US$ ＋20,000 US$
						Environment	800,000 Ksh

ANNEX

15：O&M status of Donated Equipment (Drilling Related)

ANNEX 15: O&M status of Donated Equipment(Drilling related

Category	Date of Order	Name of goods	Manufacturer	Model	Delivered QTY		Date of delivery	Procuring Agent	Plan for a Periodical Maintenance (Cost, frequency, schedule)
					No. of packages	weight, volume			
Drilling	Apr.2015	Software	Infostat systems	RIM Base 7	12		Jan. 2016	JICA Kenya Office	Department plans to allocate budget for subscription fee (1million Ksh) in the next financial year.
		Mud Test Kit	Fann Instrument Company	Porta Lab Model 804, Basic Mud Test Kit (207357)	1				N/A
		Cutting Machine(Plasma cutter)	Miller	Spectrum 875	2				Replace torch (1unit for 5 years) : US$ 730
		Gas Monitoring Unit	Riken Keiki	HS-01	21				Calibration and exchange of sensor : JPY 20,000 (not included tranportation cost)/ unit (Total JPY 420,000 equivalent to 420,000 Ksh for 5 years)
		Rotary Slip	DenCon Tool	3056	4				N/A
		Tong	BVM	2-7/8 to 11-3/4inches	12				
		Lug jaw for AAX manual tong (pipe size 10-3/4 to 11-3/4inches)	BVM	No.1376	12				
Drilling	Apr.2015	Safety Clamp	DenCon Tool	12-1/2 to 13-5/8 inches	4			JICA Kenya Office	
		Casing Pipe Tong	Gearench	SCT1020	2				
Drilling							Mar. 2017	JICA Kenya Office	
		Lug jaw (pipe size 4 to 5-1/4inches)	BVM	No.1372	12				N/A
		Lug jaw (pipe size 5 to 7-1/4inches)	BVM	No.1373	12				
		Lug jaw (pipe size 6-7/8 to 8-5/8inches)	BVM	No.1374	12				
Drilling	Nov. 2017	Viscosifier	TELNITE	TEL-POLYMER H (20kg/sac)	400	8,000kg	Mar. 2018	JICA Kenya Office	GDC has already started to procure additional mud chemicals (Already allocated the budget)
		Dispersant	TELNITE	G-500S (20kg/sac)	75	1,500kg			
		Dispersant	TELNITE	BX (20kg/sac)	295	5,900kg			
		Deformer	TELNITE	Deformer No.15 (16kg/can)	66	1,056kg			
		Viscosifier & Lubricant	TELNITE	EASY DRILL (18kg/can)	165	2,970kg			
		Forming Agent	TELNITE	TELFORMER 23L (18kg/can)	445	8,010kg			
Drilling	Feb. 2018	Alkaline agent (Sodium hydroxide NaOH)	Taiwan	Micro Pearl(25kg/pack)	344	8,600kg	Mar. 2018	JICA Kenya Office	N/A
		Flocculant (Calcium hydroxide, $Ca(OH)_2$)	Kenya	Rhino Lime (25 kg/pack)	40	1,000kg			
		Deflocculant (Sodium Bicarbonate,$NaHCO_3$)	China	Food Grade (25 kg/pack)	80	2,000kg			
Drilling	Feb. 2018	Mud Pump Sets	TSURUMI PUMP	NKZ3-D6/B6	4		Oct. 2018	JICA Kenya Office	Under confirmation (replace bearing, seals, lubrication for 5 years)
		Cabtyre cable（30m）	TOTAKU	-	4				N/A
		Hoses Line Ace (Dia.150mm/20m)	TOTAKU	-	4				
		S-Color nipple (150mm)	TOTAKU	-	4				
		Power band (150mm)	TOTAKU	-	16				
		Hose Reducer (100 x 150mm, S-Color/Both sides)	TOTAKU	-	4				
		Victauric joint S type (100mm)	Victaulic	S-0-100	4				
		Victauric joint S type (150mm)	Victaulic	S-0-150	10				

Consumables

Drilling		Cablehead boot			5			JICA HDQ (Equipment for expert)	Safety Department has budget for consumables.
		Fishing neck			1				
		Rope socket cone			2				
		Contact sub assembly			2				
Drilling		Goggles			24		Aug.2018	JICA Kenya Office	Safety Department has budget for consumables.
		Chemical Gloves			24				
		Chemical Apron			24				
		Face Shield			6				
		Dust Mask			200				
		Potable Eye Washer			2				
Drilling		Sulphuric acid			1		Aug.2018	JICA Kenya Office	N/A
		Phenolphthalein (indicator)			1				
		Phenolphthalein (solution)			1				
		Silver Nitrate			1				
		Potassium chromate			1				
		Sodium hydroxide pellets			1				
		Edta disodium salt			1				
		Hydrogen peroxide			1				
		Methylene blue (powder)			1				
		Methylene blue (solution)			1				
		Eriochrome black T			1				
		Buffer solution			3				
Drilling		pH liquid			12		Jan. 2018	West Jec	N/A
		Band-it-tool			1		Mar.2015		

Total (5 years) 1,420,000 Ksh＋ 730 US$ ＋ α

ANNEX

16：Sustainable Training Program Building a Competency Development Program

Sustainable Training Program

BUILDING A COMPETENCY DEVELOPMENT PROGRAM

Project for Capacity Strengthening for Geothermal Development in Kenya

December 2019

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Tables and Figures

CHAPTER 1 INTRODUCTION

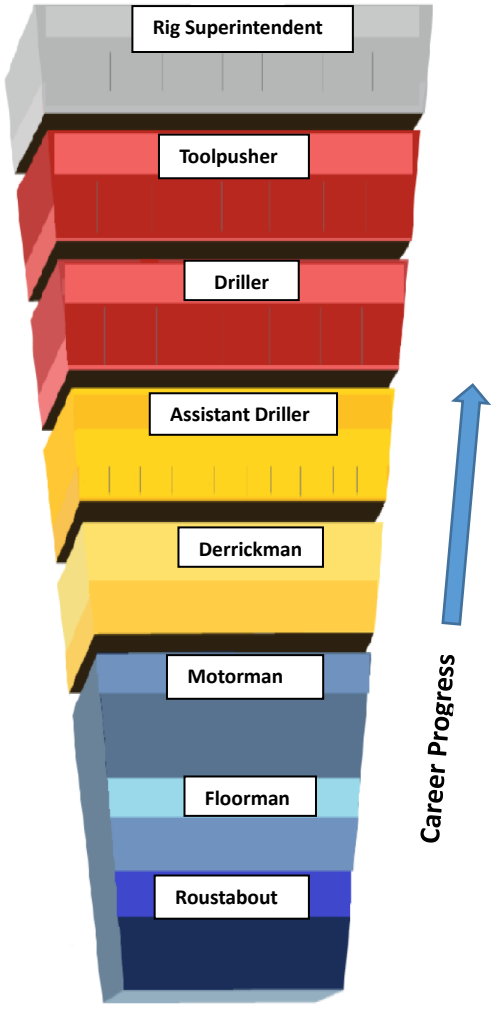
One of the outputs requested under the “Project for Capacity Strengthening for Geothermal Development in Kenya” is to establish sustainable training program which links and is reflected to the career. While this capacity building project covers almost all the corners of the GDC organization, it is not realistic to establish a comprehensive training program covering the all the modules under the project.

In this situation, it is sought to make a model training program which will bring the largest impact to GDC organization and will be relatively easier to capture and implement the program and we came to conclude it is best to target the drilling personnel from the new recruit until the driller which will be the icon of GDC driller.

The progression of career for the drilling personnel is illustrated in the figure below.

The positions shown is similar to that of GDC up to “Driller”. Though the position of “Toolpusher” in GDC is assumed to be “Shift leader”, its capacity level differs the most as compared with the “Toolpusher” by definition.

The reason why the training program is to address the career up to the driller is because the career path after reaching “driller” will have more options and also be influenced by many other factors, which a uniform training program is difficult to address.



We set the following objectives for the training program :

- Produce Driller with predefined competency in a given period
- Link the training program with the career development program(or promotion/pay rise)
- GDC management to have means to monitor/control the individual training progress and quality which is mainly conducted under OJTs.

PROPOSED TRAINING PROGRAM

1, Define target profile of each category of drilling personnel (rustabout, floorman, motorman, derrickman, driller, etc.) while considering the career progress.

2, Define key competencies for each target profile.
3, Define training goal and the period for each phase of the training curriculum.
4, Define training program (curriculum) to achieve above key competencies in terms of the technical/managerial/HSE and other subjects to meet the target profile
5, GDC management and H/R monitors and control training progress to assure maintaining quality of training mainly conducted by way of OJT.

For convenience purpose, we tentatively name the training program as follows:
VISION PROGRAM (Seniority linked curriculum based career development program

The training addresses one of the most important components of the company, the human resource, on whom the company's future depends. The role of the project team merely assists the GDC's management to set up the training program. Upon this understanding, we prepared this training program.

CHAPTER 2 Define Target Profile

The general job description of each target is shown below:

Roughneck: it's duties can include anything involved with connecting pipe down the well, as well as general work around a rig. The crew of a land-based rig can be further divided into several positions:

Toolpusher: The highest position at the drilling location, responsible for every crew. A toolpusher may stay on location for a few days or weeks at a time during operations, whereas individual drilling crews work only eight- or 12-hour shifts or "tours" (pronounced as "towers").

Driller: The head of an individual crew, responsible for controlling a rig's machinery during drilling, as well as most other rig operations.

Assistant Driller: one step below the driller and is assumed to have similar competency as the driller.

Derrick-man: . Though the exact duties vary from rig to rig, they almost always report directly to the driller and second in rank to the driller. Responsible for the drilling mud, the mud pits where drilling fluids are circulated around the system, and the mud pumps, as well as being the hand up in the derrick manipulating stands into and out of the fingers during tripping operations. Acting as a lead for the driller who is mostly restricted to the rig floor. In many cases the derrickman is exclusively responsible for work in the derrick during "tripping" pipe in and out of the hole. In terms of skill, physical exertion and perceived danger, a derrickman has one of the most demanding jobs on the rig crew.

Motorman: Responsible for maintenance of various engines, water pumps, water lines, steam lines, boilers and various other machinery incorporated into the rig on a daily basis. Also responsible for movement of equipment on site. On a four-man drilling crew the motorman is also the chainhand.

Floorman: They work primarily on the rig floor where he is the one actually operating the tongs, iron roughneck, tugger, and catwalk, and doing pretty much any other job which is asked of them.

Roustabout: Drillers start off as roustabouts until they gain enough experience to move up to a floorman position. A roustabout has no limits in the drilling rig and can, and will do any and all geothermal field work.

GDC has defined job description of some of the positions. For example, that for the derrickman is shown in the following table. It is likely that GDC has set of job descriptions of the target profiles addressed in this training program.

Table 2-1 JOB description of Derrickman defined by GDC

POST TITLE	**DERRICK MAN**
REPORTING TO:	**DRILLER**
DEPARTMENT	**DRILLING OPERATIONS**
SECTION	**OPERATIONS**
LEVEL	**GD9**

1. JOB PURPOSE

The Derrick man carries out a variety of general duties and operates from the derrick and on the mud tanks to assist in the drilling and servicing of oil/gas/geothermal wells.
The Derrick man's secondary responsibility is the mixing of mud chemicals and the measuring of mud density. He is second in rank to the Driller.

2. PRINCIPAL ACCOUNTABILITIES.

- Align and manipulate sections of pipe or drill stem from the Monkey board at the rig derrick during the tripping in and tripping out of drill stem and drill bit.
- Among the key people during Rig down, Rig move and Rig up drilling or service rigs
- Operate and maintain mud pumps, mud systems, and mix mud chemicals and additives.
- Read gauges to monitor pressure, density, rate and concentration and adjust pumping procedure as required.
- Record mud flows and volumes and take samples.
- Supervise floor men in their work.
- Assisting the driller and communicating to him the current operating conditions.
- Ensure safe operating procedures in circulation system.
- Check and maintain derrick and lines above.
- Make sure the derrick is inspected before raising or lowering pipe.
- Maintain the fluid end drilling equipment with the aid of the Driller
- Inspect and grease the crown block
- Help out in the training of new crew members
- Conduct and participate in BOP drills and explain what has to be done and assign each hand to specific jobs
- Perform pre-spud safety checks, check for and repair leaks in all lines, make sure guards are in place.
- All other duties that may be assigned by the shift in charge

3. KNOWLEDGE AND EXPERIENCE.

O level and above
3 years' experience working as floor man

4. SKILLS AND COMPETENCIES.

- Able to work independently with minimum supervision
- Analytical skill and effective communication
- Team spirit.
- Good supervision skills.
- Excellent interpersonal skills
- Capable in duties prioritization

CHAPTER 3 What is competency and its connection with training?

3.1 Definitions

One of the important steps of this program is to create list of required competency for each level of job workers. Some pages are allocated to provide guidance and outlines the importance of creating competency and setting up an assurance program.
We adopt basic definitions for these key concepts: competency, competency standard, competency model, and competency assurance program.

3.1.1 What is competency?

Competency: An individual's knowledge, skills, abilities, and behaviors.

Note: Although the definition of knowledge, skills, and abilities—often referred to as **KSA**s—is not exactly the same as that for competencies, KSAs and competencies serve the same purpose and are often used interchangeably..

Knowledge: An employee's clear and practical understanding of the material needed to perform his or her job successfully and efficiently. Knowledge may be tested.

Skill: An employee's ability to perform the job tasks consistently, precisely, and reliably. Skills may be assessed.

Ability: An employee's physical capabilities (e.g., climbing, lifting, seeing, hearing). Ability may be determined but typically cannot be enhanced.

3.1.2 What is a competency standard?

Competency Standard: The set of competency elements that comprises the total expectation of an individual in a specific role or position. It defines the expected level of performance as determined by the organization

3.1.3 What is a competency assurance program?

Competency Assurance Program: A structured and documented process of identifying, defining, assessing, developing, and managing the required competencies of company personnel. It includes the formal systems, tools, and processes that ensure personnel are competent to complete tasks to a determined standard.

3.1.4 How does competency differ from performance?

Competency encompasses the skills, knowledge, abilities, and behaviors required to perform a specific job. By using a proficiency scale, competencies indicate whether a person meets certain criteria and how well a person demonstrates the ability to do a job. By contrast, performance measures output, e.g., how well a person completes a specific task and adds value to the organization.

3.1.5 What is the difference between competencies and qualifications?

Competency differs from qualification in that a qualification is simply the prerequisite for doing a task, while competency is how well a task is done.

For example, many individuals pass a driving test and are qualified to drive a car, but they may not be good drivers and may cause accidents, so they are not competent in driving cars. Another example is that a college degree gives a person the qualification to get an entry-level job in an organization, but training and time doing the job helps that person to develop the competency to do the job well. Traditional qualification relies on attending trainings and on years of experience while competency is measured using observation of performance (knowledge, skills, abilities, behavioral attributes, etc.).

3.1.6 What is the difference between competency and training?

There is a belief that if an individual attends trainings, he or she becomes competent. Training is a means of acquiring knowledge. Knowledge can be tested, but competency must be demonstrated on the job. We can apply the 80/20 rule to training. Less than 20% of an employee's competence comes from traditional training (e.g., classroom, eLearning, etc.). Approximately 80% or more of the learning and competency is acquired through "on-the-job" and "hands on" training, coupled with experience and time in position.

"The 70-20-10 Model for Learning and Development is a commonly used formula within the training profession to describe the optimal sources of learning by successful managers. It holds that individuals obtain 70 percent of their knowledge from job-related experiences, 20 percent from interactions with others, and 10 percent from formal educational events.".

3.2 Components and basic process of Competency based Training Program

Competence programs may comprise all of a company's job titles/tasks, departments, and product lines, or may comprise only specific job titles. Tasks, departments, and product lines.

In the simplest terms, the scope of the program is many of the company's positions or job functions are included in the geographical area in which the program is implemented. There is no minimum or maximum size for a competence program. As a program grows and evolves, changes that affect its scope must be reported.

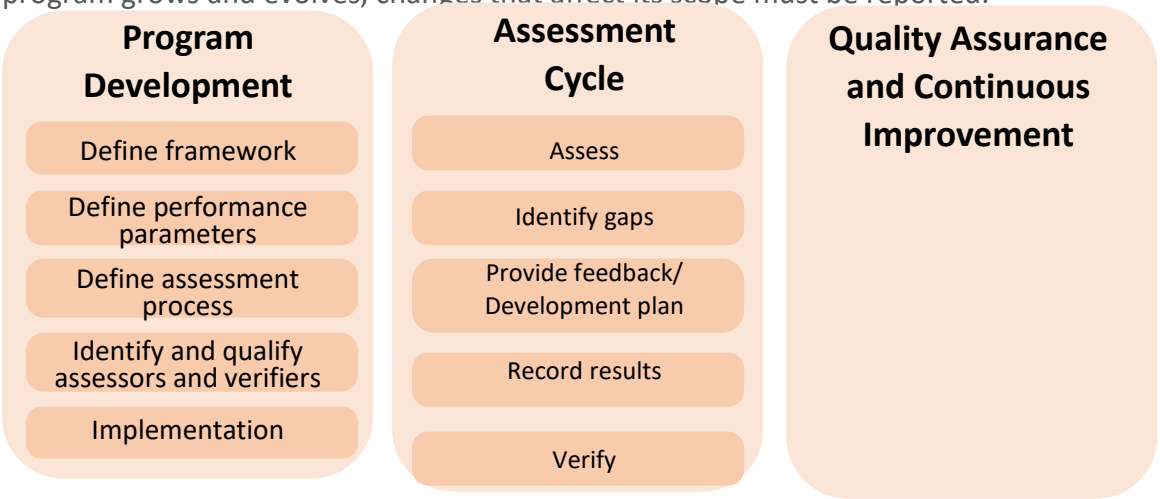


Figure 3-1 Training Program PDCA cycle

The sample case for the driller's training program, the program development may be described as follows:

① Define framework : The target of the program is from the roustabout to driller level
② Define framework : Define job description and requirements/ competencies for each level
③ Define framework : Define training tasks/curriculum to acquire competencies
④ Define performance parameters: Define conditions and period to clear each step of the training curriculum
⑤ Define assessment process: Define reporting/monitoring/assessment process for the monthly, annual and/or the event base(e.g. seminars) by first peer, secondary peer and/or H/R
⑥ Identify and qualify assessors and verifiers: As per ⑤.
⑦ Implementation

The Assessment Cycle describes how to construct system to monitor/assess/ control the OJT quality for standardization of the training outputs. This is because, as explained in I-1-6, the most of the training takes place as form of OJT which is a de-centralized and the training quality may be very influenced by the individual environment (tutor who is essentially his/her peer, work load, etc.). The management and H/R must make sure the quality of training by proper implementation of monitoring and assessment of the OJT. And if necessary they must intervene the OJT. The seminar is one of the effective tools to assess and standardize individual performance.

3.3 RESPONSIBILITY MATRIX

Each key personnel in the GDC organization must take responsibility in the set-up, implementation, outcome and the improvement of the training program.
As it was explained, the main venue for the training implementation occurs in the field as OJT. Therefore the direct peer of the trainee will be the most important person responsible for the implementation/monitor/control of the training and its quality. But because of its de-centralized nature, the top managers and the personnel department must be carefully monitor the quality of training and must make sure not only the progress and the quality of the training but also the standardization of the quality of the training.
Under the VISION program, the PDCA(Plan-Do-Check-Act) process is realized by the training curriculum, the monthly training report, the annual merit rating, the centralized control(paper test, practical test, clearing tasks) and/or the centralized seminars.

Table 3-1 Competence Assurance Process Steps and responsibility matrix

Competence Assurance Process Steps and Tasks in the Training Program for the Rig Operation Personnel	Drilling Operations Head	Management Representative	Department Head-Rig Operations	HR Head	Competence Dev't Focal Person	Line Manager / Supervisor
1) Identification and documentation of rig operations critical positions	A	I	I	R	C	
2) Determination and documentation of Competence Requirement for the Rig Operations Job Competence Profiles	A	I	I	R	C	
3) Determination and documentation of required Levels of Proficiency for the tasks in the Job Competence Profiles	A	I	I	R	C	
4) Identify and provide Competence Assessors within the company's organization;	A	I	I	C	S	I
5) Conduct proficiency level assessment of an individual, and documentation	A	I	I	C	I	R
6) Develop Individual Competence Development Plan	A	I	I	C	I	R
7) Implement and complete documentation and monitoring of the each Individual's development plan	A	I	I	C	I	R
8) Periodic re-validation of proficiency levels for rig operations positions	A	I	I	R	C	I
9) Periodic review of competences relevant to rig operations position	A	I	I	R	C	I
10) Management Review of the competence assurance process and its results	A	R	C	S	I	

R	Responsible - Person responsible for carrying out the task. This person typically reports to the Accountable Person
A	Accountable (or Approver) - Person responsible for the whole task/activity. This person typically is the Line Manager/ Supervisor of the Responsible Person
S	Support - Person who provides support during the implementation of the activity / process / task
C	Consult - Person who can provide valuable advice or consultation for the task
I	Inform - Person who should be informed about the task progress or the decisions in the task

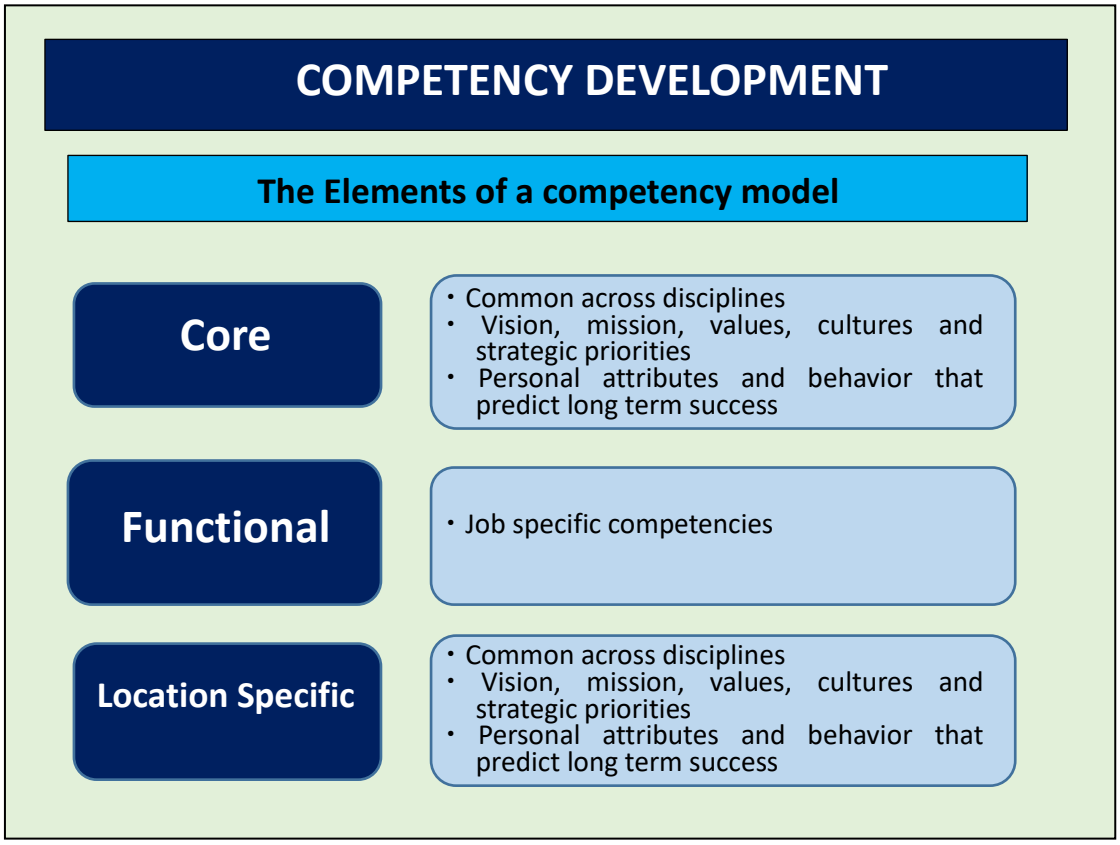
3.4 COMPETENCY DEVELOPMENT

Competency frameworks vary across companies; each one must identify and choose which model will work best for them. The model should be designed as a resource that

provides a lifelong learning template of the core competencies and skills necessary for entry into the drilling profession as well as in maintaining proficiency.

- Competency models should include the competencies an employee must have now and in the future.
- Competency models must support the intended programs, e.g., assessment, development, performance management, etc.
- Competencies must be easy to use and understood across the organization

Table 3-2 Competency Development



According to Thermaprime Drilling of Philippines, they categorize the competencies in 5 different groups: 1. CORE, 2, Drilling, 3, QHSE(quality, health, safety and environment), 4. RM (Records management), 5. SS (transport).

They kindly provide a suggested list of competencies required for a qualified driller. In fact up to the toolpusher level. As mentioned earlier, there is no minimum or maximum size for a competence program. As a program grows and evolves, changes that affect its scope must be reported. Therefore the competency list provided here should be treated as a mere reference and must be adapted to the GDC situation. The comprehensive list of competencies categorized in each group are shown in the Annex 2 ~ Annex 6.

3.5 COMPETENCY RATING SYSTEM (EXAMPLE OF PROFICIENCY SCALE)

A competency program requires a system in rating employee performance against the identified competency for each position. Examples of rating system:

- **Two-point**; Competent/Not yet Competent
- **Three-point**; Needs Improvement/Capable/Proficient
- **Four-point**; Unsatisfactory/Needs Improvement/Competent/Exceeds Expectations

The proficiency scale shall be set based on the organizational needs. This table illustrates proficiency rating using a 5-point scale.

Table 3-3 Competency Guide – Proficiency Scale

Competency Level	1	2	3	4	5
Qualitative Rating	**Awareness**	**Application Level (Beginner)**	**Career Proficient Level (Mature)**	**Advanced Level (Mastery)**	**Expert Level (Excellence)**
	Awareness of competency	Significant advancement over entry level requirements (""entry" defined as minimum hiring requirements)	Significant advancement over beginner level competence. Is a role model in the department...?	Significant advancement over mature competency level, bringing greater value to the organization and higher learning requirement for the individual. Is a role model in the organization	Achievement of a proven track record in providing knowledge and solutions within the organization and is an industry expert and role model.
	No opportunity to demonstrate competency	Capabilities to perform basic types of work as related to the activities/tasks within the job family with close supervision.	Capabilities to perform Virtually all work assigned in the department/division / function as related to the activities/ tasks within the job family with minimum supervision. Able to make wise recommendations	.Capable to provide advices on all work assignment in the department/division /function as related ·to the activities /tasks within the Job family without supervision and able to· decide.	Capabilities to perform most complex and technically demanding work within the organization without supervision and able to decide.

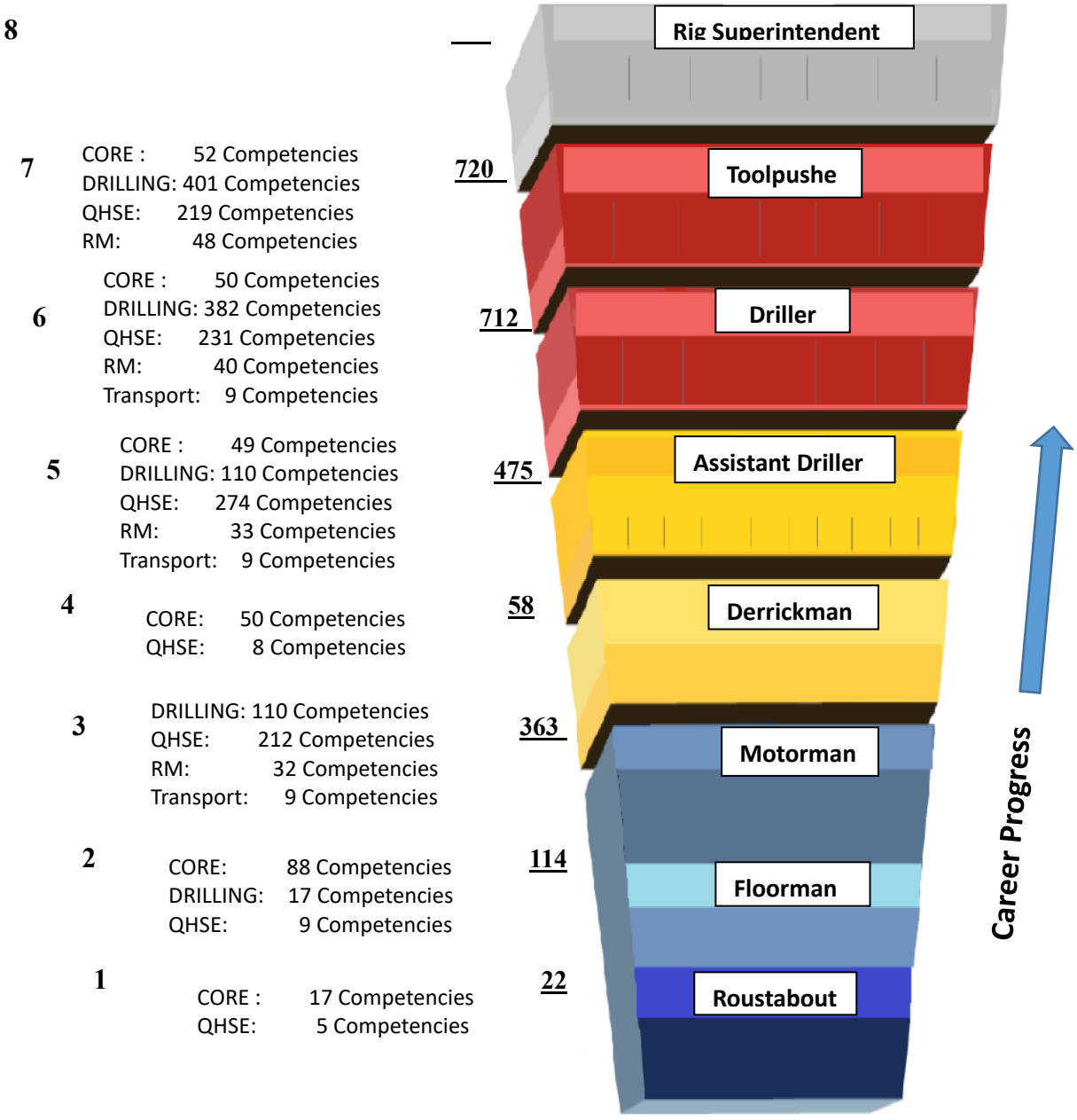
3.6 COMPETENCY BUILDUP

Each line competency shall be rated. It is important to understand the meaning of each rating and the expectations are based on the job requirements. With help of the human resource department of Thermaprime Drilling of Philippines, we prepared a sample competency list for the drilling personnel, e.g. Roustabout, Floorman, Motorman, Derrickman, Assistant Driller, Driller and Toolpusher shown in the Annex. The competency list for the toolpusher is shown just as reference and this position is

not part of the training program in the VISION program.

The diagram shown below illustrates how competency is built up with number of required competencies for each level of drilling personnel. Those comprehensive list of required competencies for each level with suggested competency level are shown in Annex 7 ~ Annex 13.

Table 3-4 Competency build-up with career progress



3.7 CAREER PROGRESSION

How the organization defines, assesses and rates employee competence is based on business need and legal requirements. Once established it will show a clear path to achieving the next level position and level, based on the set standards and the curriculum for the training program.

In the following diagram, a rule of thumb career progression in rig operations is shown. The most of the current drilling work force in GDC have not followed this career progression nor the associated training program.

It is required to fulfill the missing gaps in the required competencies for the relevant GDC drilling personnel.

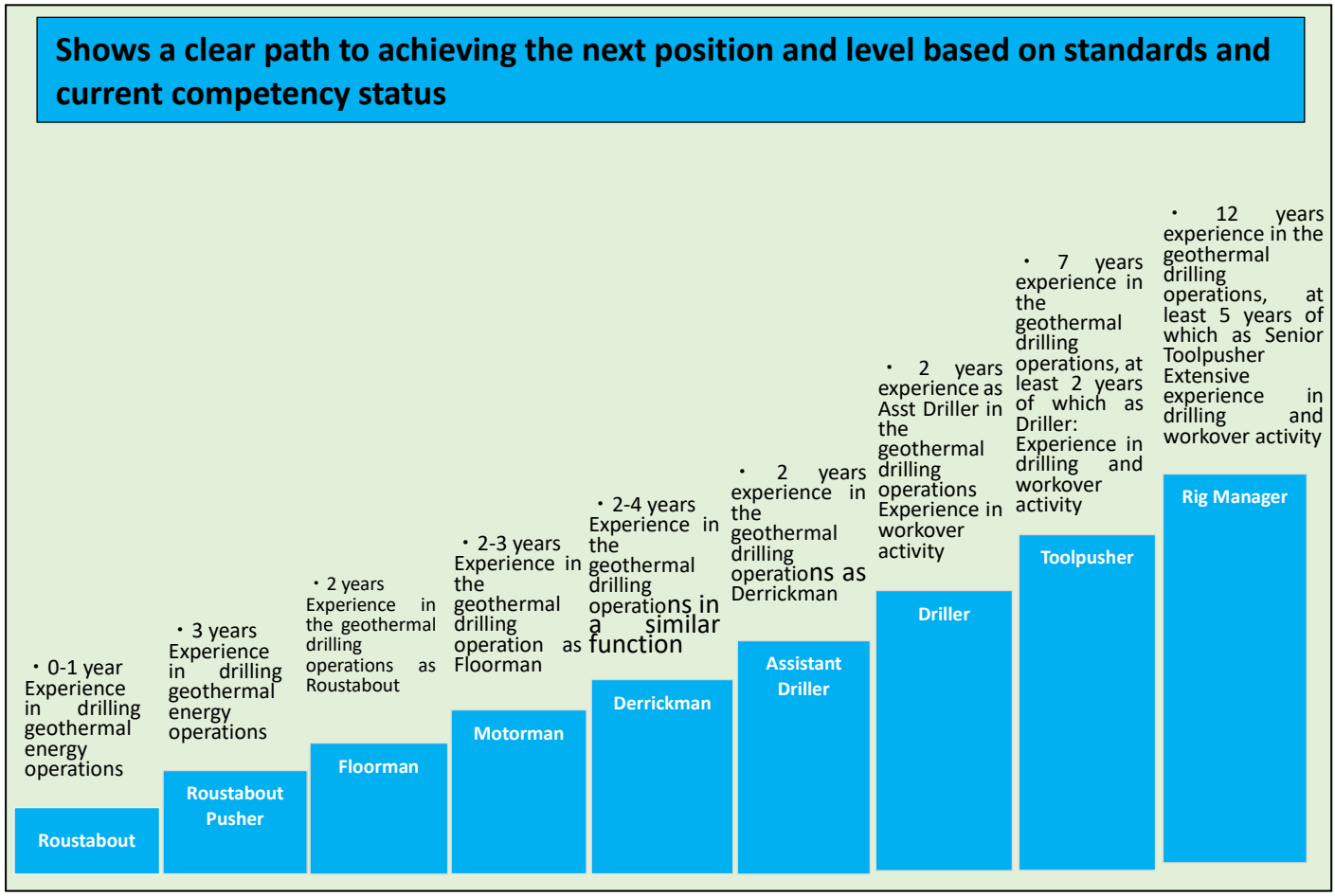


Figure 3-3 CAREER PROGRESSION

CHAPTER 4 Training Curriculum

The training curriculum is based on the required competency for the next level of the career step. In accordance with the standard career progression and the competency requirement, the following training plan is presented.

Table 4-1 Summary of the VISION program

Seniority (months)	Phase	Title	Curriculum Competencies	Seminars	Controls
0~12	VISION-1	Junior Roustabout	CORE-1 QHSE-1		
12~36 (24)	VISION-2	Roustabout	CORE-2 QHSE-2 Drilling-1	Basic drilling seminar	Floorman Control
36~60 (24)	VISION-3	Floorman	RM-1 QHSE-3 Drilling-2	Next Phase DRILLING SEMINAR	Motorman Control
60~90 (30)	VISION-4	Motorman	CORE-3 QHSE-4		Derrickman Control
90~114 (24)	VISION-5	Derrickman	CORE-4 QHSE-4 Drilling-3 RM-2 SS-1	1st Advanced Drilling Seminar	
114~138 (24)	VISION-6	Derrickman	CORE-5 QHSE-5 Drilling-4 RM-3 SS-2	2nd Advanced Drilling Seminar	Assit.Driller Control
138~162	VISION-7	Assistant Driller	CORE-6 QHSE-6 Drilling-5 RM-4 SS-3	3rd Advanced Drilling Seminar	Driller Screen Test Driller Control

The most of the training is conducted by OJT basis with occasional centralized seminar for quality control. Therefore the peer in the work is their tutor and primarily responsible for the training quality and the progress. The H/R and HQ management must make sure the VISON participants understand the program and importance to adhere the VISION requirement.

Regarding the learning materials, in the JICA capacity build up project, more than 6000 pages of the handbooks for the training purpose has been created in addition to the visual training material. Nearly half of the handbook pages are dedicated to the drilling

module and all the visual aid is are prepared for the drillers training. These handbooks and visual aid should serve OJT and seminar lecturing for the VISON program.

Because the most of the training scene is decentralized, there needs occasional events to monitor and control the training quality. The monthly training report and annual merit rating serves this purpose. But also the centralized training seminars are very effective to monitor the performance of trainee, detect flaw in the specific OJT and/or standardize the training/capacity quality. Regarding the seminar, if possible, the annual schedule of the seminars should be prepared and advocated well in advance. If it is not possible, the seminar schedule must be known to all the GDC personnel well in advance so that the relevant participants can plan for them considering job workload and/or private constraints.

As part of the training, it is recommended to give some hand-on training such as having the trainee carry out some maintenance program of the drilling equipment.

CHAPTER 5 Training Reporting and Monitoring

As mentioned above, because the training scene is mainly by the decentralized OJT, the management and H/R must monitor the quality of the training and its implementation. The sample monthly training report shown below is one of the vital tools.
The format of the monthly training report is straight forward so that the training progress and its achievement can be glanced easily.
The column can be added to show number of competency completed vs. total number of competencies to be completed in the particular VISION curriculum. Columns for the date of completion of VISION task and the plan are provided to assess the training progress. The trainer (often trainee's peer) must make sure the trainee makes effort to complete the tasks in time and to plan for the attendance on the relevant seminars.
Another tool to monitor and control the training progress/quality is the annual merit rating. The current GDC merit rating form can be modified to accommodate such function. A sample format is shown in Figure VI-2 and 3. The other forms associated the annual merit rating such as interview record, job performance plan and review can be added according to the needs and relevancy.
Among the other purposes, these forms are communication tools for monitoring and controlling the training between the trainee and the management/HR people.

VISION

GDC Geothermal Development Company

Powering the Vision

MONTHLY TRAINING PROGRAM (DRILLER)

	Name
Month	District/Loc
Seniority	VISION Director

	Time SCALE	VISION Requirements	Target DATE	ACTUAL DATE	RATING
	162	Driller			
VISION 6	24	Driller Control			
		Drillir Screen Test			
		3rd Advanced Drilling Seminar			
		SS-3			
		RM-4			
		QHSE-7			
		DL-5			
		CO-6			
		Assit.Driller			
VISION 6	24	Assit.Driller Control			
		2nd Advanced Drilling Seminar			
		SS-2			
		RM-3			
		QHSE-6			
		DL-4			
		CO-5			
VISION 5	24	1st Advanced Drilling Seminar			
		SS-1			
		RM-2			
		QHSE-5			
		DL-3			
		CO-4			
		Derrickman			
VISION 4	30	Derrickman Control			
		QHSE-4			
		CO-3			
		Motorman			
VISION 3	24	Motorman Control			
		Next Phase DRILLING SEMINAR			
		RM-1			
		QHSE-3			
		DL-2			
		Floorman			
VISION 2	24	Floorman Control			
		BASIC DRILLING SEMINAR			
		QHSE-2			
		DL-1			
		CO-2			
		Roustabout			
VISION 1	12	Roustabout CONTROL			
		QHSE-1			
		CO-1			
	Orientation/Introductory Training				

- PROGRESS REPORT (achievement last month)

- NEXT MONTH TRAINING PROGRAM

- COMMENTS BY VISION DIRECTOR / FIELD SERVICE MANAGER

VISA Driller	VISA VISION DIRECTOR	VISA FIELD MANAGER

DISTRIBUTION : Driller / DRILLING DEPT. / HR

Figure 5-1 Sample Monthly Reporting Form

GDC Drilling Department

MERIT RATING FOR DRILLER

ENGINEER NAME	SALARY GRADE	SENIORITY DATE	PLACE OF ASSIGNMENT	DATE OF ASSIGNMENT	POSITION	BIRTH DATE

1. SPECIFIC OBJECTIVES AND RESULTS SUMMARY

Outline of Specific Objectives (List no more than 3)	Results	Comments - Objectives vs. Results

2. PERFORMANCE

TECHNIQUE - HARDWARE

	E	G	S	U		E	G	S	U
1. Theory, application and limitations of drilling services	☐	☐	☐	☐	7. Appearance of equipment	☐	☐	☐	☐
2. Operational skill of drilling services	☐	☐	☐	☐	8. Troubleshooting and repair of mechanical equipment	☐	☐	☐	☐
3. Manual skill. Mechanical aptitude	☐	☐	☐	☐	9. Troubleshooting and repair of electrical equipment	☐	☐	☐	☐
4. Theory, application and limitations of drilling equipment	☐	☐	☐	☐	10. Product quality	☐	☐	☐	☐
5. Indepth knowledge of drilling hydraulics	☐	☐	☐	☐	11. Conducts trouble - free operations	☐	☐	☐	☐
6. Application of MAINTENANCE PROGRAM	☐	☐	☐	☐	Overall technical performance	☐	☐	☐	☐

TECHNOLOGIES	FLUID CONTROL	RIG EQUIPMENT	AIR DRILLING	TUBULAR GOODS	DIRECTIONAL DRILLING	CEMENTING	TDS	FISHING
EXPERIENCE								
MODERATE								
NO EXPERIENCE								

COMMENTS

TECHNIQUE - SOFTWARE/GEOSCIENCE

1. Knowledge of geology and reservoir engineering	☐	☐	☐	☐	5. Application of Interpretation knowledge	☐	☐	☐	☐
2. Knowledge of geoscientific parameters and drilling performance	☐	☐	☐	☐	6. Client relations	☐	☐	☐	☐
3. Knowledge of RIMBASE	☐	☐	☐	☐	7. Job follow up or client follow up	☐	☐	☐	☐
4. Knowledge of CH Interpretation	☐	☐	☐	☐	Overall sales performance	☐	☐	☐	☐

COMMENTS

MANAGEMENT

1. Job planning	☐	☐	☐	☐	7. Communication with subordinates	☐	☐	☐	☐
2. Organizations and direction of crew	☐	☐	☐	☐	8. Communication with peers and supervisor	☐	☐	☐	☐
3. Makes sound decisions	☐	☐	☐	☐	9. Motivation of subordinates	☐	☐	☐	☐
4. Accomplish results	☐	☐	☐	☐	10. Appraisal of crew	☐	☐	☐	☐
5. Delegation of responsibility and authority	☐	☐	☐	☐	10. Reporting efficiency	☐	☐	☐	☐
6. Leadership	☐	☐	☐	☐	Overall management	☐	☐	☐	☐

COMMENTS

DISTRIBUTION: **HR, NAIROBI** **DRILLING DEPARTMENT, POLO CENTRE**

Figure 5-2 Sample merit rating form 1/2

GDC Geothermal Development Company

GDC Drilling Department

MERIT RATING (Page 2)

DATE _____

ENGINEER NAME

		E	G	S	U		E	G	S	U
SAFETY	1. Attitude towards safety	☐	☐	☐	☐	4. Driving Habits	☐	☐	☐	☐
	2. Safety record	☐	☐	☐	☐	5	☐	☐	☐	☐
	3. Promotion safety	☐	☐	☐	☐	Overall technical performance	☐	☐	☐	☐
	COMMENTS									
TRAINING	1. Self training	☐	☐	☐	☐	4. Lecturing ability	☐	☐	☐	☐
	2. Involvement in training(VISION)	☐	☐	☐	☐	5	☐	☐	☐	☐
	3. Ability to develop people	☐	☐	☐	☐	Overall sales performance	☐	☐	☐	☐
	COMMENTS									

3. PERSONAL QUALITIES

1. Personal appearance	☐	☐	☐	☐	9. Hard worker	☐	☐	☐	☐
2. Attitude	☐	☐	☐	☐	10. Ability to work under pressure	☐	☐	☐	☐
3. Enthusiasm/Agressiveness	☐	☐	☐	☐	11. Ability to express himself	☐	☐	☐	☐
4. Physical resistance	☐	☐	☐	☐	12. Co-operation	☐	☐	☐	☐
5. Initiative	☐	☐	☐	☐	13. Accepts criticism	☐	☐	☐	☐
6. Creativity	☐	☐	☐	☐	14. Dependability	☐	☐	☐	☐
7. Matuarity/Common sense	☐	☐	☐	☐	15. Linguistic ability	☐	☐	☐	☐
8. Adaptability	☐	☐	☐	☐					
					Overall disposition for GDC drilling job	☐	☐	☐	☐
COMMENTS									

4. MAJOR STRENGTH & WEAKNESS

(List the main strength and main weakness, with comments)

STRENGTH	WEAKNESS

OVERALL PERFORMANCE

☐ A ☐ B ☐ C ☐ D ☐ E

5. DRILLER'S COMMENTS

DATE DISCUSSED WITH EMPLOYEE	**IMMEDIATE SUPERVISOR**	NAME	SIGNATURE	TITLE	DATE
EMPLOYEE SIGNATURE	**REVIEWING MANAGER**	NAME	SIGNATURE	TITLE	DATE

DISTRIBUTION: **HR, NAIROBI** **DRILLING DEPARTMENT, POLO CENTRE**

Figure 5-3 Sample merit rating form 2/2

Seminar is another tool not only for teaching but also for monitoring and controlling the training which is primarily conducted in the OJT. Therefore the key seminars under Vision Program are well schedule in advance and fixed so that the participants and their peers can plan these seminars well ahead.

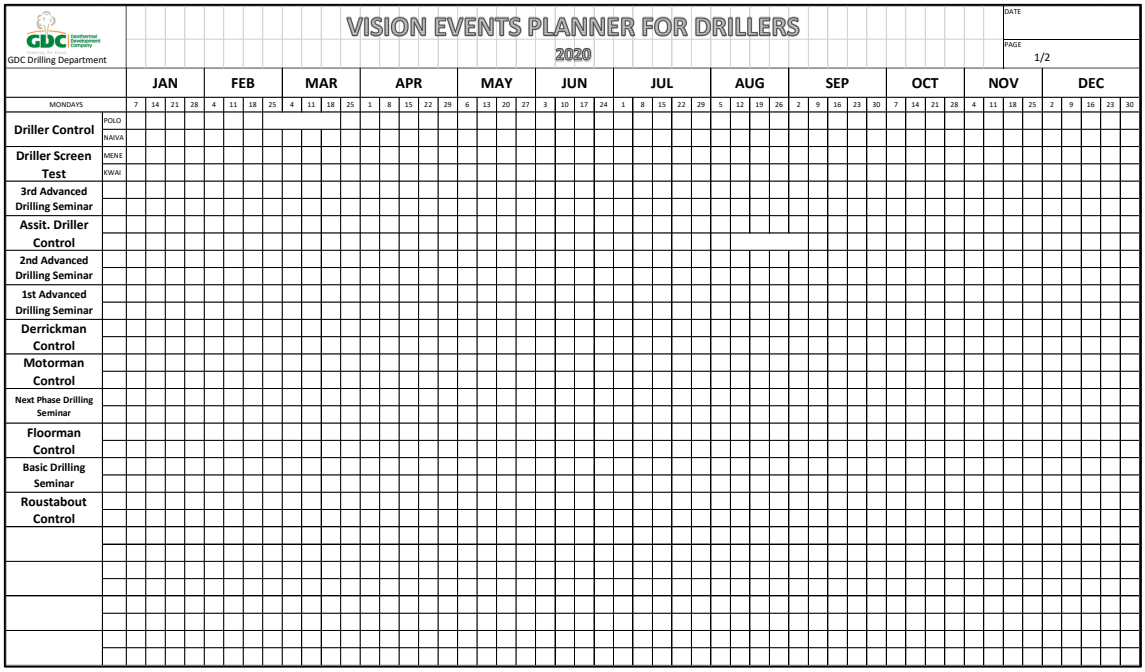


Figure 5-4 VISION EVENTS SCHEDULE

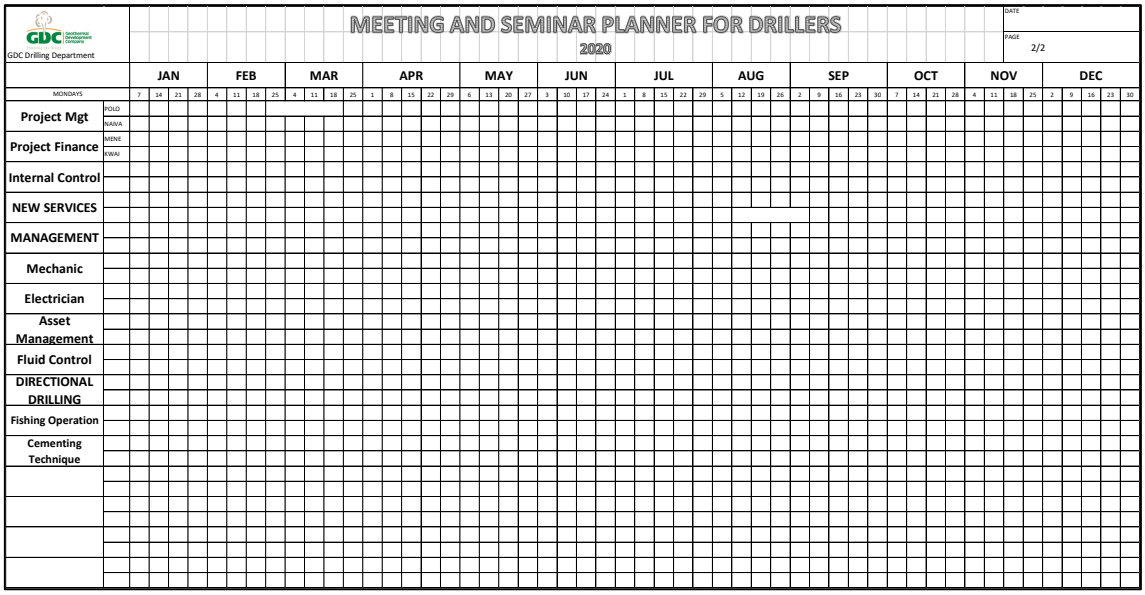


Figure 5-5 Meeting and Seminar Planner for Drillers

Annexes

Annex-1 : Competency List: – GENERAL CORE COMPETENCIES
Annex-2 : Competency List related to CORE
Annex-3 : Competency List related to Drilling
Annex-4 : Competency List related to QHSE
Annex-5 : Competency List related to Record Management
Annex-6 : Competency List related to Transport

Annex-7 : Competency Table: – Roustabout
Annex-8 : Competency Table: – Floorman
Annex-9 : Competency Table: – Motorman
Annex-10 : Competency Table: – Derrickman
Annex-11 : Competency Table: – Assistant Driller
Annex-12 : Competency Table: – Driller
Annex-13 : Competency Table: – Toolpusher (merely for reference)

Annex-1 : Competency List: – GENERAL CORE COMPETENCIES

GENERAL CORE COMPETENCIES

No.	Competencies	
1	**Integrity & Professionalism**	► Honors and delivers commitments and consistently acts in a fair, honest and respectful manner in all dealings and transactions with partners and stakeholders guided by governing rules and highest ethical standards ► Carries out responsibilities according to ethical standards, avoids opportunities that would create conflict of interest ► Adheres to a set of values comprising professional obligations, agreed codes of conduct, acts in the company's best interest and maintains the standards of competence and knowledge ► Accomplishes obligations on time Complies with professional and ethical standards
2	**Commitment to Excellence**	► Strives to exceed industry standards in terms of products, processes and services through flawless execution, continuous improvements and employee involvement ► Takes ownership of company's vision and values and applies to the agreed results ► Continuously evaluates drilling operations processes and recommends improvements on current practices
3	**HSE Leadership**	► Understands, takes ownership and encourages others in the execution of our integrated HSE management system ► Embraces safety as the way of life in the rig ► Implements strict adherence of all personnel and yard crew to the HSE program and calls the attention of anybody who deviates from it
4	**Teamwork**	► Works together cooperatively to achieve a common goal. Resolves conflicts and shares resources ► Good team player and works with the team with customer satisfaction in mind ► Maintains an open and honest relationship with work crew and third party contractors
5	**Initiative/ Willingness to Change**	► Proactively identifies and initiates changes; flexible in managing changes to improve processes and achieve results ► Acts immediately on operational concerns to prevent lags and achieve results

Annex-2 : Competency List related to CORE

No.	Functional competency	Description of competency
01	Crane Basics	Demonstrate ability to follow the permit-to-work and lockout/tagout procedures required for crane operations.
		Describe the lifting equipment available on current location.
		Describe the type(s) of crane(s) by name and type, found on current location.
02	Rigger Basics	Demonstrate ability to use all rigging hitches (e.g., basket, choker, vertical, bridle) needed for the current job.
		Demonstrate adhering to the permit-to-work for routine and non-routine rigging tasks, if applicable.
		Demonstrate correct and safe use of taglines attached to loads, including proper positioning and quantity.
		Demonstrate following the lift plan required for critical lift rigging tasks.
		Demonstrate how to correctly rig a load according to its specific center of gravity.
		Demonstrate the ability to control an area where lifting operations are being carried out.
		Demonstrate the ability to correctly and safely connect/disconnect loads.
		Demonstrate the ability to correctly secure cargo in various conditions.
		Demonstrate the ability to find the center of gravity of a load.
		Demonstrate the ability to select the appropriate rigging equipment for a specific job.
		Demonstrate the use of sling capacity tables.
		Determine and/or estimate weight of loads for the purpose of rigging safely.
		Explain center of gravity as it relates to rigging.
		Explain D/d ratio for wire rope sling.
		Explain how the tension or loading increases as sling angles decrease, especially the rapid increase in tension that occurs when slings are used below 30 degrees.
		Explain the different methods in which a slings are rigged or attached to load.
		Explain the effect of beating the choker legs down.
		Explain the effect of bringing the legs of a vertical basket hitch inwards.
		Explain the importance of the eye of a synthetic web and why it should never be used or forced over a hook or pin.
		Explain the importance of using padding (protection over sharp edges).
		Explain the risk of using wire rope clips (i.e., clamps) to fabricate wire rope slings eyes.
		Explain the use of push poles, if required by company policy.
		Explain vertical and horizontal planes as they relate to rigging (e.g., how force is distributed based on the plane).
		Explain why a wire rope hand-tucked splice should not be used in a single vertical lift.
		Explain why the chain sling must never be used when twisted, knotted, or whenever the links bind and do not move freely.
		Explain why the eye of a wire rope sling should never be forced over a hook or pin.
		Explain why the hook should not be inserted into one of the chain links.
		Locate company policies and procedures that apply to rigging.
		Select correct slings, or other similar lifting devices, according to size, weight, and configuration.

03	General Rigger Qualifications and Role	Explain the basic rigger's role in ensuring safe lifting operations.
		Explain the basic rigger's role in ensuring that all lifting gear is certified to company and regulatory requirements.
		Explain who at the jobsite is authorized to use rigging hardware.
		List the recommended qualifications, experience, and training necessary to be able to rig a load (see API RP 1e, 2d, latest edition).
04	General Rigging Hardware Information	Describe and explain sling manufacturers' recommendations for safe slinging configurations.
		Describe the proper installation and rigging of all permanent and temporary lifting points (anchor points, pad eyes, etc.).
		Describe the proper use of tag lines attached to loads, including proper positioning and quantity.
		Describe the storage requirements for all rigging hardware (rigging/slings/shackles, etc.).
		Explain how the sling capacity changes when using different sling configurations.
		Explain how to interpret manufacturer's guidelines for rigging hardware.
		Locate the manufacturer's guidelines, as applicable, for rigging hardware.
05	Rigging Hardware Inspection & Maintenance	Demonstrate ability to maintain and inspect hand and power tools in operationally safe condition, without any unauthorized modifications.
		Demonstrate proper application, use, and inspection of cargo nets.
		Demonstrate proper application, use, and inspection of chain binders.
		Demonstrate proper application, use, and inspection of chain falls.
		Demonstrate proper application, use, and inspection of chains.
		Demonstrate proper application, use, and inspection of come-alongs.
		Demonstrate proper application, use, and inspection of drum lifters.
		Demonstrate proper application, use, and inspection of eye bolt types.
		Demonstrate proper application, use, and inspection of hoist rings.
		Demonstrate proper application, use, and inspection of hook types.
		Demonstrate proper application, use, and inspection of master links.
		Demonstrate proper application, use, and inspection of pad eyes.
		Demonstrate proper application, use, and inspection of pallet forks.
		Demonstrate proper application, use, and inspection of plate clamps.
		Demonstrate proper application, use, and inspection of shackles types.
		Demonstrate proper application, use, and inspection of spreader bars.
		Demonstrate proper application, use, and inspection of turnbuckles types.
		Demonstrate proper application, use, and inspection of web slings.
		Demonstrate proper application, use, and inspection of wire rope clips.
		Demonstrate proper application, use, and inspection of wire rope slings.
		Demonstrate the proper application, use, and inspection of personnel lifting baskets.
		Explain procedures to follow when defective rigging hardware is identified.
		Explain the lifting gear color-coding system and how records are kept for each item.
		Identify appropriate tools and materials for the purpose of performing preventive maintenance and minor adjustments.
06	General Crane Operator Qualifications and Role	Explain the crane operator's role in ensuring safe lifting operations.
10	General Crane Operation HSE	Explain the importance of designating one person to give correct hand signals and responding appropriately to those hand signals.

		Explain why personnel should observe and report any fluid leaks from the crane that could be contaminating the work environment and affecting safe operations.
		Explain your Stop Work Authority when you observe an unsafe act during lifting operations.
		Identify the appropriate personal protective equipment required for crane/lifting operations.
15	General Rigging HSE	Demonstrate ability to ensure that deck personnel use safe lifting procedures (e.g., tag lines, escape routes).
		Demonstrate correct use of personal protective equipment.
		Demonstrate the ability to identify pinch points and explain proper body position.
16	Crane/Rigging Operations Communications	Demonstrate ability to write clear and concise reports, such as those involving near-misses and incidents, involving lifting operations.
17	Personnel: Lifting Operations	Demonstrate how to properly utilize personnel lifting equipment.
		Demonstrate how to select the proper personnel lifting equipment/device.
		Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.
		Explain procedures for raising and lowering a personnel basket safely.
		Explain the importance of load balance, weight tolerances, and environmental conditions before and during personnel transfer.
		Explain the precautions and pre-lift requirements applicable before personnel are transferred or lifted.
18	Offboard/Onboard Supply Boat Lifting Operations	Demonstrate how to properly utilize personnel lifting equipment.
		Demonstrate how to select the proper personnel lifting equipment/device.
		Describe the basic work sequence/policy followed prior to making a critical lift.
		Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.
		Explain the importance of load balance, weight tolerances, and environmental conditions before and during personnel transfer.
		Explain the precautions and pre-lift requirements applicable before personnel are transferred or lifted.
19	Company-Specific Crane Ops Policies & Procedures	Explain why the hook should not be inserted into one of the chain links.
20	General Housekeeping/Orderliness	Demonstrate cleaning and organizing the work area upon completion of the work, task, or repairs.
		Explain procedures personnel should follow if they observe worksite and water pollutants during lifting operations.

Annex-3 : Competency List related to Drilling

No.	Functional competency	Description of competency
01	Rig Move (Skidding/Walking): Skidding Rig with BOP Suspended	Demonstrate how to secure the BOP for transit.
		Explain the need to assign watchmen to important areas during transit.
		Demonstrate ability to coach drill crews on how to be able to position rig on well center.
		Demonstrate ability to utilize correct measuring methods and techniques to position rig on well center.
02	Rig Move (Skidding/Walking): Location of Hole Center	Demonstrate ability to coach drill crews on how to be able to position rig on well center.
		Demonstrate ability to utilize correct measuring methods and techniques to position rig on well center
03	Rig Move (Skidding/Walking): Unload and install matting boards	Demonstrate ability to spot matting boards as per rig design.
04	Rig Move (Skidding/Walking): Well Control Equipment	Demonstrate the ability to install choke, flow, flare, and diverter lines.
05	Rig Up: Unload and install matting boards	Demonstrate ability to ensure only approved and certified lifting equipment is utilized.
05	Rig Up: Unload and install matting boards	Demonstrate the ability to recognize approved and certified lifting equipment.
06	Rig Up: Spot & Assemble Substructure Base & Associated Bracing	Demonstrate ability to spot sub base on well center as per rig design.
07	Rig Up: Spot & Assemble Shaker Tanks, Intermediate Tanks, Suction Tanks &/or Reserve Tanks	Demonstrate ability to inspect and tighten all hammer seal unions to equalizer and mud mixing lines.
		Demonstrate ability to properly earth ground equipment.
		Demonstrate ability to spot mud tanks level, in proper order and in line as per rig design.
08	Rig Up: Spot Mud Pumps & Assemble All Suction Lines, Pressure Release Lines & Braces	Demonstrate the ability to spot mud pumps and rig up all associated plumbing and operating lines.
09	Spot & Assemble Suitcases and lines	Demonstrate ability to inspect and tighten all hammer seal unions between suitcases to prevent fluid or air leaks.
		Demonstrate ability to properly earth ground equipment.
		Demonstrate ability to spot suitcase level, in proper order and in line as per rig design.
10	Rig Up: Spot & Rig up Rig Power Package & Fuel Tank	Demonstrate ability to properly install all electricity connections and fuel lines.
		Demonstrate ability to spot power package & fuel tank level, in proper order and in line as per rig design.

11	Rig Up: Startup & Energize Rig Power	Demonstrate the ability to start up generators and VFD/SCR systems.
12	Rig Up: Assemble Rig Floor structural supports	Demonstrate ability to install structural supports.
13	Rig Up: Rotary system	Demonstrate ability to rig up rotary and applicable drive system.
14	Rig Up: HPU	Demonstrate the ability to rig up the HPU system.
15	Rig Up: Energize Draw Works & Driller Control	Demonstrate ability to function test the Draw Works operations and emergency shut down.
	Rig Up: Energize Draw Works & Driller Control	Explain Draw Works & Drillers Console energizing procedures & requirements.
16	Rig Up: Pipe Handler Equipment	Demonstrate ability to correctly connect all hydraulic lines.
		Explain the process for assembling derrick/mast, raising structure & equipment.
17	Rig Up: Derrick/Mast Assembly	Demonstrate the ability to perform the Pre-Raise Mast/Derrick Inspection.
		Demonstrate the ability to raise and secure Mast/Derrick to Rig Floor.
		Demonstrate the ability to string up lines & blocks in the mast/derrick.
		Demonstrate the process for assembling derrick/mast, raising structure & equipment.
		Ensure derrick ladders are in proper position & stand pipe connected.
		Explain how to raise and secure Mast/Derrick to Rig Floor.
		Explain the Pre-Raise Mast/Derrick Inspection.
18	Rig Up: Rig Floor	Demonstrate the ability to install & rig up winches and air tuggers.
		Explain how to install & rig up winches and air tuggers.
20	Rig Up: Mud Tanks	Demonstrate the ability to Fill Mud Tanks, Check & Repair Leaks & Function Test All Associated Equipment.
		Demonstrate the ability to install flow line & associated equipment.
		Demonstrate the ability to install mud mix equipment.
		Demonstrate the ability to install solids/gas control equipment.
22	Rig Up: Drill Water Systems	Demonstrate the ability to Install Trip Tank & Associated Equipment & lines.
22	Rig Up: Drill Water Systems	Demonstrate the ability to set Reserve Water Tanks, Rig Water Tanks, and Check & Repair Leaks.
22	Rig Up: Well Control Equipment	Demonstrate the ability to position choke manifold/gas separator.
23	Prepare for Rig Down: Preparation	Explain what can be prepared for move prior to rig release.
24	Prepare for Rig Down: Inspection	Explain pre-move inspection/check list.
25	Prepare for Rig Down: Work plan	Explain pre-move JSA/Work Plan, including 3rd party involvement.
26	Prepare for Rig Down: Crew Deployment	Explain supervision/crew deployment for rig down.

27	Rig Down: Critical Steps	Demonstrate ability to ensure all equipment has been removed from location.
		Demonstrate ability to ensure BOP and associated equipment is nippled down and loaded out.
		Demonstrate ability to ensure only approved and certified lifting equipment is used.
		Demonstrate ability to lower and prepare mast for transport.
		Demonstrate ability to shut down power for ancillary equipment.
		Explain ability to ensure correct order for shut down of ancillary equipment.
		Explain critical steps for rig down and move.
		Explain JSA / Work Plan knowledge for each critical step.
		Explain load out procedure / order of equipment to be moved.
		Explain Repair & Maintenance plan (if applicable).
		Explain required coordination between rig crew, supervisor, move crew, and 3rd party vendor.
28	Rig Down: Fall Protection	Demonstrate ability to ensure anchor points are identified for crew lanyards.
		Explain pin removal and associated hazards.
		Explain procedures for working around the cellar/well head.
29	Rig Down: Inspection Process	Explain inspection process for drill line.
		Explain pre-move inspection process for ancillary equipment.
30	Rig Down: Transportation	Demonstrate ability to ensure drill line is prepared for travel.
		Demonstrate ability to separate and load out substructure.
		Explain how to secure all lines, piping and physical objects to prevent hazards during transporting.
		Explain mat cleaning requirement prior to load out.
31	Rig Down: Environmental	Explain drilling fluid capture and transfer process.
		Explain, if applicable, the process for oil-based mud (OBM) rig clean up and containment.
		Demonstrate ability to complete a stack out inventory list.
		Demonstrate ability to ensure rig components are stored in an appropriate location and secured.
		Explain procedure for ensuring power equipment is prepared for storage.
		Explain the procedure to ensure rig components are stored in an appropriate location and secured.
33	Vertical/Conventional Drilling: Rig Math, Well Head and BOP Control Equipment	Demonstrate how to measure, strap, & caliper all tubulars.
		Demonstrate how to check drilling fluids characteristics and measurement.
		Demonstrate how to measure from Rotary Kelly Bushings to Well Head/Rotary Kelly Bushings to all Blowout Preventer Rams and Annular.

		Demonstrate how to perform math calculations on pressure & volume.
		Explain the rig components and their limitations.
34	Vertical/Conventional Drilling: Drawworks & Associated Equipment	Demonstrate how to operate drawworks and associated components.
		Explain the function of drawworks and all associated components (crown saving devices, brake systems & coolant lines, guards, chains, sprockets, gear boxes, shut downs, hoisting/lowering limits per rig design).
35	Vertical/Conventional Drilling: Automated Pipe Handling	Demonstrate how to ensure that moving equipment does not interfere with other equipment/machinery - Simultaneous Operations.
		Explain the importance of checking the equipment prior to use.
36	Vertical/Conventional Drilling: Execution Of Drilling And Well Operations	Demonstrate how to follow the client's daily drilling plans.
		Demonstrate how to maintain an accurate pipe tally in relation to the well design.
		Demonstrate how to make trips.
		Demonstrate how to complete the daily tour sheet...
37	Vertical/Conventional Drilling: Drilling/Reaming	Demonstrate how to ream at the correct RPM and GPM.
		Explain the importance to maintain complete records of all tools and tubular run into the hole (including make-up lengths, tool-joints OD, ID, Serial numbers).
39	Vertical/Conventional Drilling: Pipe measurement, number and strapping of pipes	Demonstrate correct measuring points on all tubular, casings and tools.
		Explain how to correctly read a strapping tape.
		Explain how to properly number stands in derrick when TIH or POOH.
40	Vertical/Conventional Drilling: Stuck Pipe Operation	Demonstrate how to determine the drill string operating limits.
41	Vertical/Conventional Drilling: Downhole problems and equipment failure	Explain downhole problems and potential equipment failures.
42	Vertical/Conventional Drilling: Standpipe and Bleed Off Line	Demonstrate how to ensure all valves are in the "full open" or "closed" position.
44	Vertical/Conventional Drilling: Tripping	Demonstrate how to correctly monitor and record mud return and fill volumes while tripping in/out to recognize warning signs for well control issues.
		Explain efficient tripping speeds in open hole and when bit/ stab go through BOPs.
		Explain how to monitor and record mud return and fill volumes while tripping in/out to recognize warning signs for well control issues.
45	Vertical/Conventional Drilling: Drilling Program	Explain how to plan and carry out all aspects of the client's well program.
47	Vertical/Conventional Drilling: Picking up drilling assembly	Demonstrate the ability to caliper and measure the BHA.
		Demonstrate the method for strapping and counting the drill pipe.

		Explain the importance and how to caliper and measure the BHA.
		Explain the method for strapping and counting the drill pipe.
48	Vertical/Conventional Drilling: Trip in hole (TIH)	Explain fluid displacement when TIH.
		Explain kick identification while TIH.
		Explain the importance of recognizing bridging conditions.
		Explain the importance of surge/swab hole conditions.
		Explain the procedure if a kick is detected during TIH.
49	Vertical/Conventional Drilling: Trip out of hole (TOH)	Explain displacement as drilling assembly is pulled out of hole.
		Explain kick identification while TOH.
		Explain procedure if a kick is detected during TOH.
50	Vertical/Conventional Drilling: Underbalanced Drilling	Demonstrate how to maintain equivalent circulating density (ECD) during underbalanced drilling.
		Explain additional instrumentation used during underbalanced drilling.
		Explain pit volumes and flow characteristics.
		Explain the use of rotating control device (RCD).
		Explain the well control procedures and process during underbalanced drilling.
51	Well Control: Riser/Diverter/ BOP (Run & Retrieve)	Demonstrate how to install new wellhead gaskets.
		Explain how to identify ring gaskets in relation to BOP flanges.
		Explain how to install new wellhead gaskets.
		Explain the different phases of nippling up BOP and diverter based on hole section.
52	Well Control: Diverting	Explain how to pump either kill mud or water.
		Explain the importance of operating the diverter.
53	Well Control: Management Well Control Systems	Demonstrate function test of the BOP.
		Explain BOP components, their functions and their limitations.
		Explain the normal line up of BOP valves, Hydraulic chokes, Choke manifold and degasser in accordance to the well program.
54	Well Control: Well Integrity And Well Control	Demonstrate how to take SPR‘s, complete kill sheet and take accurate and correct SIDPP and SICP gauge readings.
		Explain how to take SPR‘s, complete kill sheet and take accurate and correct SIDPP and SICP gauge readings.
		Explain the different methods for shutting the well and the killing procedures.
		Explain how to recognize influx and shut in well.
55	Unconventional Drilling: Air Drilling	Explain instrumentation used during air drilling.
		Explain rig up of low pressure air system into high pressure mud system.
		Explain the differences between mud drilling and air drilling.

		Explain the function of blooie line and how to secure.
		Explain the importance of an igniter at the end of a blooie line.
		Explain the pressure differential between input air and return air.
		Explain the use of rotating control device (RCD).
56	Unconventional Drilling: Coring	Explain pick up and lay down procedures of the core barrel.
		Explain the differences between conventional coring and sidewall coring.
		Explain the hazards when retrieving cores.
		Explain the relationship of the outer and inner barrels for coring.
57	Directional Drilling: Mechanical Survey Tools	Explain the application for Teledrift type drift indicators.
		Explain the application for Totco type drift indicators.
58	Directional Drilling: Magnetic Survey Tools	Explain the application for Multi-shot film.
58	Directional Drilling: Magnetic Survey Tools	Explain the application for Single shot film.
59	Directional Drilling: Gyroscopic Survey Tools	Explain how information travels from the MWD to the surface to the computer system.
		Explain the application for Electronic single and multi-shot instruments.
		Explain the application for Magnetic and gyroscopic MWD surveys.
		Explain the application for Multi-shot.
		Explain the application for Single shot.
		Explain the MWD components.
		Explain the purpose and positioning of Non-magnetic drill collars and the BHA.
60	Directional Drilling: Wellbore Surveying and Record Keeping	Demonstrate ability to solve problems associated with running a survey.
		Demonstrate application of the above.
		Demonstrate how to run a survey.
		Differentiate when survey data may be considered valid or invalid.
		Explain general practices to take to prevent survey data discrepancies.
		Explain problems associated with survey data.
		Explain the application for elements of a directional survey.
		Explain the concepts dogleg and how dogleg severity affects the wellbore.
61	Directional Drilling: Directional Plots and Drilling Parameters	Drilling Parameters & Directional Drilling: Explain hydraulics with and without downhole motors.
		Drilling Parameters & Directional Drilling: Explain mechanical limitations of downhole motors.
		Drilling Parameters & Directional Drilling: Explain rotary speed limitations.
		Drilling Parameters & Directional Drilling: Explain solids control and oil-based mud (OBM) considerations.

		Drilling Parameters & Directional Drilling: Explain weight on bit (WOB) considerations.
		Elements of the Directional Plot: Explain the intent/importance of plot details.
		Elements of the Directional Plot: Explain the plan view.
		Elements of the Directional Plot: Explain vertical section view.
		Elements of the Directional Plot: Explain wellpath and site legend details.
62	Directional Drilling: Motor Theory and Operations	Explain chemical and fluid slide enhancement.
		Explain factors affecting slide ability.
		Explain how a PDM (positive displacement motor) works and major mechanical assemblies.
		Explain micro doglegs and ledging when drilling with motors.
		Explain motor operating procedures and parameters.
		Explain reactive torque such as hole conditions and drill string design.
		Explain stabilizer use and effect on build rates.
		Identify & Explain bearing and housing types.
63	Directional Drilling: Hole Cleaning and Cuttings Transport in Horizontal Wells	Explain clean up cycles.
		Explain helical cuttings path hole cleaning model in horizontal wells.
		Explain LGS (low gravity solids) and solids control considerations.
66	Hoisting/Rig Floor: Derrick Climbing Systems	Demonstrate how to use equipment associated with personnel climbing systems (rig specific).
		Explain how to inspect equipment associated with personnel climbing systems.
70	Hoisting/Rig Floor: Manriding Winches & Belts	Demonstrate correct hand signals associated with operating manriding winch.
		Demonstrate how to inspect manriding winch.
		Demonstrate how to inspect, wear & fasten manriding belt.
71	Hoisting/Rig Floor: Utility Winches	Demonstrate correct hand signals associated with operating utility winch.
		Demonstrate how to safely operate and maintain utility winch.
72	Power Systems: Engine instrumentation	Explain the purpose of engine instrumentation.
73	Power Systems: Engine report and log book	Demonstrate how to record engine gauge readings and maintain logs.
		Explain the purpose of record keeping.
74	Power Systems: Engine fluids	Demonstrate how to check engines fluids levels and add as required.
		Explain types of engine fluids and level requirements.
75	Power Systems: Engine fuel system	Demonstrate how to ensure pressure, filtration and line requirements will sustain engine operation.
		Explain pressures, filtration, and line inspection.

76	Power Systems: Engine cooling system	Explain how to check engine coolant level.
		Explain radiator and cooling fan inspection.
77	Power Systems: Engine air intake systems	Demonstrate how to change air filters.
		Explain how to inspect air filters and intake differential pressures.
78	Circulating Systems: Low Pressure Mud System	Demonstrate valve alignment to transfer mud and mix chemicals in each pit.
		Explain the layout of the pits including valve locations.
79	Circulating Systems: High Pressure Mud System	Demonstrate how to change out expendables.
		Demonstrate how to isolate the valves.
		Demonstrate how to monitor mud pumps during operating.
		Explain how to change out expendables.
		Explain the purpose and operation of mud pumps.
		Identify where valves are located.
80	Circulating Systems: Pulsation Dampener/Bladder	Demonstrate how to perform maintenance of a pulsation dampener.
		Explain the operation and maintenance of a pulsation dampener.
		Explain the purpose of a pulsation dampener.
81	Circulating Systems: Shale shakers	Demonstrate shale shaker maintenance.
		Demonstrate how to adjust shaker screens.
		Demonstrate how to change shaker screens.
		Explain how to adjust shaker screens.
		Explain how to change shaker screens.
		Explain shale shaker maintenance.
		Explain the purpose of a shale shaker.
82	Circulating Systems: Trip Tanks	Demonstrate how to line up trip tank valves for filling or monitoring the hole.
		Explain how to line up trip tank valves for filling or monitoring the hole.
		Explain the purpose of the trip tank.
83	Circulating Systems: Mud Saver Bucket	Demonstrate how to perform maintenance on the mud saver bucket.
		Demonstrate how to use the mud saver bucket.
		Explain the purpose of a mud saver bucket.
		Explain when to use the mud saver bucket.
84	Rotating System: Master Bushings	Demonstrate how to identify wear of the master bushings.
		Demonstrate how to perform maintenance of the master bushings.
		Demonstrate how to pull and set master bushings.
		Explain how to identify wear of the master bushings.
		Explain how to perform maintenance of the master bushings.
		Explain the purpose of the master bushings.
85	Rotating System: Rotary Table	Demonstrate the maintenance procedures for the rotary table.

		Demonstrate the procedure for locking and working around.
		Explain the maintenance procedures for the rotary table.
		Explain the procedure for locking and working around.
		Explain the purpose of the rotary table.
86	Well Control Equipment: BOP Handling Systems	Demonstrate proper sling application and attachment methods between lifting device and BOP equipment.
		Explain JSA / Work Plan knowledge for each critical step.
		Explain proper application and use of BOP handling systems.
87	Well Control Equipment: BOP Control System And Accumulator	Demonstrate how to connect the HCR valve, manual valve, coflex hose, for BOP and choke manifold.
		Demonstrate how to connect the kill line and check valve as designed.
		Demonstrate how to function test all BOP elements.
		Demonstrate how to identify that BOPE hydraulic lines meet OEM requirements and are connected and protected to ensure BOPE function as designed.
		Demonstrate how to install the Driller's and remote BOP control panels and function test same.
		Demonstrate that all valves and gauges are in good working condition and clearly marked as to their function.
		Demonstrate that reservoir is filled to proper fluid level with proper fluid.
		Demonstrate that the accumulator unit has the proper fluid volume capacity for the BOP application to which it is being connected.
		Demonstrate that the BOP Control system and accumulator unit has the proper working pressure rating for the BOP equipment to be installed.
		Explain accumulator unit fluid volume capacity as related to the BOP equipment to be installed.
		Explain BOP Control system and accumulator unit working pressure rating as related to the BOP equipment to be installed.
		Explain how to connect the HCR valve, manual valve, coflex hose, for BOP and choke manifold.
		Explain how to function test all BOP elements.
		Explain how to install the Driller's and remote BOP control panels and function test same.
		Explain the designed arrangement for kill line and check valve.
		Explain the importance of the condition of valves and gauges and their identification.
		Explain the requirements for BOPE hydraulic lines.
88	Well Control Equipment: BOP Preventers & Fail Safe Valves	Demonstrate how to install new ring and wellhead gaskets.
		Demonstrate how to install bolt completely into the nut.

		Demonstrate how to select and install the appropriate ring gaskets in all connections.
		Demonstrate proper torque sequence to insure flange gap is even on all sides.
		Demonstrate that all BOP components have been inspected and certified in accordance with OEM specifications.
		Explain how to guide upper BOP sections onto lower sections.
		Explain how to install new ring and wellhead gaskets.
		Explain how to open the BOP doors and change pipe rams and blind rams.
		Explain OEM specifications and certification for BOP components.
		Explain the importance of always using new and appropriate ring gaskets in all connections.
		Explain the importance of having the proper flange gap on all sides.
		Explain the importance of why all bolts need to be engaged completely into the nut.
		Explain the proper assembly (stack-out) of all BOP components to be used per drilling program.
89	Well Control Equipment: BOP Testing Equipment	Demonstrate how to connect the test lines and secure from test unit to BOP.
		Demonstrate how to open the BOP doors and change rams.
		Demonstrate that hydraulic lines are of proper pressure rating.
		Demonstrate that the test unit is of adequate pressure rating to test the BOP.
		Explain how to connect the test lines and secure from test unit to BOP.
		Explain how to open the BOP doors and change rams.
		Explain test unit pressure requirements in relation to BOP testing.
		Explain the requirements for BOPE hydraulic lines.
90	Well Control Equipment: Full Opening Safety Valve, Kelly cock valve, IBOP	Demonstrate how to function test each valve.
		Explain each tool, their function, storage position and location of each.
		Explain the importance all wrenches for each safety valve are kept orderly and are readily available.
		Explain the importance of inspecting valve connections in accordance with drill string requirements.
91	Well Control Equipment: Float Valve	Demonstrate how to visually inspect float valves for damage.
		Demonstrate the installation of float valve in drill string.
		Explain how to visually inspect float valves for damage.
		Explain the installation of float valve in drill string.
92	Well Control Equipment: Diverter	Demonstrate a function test and operation of diverter and valves.

		Demonstrate the ability to configuration all components in diverter system including flow lines, valves, and sizing for the application per the drilling program.
		Explain a function test and operation of diverter and valves.
		Explain the configuration of all components in diverter system including flow lines, valves, and sizing for the application per the drilling program.
		Explain the purpose of a diverter system as opposed to a BOP.
93	Well Control Equipment: Wellhead Adaptor Spools and Risers	Demonstrate sizing and pressure rating of spools for wellhead and BOP equipment meet requirements of drilling program.
		Demonstrate that flow lines are routed and secured at a location and distance to allow for flaring and/or fluid containment.
		Explain flow lines routing and anchoring for flaring and/or fluid containment.
		Explain sizing and pressure rating of spools for wellhead and BOP equipment per drilling program.
94	Well Control: Testing BOP: Pressure And Function Testing Of BOPs	Demonstrate how to ensure tool joint space out within the BOP are adequate and a vent open below the wellhead test plug is open.
		Demonstrate that appropriate ring gaskets are used for each flange.
		Demonstrate the test sequence of valves and BOP's including identifying leaks and how to correct them.
		Explain how to identify ring gaskets in relation to BOP flanges.
		Explain the test sequence of valves and BOP's including identifying leaks and how to correct them.
		Explain tool joint placement (space out) within the BOP and the purpose of venting below the test plug.
95	Well Control: Testing BOP: Pressure And Function Testing Of BOPs Choke Manifold	Demonstrate how to function the valves to their fully open and closed positions and align for drilling operations.
		Demonstrate how to lubricate valves with the high pressure grease.
		Demonstrate how to test to rated pressures and durations and how to bleed off test pressure after test.
		Explain how to test to rated pressures and durations and how to bleed off test pressure after test.
		Explain how to function the valves to their fully open and closed positions and align for drilling operations.
		Explain how to lubricate valves with the high pressure grease.
96	Well Control: Testing BOP: Pressure And Function Testing Of BOPs Kill and Choke line Valves	Demonstrate how to function the valves to their fully open and closed positions and align for drilling operations.
		Demonstrate how to lubricate valves with the high pressure grease.
		Explain how to test to rated pressures and durations and how to bleed off test pressure after test.

		Explain how to function the valves to their fully open and closed positions and align for drilling operations.
		Explain how to lubricate valves with the high pressure grease.
97	Well Control: Testing BOP: Pressure And Function Testing Of BOPs Pressure Test Standpipe manifold	Demonstrate how to function the valves to their fully open and closed positions and align for drilling operations.
		Demonstrate how to lubricate valves.
		Demonstrate how to test to rated pressures and durations and how to bleed off test pressure after test.
		Explain how to test to rated pressures and durations and how to bleed off test pressure after test.
		Explain how to function the valves to their fully open and closed positions and align for drilling operations.
		Explain how to lubricate valves.
103	Diesel pumps	Explain when the different types of closed loop mud cleaning equipment are used.
		Demonstrate the use and maintenance of diesel pumps.
		Explain the importance of rig fuel filtering system.
		Explain the use and maintenance of diesel pumps.
105	Centrifugal pumps	Demonstrate how to prime and maintain a centrifugal pump.
		Explain how to prime and maintain a centrifugal pump.
106	Diaphragm pumps	Demonstrate how to prime and maintain a diaphragm pump.
		Explain how to prime and maintain a diaphragm pump.
107	Valve types	Demonstrate how to operate low pressure and high pressure valves.
		Explain the different types of valves used in mud systems and where each type is applicable.
108	Rotary swivel	Explain what a rotary swivel is and when it is used.
112	Tubulars: Tubular care and maintenance	Demonstrate how to store and transport tubulars.
		Demonstrate how to clean and inspect connections during drilling and tripping operations.
		Explain how the slips and rotary bushing relate to the care of tubulars.
		Explain how to break in new tool joints.
		Explain how to clean and inspect connections during drilling and tripping operations.
		Explain the different types of mechanical surface imperfections that should be monitored or prevented that could lead to failures.
		Explain the importance of breaking in new tool joints.
		Explain the importance of cleaning and inspection of tubular connections.
		Explain the procedures for storing and transporting tubulars.
		Explain why thread compound is used.

114	Tubulars: Make Up/ Break Out of Drilling Bits	Demonstrate how to apply the required torque for different thread connections on all tubular, subs and drill bits.
		Explain torque requirements for different thread connections on all tubular, subs and drill bits.
115	Completions: Coiled Tubing (CT)	Explain the importance of ensuring why all surface equipment (BOP, coil tubing lines, etc.) must be tested.
		Explain the possible consequence of coil tubing failure (bursts, whiplash, etc.).
116	Completions: Completions string	Demonstrate how to ensure tubing hanger lands appropriately on wellhead.
		Demonstrate the correct running order of completion tubulars and correct space-out with seal assembly.
		Explain the correct running order of completion tubulars and correct space-out with seal assembly.
		Explain the differences between handling tubing vs. drill pipe.
118	Fishing Equipment	Demonstrate the ability to PU BHA assembly of fishing tools and run in hole.
		Demonstrate how to POOH with fish engaged.
		Explain BHA assembly of fishing tools and knowledge of down-hole operations.
		Explain the procedure and precautions when POOH with fish.
119	Forklift Operations	Demonstrate how to operate forklift.
		Demonstrate the ability to perform rigging and determine lifting capacities for forklift.
		Demonstrate the inspection and general maintenance procedure for a forklift.
		Explain how to operate forklift.
		Explain rigging and lift capacities for forklift.
		Explain the inspection and general maintenance of forklift.
120	Cementing	Calculate strokes required to bump the cement plug while displacing with rig pump.
		Explain the characteristics and importance of a proper cement job.
		Monitor returns to surface and distinguish the difference between cement and drilling fluid.
		Rig-up cementing lines and line up valves/ transfer mud to cementing unit.
121	Other Operations: Plug & Abandon Well	Demonstrate how to follow the plug and abandon program.
		Demonstrate how to perform pressure testing after plug has cured.
		Demonstrate tripping after cement plug is set in place.
		Explain how to perform pressure testing after plug has cured.
		Explain the plug and abandon program.

		Explain tripping procedure after cement plug is set in place.
122	Other Operations: Drillstem Test	Demonstrate the ability to perform drillstem test procedure and related operations.
		Demonstrate how to make up and torque components of the drill stem test assembly.
		Demonstrate safe tripping speeds and procedures in cased and open hole.
		Explain how to make up and torque components of the drill stem test assembly.
		Explain safe tripping speeds and procedures in cased and open hole.
		Explain the drillstem test procedure and related operations.
123	Other Operations: Conductor and Casings	Demonstrate how to determine the back-up tong line is sized and installed correctly.
		Demonstrate how to identify cross-threaded pipe.
		Demonstrate how to stab casing.
		Demonstrate visual inspection of casing threads for damage and cleanliness.
		Explain how to determine the back-up tong line is sized and installed correctly.
		Explain how to identify cross-threaded pipe.
		Explain how to stab casing.
		Explain visual inspection of casing threads for damage and cleanliness.
124	Other Operations: Casing Stabbing Board	Demonstrate how to rig up and position stabbing board.
		Explain how to rig up and position stabbing board.
125	Other Operations: Logging	Demonstrate how to rig up the wireline sheaves, (in mast and V-door).
		Demonstrate how to monitor well conditions during logging operation.
		Demonstrate how to rig up packoff/lubricator assembly.
		Explain how to monitor well conditions during logging operation.
		Explain how to rig up the wireline sheaves, (in mast and V-door).
		Explain the procedure for rigging up packoff assembly.
		Explain well control shut in during wireline logging depending on type and length of packoff/lubricator assembly being used.
126	Other Operations: Mud Characteristics	Demonstrate how to maintain correct mud properties mixing chemicals to mud as instructed by mud engineer.
		Demonstrate how to manage aerated or if it is gas-cut mud.
		Demonstrate how to monitor solids control equipment.
		Demonstrate how to record mud weight, viscosity, and volumes.
		Demonstrate the mixing of chemicals required for the operation.
		Explain how to identify if mud is aerated or if it is gas-cut.
		Explain how to record mud weight, viscosity, and volumes.

		Explain how to utilize the different solids control equipment for mud filtration.
		Explain the basic chemicals needed for the operation.
		Explain the characteristics of drilling fluids & their purpose.
		Explain the importance of communicating mud properties and all fluid changes to rig personnel.
127	Other Operations: Mud Transfer	Demonstrate how to line up valves, hoses and hard piping for the mud system transfers.
		Demonstrate how to notify personnel of transfers, monitor mud volume sensors and re-set once completed.
		Explain the importance of communicating fluid transfers and resetting PVT system.
		Explain the process for mud system transfers.
128	Other Operations: Drill Water System	Demonstrate how to maintain adequate drill water.
		Explain the importance of maintaining adequate water volume for drilling operations.

Annex-4 : Competency List related to QHSE

No.	Functional competency	Description of competency
01	Induction (Post Hire Corporate and Unit Specific)	Demonstrate immediate response during coordinated drills (Including your assigned Muster Station(s) and location of your Lifeboat(s) (if applicable).
		Explain assigned roles and responsibilities according to the Emergency Response Plans or Station Bill.
		Explain the general duties of the Unit/Crew specific positions.
		Explain your company's position in regard to compliance with regulatory requirements (for applicable position).
		Explain your Company's specific Short Service Employee program (if applicable).
		Identify and explain the various components of the Rig or Unit.
		Provide evidence of completion of the Corporate and Unit Specific Induction/Orientation course.
02	International Safety Management Code (ISM) - If applicable	Demonstrate where you will find onboard reference resources for the ISM Code.
		Explain (in brief) the elements of the ISM code and their importance to ensure safe management and operation of ships and for pollution prevention.
		Explain the significance of ISM code and to which vessels it applies.
		Explain what DPA, his functions and importance thereof is.
03	International Ship and Port Facility Security Code (ISPS)	Explain the applicable local and flag state security requirements.
		Explain the ISPS security levels and the significance of each including expected response to it.
		Explain the significance of the ISPS code.
		Identify who the SSO is and briefly explain the SSO's function onboard.
		Provide evidence of completion of the onboard ISPS course.
		Provide evidence that the security assessment has been carried out and where it is maintained.
04	Quality, Health, Safety, Environment and Security (QHSES) Policy	Describe your role and responsibilities in order to comply with company's QHSES policies.
		Explain good housekeeping practices and personal hygiene practices in accordance with company policies.
		Explain the company's QHSES policies (as applicable).
		Explain the objectives and the importance of active participation in the various meetings held onsite/onboard (Induction meeting, Pre-shift meeting, Weekly safety meeting, Risk Assessment/Pre-job meeting).
		Identify where you would find the company QHSES Policies.
05	HSE Local Regulations and Relevant International Standards	Explain the local HSE regulations (Standards, laws and regulations that apply to occupational health and safety).
06	Quality Safety & Management System	Demonstrate the ability to navigate the company specific Quality Safety & Management System.
07	Station Bill/Emergency Response Plan and Emergency Drills	Demonstrate the ability to perform the assigned duties as per the station bill/emergency response plan.
		Demonstrate the correct donning, doffing and stowing of emergency PPE.
		Describe all the emergency alarm sounds as well as the respective actions to take (H2S, Well Control, Fire Alarm, Abandon Alarm, Gas Alarm, Man overboard Alarm, Loss of Station Position etc.).

		Describe and identify the location of your muster point(s).
		Describe the process to search and rescue personnel unaccounted for in an emergency situation.
		Identify the various site specific emergency equipment (Portable fire extinguishers, fixed fire systems such as CO2, Life Boat, Life Raft, Rescue Boat, Escape Ladder etc.).
08	Emergency Preparedness and Response	Demonstrate the assigned duties to be carried out during various emergencies/drills (for example: Fire Drill, Abandon Drill, Gas Drill, Man Overboard Drill, Man Down, Stability Drill, Well Control Drill, SOPEP Drill, Helpdesk Fire Drill, Blackout Drill).
		Demonstrate the proper recording and completion of all emergency response training and drills.
		Describe and identify the escape routes, markings, signage systems and lighting systems as applicable.
		Describe and identify the location of all emergency alarm actuators.
		Describe how to react to well control situations and how often well control drills are conducted.
		Describe the rig (unit) emergency response abandonment and notification procedures.
		Explain the assigned duties to be carried out during various emergencies/drills (for example: Fire Drill, Abandon Drill, Gas Drill, Man Overboard Drill, Man Down, Stability Drill, Well Control Drill, SOPEP Drill, Helpdesk Fire Drill, Blackout Drill).
		Explain the oil spill emergency plan(s) (Shipboard Oil Pollution Emergency Plan/Spill Prevention Control and Countermeasures Plan).
		Explain the site specific emergency responses, exercises and training plans for all major hazardous situations.
09	Risk Assessments (RA)	Demonstrate the ability to verify that risk control measurements are implemented and demonstrate how to assess their effectiveness.
		Describe and demonstrate how safety critical equipment is tested and maintained.
		Describe how simultaneous operations (SIMOPS) are managed to ensure that risk control procedures are in place during the execution of related activities.
		Describe the operational boundaries and performance standards of the safety critical equipment.
		Describe the potential hazards on site and provide examples of what could trigger them and what could be their associated consequences.
		Describe the process by which potential or unforeseen risks are communicated to management and affected employees.
		Describe the process to systematically identify, evaluate, select and implement risk reducing controls.
		Describe the roles and responsibilities of personnel participating in the risk assessment process.
		Describe the site specific risk assessment process.
		Explain adverse environmental conditions by which the unit should not operate and the alerting systems available on site.

		Explain and demonstrate how to stop and secure work or tasks in case of any unforeseen or unplanned changes or hazards, and how to further assess risks associated with these changes or hazards.
		Explain how the interaction of major hazards within your unit has been considered during normal or simultaneous operations.
		Explain how to apply the hazard recognition and risk assessment techniques and the ability to implement risk mitigation measurements and controls.
		Explain the maintenance and control of risk assessment documents.
		Explain when/if operations can continue when risk associated with simultaneous operations, inadequate equipment or lack of personnel are present.
		Identify and describe the safety critical equipment on site.
10	Permit To Work (PTW)/ Energy Isolations/L.O.T.O.	Demonstrate control and execution of energy isolation.
		Describe a scenario where electrical/ mechanical isolations are required.
		Describe the objectives of energy isolation and why precautions are important.
		Describe what constitutes a critical lift and all the precautions that must be in place.
		Explain how electrical/mechanical isolation would be confirmed safe to work on.
		Explain the types of energy sources that could be released at the site and the precautions that need to be in place.
11	Behavioral Based Safety System (BBSS)	Demonstrate the corrective action/feedback process in the BBSS program for an observed unsafe action/behavior.
		Demonstrate the process to record and track non conformities from BBSS Observations.
		Describe the difference between an unsafe action/behavior and an unsafe condition.
		Describe the importance of reviewing past BBSS observations and behaviors at safety meetings.
		Describe your role in the BBSS.
		Explain the company's BBSS.
		Demonstrate the ability to secure the current work area or operation before evacuating during an emergency or drill.
12	General Housekeeping/Orderliness	Demonstrates ability to ensure that the work area is clean and orderly, prior to and upon completion of the work, task or repairs.
		Demonstrates ability to maintain and inspect hand and power tools in operationally safe condition, without any unauthorized modifications.
		Explain the hazards associated with using defective or modified hand or power tools.
		Explain the importance of closing out hazardous work activities before evacuating the area for an emergency or drill.
		Explain the importance of good housekeeping practices in the work areas and living quarters.
		Explain why it is important to keep tools put away and the work place clean in case of an emergency.
		Explain your role in the housekeeping practices in the work areas and living quarters.

		Demonstrate cleaning and organizing the work area upon completion of the work, task, or repairs.
		Explain procedures personnel should follow if they observe worksite and water pollutants during lifting operations.
13	Environmental Management Plan	Describe the company Environmental Management Plan (EMP).
		Describe the location specific sensitivities of the receiving environment.
		Describe the process for handling or discharging cuttings.
		Describe the process for maintaining environmental discharge or emission records and their location.
		Describe the process for monitoring discharges and emissions.
14	Ship Oil Pollution Emergency Plan (SOPEP)	Describe the spill kit contents and how to use them.
15	Spill Prevention Control and Countermeasures Plan (SPCC)	Describe the rig specific SPCC plan procedures to follow in case of a spill.
		Demonstrate the ability to locate the SPCC Plan.
		Demonstrate the ability to locate the Spill kit.
		Describe the SPCC inspection process for the location and equipment before spud in.
		Describe the spill kit contents and how to use them.
		Explain how the SPCC plan bridges to the operator's well site plan.
		Explain the process or requirements of training on the SPCC elements.
		Explain the reporting procedures in the event of a spill on or off the well site location.
		Explain the SPCC containment system including the layout, need and maintenance.
		Explain your role in a SPCC drill or an actual spill.
16	Waste Segregation	Describe the company waste management plan.
		Describe the waste materials (either solid or liquid), and identify/categorize as one of the following: common waste, industrial waste, hazardous waste and recyclable materials.
		Describe what materials should be placed into the waste containers and why they need to be segregated.
		Explain the continuous improvement of waste handling on the unit/location.
		Explain the waste containers provided for common waste, industrial waste, hazardous waste and recyclable materials.
17	Dropped Objects Prevention	Describe the hazards associated while work is being conducted overhead.
		Describe the main hazard areas/zones where dropped objects may occur.
		Explain how potential dropped objects are identified and how they should be reported.
		Explain how the restricted areas/zones are enforced.
		Explain precautionary measures required to avoid causing dropped objects and to protect personnel from those potential hazards.
		Explain the importance of a daily/weekly/monthly/annual dropped objects prevention inspection program.
		Explain why access should be restricted to all known dropped object areas/zones.

19	Fall Protection	Demonstrate the ability to find the fall arrest or restraint gear/equipment's information tag.
		Demonstrate the ability to select the proper size and type as well as the donning of, and correct usage, of fall arrest gear.
		Demonstrate transferring from one location to another while maintaining 100 percent tie off while working at heights.
		Describe the difference between fall arrest and fall restraint.
		Describe the emergency equipment and procedures (rescue plan) when rescuing someone at heights.
		Describe the general requirements of the fall protection.
		Describe the limitations and the common misuse of fall arrest and restraint equipment.
		Describe the management of defective fall arrest equipment.
		Describe the proper maintenance, cleaning, inspection (including documentation) and storage of fall arrest equipment.
		Describe the proper use of ladders (fixed and portable) or scaffolds.
		Describe the proper work procedures and communication using fall protection while working in an aerial lift platform (man-lift/work basket).
		Describe the types of fall protection and fall arrest gear/equipment and how it is used.
		Explain the different types of fall protection and fall arrest systems and how each of them work.
		Explain the importance of maintaining the proper overhead anchorage point.
20	Safe Use Of Lifting Equipment	Explain who is authorized to operate lifting equipment.
		Demonstrate proper hand and body placement when attaching the rigging to a load.
		Demonstrate the ability to properly operate lifting equipment.
		Demonstrate the ability to select the correct lifting equipment for the task at hand.
		Demonstrate the proper use of tag lines attached to loads including proper positioning.
		Demonstrate the verbal communications and hand signals used in lifting operations.
		Describe the basic work sequence/policy and precautions that must be in place prior to making a critical lift.
		Describe the lifting equipment available on location.
		Describe the maintenance, storage and inspection of all lifting equipment (rigging/slings/shackles, etc.).
		Describe the proper installation and rigging of all permanent and temporary lifting points (anchor points, pad eyes, etc.).
		Describe the proper use of tag lines attached to loads including proper positioning and quantity.
		Describe the verbal communications and hand signals used in lifting operations.
		Explain proper hand and body placement when attaching the rigging to a load.
		Explain the importance of a spotter during blind lifting operations.

		Explain the minimum number of personnel and special precautions to be used during critical lifting operations.
		Explain the pre-lift plan and inspections process.
		Explain the responsibilities of a rigger (banksman).
		Explain what constitutes a critical lift.
21	Lifting of Personnel	Demonstrate the ability to properly utilize personnel lifting equipment.
		Demonstrate the ability to select the proper personnel lifting equipment/device.
		Demonstrate the inspection of personnel lifting equipment.
		Describe safety precautions necessary for the use of personnel lifting devices.
		Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.
		Explain the importance of using load balance, weight tolerances, and environmental conditions before and during personnel transfer.
		Explain the inspection of equipment necessary for lifting of personnel.
		Explain the precautions and pre-lift requirements before personnel are transferred or lifted.
22	Crane Safety	Describe the maintenance, storage and inspection of all lifting equipment (rigging/slings/shackles, etc.).
23	Use and maintenance of utility winch	Demonstrate rigging practices for safe lifting and movement of tubulars and irregular shaped equipment/materials.
		Demonstrate the hand signals used during winch operations.
		Demonstrate the operation of a utility winch.
		Describe the operational and safety responsibilities of a winch operator.
		Describe the specific locations where utility winches are installed on the unit.
		Explain rigging practices for safe lifting and movement of tubulars and irregular shaped equipment/materials.
		Explain the capacity and limitations of utility winches.
		Explain the pre-use inspection steps required before operating a utility winch.
		Explain the required maintenance for a utility winch and accessories.
25	Accident/Incident Investigation	Describe the company policy on determining the actual and potential risk of an incident or near miss.
		Explain the company's policies/procedures for reporting an incident resulting in personal injury, equipment damage, a near miss or any potential hazard.
		Explain the importance of active participation in an incident investigation.
		Explain the importance of following up and closing corrective actions.
		Explain the processes used to identify incident causes.
		Explain what a corrective action is and why it is being implemented.
		Explain why facts are important to an incident investigation.
26	Chemical Handling & SDS (MSDS) (GHS)	Demonstrate selection and correct use of PPE when handling chemicals in accordance with the SDS.
		Describe appropriate actions necessary in the event of exposure/contact with chemicals or spill.

		Describe the health and environmental risks associated with chemicals used at the work site.
		Describe the information contained in a SDS.
		Describe the storage and segregation process for chemicals.
		Explain the minimum requirements for labeling, documentation and packing of chemicals.
		Explain what NORM is, where NORM occurs and explain the precautions to be taken to prevent exposure.
		Explain where Safety Data Sheets (SDS) are located.
27	Equipment Safety	Describe and give examples of various equipment guards and their purpose.
		Explain the hazards and precautions of working around moving (dynamic) equipment.
		Explain the hazards and precautions of working around rotating equipment.
		Explain the hazards and precautions to take when working with or near low or high pressurized equipment.
		Explain the importance of ensuring that proper fittings (hammer unions/quick connect/hydraulic fittings) are being used in piping, hoses and equipment.
29	Personal Protective Equipment (PPE)	Demonstrate the proper selection and usage (donning/doffing) of PPE.
		Describe different types of PPE, appropriate selection, proper usage and its limitations for various work tasks.
		Describe the proper maintenance/care and storage of PPE in accordance with the manufacturer's instructions.
		Explain your responsibility and the importance of wearing PPE that is appropriate for the work-task.
30	Manual Handling/Ergonomics/Posture	Demonstrate how to support a load when walking with various size loads.
		Demonstrate the ergonomic posture to take when physically lifting and setting a load.
		Describe when mechanical lifting is preferred to manual lifting and why.
		Describe where the force is concentrated on the spine when improperly lifting or setting a load.
		Explain the company's policy and procedures on the manual handling/lifting of materials.
		Explain the importance of planning your path of movement prior to lifting and carrying a load.
		Explain the proper manual lifting or setting techniques to prevent back injuries as well as the benefits of using mechanical lifting devices.
		Explain the value of manually "testing a load" before attempting to lift the load.
31	Confined Space Entry	Describe what constitutes a confined space entry.
		Explain how environmental conditions can negatively impact working in a confined space.
		Explain the company's policy on confined space entry.
		Explain the hazards associated with a confined space.
		Explain the importance of using atmospheric monitoring equipment in a confined space.

		Explain the procedures to take before entering a confined space.
		Explain the procedures to take upon entering a confined space.
		Explain the required PPE needed when working in a confined space.
		Explain what a competent person is in the context of regulatory standards covering confined space entry.
		Explain what a qualified person is in the context of regulatory standards covering confined space entry.
		Explain what and how to identify a confined space and give some examples on your worksite.
		Explain why it is important to continually monitor the atmosphere of a confined space.
		Explain your role and responsibility during a confined space rescue operation.
32	Severe Weather Conditions	Demonstrate the ability to recognize operational shut down point(s).
		Describe actions to be taken to protect personnel during severe weather conditions.
		Describe operations which may be impacted by severe weather and the actions taken to mitigate it.
		Describe the process to restart operations after a severe weather event.
		Describe the process to secure the unit, before evacuating, when a severe weather alert has been issued.
		Explain the company's policy and procedures to follow during a severe weather threat.
33	Fire Prevention, Fire Fighting and Fire Control and Gas/Fire Detection Equipment	Demonstrate the use of portable fire extinguishers.
		Describe the company's policies and procedures for fire prevention.
		Describe the different types of portable fire extinguishers and their applications (Water, Carbon Dioxide and Dry Chemical).
		Describe the engine shutdown procedure in the event of a gas release.
		Describe the fire and gas detection systems, sensor locations and how they function.
		Describe the fixed and/or portable systems used to detect the presence of Oxygen (O2), Hydrocarbon (HC) and Hydrogen Sulphide (H2S), etc.
		Describe the passive fire protection systems on the unit, including their location and rating.
		Describe the process and documentation needed for inspecting and maintaining portable fire extinguishers.
		Describe the process for inspecting, maintaining, testing and calibrating the fire and gas detection systems.
		Describe the testing and regulatory requirements for portable fire extinguishers.
		Describe the three elements to complete the fire triangle.
		Describe the thresholds and the actions automatically initiated on detection of HC and/or H2S.
		Explain the different levels of shutdown associated with the unit (if applicable).
		Explain the rig/unit emergency action (response) plan for a fire event.
		Explain the use of portable fire extinguishers.

34	Occupational Health Plan	Explain the process for monitoring occupational health exposures.
		Explain the company occupational health protection plan.
		Explain the exposures (noise, vibration, heat, etc.) that are unacceptable.
		Explain the process to identify, set, control and verify the exposure limits that could prevent potential acute and or chronic health hazards.
35	Simultaneous Operations	Describe management of change and why it is important when conducting SIMOPS operations.
		Describe what constitutes a SIMOPS Plan.
		Explain Stop Work Authority and who is responsible to initiate when a potential risk is present.
		Explain the elements of the SIMOPS Plan.
		Explain the summary of operational boundaries and the difference between proceed, proceed with caution and stop operations.
36	Powered/Manual Tools	Describe your company's powered/manual tool policy.
		Explain the importance of inspection, maintenance and storage of powered/manual tools.
		Explain the importance of removing defective or altered powered/manual tools.
		Explain the importance of using the proper powered/manual tool for the task at hand.
		Explain the required PPE and safe procedures for operating powered/manual tools.

Annex-5 : Competency List related to Record Management

Functional competency	Description of competency
Document Control	Demonstrate how handover records are filed and maintained.
	Demonstrate the ability to accurately complete the IADC Daily Drilling Report.
	Demonstrate the ability to apply action items contained in the communication document (Alerts/Notifications/Best Practices) through closure.
	Demonstrate the ability to communicate to all current operations.
	Demonstrate the ability to complete a handover report, note and form.
	Demonstrate the ability to order, receive, distribute and track inventory.
	Demonstrate the ability to store inventory items including dangerous goods.
	Demonstrate the execution and application of a management of change request.
	Demonstrate the handover procedure.
	Describe the personnel involved in the development, implementation and maintenance of written policy and procedure standards.
	Describe where operational documentation is maintained.
	Explain how each business unit will utilize the quality and control system.
	Explain how written policy and procedure standards are implemented into the current workforce and new hire process.
	Explain the Company policy and procedure for the handover process.
	Explain the Company policy and procedures for the storage of inventory items including dangerous goods.
	Explain the Company policy and procedures on operations and HSE communications.
	Explain the Company policy on documentation control.
	Explain the Company process for implementing and maintaining a bridging document.
	Explain the Company process for issuing, distributing and responding to communication documents (Alerts/Notifications/Best Practices).
	Explain the Company process for maintaining the daily drilling reports.
	Explain the Company process to ensure that all drawings, diagrams and procedures are current.
	Explain the Company's material inventory and parts list including the vendor's nomenclature (name) of the part.
	Explain the Company's policies and procedures for quality control.
	Explain the Company's policy and procedures on the completion of and distribution/filing of the IADC Daily Drilling Report.
	Explain the Company's process for the development of written policy and procedure standards.
	Explain the Company's policy and procedures for inventory management.
	Explain the Company's policy for management of change.
	Explain the Company's procedure for document tracking and retention.
	Explain the Company's procedures for a management of change, including team member's roles and responsibilities.
	Explain the documentation control procedure and which personnel are involved in the filing of operational documentation.
	Explain the importance of accurately completing the IADC Daily Drilling Report.
	Explain the importance of effective document control.
	Explain the importance of ensuring that handover reports are understood and signed off by outgoing and incoming personnel.
	Explain the importance of handover reports.
	Explain the importance of operations and HSE communications throughout the Company.
	Explain what quality and control system is used by the Company.

	Explain who is responsible for completing the IADC Daily Drilling Report.
	Explain who is responsible for revising documentation and describe how to recognize the latest version.
	Explain who is responsible for updating the HSE policy and procedures and what the process is.
	Explain why proper review, approval and document control are essential parts of management of change requests.

Annex-6 ： Competency List related to Transport

Functional competency	Description of competency
Transportation	Demonstrate the proper procedure to approach the helicopter when boarding and exiting the aircraft.
	Describe the Company's helicopter transportation policy.
	Describe the Company's motor vehicle policy.
	Describe the emergency response procedures and equipment associated with helicopter operations.
	Describe the importance of journey management (trip planning).
	Describe the proper procedure to approach the helicopter when boarding and exiting the aircraft.
	Describe what constitutes being fit for duty when operating a motor vehicle.
	Explain the importance of a "walk around" inspection (fluids, fuel, tire pressure etc.) before entering a vehicle and putting it into motion.
	Explain who is in total command of the helicopter and who will make decisions concerning the flight and personnel allowed onboard.

Annex-7 : Competency Table: – Roustabout

Position: Roustabout

Item No	Code	No	Functional competency	Ref	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level 5	GAP	Individual Development Plan
1	CO	15	General Rigging HSE	•	Demonstrate ability to ensure that deck personnel use safe lifting procedures (e.g., tag lines, escape routes).		2				1					1	
				•	Demonstrate correct use of personal protective equipment.		2				1					1	
				•	Demonstrate the ability to identify pinch points and explain proper body position.		2				1					1	
2	CO	17	Personnel: Lifting Operations	•	Demonstrate how to properly utilize personnel lifting equipment.		2				1					1	
				•	Demonstrate how to select the proper personnel lifting equipment/device.		2				1					1	
				•	Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.		2				1					1	
				•	Explain procedures for raising and lowering a personnel basket safely.		2				1					1	
				•	Explain the importance of load balance, weight tolerances, and environmental conditions before and during personnel transfer.		2				1					1	
				•	Explain the precautions and pre-lift requirements applicable before personnel are transferred or lifted.		2				1					1	
3	CO	18	Offboard/Onboard Supply Boat Lifting Operations	•	Demonstrate how to properly utilize personnel lifting equipment.		2				1					1	
				•	Demonstrate how to select the proper personnel lifting equipment/device.		2				1					1	
				•	Describe the basic work sequence/policy followed prior to making a critical lift.		2				1					1	
				•	Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.		2				1					1	
				•	Explain the importance of load balance, weight tolerances, and environmental conditions before and during personnel transfer.		2				1					1	
				•	Explain the precautions and pre-lift requirements applicable before personnel are transferred or lifted.		2				1					1	
4	CO	20	General Housekeeping/Orderliness	•	Demonstrate cleaning and organizing the work area upon completion of the work, task, or repairs.		2				1					1	
				•	Explain procedures personnel should follow if they observe worksite and water pollutants during lifting operations.		2				1					1	
5	QHSE	12	General Housekeeping/Orderliness	•	Demonstrate cleaning and organizing the work area upon completion of the work, task, or repairs.		2				1					1	
				•	Explain procedures personnel should follow if they observe worksite and water pollutants during lifting operations.		2				1					1	
6	QHSE	20	Safe Use Of Lifting Equipment	•	Demonstrate proper hand and body placement when attaching the rigging to a load.		2				1					1	
			Safe Use Of Lifting Equipment	•	Explain proper hand and body placement when attaching the rigging to a load.		2				1					1	
7	QHSE	21	Lifting of Personnel		Demonstrate the inspection of personnel lifting equipment.		2				1					1	

Maximum Score	44
Actual Score	22
	22

Annex-8 : Competency Table: – Floorman 1/4

Position: Floorman

No	Code	No	Functional competency		Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	GAP	Individual Development Plan
1	CO	01	Crane Basics	•	Demonstrate ability to follow the permit-to-work and lockout/tagout procedures required for crane operations.											0	
				•	Describe the lifting equipment available on current location.											0	
				•	Describe the type(s) of crane(s) by name and type, found on current location.											0	
2	CO	02	Rigger Basics	•	Demonstrate ability to use all rigging hitches (e.g., basket, choker, vertical, bridle) needed for the current job.											0	
				•	Demonstrate adhering to the permit-to-work for routine and non-routine rigging tasks, if applicable.											0	
				•	Demonstrate correct and safe use of taglines attached to loads, including proper positioning and quantity.											0	
				•	Demonstrate following the lift plan required for critical lift rigging tasks.											0	
				•	Demonstrate how to correctly rig a load according to its specific center of gravity.											0	
				•	Demonstrate the ability to control an area where lifting operations are being carried out.											0	
				•	Demonstrate the ability to correctly and safely connect/disconnect loads.											0	
				•	Demonstrate the ability to correctly secure cargo in various conditions.											0	
				•	Demonstrate the ability to find the center of gravity of a load.											0	
				•	Demonstrate the ability to select the appropriate rigging equipment for a specific job.											0	
				•	Demonstrate the use of sling capacity tables.											0	
				•	Determine and/or estimate weight of loads for the purpose of rigging safely.											0	
				•	Explain center of gravity as it relates to rigging.											0	
				•	Explain D/d ratio for wire rope sling.											0	
				•	Explain how the tension or loading increases as sling angles decrease, especially the rapid increase in tension that occurs when slings are used below 30 degrees.											0	
				•	Explain the different methods in which a slings are rigged or attached to load.											0	
				•	Explain the effect of beating the choker legs down.											0	
				•	Explain the effect of bringing the legs of a vertical basket hitch inwards.											0	
				•	Explain the importance of the eye of a synthetic web and why it should never be used or forced over a hook or pin.											0	
				•	Explain the importance of using padding (protection over sharp edges).											0	
				•	Explain the risk of using wire rope clips (i.e., clamps) to fabricate wire rope slings eyes.											0	
				•	Explain the use of push poles, if required by company policy.											0	
				•	Explain vertical and horizontal planes as they relate to rigging (e.g., how force is distributed based on the plane).											0	
				•	Explain why a wire rope hand-tucked splice should not be used in a single vertical lift.											0	
				•	Explain why the chain sling must never be used when twisted, knotted, or whenever the links bind and do not move freely.											0	
				•	Explain why the eye of a wire rope sling should never be forced over a hook or pin.											0	
				•	Explain why the hook should not be inserted into one of the chain links.											0	
				•	Locate company policies and procedures that apply to rigging.											0	
				•	Select correct slings, or other similar lifting devices, according to size, weight, and configuration.											0	
3	CO	03	General Rigger Qualifications and Role	•	Explain the basic rigger's role in ensuring safe lifting operations.											0	
				•	Explain the basic rigger's role in ensuring that all lifting gear is certified to company and regulatory requirements.											0	
				•	Explain who at the jobsite is authorized to use rigging hardware.											0	
				•	List the recommended qualifications, experience, and training necessary to be able to rig a load (see API RP 1e, 2d, latest edition).											0	

Annex-8 : Competency Table: – Floorman 2/4

Position: Floorman

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	GAP	Individual Development Plan
4	CO	04	General Rigging Hardware Information	• Describe and explain sling manufacturers' recommendations for safe slinging configurations.											0	
				• Describe the proper installation and rigging of all permanent and temporary lifting points (anchor points, pad eyes, etc.).											0	
				• Describe the proper use of tag lines attached to loads, including proper positioning and quantity.											0	
				• Describe the storage requirements for all rigging hardware (rigging/slings/shackles, etc.).											0	
				• Explain how the sling capacity changes when using different sling configurations.											0	
				• Explain how to interpret manufacturer's guidelines for rigging hardware.											0	
				• Locate the manufacturer's guidelines, as applicable, for rigging hardware.											0	
5	CO	05	Rigging Hardware Inspection & Maintenance	• Demonstrate ability to maintain and inspect hand and power tools in operationally safe condition, without any unauthorized modifications.											0	
				• Demonstrate proper application, use, and inspection of cargo nets.											0	
				• Demonstrate proper application, use, and inspection of chain binders.											0	
				• Demonstrate proper application, use, and inspection of chain falls.											0	
				• Demonstrate proper application, use, and inspection of chains.											0	
				• Demonstrate proper application, use, and inspection of come-alongs.											0	
				• Demonstrate proper application, use, and inspection of drum lifters.											0	
				• Demonstrate proper application, use, and inspection of eye bolt types.											0	
				• Demonstrate proper application, use, and inspection of hoist rings.											0	
				• Demonstrate proper application, use, and inspection of hook types.											0	
				• Demonstrate proper application, use, and inspection of master links.											0	
				• Demonstrate proper application, use, and inspection of pad eyes.											0	
				• Demonstrate proper application, use, and inspection of pallet forks.											0	
				• Demonstrate proper application, use, and inspection of plate clamps.											0	
				• Demonstrate proper application, use, and inspection of shackles types.											0	
				• Demonstrate proper application, use, and inspection of spreader bars.											0	
				• Demonstrate proper application, use, and inspection of turnbuckles types.											0	
				• Demonstrate proper application, use, and inspection of web slings.											0	
				• Demonstrate proper application, use, and inspection of wire rope clips.											0	
				• Demonstrate proper application, use, and inspection of wire rope slings.											0	
				• Demonstrate the proper application, use, and inspection of personnel lifting baskets.											0	
				• Explain procedures to follow when defective rigging hardware is identified.											0	
				• Explain the lifting gear color-coding system and how records are kept for each item.											0	
				• Identify appropriate tools and materials for the purpose of performing preventive maintenance and minor adjustments.											0	
6	CO	06	General Crane Operator Qualifications and Role	• Explain the crane operator's role in ensuring safe lifting operations.											0	
7	CO	10	General Crane Operation HSE	• Explain the importance of designating one person to give correct hand signals and responding appropriately to those hand signals.											0	
				• Explain why personnel should observe and report any fluid leaks from the crane that could be contaminating the work environment and affecting safe operations.											0	
				• Explain your Stop Work Authority when you observe an unsafe act during lifting operations.											0	
				• Identify the appropriate personal protective equipment required for crane/lifting operations.											0	

Annex-8 : Competency Table: – Floorman 3/4

Position: Floorman

No	Code	No	Functional competency		Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	GAP	Individual Development Plan
8	CO	15	General Rigging HSE	•	Demonstrate ability to ensure that deck personnel use safe lifting procedures (e.g., tag lines, escape routes).											0	
				•	Demonstrate correct use of personal protective equipment.											0	
9	CO	17	Personnel: Lifting Operations	•	Demonstrate how to properly utilize personnel lifting equipment.											0	
				•	Demonstrate how to select the proper personnel lifting equipment/device.											0	
				•	Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.											0	
				•	Explain the importance of load balance, weight tolerances, and environmental conditions before and during personnel transfer.											0	
				•	Explain the precautions and pre-lift requirements applicable before personnel are transferred or lifted.											0	
10	CO	18	Offboard/Onboard Supply Boat Lifting Operations	•	Demonstrate how to properly utilize personnel lifting equipment.											0	
				•	Demonstrate how to select the proper personnel lifting equipment/device.											0	
				•	Describe the basic work sequence/policy followed prior to making a critical lift.											0	
				•	Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.											0	
				•	Explain the importance of load balance, weight tolerances, and environmental conditions before and during personnel transfer.											0	
				•	Explain the precautions and pre-lift requirements applicable before personnel are transferred or lifted.											0	
11	CO	19	Company-Specific Crane Ops Policies & Procedures	•	Explain why the hook should not be inserted into one of the chain links.											0	
12	CO	20	General Housekeeping/Orderliness	•	Demonstrate cleaning and organizing the work area upon completion of the work, task, or repairs.											0	
				•	Explain procedures personnel should follow if they observe worksite and water pollutants during lifting operations.											0	
13	DL	01	Rig Move (Skidding/Walking): Skidding Rig with BOP Suspended	•	Explain the need to assign watchmen to important areas during transit.											0	
14	DL	05	Rig Up: Unload and install matting boards	•	Demonstrate the ability to recognize approved and certified lifting eqiupment.											0	
15	DL	07	Rig Up: Spot & Assemble Shaker Tanks, Intermediate Tanks, Suction Tanks &/or Reserve Tanks	•	Demonstrate ability to properly earth ground equipment.											0	
16	DL	09	Spot & Assemble suitcases and lines	•	Demonstrate ability to properly earth ground equipment.											0	
17	DL	16	Rig Up: Pipe Handler Equipment	•	Demonstrate ability to correctly connect all hydraulic lines.											0	
18	DL	28	Rig Down: Fall Protection	•	Explain pin removal and associated hazards.												
19	DL	30	Rig Down: Transportation	•	Explain how to secure all lines, piping and physical objects to prevent hazards during transporting.											0	
20	DL	31	Rig Down: Environmental	•	Explain, if applicable, the process for oil-based mud (OBM) rig clean up and containment.											0	
21	DL	33	Vertical/Conventional Drilling: Rig Math, Well Head and BOP Control Equipment	•	Demonstrate how to measure, strap, & caliper all tubulars.											0	
				•	Demonstrate how to check drilling fluids characteristics and measurement.											0	

Annex-8 : Competency Table: – Floorman 4/4

Position: Floorman

No	Code	No	Functional competency		Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	GAP	Individual Development Plan
22	DL	36	Vertical/Conventional Drilling: Execution Of Drilling And Well Operations	•	Demonstrate how to make trips.											0	
23	DL	39	Vertical/Conventional Drilling: Pipe measurement, number and strapping of pipes	•	Demonstrate correct measuring points on all tubular, casings and tools.											0	
				•	Explain how to correctly read a strapping tape.											0	
				•	Explain how to properly number stands in derrick when TIH or POOH.											0	
24	DL	42	Vertical/Conventional Drilling: Standpipe and Bleed Off Core	•	Demonstrate how to ensure all valves are in the "full open" or "closed" position.											0	
25	DL	71	Hoisting/Rig Floor: Utility Winches	•	Demonstrate correct hand signals associated with operating utility winch.											0	
26	DL	88	Well Control Equipment: BOP Preventers & Fail Safe Valves	•	Explain the importance of why all bolts need to be engaged comletely into the nut.											0	
27	QHSE	12	General Housekeeping/Orderliness	•	Demonstrate the ability to secure the current work area or operation before evacuating during an emergency or drill.											0	
				•	Explain the hazards associated with using defective or modified hand or power tools.											0	
				•	Explain the importance of closing out hazardous work activities before evacuating the area for an emergency or drill.											0	
				•	Demonstrate cleaning and organizing the work area upon completion of the work, task, or repairs.											0	
				•	Explain procedures personnel should follow if they observe worksite and water pollutants during lifting operations.											0	
28	QHSE	20	Safe Use Of Lifting Equipment	•	Demonstrate proper hand and body placement when attaching the rigging to a load.											0	
				•	Demonstrate the proper use of tag lines attached to loads including proper positioning.											0	
				•	Explain proper hand and body placement when attaching the rigging to a load.											0	
29	QHSE	21	Lifting of Personnel	•	Demonstrate the inspection of personnel lifting equipment.											0	

Maximum Score	0	Actual Score	0	0

Annex-9 : Competency Table: – Motorman 1/11

Position: Motorman

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	GAP	Individual Development Plan
1	DL	01	Rig Move (Skidding/Walking): Skidding Rig with BOP Suspended	• Explain the need to assign watchmen to important areas during transit.											0	
2	DL	05	Rig Up: Unload and install matting boards	• Demonstrate the ability to recognize approved and certified lifting eqiupment.											0	
3	DL	07	Rig Up: Spot & Assemble Shaker Tanks, Intermediate Tanks, Suction Tanks &/or Reserve Tanks	• Demonstrate ability to properly earth ground equipment.											0	
4	DL	09	Spot & Assemble Suitcases and lines	● Demonstrate ability to inspect and tighten all hammer seal unions between suitcases to prevent fluid or air leaks.											0	
				● Demonstrate ability to properly earth ground equipment.											0	
				● Demonstrate ability to spot suitcase level, in proper order and in line as per rig design.											0	
5	DL	10	Rig Up: Spot & Rig up Rig Power Package & Fuel Tank	● Demonstrate ability to properly install all electricity connections and fuel lines.											0	
				● Demonstrate ability to spot power package & fuel tank level, in proper order and in line as per rig design.											0	
6	DL	14	Rig Up: HPU	● Demonstrate the ability to rig up the HPU system											0	
7	DL	16	Rig Up: Pipe Handler Equipment	● Demonstrate ability to correctly connect all hydraulic lines.											0	
8	DL	18	Rig Up: Rig Floor	● Demonstrate the ability to install & rig up winches and air tuggers.											0	
				● Explain how to install & rig up winches and air tuggers.											0	
9	DL	27	Rig Down: Critical Steps	● Demonstrate ability to ensure all equipment has been removed from location.											0	
10	DL	28	Rig Down: Fall Protection	● Explain pin removal and associated hazards.											0	
				● Explain procedures for working around the cellar/well head.											0	
11	DL	30	Rig Down: Transportation	● Explain how to secure all lines, piping and physical objects to prevent hazards during transporting.											0	
12	DL	31	Rig Down: Environmental	● Explain, if applicable, the process for oil-based mud (OBM) rig clean up and containment.											0	
13	DL	33	Vertical/Conventional Drilling: Rig Math, Well Head and BOP Control Equipment	● Demonstrate how to measure, strap, & caliper all tubulars.											0	
				● Demonstrate how to check drilling fluids characteristics and measurement.											0	
14	DL	35	Vertical/Conventional Drilling: Automated Pipe Handling	● Demonstrate how to ensure that moving equipment does not interfere with other equipment/machinery - Simulataneous Operations.											0	
				● Explain the importance of checking the equipment prior to use.											0	
15	DL	36	Vertical/Conventional Drilling: Execution Of Drilling And Well Operations	● Demonstrate how to maintain an accurate pipe tally in relation to the well design.											0	
				● Demonstrate how to make trips.											0	
				● Demonstrate correct measuring points on all tubular, casings and tools.											0	
				● Explain how to correctly read a strapping tape.											0	
				● Explain how to properly number stands in derrick when TIH or POOH.											0	
16	DL	47	vertical/Conventional Drilling: Picking up drilling assembly	● Demonstrate the method for strapping and counting the drill pipe.											0	
				● Explain the method for strapping and counting the drill pipe.											0	
17	DL	51	Well Control: Riser/Diverter/ BOP (Run & Retrieve)	● Demonstrate how to install new wellhead gaskets.											0	
				● Explain how to install new wellhead gaskets.											0	
18	DL	70	Hoisting/Rig Floor: Manriding Winches & Belts	● Demonstrate correct hand signals associated with operating manriding winch.											0	
				● Demonstrate how to inspect manriding winch.											0	
				● Demonstrate how to inspect, wear & fasten manriding belt.											0	

Annex-9 : Competency Table: – Motorman 2/11

Position: Motorman

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	GAP	Individual Development Plan
19	DL	71	Hoisting/Rig Floor: Utility Winches	● Demonstrate correct hand signals associated with operating utility winch.											0	
				● Demonstrate how to safely operate and maintain utility winch.											0	
20	DL	72	Power Systems: Engine instrumentation	● Explain the purpose of engine instrumentation.											0	
21	DL	73	Power Systems: Engine report and log book	● Demonstrate how to record engine gauge readings and maintain logs.											0	
				● Explain the purpose of record keeping.											0	
22	DL	74	Power Systems: Engine fluids	● Explain types of engine fluids and level requirements.											0	
23	DL	75	Power Systems: Engine fuel system	● Explain pressures, filtration, and line inspection.											0	
24	DL	76	Power Systems: Engine cooling system	● Explain how to check engine coolant level.											0	
25	DL	77	Power Systems: Engine air intake systems	● Explain how to inspect air filters and intake differential pressures.											0	
26	DL	82	Circulating Systems: Trip Tanks	● Demonstrate how to line up trip tank valves for filling or monitoring the hole.											0	
				● Explain how to line up trip tank valves for filling or monitoring the hole.											0	
				● Explain the purpose of the trip tank.											0	
27	DL	83	Circulating Systems: Mud Saver Bucket	● Demonstrate how to perform maintenance on the mud saver bucket.											0	
				● Demonstrate how to use the mud saver bucket.											0	
				● Explain the purpose of a mud saver bucket.											0	
				● Explain when to use the mud saver bucket.											0	
28	DL	84	Rotating System: Master Bushings	● Demonstrate how to perform maintenance of the master bushings.											0	
				● Explain how to perform maintenance of the master bushings.											0	
				● Explain the purpose of the master bushings.											0	
29	DL	85	Rotating System: Rotary Table	● Demonstrate the maintenance procedures for the rotary table.											0	
				● Demonstrate the procedure for locking and working around.											0	
				● Explain the maintenance procedures for the rotary table.											0	
				● Explain the procedure for locking and working around.											0	
				● Explain the purpose of the rotary table.											0	
30	DL	87	Well Control Equipment: BOP Control System And Accumulator	● Demonstrate how to connect the HCR valve, manual valve, coflex hose, for BOP and choke manifold.											0	
				● Demonstrate how to connect the kill line and check valve as designed.											0	
				● Demonstrate how to install the Driller's and remote BOP control panels and function test same.											0	
				● Explain how to connect the HCR valve, manual valve, coflex hose, for BOP and choke manifold.											0	
				● Explain how to install the Driller's and remote BOP control panels and function test same.											0	
				● Explain the designed arrangement foor kill line and check valve.											0	
31	DL	88	Well Control Equipment: BOP Preventers & Fail Safe Valves	● Demonstrate proper torque sequence to insure flange gap is even on all sides.											0	
				● Explain how to open the BOP doors and change pipe rams and blind rams.											0	
				● Explain the importance of having the proper flange gap on all sides.											0	
				● Explain the importance of why all bolts need to be engaged comletely into the nut.											0	
32	DL	89	Well Control Equipment: BOP Testing Equipment	● Demonstrate how to connect the test lines andsecure from test unit to BOP.											0	
				● Explain how to connect the test lines and secure from test unit to BOP.											0	
33	DL	90	Well Control Equipment: Full Opening Safety Valve, Kelly cock valve, IBOP	● Explain each tool, their function, storage position and location of each.											0	
				● Explain the importance all wrenches for each safety valve are kept orderly and are readily available.											0	
				● Explain the importance of inspecting valve connections in accordance with drill string requirements.											0	

Annex-9 : Competency Table: – Motorman 3/11

Position: Motorman

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	GAP	Individual Development Plan
34	DL	91	Well Control Equipment: Float Valve	● Demonstrate how to visually inspect float valves for damage.											0	
				● Demonstrate the installation of float valve in drill string.											0	
				● Explain how to visually inspect float valves for damage.											0	
				● Explain the installation of float valve in drill string.											0	
35	DL	93	Well Control Equipment: Wellhead Adaptor Spools and Risers	● Demonstrate sizing and pressure rating of spools for wellhead and BOP equipment meet requirements of drilling program.											0	
				● Explain sizing and pressure rating of spools for wellhead and BOP equipment per drilling program.											0	
36	DL	103	Diesel pumps	● Demonstrate the use and maintenance of diesel pumps.											0	
				● Explain the the importance of rig fuel filtering system.											0	
				● Explain the use and maintenance of diesel pumps.											0	
37	DL	105	Centrifugal pumps	● Demonstrate how to prime and maintain a centrifugal pump.											0	
				● Explain how to prime and maintain a centrifugal pump.											0	
38	DL	106	Diaphram pumps	● Demonstrate how to prime and maintain a diaphram pump.											0	
				● Explain how to prime and maintain a diaphram pump.											0	
39	DL	108	Rotary swivel	● Explain what a rotary swivel is and when it is used.											0	
40	DL	111	Rig Up: Startup & Energize Rig Power	● Demonstrate the ability to start up generators and VFD/SCR systems.											0	
41	DL	112	Tubulars: Tubular care and maintenance	● Demonstrate how to clean and inspect connections during drilling and tripping operations.											0	
				● Explain how the slips and rotary bushing relate to the care of tubulars.											0	
				● Explain how to break in new tool joints.											0	
				● Explain how to clean and inspect connections during drilling and tripping operations.											0	
				● Explain the different types of mechanical surface imperfections that should be monitored or prevented that could lead to failures.											0	
				● Explain the importance of cleaning and inspection of tubular connections.											0	
				● Explain the procedures for storing and transporting tubulars.											0	
42	DL	119	Forklift Operations	● Demonstrate how to operate forklift.											0	
				● Demonstrate the ability to perform rigging and determine lifting capacities for forklift.											0	
				● Demonstrate the inspection and general maintenance procedure for a forklift.											0	
				● Explain how to operate forklift.											0	
				● Explain rigging and lift capacities for forklift.											0	
				● Explain the inspection and general maintenance of forklift.											0	
43	DL	123	Other Operations: Conductor and Casings	● Demonstrate how to identify cross-threaded pipe.											0	
				● Demonstrate how to stab casing.											0	
				● Demonstrate visual inspection of casing threads for damage and cleanliness.											0	
				● Explain how to identify cross-threaded pipe.											0	
				● Explain how to stab casing.											0	
				● Explain visual inspection of casing threads for damage and cleanliness.											0	
				● Demonstate how to maintain adequate drill water.											0	
				● Explain the importance of maintaining adequate water volume for drilling operations.											0	
44	DL	13	Rig Up: Rotary system	● Demonstrate ability to rig up rotary and applicable drive system.											0	
45	DL	42	Vertical/Conventional Drilling: Standpipe and Bleed Off Line	● Demonstrate how to ensure all valves are in the "full open" or "closed" position.											0	

Annex-9 : Competency Table: – Motorman 4/11

Position: Motorman					Competency level required					Proficiency Scale					GAP	Individual Development Plan
					Required Score					Actual Score						
No	Code	No	Functional competency	Description of competency	Awareness	Application	Career Proficien	Advanced Level	Expert Level	Awareness	Application	Career Proficie	Advanced Level	Expert Level		
46	QHSE	01	Induction (Post-Hire Corporate and Unit Specific)	● Demonstrate immediate response during coordinated drills (Including your assigned Muster Station(s) and location of your Lifeboat(s) (if applicable).											0	
				● Explain assigned roles and responsibilities according to the Emergency Response Plans or Station Bill.											0	
				● Explain the general duties of the Unit/Crew specific positions.											0	
				● Explain your company's position in regard to compliance with regulatory requirements (for applicable position).											0	
				● Explain your Company's specific Short Service Employee program (if applicable).											0	
				● Identify and explain the various components of the Rig or Unit.											0	
				● Provide evidence of completion of the Corporate and Unit Specific Induction/Orientation course.											0	
47	QHSE	04	Quality, Health, Safety, Environment and Security (QHSES) Policy	● Describe your role and responsibilities in order to comply with company's QHSES policies.											0	
				● Explain good housekeeping practices and personal hygiene practices in accordance with company policies.											0	
				● Explain the company's QHSES policies (as applicable).											0	
				● Explain the objectives and the importance of active participation in the various meetings held onsite/onboard (Induction meeting, Pre-shift meeting, Weekly safety meeting, Risk Assessment/Pre-job meeting).											0	
				● Identify where you would find the company QHSES Policies.											0	
48	QHSE	05	HSE Local Regulations and Relevant International Standards	● Explain the local HSE regulations (Standards, laws and regulations that apply to occupational health and safety).											0	
49	QHSE	06	Quality Safety & Management System	● Demonstrate the ability to navigate the company specific Quality Safety & Management System.											0	
50	QHSE	07	Station Bill/Emergency Response Plan and Emergency Drills	● Demonstrate the ability to perform the assigned duties as per the station bill/emergency response plan.											0	
				● Demonstrate the correct donning, doffing and stowing of emergency PPE.											0	
				● Describe all the emergency alarm sounds as well as the respective actions to take (H2S, Well Control, Fire Alarm, Abandon Alarm, Gas Alarm, Man overboard Alarm, Loss of Station Position etc).											0	
				● Describe and identify the location of your muster point(s).											0	
				● Describe the process to search and rescue personnel unaccounted for in an emergency situation.											0	
				● Identify the various site specific emergency equipment (Portable fire extinguishers, fixed fire systems such as CO2, Life Boat, Life Raft, Rescue Boat, Escape Ladder etc).											0	
51	QHSE	08	Emergency Preparedness and Response	● Demonstrate the assigned duties to be carried out during various emergencies/drills (for example: Fire Drill, Abandon Drill, Gas Drill, Man Overboard Drill, Man Down, Stability Drill, Well Control Drill, SOPEP Drill, Helpdesk Fire Drill, Blackout Drill).											0	
				● Demonstrate the proper recording and completion of all emergency response training and drills.											0	
				● Describe and identify the escape routes, markings, signage systems and lighting systems as applicable.											0	
				● Describe and identify the location of all emergency alarm actuators.											0	
				● Describe how to react to well control situations and how often well control drills are conducted.											0	
				● Describe the rig (unit) emergency response abandonment and notification procedures.											0	
				● Explain the assigned duties to be carried out during various emergencies/drills (for example: Fire Drill, Abandon Drill, Gas Drill, Man Overboard Drill, Man Down, Stability Drill, Well Control Drill, SOPEP Drill, Helpdesk Fire Drill, Blackout Drill).											0	
				● Explain the oil spill emergency plan(s) (Shipboard Oil Pollution Emergency Plan/Spill Prevention Control and Countermeasures Plan).											0	
				● Explain the site specific emergency responses, exercises and training plans for all major hazardous situations.											0	

Annex-9 : Competency Table: – Motorman 5/11

Position: Motorman

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	GAP	Individual Development Plan
52	QHSE	09	Risk Assessments (RA)	● Demonstrate the ability to verify that risk control measurements are implemented and demonstrate how to assess their effectiveness.											0	
				● Describe and demonstrate how safety critical equipment is tested and maintained.											0	
				● Describe how simultaneous operations (SIMOPS) are managed to ensure that risk control procedures are in place during the execution of related activities.											0	
				● Describe the operational boundaries and performance standards of the safety critical equipment.											0	
				● Describe the potential hazards on site and provide examples of what could trigger them and what could be their associated consequences.											0	
				● Describe the process by which potential or unforeseen risks are communicated to management and affected employees.											0	
				● Describe the process to systematically identify, evaluate, select and implement risk reducing controls.											0	
				● Describe the roles and responsibilities of personnel participating in the risk assessment process.											0	
				● Describe the site specific risk assessment process.											0	
				● Explain and demonstrate how to stop and secure work or tasks in case of any unforeseen or unplanned changes or hazards, and how to further assess risks associated with these changes or hazards.											0	
				● Explain how the interaction of major hazards within your unit has been considered during normal or simultaneous operations.											0	
				● Explain how to apply the hazard recognition and risk assessment techniques and the ability to implement risk mitigation measurements and controls.											0	
				● Explain the maintenance and control of risk assessment documents.											0	
				● Explain when/if operations can continue when risk associated with simultaneous operations, inadequate equipment or lack of personnel are present.											0	
				● Identify and describe the safety critical equipment on site.											0	
53	QHSE	10	Permit To Work (PTW)/ Energy Isolations/L.O.T.O.	● Demonstrate control and execution of energy isolation.											0	
				● Describe a scenario where electrical/ mechanical isolations are required.											0	
				● Describe the objectives of energy isolation and why precautions are important.											0	
				● Explain how electrical/mechanical isolation would be confirmed safe to work on.											0	
				● Explain the types of energy sources that could be released at the site and the precautions that need to be in place.											0	
54	QHSE	11	Behavioral Based Safety System (BBSS)	● Demonstrate the corrective action/feedback process in the BBSS program for an observed unsafe action/behavior.											0	
				● Demonstrate the process to record and track non conformities from BBSS Observations.											0	
				● Describe the difference between an unsafe action/behavior and an unsafe condition.											0	
				● Describe the importance of reviewing past BBSS observations and behaviors at safety meetings.											0	
				● Describe your role in the BBSS.											0	
				● Explain the company's BBSS.											0	
55	QHSE	12	General Housekeeping/Orderliness	● Demonstrate the ability to secure the current work area or operation before evacuating during an emergency or drill.											0	
				● Demonstrates ability to ensure that the work area is clean and orderly, prior to and upon completion of the work, task or repairs.											0	
				● Demonstrates ability to maintain and inspect hand and power tools in operationally safe condition, without any unauthorized modifications.											0	
				● Explain the hazards associated with using defective or modified hand or power tools.											0	
				● Explain the importance of closing out hazardous work activities before evacuating the area for an emergency or drill.											0	
				● Explain the importance of good housekeeping practices in the work areas and living quarters.											0	
				● Explain why it is important to keep tools put away and the work place clean in case of an emergency.											0	
				● Explain your role in the housekeeping practices in the work areas and living quarters.											0	

Annex-9 : Competency Table: – Motorman 6/11

Position: Motorman					Competency level required					Proficiency Scale					GAP	Individual Development Plan
					Required Score					Actual Score						
No	Code	No	Functional competency	Description of competency	Awareness	Application	Career Proficien	Advanced Level	Expert Level	Awareness	Application	Career Proficie	Advanced Level	Expert Level		
56	QHSE	13	Environmental Management Plan	● Describe the company Environmental Management Plan (EMP).											0	
				● Describe the location specific sensitivities of the receiving environment.											0	
				● Describe the process for handling or discharging cuttings.											0	
				● Describe the process for maintaining environmental discharge or emission records and their location.											0	
				● Describe the process for monitoring discharges and emissions.											0	
57	QHSE	14	Ship Oil Pollution Emergency Plan (SOPEP)	● Describe the spill kit contents and how to use them.											0	
58	QHSE	15	Spill Prevention Control and Countermeasures Plan (SPCC)	● Describe the rig specific SPCC plan procedures to follow in case of a spill.											0	
				● Demonstrate the ability to locate the SPCC Plan.											0	
				● Demonstrate the ability to locate the Spill kit.											0	
				● Describe the SPCC inspection process for the location and equipment before spud in.											0	
				● Describe the spill kit contents and how to use them.											0	
				● Explain how the SPCC plan bridges to the operator's well site plan.											0	
				● Explain the process or requirements of training on the SPCC elements.											0	
				● Explain the reporting procedures in the event of a spill on or off the well site location.											0	
				● Explain the SPCC containment system including the layout, need and maintenance.											0	
				● Explain your role in a SPCC drill or an actual spill.											0	
59	QHSE	16	Waste Segregation	● Describe the company waste management plan.											0	
				● Describe the waste materials (either solid or liquid), and identify/categorize as one of the following: common waste, industrial waste, hazardous waste and recyclable materials.											0	
				● Describe what materials should be placed into the waste containers and why they need to be segregated.											0	
				● Explain the continuous improvement of waste handling on the unit/location.											0	
				● Explain the waste containers provided for common waste, industrial waste, hazardous waste and recyclable materials.											0	
60	QHSE	17	Dropped Objects Prevention	● Describe the hazards associated while work is being conducted overhead.											0	
				● Describe the main hazard areas/zones where dropped objects may occur.											0	
				● Explain how potential dropped objects are identified and how they should be reported.											0	
				● Explain how the restricted areas/zones are enforced.											0	
				● Explain precautionary measures required to avoid causing dropped objects and to protect personnel from those potential hazards.											0	
				● Explain the importance of a daily/weekly/monthly/annual dropped objects prevention inspection program.											0	
				● Explain why access should be restricted to all known dropped object areas/zones.											0	
61	QHSE	19	Fall Protection	● Demonstrate the ability to find the fall arrest or restraint gear/equipment's information tag.											0	
				● Demonstrate the ability to select the proper size and type as well as the donning of, and correct usage, of fall arrest gear.											0	
				● Demonstrate transferring from one location to another while maintaining 100 percent tie off while working at heights.											0	
				● Describe the difference between fall arrest and fall restraint.											0	
				● Describe the emergency equipment and procedures (rescue plan) when rescuing someone at heights.											0	
				● Describe the general requirements of the fall protection.											0	
				● Describe the limitations and the common misuse of fall arrest and restraint equipment.											0	
				● Describe the management of defective fall arrest equipment.											0	
				● Describe the proper maintenance, cleaning, inspection (including documentation) and storage of fall arrest equipment.											0	
				● Describe the proper use of ladders (fixed and portable) or scaffolds.											0	
				● Describe the proper work procedures and communication using fall protection while working in an aerial lift platform (man-lift/work basket).											0	
				● Describe the types of fall protection and fall arrest gear/equipment and how it is used.											0	
				● Explain the different types of fall protection and fall arrest systems and how each of them work.											0	
				● Explain the importance of maintaining the proper overhead anchorage point.											0	

Annex-9 : Competency Table: – Motorman 7/11

Position: Motorman

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	GAP	Individual Development Plan
62	QHSE	20	Safe Use Of Lifting Equipment	● Explain who is authorized to operate lifting equipment.											0	
				● Demonstrate proper hand and body placement when attaching the rigging to a load.											0	
				● Demonstrate the ability to properly operate lifting equipment.											0	
				● Demonstrate the ability to select the correct lifting equipment for the task at hand.											0	
				● Demonstrate the proper use of tag lines attached to loads including proper positioning.											0	
				● Demonstrate the verbal communications and hand signals used in lifting operations.											0	
				● Describe the basic work sequence/policy and precautions that must be in place prior to making a critical lift.											0	
				● Describe the lifting equipment available on location.											0	
				● Describe the maintenance, storage and inspection of all lifting equipment (rigging/slings/shackles, etc.).											0	
				● Describe the proper installation and rigging of all permanent and temporary lifting points (anchor points, pad eyes, etc.).											0	
				● Describe the proper use of tag lines attached to loads including proper positioning and quantity.											0	
				● Describe the verbal communications and hand signals used in lifting operations.											0	
				● Explain proper hand and body placement when attaching the rigging to a load.											0	
				● Explain the importance of a spotter during blind lifting operations.											0	
				● Explain the minimum number of personnel and special precautions to be used during critical lifting operations.											0	
				● Explain the pre-lift plan and inspections process.											0	
				● Explain the responsibilities of a rigger (banksman).											0	
				● Explain what constitutes a critical lift.											0	
63	QHSE	21	Lifting of Personnel	● Demonstrate the ability to properly utilize personnel lifting equipment.											0	
				● Demonstrate the ability to select the proper personnel lifting equipment/device.											0	
				● Demonstrate the inspection of personnel lifting equipment.											0	
64	QHSE	22	Crane Safety	● Describe the maintenance, storage and inspection of all lifting equipment (rigging/slings/shackles, etc.).											0	
65	QHSE	23	Use and maintenance of utility winch	● Demonstrate rigging practices for safe lifting and movement of tubulars and irregular shaped equipment/materials.											0	
				● Demonstrate the hand signals used during winch operations.											0	
				● Demonstrate the operation of a utility winch.											0	
				● Describe the operational and safety responsibilities of a winch operator.											0	
				● Describe the specific locations where utility winches are installed on the unit.											0	
				● Explain rigging practices for safe lifting and movement of tubulars and irregular shaped equipment/materials.											0	
				● Explain the capacity and limitations of utility winches.											0	
				● Explain the pre-use inspection steps required before operating a utility winch.											0	
				● Explain the required maintenance for a utility winch and accessories.											0	
66	QHSE	25	Accident/Incident Investigation	● Explain the company's policies/procedures for reporting an incident resulting in personal injury, equipment damage, a near miss or any potential hazard.											0	
				● Explain the importance of active participation in an incident investigation.											0	
				● Explain the importance of following up and closing corrective actions.											0	
				● Explain what a corrective action is and why it is being implemented.											0	
				● Explain why facts are important to an incident investigation.											0	

Annex-9 : Competency Table: – Motorman 8/11

Position: Motorman					Competency level required					Proficiency Scale					GAP	Individual Development Plan
					Required Score					Actual Score						
No	Code	No	Functional competency	Description of competency	Awareness	Application	Career Proficien	Advanced Level	Expert Level	Awareness	Application	Career Proficie	Advanced Level	Expert Level		
67	QHSE	26	Chemical Handling & SDS (MSDS) (GHS)	● Demonstrate selection and correct use of PPE when handling chemicals in accordance with the SDS.											0	
				● Describe appropriate actions necessary in the event of exposure/contact with chemicals or spill.											0	
				● Describe the health and environmental risks associated with chemicals used at the work site.											0	
				● Describe the information contained in a SDS.											0	
				● Describe the storage and segregation process for chemicals.											0	
				● Explain the minimum requirements for labeling, documentation and packing of chemicals.											0	
				● Explain what NORM is, where NORM occurs and explain the precautions to be taken to prevent exposure.											0	
				● Explain where Safety Data Sheets (SDS) are located.											0	
68	QHSE	27	Equipment Safety	● Describe and give examples of various equipment guards and their purpose.											0	
				● Explain the hazards and precautions of working around moving (dynamic) equipment.											0	
				● Explain the hazards and precautions of working around rotating equipment.											0	
				● Explain the hazards and precautions to take when working with or near low or high pressurized equipment.											0	
				● Explain the importance of ensuring that proper fittings (hammer unions/quick connect/hydraulic fittings) are being used in piping, hoses and equipment.											0	
69	QHSE	29	Personal Protective Equipment (PPE)	● Demonstrate the proper selection and usage (donning/doffing) of PPE.											0	
				● Describe different types of PPE, appropriate selection, proper usage and its limitations for various work tasks.											0	
				● Describe the proper maintenance/care and storage of PPE in accordance with the manufacturer's instructions.											0	
				● Explain your responsibility and the importance of wearing PPE that is appropriate for the work-task.											0	
70	QHSE	30	Manual Handling/Ergonomics/Posture	● Demonstrate how to support a load when walking with various size loads.											0	
				● Demonstrate the ergonomic posture to take when physically lifting and setting a load.											0	
				● Describe when mechanical lifting is preferred to manual lifting and why.											0	
				● Describe where the force is concentrated on the spine when improperly lifting or setting a load.											0	
				● Explain the company's policy and procedures on the manual handling/lifting of materials.											0	
				● Explain the importance of planning your path of movement prior to lifting and carrying a load.											0	
				● Explain the proper manual lifting or setting techniques to prevent back injuries as well as the benefits of using mechanical lifting devices.											0	
				● Explain the value of manually "testing a load" before attempting to lift the load.											0	
71	QHSE	31	Confined Space Entry	● Describe what constitutes a confined space entry.											0	
				● Explain how environmental conditions can negatively impact working in a confined space.											0	
				● Explain the company's policy on confined space entry.											0	
				● Explain the hazards associated with a confined space.											0	
				● Explain the importance of using atmospheric monitoring equipment in a confined space.											0	
				● Explain the procedures to take before entering a confined space.											0	
				● Explain the procedures to take upon entering a confined space.											0	
				● Explain the required PPE needed when working in a confined space.											0	
				● Explain what a competent person is in the context of regulatory standards covering confined space entry.											0	
				● Explain what a qualified person is in the context of regulatory standards covering confined space entry.											0	
				● Explain what and how to identify a confined space and give some examples on your worksite.											0	
				● Explain why it is important to continually monitor the atmosphere of a confined space.											0	
				● Explain your role and responsibility during a confined space rescue operation.											0	

Annex-9 : Competency Table: – Motorman 9/11

Position: Motorman					Competency level required					Proficiency Scale					GAP	Individual Development Plan
					Required Score					Actual Score						
No	Code	No	Functional competency	Description of competency	Awareness	Application	Career Proficien	Advanced Level	Expert Level	Awareness	Application	Career Proficie	Advanced Level	Expert Level		
72	QHSE	32	Severe Weather Conditions	● Demonstrate the ability to recognize operational shut down point(s).											0	
				● Describe actions to be taken to protect personnel during severe weather conditions.											0	
				● Describe operations which may be impacted by severe weather and the actions taken to mitigate it.											0	
				● Describe the process to restart operations after a severe weather event.											0	
				● Describe the process to secure the unit, before evacuating, when a severe weather alert has been issued.											0	
				● Explain the company's policy and procedures to follow during a severe weather threat.											0	
73	QHSE	33	Fire Prevention, Fire Fighting and Fire Control and Gas/Fire Detection Equipment	● Demonstrate the use of portable fire extinguishers.											0	
				● Describe the company's policies and procedures for fire prevention.											0	
				● Describe the different types of portable fire extinguishers and their applications (Water, Carbon Dioxide and Dry Chemical).											0	
				● Describe the engine shutdown procedure in the event of a gas release.											0	
				● Describe the fire and gas detection systems, sensor locations and how they function.											0	
				● Describe the fixed and/or portable systems used to detect the presence of Oxygen (O2), Hydrocarbon (HC) and Hydrogen Sulphide (H2S), etc											0	
				● Describe the passive fire protection systems on the unit, including their location and rating.											0	
				● Describe the process and documentation needed for inspecting and maintaining portable fire extinguishers.											0	
				● Describe the process for inspecting, maintaining, testing and calibrating the fire and gas detection systems.											0	
				● Describe the testing and regulatory requirements for portable fire extinguishers.											0	
				● Describe the three elements to complete the fire triangle.											0	
				● Describe the thresholds and the actions automatically initiated on detection of HC and/or H2S.											0	
				● Explain the different levels of shutdown associated with the unit (if applicable).											0	
				● Explain the rig/unit emergency action (response) plan for a fire event.											0	
				● Explain the use of portable fire extinguishers.											0	
74	QHSE	34	Occupational Health Plan	● Explain the company occupational health protection plan.											0	
				● Explain the exposures (noise, vibration, heat, etc.) that are unacceptable.											0	
75	QHSE	35	Simultaneous Operations	● Describe management of change and why it is important when conducting SIMOPS operations.											0	
				● Describe what constitutes a SIMOPS Plan.											0	
				● Explain Stop Work Authority and who is responsible to initiate when a potential risk is present.											0	
				● Explain the elements of the SIMOPS Plan.											0	
				● Explain the summary of operational boundaries and the difference between proceed, proceed with caution and stop operations.											0	
76	QHSE	36	Powered/Manual Tools	● Describe your company's powered/manual tool policy.											0	
				● Explain the importance of inspection, maintenance and storage of powered/manual tools.											0	
				● Explain the importance of removing defective or altered powered/manual tools.											0	
				● Explain the importance of using the proper powered/manual tool for the task at hand.											0	
				● Explain the required PPE and safe procedures for operating powered/manual tools.											0	

Annex-9 : Competency Table: – Motorman 10/11

Position: Motorman

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	GAP	Individual Development Plan
77	RM	A1	Document Control	● Demonstrate how handover records are filed and maintained.											0	
				● Demonstrate the ability to apply action items contained in the communication document (Alerts/Notifications/Best Practices) through closure.											0	
				● Demonstrate the ability to communicate to all current operations.											0	
				● Demonstrate the ability to complete a handover report, note and form.											0	
				● Demonstrate the ability to store inventory items including dangerous goods.											0	
				● Demonstrate the execution and application of a management of change request.											0	
				● Demonstrate the handover procedure.											0	
				● Describe the personnel involved in the development, implementation and maintenance of written policy and procedure standards.											0	
				● Describe where operational documentation is maintained.											0	
				● Explain how each business unit will utilize the quality and control system.											0	
				● Explain how written policy and procedure standards are implemented into the current workforce and new hire process.											0	
				● Explain the Company policy and procedure for the handover process.											0	
				● Explain the Company policy and procedures for the storage of inventory items including dangerous goods.											0	
				● Explain the Company policy and procedures on operations and HSE communications.											0	
				● Explain the Company policy on documentation control.											0	
				● Explain the Company process for issuing, distributing and responding to communication documents (Alerts/Notifications/Best Practices).											0	
				● Explain the Company's material inventory and parts list including the vendor's nomenclature (name) of the part.											0	
				● Explain the Company's policies and procedures for quality control.											0	
				● Explain the Company's process for the development of written policy and procedure standards.											0	
				● Explain the Company's policy and procedures for inventory management.											0	
				● Explain the Company's policy for management of change.											0	
				● Explain the Company's procedure for document tracking and retention.											0	
				● Explain the Company's procedures for a management of change, including team member's roles and responsibilities.											0	
				● Explain the documentation control procedure and which personnel are involved in the filing of operational documentation.											0	
				● Explain the importance of effective document control.											0	
				● Explain the importance of ensuring that handover reports are understood and signed off by outgoing and incoming personnel.											0	
				● Explain the importance of handover reports.											0	
				● Explain the importance of operations and HSE communications throughout the Company.											0	
				● Explain what quality and control system is used by the Company.											0	
				● Explain who is responsible for revising documentation and describe how to recognize the latest version.											0	
				● Explain who is responsible for updating the HSE policy and procedures and what is the process.											0	
				● Explain why proper review, approval and document control are essential parts of management of change requests.											0	

Annex-9 : Competency Table: – Motorman 11/11

Position: Motorman

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	GAP	Individual Development Plan
78	SS	17	Transportation	● Demonstrate the proper procedure to approach the helicopter when boarding and exiting the aircraft.											0	
				● Describe the Company's helicopter transportation policy.											0	
				● Describe the Company's motor vehicle policy.											0	
				● Describe the emergency response procedures and equipment associated with helicopter operations.											0	
				● Describe the importance of journey management (trip planning).											0	
				● Describe the proper procedure to approach the helicopter when boarding and exiting the aircraft.											0	
				● Describe what constitutes being fit for duty when operating a motor vehicle.											0	
				● Explain the importance of a "walk around" inspection (fluids, fuel, tire pressure etc.) before entering a vehicle and putting it into motion.											0	
				● Explain who is in total command of the helicopter and who will make decisions concerning the flight and personnel allowed onboard.											0	

Maximum Scor 0 **Actual Score 0** **0**

Annex-10 : Competency Table: – Derrickman 1/2

Position: Derrickman

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	GAP	Individual Development Plan
1	CO	01	Crane Basics	● Demonstrate ability to follow the permit-to-work and lockout/tagout procedures required for crane operations.											0	
				● Describe the lifting equipment available on current location.											0	
				● Describe the type(s) of crane(s) by name and type, found on current location.											0	
2	CO	02	Rigger Basics	● Demonstrate ability to use all rigging hitches (e.g., basket, choker, vertical, bridle) needed for the current job.											0	
				● Demonstrate adhering to the permit-to-work for routine and non-routine rigging tasks, if applicable.											0	
				● Demonstrate correct and safe use of taglines attached to loads, including proper positioning and quantity.											0	
				● Demonstrate following the lift plan required for critical lift rigging tasks.											0	
				● Demonstrate how to correctly rig a load according to its specific center of gravity.											0	
				● Demonstrate the ability to control an area where lifting operations are being carried out.											0	
				● Demonstrate the ability to correctly and safely connect/disconnect loads.											0	
				● Demonstrate the ability to correctly secure cargo in various conditions.											0	
				● Demonstrate the ability to find the center of gravity of a load.											0	
				● Demonstrate the ability to select the appropriate rigging equipment for a specific job.											0	
				● Demonstrate the use of sling capacity tables.											0	
				● Determine and/or estimate weight of loads for the purpose of rigging safely.											0	
				● Explain center of gravity as it relates to rigging.											0	
				● Explain how the tension or loading increases as sling angles decrease, especially the rapid increase in tension that occurs when slings are used below 30 degrees.											0	
				● Explain the different methods in which a slings are rigged or attached to load.											0	
				● Explain the importance of the eye of a synthetic web and why it should never be used or forced over a hook or pin.											0	
				● Explain the importance of using padding (protection over sharp edges).											0	
				● Explain the use of push poles, if required by company policy.											0	
				● Explain vertical and horizontal planes as they relate to rigging (e.g., how force is distributed based on the plane).											0	
				● Locate company policies and procedures that apply to rigging.											0	
				● Select correct slings, or other similar lifting devices, according to size, weight, and configuration.											0	
3	CO	03	General Rigger Qualifications and Role	● Explain the basic rigger's role in ensuring safe lifting operations.											0	
				● Explain the basic rigger's role in ensuring that all lifting gear is certified to company and regulatory requirements.											0	
				● Explain who at the jobsite is authorized to use rigging hardware.											0	
				● List the recommended qualifications, experience, and training necessary to be able to rig a load (see API RP 1e, 2d, latest edition).											0	
4	CO	04	General Rigging Hardware Information	● Describe the proper installation and rigging of all permanent and temporary lifting points (anchor points, pad eyes, etc.).											0	
				● Describe the storage requirements for all rigging hardware (rigging/slings/shackles, etc.).											0	
5	CO	05	Rigging Hardware Inspection & Maintenance	● Demonstrate ability to maintain and inspect hand and power tools in operationally safe condition, without any unauthorized modifications.											0	
				● Explain procedures to follow when defective rigging hardware is identified.											0	
				● Explain the lifting gear color-coding system and how records are kept for each item.											0	

Annex-10 : Competency Table: – Derrickman 2/2

Position: Derrickman

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	GAP	Individual Development Plan
6	CO	10	General Crane Operation HSE	● Explain why personnel should observe and report any fluid leaks from the crane that could be contaminating the work environment and affecting safe operations.											0	
				● Explain your Stop Work Authority when you observe an unsafe act during lifting operations.											0	
7	CO	15	General Rigging HSE	● Demonstrate ability to ensure that deck personnel use safe lifting procedures (e.g., tag lines, escape routes).											0	
				● Demonstrate correct use of personal protective equipment.											0	
8	CO	17	Personnel: Lifting Operations	● Demonstrate how to properly utilize personnel lifting equipment.											0	
				● Demonstrate how to select the proper personnel lifting equipment/device.											0	
				● Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.											0	
				● Explain the importance of load balance, weight tolerances, and environmental conditions before and during personnel transfer.											0	
				● Explain the precautions and pre-lift requirements applicable before personnel are transferred or lifted.											0	
9	CO	18	Offboard/Onboard Supply Boat Lifting Operations	● Demonstrate how to properly utilize personnel lifting equipment.											0	
				● Demonstrate how to select the proper personnel lifting equipment/device.											0	
				● Describe the basic work sequence/policy followed prior to making a critical lift.											0	
				● Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.											0	
				● Explain the importance of load balance, weight tolerances, and environmental conditions before and during personnel transfer.											0	
				● Explain the precautions and pre-lift requirements applicable before personnel are transferred or lifted.											0	
10	CO	20	General Housekeeping/Orderliness	● Demonstrate cleaning and organizing the work area upon completion of the work, task, or repairs.											0	
				● Explain procedures personnel should follow if they observe worksite and water pollutants during lifting operations.											0	
11	QHSE	12	General Housekeeping/Orderliness	● Demonstrate the ability to secure the current work area or operation before evacuating during an emergency or drill.											0	
				● Explain the hazards associated with using defective or modified hand or power tools.											0	
				● Explain the importance of closing out hazardous work activities before evacuating the area for an emergency or drill.											0	
				● Demonstrate cleaning and organizing the work area upon completion of the work, task, or repairs.											0	
				● Explain procedures personnel should follow if they observe worksite and water pollutants during lifting operations.											0	
12	QHSE	20	Safe Use Of Lifting Equipment	● Demonstrate proper hand and body placement when attaching the rigging to a load.											0	
				● Explain proper hand and body placement when attaching the rigging to a load.											0	
13	QHSE	21	Lifting of Personnel	● Demonstrate the inspection of personnel lifting equipment.											0	

Maximum Sco 0 **Actual Score 0** **0**

Annex-11 : Competency Table: – Assistant Driller 1/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
1	CO	01	Crane Basics	● Describe the lifting equipment available on current location.											0	
				● Describe the type(s) of crane(s) by name and type, found on current location.											0	
2	CO	02	Rigger Basics	● Demonstrate ability to use all rigging hitches (e.g., basket, choker, vertical, bridle) needed for the current job.											0	
				● Demonstrate adhering to the permit-to-work for routine and non-routine rigging tasks, if applicable.											0	
				● Demonstrate correct and safe use of taglines attached to loads, including proper positioning and quantity.											0	
				● Demonstrate following the lift plan required for critical lift rigging tasks.											0	
				● Demonstrate how to correctly rig a load according to its specific center of gravity.											0	
				● Demonstrate the ability to control an area where lifting operations are being carried out.											0	
				● Demonstrate the ability to correctly and safely connect/disconnect loads.											0	
				● Demonstrate the ability to correctly secure cargo in various conditions.											0	
				● Demonstrate the ability to find the center of gravity of a load.											0	
				● Demonstrate the ability to select the appropriate rigging equipment for a specific job.											0	
				● Demonstrate the use of sling capacity tables.											0	
				● Determine and/or estimate weight of loads for the purpose of rigging safely.											0	
				● Explain center of gravity as it relates to rigging.											0	
				● Explain how the tension or loading increases as sling angles decrease, especially the rapid increase in tension that occurs when slings are used below 30 degrees.											0	
				● Explain the different methods in which a slings are rigged or attached to load.											0	
				● Explain the importance of the eye of a synthetic web and why it should never be used or forced over a hook or pin.											0	
				● Explain the importance of using padding (protection over sharp edges).											0	
				● Explain the use of push poles, if required by company policy.											0	
				● Explain vertical and horizontal planes as they relate to rigging (e.g., how force is distributed based on the plane).											0	
				● Locate company policies and procedures that apply to rigging.											0	
				● Select correct slings, or other similar lifting devices, according to size, weight, and configuration.											0	
3	CO	03	General Rigger Qualifications and Role	● Explain the basic rigger's role in ensuring safe lifting operations.											0	
				● Explain the basic rigger's role in ensuring that all lifting gear is certified to company and regulatory requirements.											0	
				● Explain who at the jobsite is authorized to use rigging hardware.											0	
				● List the recommended qualifications, experience, and training necessary to be able to rig a load (see API RP 1e, 2d, latest edition).											0	
4	CO	04	General Rigging Hardware Information	● Describe the proper installation and rigging of all permanent and temporary lifting points (anchor points, pad eyes, etc.).											0	
				● Describe the storage requirements for all rigging hardware (rigging/slings/shackles, etc.).											0	
5	CO	05	Rigging Hardware Inspection & Maintenance	● Demonstrate ability to maintain and inspect hand and power tools in operationally safe condition, without any unauthorized modifications.											0	
				● Explain procedures to follow when defective rigging hardware is identified.											0	
				● Explain the lifting gear color-coding system and how records are kept for each item.											0	
6	CO	10	General Crane Operation HSE	● Explain why personnel should observe and report any fluid leaks from the crane that could be contaminating the work environment and affecting safe operations.											0	
															0	
7	CO	15	General Rigging HSE	● Demonstrate ability to ensure that deck personnel use safe lifting procedures (e.g., tag lines, escape routes).											0	
				● Demonstrate correct use of personal protective equipment.											0	

Annex-11 : Competency Table: – Assistant Driller 2/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
8	CO	17	Personnel: Lifting Operations	● Demonstrate how to properly utilize personnel lifting equipment.											0	
				● Demonstrate how to select the proper personnel lifting equipment/device.											0	
				● Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.											0	
				● Explain the importance of load balance, weight tolerances, and environmental conditions before and during personnel transfer.											0	
				● Explain the precautions and pre-lift requirements applicable before personnel are transferred or lifted.											0	
9	CO	18	Offboard/Onboard Supply Boat Lifting Operations	● Demonstrate how to properly utilize personnel lifting equipment.											0	
				● Demonstrate how to select the proper personnel lifting equipment/device.											0	
				● Describe the basic work sequence/policy followed prior to making a critical lift.											0	
				● Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.											0	
				● Explain the importance of load balance, weight tolerances, and environmental conditions before and during personnel transfer.											0	
				● Explain the precautions and pre-lift requirements applicable before personnel are transferred or lifted.											0	
10	CO	20	General Housekeeping/Orderliness	● Demonstrate cleaning and organizing the work area upon completion of the work, task, or repairs.											0	
				● Explain procedures personnel should follow if they observe worksite and water pollutants during lifting operations.											0	
11	DL	01	Rig Move (Skidding/Walking): Skidding Rig with BOP Suspended	● Demonstrate how to secure the BOP for transit.											0	
				● Explain the need to assign watchmen to important areas during transit.											0	
12	DL	02	Rig Move (Skidding/Walking): Location of Hole Center	● Demonstrate ability to coach drill crews on how to be able to position rig on well center.											0	
				● Demonstrate ability to utilize correct measuring methods and techniques to position rig on well center.											0	
13	DL	03	Rig Move (Skidding/Walking): Unload and install matting boards	● Demonstrate ability to spot matting boards as per rig design.											0	
14	DL	04	Rig Move (Skidding/Walking): Well Control Equipment	● Demonstrate the ability to install choke, flow, flare, and diverter lines.											0	
15	DL	05	Rig Up: Unload and install matting boards	● Demonstrate ability to ensure only approved and certified lifting equipment is utilized.											0	
				● Demonstrate the ability to recognize approved and certified lifting eqiupment.											0	
16	DL	06	Rig Up: Spot & Assemble Subtructure Base & Associated Bracing	● Demonstrate ability to spot sub base on well center as per rig design.											0	
17	DL	07	Rig Up: Spot & Assemble Shaker Tanks, Intermediate Tanks, Suction Tanks &/or Reserve Tanks	● Demonstrate ability to inspect and tighten all hammer seal unions to equalizer and mud mixing lines.											0	
				● Demonstrate ability to properly earth ground equipment.											0	
				● Demonstrate ability to spot mud tanks level, in proper order and in line as per rig design.											0	
18	DL	08	Rig Up: Spot Mud Pumps & Assemble All Suction Lines, Pressure Release Lines & Braces	● Demonstrate the ability to spot mud pumps and rig up all associated plumbing and operating lines.											0	
19	DL	09	Spot & Assemble Suitcases and lines	● Demonstrate ability to inspect and tighten all hammer seal unions between suitcases to prevent fluid or air leaks.											0	
				● Demonstrate ability to properly earth ground equipment.											0	
				● Demonstrate ability to spot suitcase level, in proper order and in line as per rig design.											0	

Annex-11 : Competency Table: – Assistant Driller 3/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
20	DL	10	Rig Up: Spot & Rig up Rig Power Package & Fuel Tank	● Demonstrate ability to properly install all electricity connections and fuel lines.											0	
				● Demonstrate ability to spot power package & fuel tank level, in proper order and in line as per rig design.											0	
21	DL	11	Rig Up: Startup & Energize Rig Power	● Demonstrate the ability to start up generators and VFD/SCR systems.											0	
22	DL	12	Rig Up: Assemble Rig Floor structural supports	● Demonstrate ability to install structual supports.											0	
23	DL	13	Rig Up: Rotary system	● Demonstrate ability to rig up rotary and applicable drive system.											0	
24	DL	14	Rig Up: HPU	● Desmonstrate the ability to rig up the HPU system.											0	
25	DL	15	Rig Up: Energize Draw Works & Driller Control	● Demonstrate ability to function test the Draw Works operations and emergency shut down.											0	
				● Explain Draw Works & Drillers Console energizing procedures & requirements.											0	
26	DL	16	Rig Up: Pipe Handler Equipment	● Demonstrate ability to correctly connect all hydraulic lines.											0	
				● Explain the process for assembling derrick/mast, raising structure & equipment.											0	
27	DL	17	Rig Up: Derrick/Mast Assembly	● Demonstrate the ability to perform the Pre-Raise Mast/Derrick Inspection.											0	
				● Demostrate the ability to string up lines & blocks in the mast/derrick.											0	
				● Desmonstrate the process for assembling derrick/mast, raising structure & equipment.											0	
				● Ensure derrick ladders are in proper position & stand pipe connected.											0	
				● Explain the Pre-Raise Mast/Derrick Inspection.											0	
28	DL	18	Rig Up: Rig Floor	● Demonstrate the ability to install & rig up winches and air tuggers.											0	
				● Explain how to install & rig up winches and air tuggers.											0	
29	DL	20	Rig Up: Mud Tanks	● Demonstrate the ability to Fill Mud Tanks, Check & Repair Leaks & Function Test All Associated Equipment.											0	
				● Demonstrate the ability to install flow line & associated equipment.											0	
				● Demonstrate the ability to install mud mix equipment.											0	
				● Demonstrate the ability to install solids/gas control equipment.											0	
30	DL	22	Rig Up: Drill Water Systems	● Demonstrate the ability to Install Trip TanK & Associated Equipment & lines.											0	
				● Demonstrate the ability to set Reserve Water Tanks, Rig Water Tanks, Check & Repair Leaks.											0	
				● Demonstrate the ability to position choke manifold/gas seperator.											0	
31	DL	27	Rig Down: Critical Steps	● Demonstrate ability to ensure all equipment has been removed from location.											0	
				● Demonstrate ability to ensure BOP and associated equipment is nippled down and loaded out.											0	
				● Demonstrate ability to lower and prepare mast for transport.											0	
				● Demonstrate ability to shut down power for ancillary equipment.											0	
				● Explain ability to ensure correct order for shut down of ancillary equipment.											0	
				● Explain JSA / Work Plan knowledge for each critical step.											0	
32	DL	28	Rig Down: Fall Protection	● Demonstrate ability to ensure anchor points are identified for crew lanyards.											0	
				● Explain pin removal and associated hazards.											0	
				● Explain procedures for working around the cellar/well head.											0	
33	DL	29	Rig Down: Inspection Process	● Explain inspection process for drill line.											0	
				● Explain pre-move inspection process for ancillary equipment.											0	
34	DL	30	Rig Down: Transportation	● Demonstrate ability to ensure drill line is prepared for travel.											0	
				● Demonstrate ability to separate and load out substructure.											0	
				● Explain how to secure all lines, piping and physical objects to prevent hazards during transporting.											0	
35	DL	31	Rig Down: Environmental	● Explain drilling fluid capture and transfer process.											0	
				● Explain, if applicable, the process for oil-based mud (OBM) rig clean up and containment.											0	

Annex-11 : Competency Table: – Assistant Driller 4/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
36	DL	33	Vertical/Conventional Drilling: Rig Math, Well Head and BOP Control Equipment	● Demonstrate how to measure, strap, & caliper all tubulars.											0	
				● Demonstrate how to check drilling fluids characteristics and measurement.											0	
				● Demonstrate how to measure from Rotary Kelly Bushings to Well Head/Rotary Kelly Bushings to all Blowout Preventor Rams and Annular.											0	
				● Demonstrate how to perform math calculations on pressure & volume.											0	
				● Explain the rig components and their limitations.											0	
37	DL	34	Vertical/Conventional Drilling: Drawworks & Associated Equipment	● Demonstrate how to operate drawworks and associated components.											0	
				● Explain the function of drawworks and all associated components (crown saving devices, brake systems & coolant lines, guards, chains, sprockets, gear boxes, shut downs, hoisting/lowering limits per rig design).											0	
38	DL	35	Vertical/Conventional Drilling: Automated Pipe Handling	● Demonstrate how to ensure that moving equipment does not interfere with other equipment/machinery - Simulataneous Operations.											0	
				● Explain the importance of checking the equipment prior to use.											0	
39	DL	36	Vertical/Conventional Drilling: Execution Of Drilling And Well Operations	● Demonstrate how to follow the client's daily drilling plans.											0	
				● Demonstrate how to maintain an accurate pipe tally in relation to the well design.											0	
				● Demonstrate how to make trips.											0	
				● Demonstrate how to complete the daily tour sheet.											0	
40	DL	39	Vertical/Conventional Drilling: Pipe measurement, number and strapping of pipes	● Demonstrate correct measuring points on all tubular, casings and tools.											0	
				● Explain how to correctly read a strapping tape.											0	
				● Explain how to properly number stands in derrick when TIH or POOH.											0	
41	DL	40	Vertical/Conventional Drilling: Stuck Pipe Operation	● Demonstrate how to determine the drill string operating limits.											0	
42	DL	41	Vertical/Conventional Drilling: Downhole problems and equipment failure	● Explain downhole problems and potential equipment failures.											0	
43	DL	42	Vertical/Conventional Drilling: Standpipe and Bleed Off Line	● Demonstrate how to ensure all valves are in the "full open" or "closed" position.											0	
44	DL	44	Vertical/Conventional Drilling: Tripping	● Demonstrate how to correctly monitor and record mud return and fill volumes while tripping in/out to recognize warning signs for well control issues.											0	
				● Explain efficient tripping speeds in open hole and when bit/ stab go through BOPs.											0	
				● Explain how to monitor and record mud return and fill volumes while tripping in/out to recognize warning signs for well control issues.											0	
45	DL	47	Vertical/Conventional Drilling: Picking up drilling assembly	● Demonstrate the ability to caliper and measure the BHA.											0	
				● Demonstrate the method for strapping and counting the drill pipe.											0	
				● Explain the importance and how to caliper and measure the BHA.											0	
				● Explain the method for strapping and counting the drill pipe.											0	
46	DL	50	Vertical/Conventional Drilling: Underbalanced Drilling	● Demostrate how to maintain equivalent circulating density (ECD) during underbalanced drilling.											0	
				● Explain additional instrumentation used during underbalanced drilling.											0	
				● Explain pit volumes and flow characteristics.											0	
				● Explain the use of rotating control device (RCD).											0	
				● Explain the well control procedures and process during underbalanced drilling.											0	
47	DL	51	Well Control: Riser/Diverter/ BOP (Run & Retrieve)	● Demonstrate how to install new wellhead gaskets.											0	
				● Explain how to identify ring gaskets in relation to BOP flanges.											0	
				● Explain how to install new wellhead gaskets.											0	
				● Explain the different phases of nippling up BOP and diverter based on hole section.											0	

Annex-11 : Competency Table: – Assistant Driller 5/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
48	DL	52	Well Control: Diverting	● Explain how to pump either kill mud or water.											0	
				● Explain the importance of operating the diverter.											0	
49	DL	53	Well Control: Management Well Control Systems	● Demonstrate function test of the BOP.											0	
				● Explain BOP components, their functions and their limitations.											0	
				● Explain the normal line up of BOP valves, Hydraulic chokes, Choke manifold and degasser in accordance to the well program.											0	
50	DL	54	Well Control: Well Integrity And Well Control	● Demonstrate how to take SPR's, complete kill sheet and take accurate and correct SIDPP and SICP gauge readings.											0	
				● Explain how to take SPR's, complete kill sheet and take accurate and correct SIDPP and SICP gauge readings.											0	
				● Explain the different methods for shutting the well and the killing procedures.											0	
				● Explan how to recognize influx and shut in well.											0	
51	DL	55	Unconventional Drilling: Air Drilling	● Explain rig up of low pressure air system into high pressure mud system.											0	
				● Explain the function of blooie line and how to secure.											0	
				● Explain the importance of an igniter at the end of a blooie line.											0	
				● Explain the pressure differential between input air and return air.											0	
				● Explain the use of rotating control device (RCD).											0	
52	DL	57	Directional Drilling: Mechanical Survey Tools	● Explain the application for Teledrift type drift indicators.											0	
				● Explain the application for Totco type drift indicators.											0	
53	DL	60	Directional Drilling: Wellbore Surveying and Record Keeping	● Demonstrate how to run a survey.											0	
54	DL	66	Hoisting/Rig Floor: Derrick Climbing Systems	● Demonstrate how to use equipment associated with personnel climbing systems (rig specific).											0	
				● Explain how to inspect equipment associated with personnel climbing systems.											0	
55	DL	70	Hoisting/Rig Floor: Manriding Winches & Belts	● Demonstrate correct hand signals associated with operating manriding winch.											0	
				● Demonstrate how to inspect manriding winch.											0	
				● Demonstrate how to inspect, wear & fasten manriding belt.											0	
56	DL	71	Hoisting/Rig Floor: Utility Winches	● Demonstrate correct hand signals associated with operating utility winch.											0	
				● Demonstrate how to safely operate and maintain utility winch.											0	
57	DL	72	Power Systems: Engine instrumentation	● Explain the purpose of engine instrumentation.											0	
58	DL	73	Power Systems: Engine report and log book	● Demostrate how to record engine gauge readings and maintain logs.											0	
				● Explain the purpose of record keeping.											0	
59	DL	74	Power Systems: Engine fluids	● Demonstrate how to check engines fluids levels and add as required.											0	
				● Explain types of engine fluids and level requirements.											0	
60	DL	75	Power Systems: Engine fuel system	● Demonstrate how to ensure pressure, filtation and line requirements will sustain engine operation.											0	
				● Explain pressures, filtration, and line inspection.											0	
61	DL	76	Power Systems: Engine cooling system	● Explain how to check engine coolant level.											0	
				● Explain radiator and cooling fan inspection.											0	
62	DL	77	Power Systems: Engine air intake systems	● Demonstate how to change air filters.											0	
				● Explain how to inspect air filters and intake differential pressures.											0	
63	DL	78	Circulating Systems: Low Pressure Mud System	● Demonstrate valve alignment to transfer mud and mix chemicals in each pit.											0	
				● Explain the layout of the pits including valve locations.											0	
64	DL	79	Circulating Systems: High Pressure Mud System	● Demonstrate how to change out expendables.											0	
				● Demonstrate how to isolate the valves.											0	
				● Demonstrate how to monitor mud pumps during operating.											0	
				● Explain how to change out expendables.											0	
				● Explain the purpose and operation of mud pumps.											0	
				● Identify where valves are located.											0	

Annex-11 : Competency Table: – Assistant Driller 6/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
65	DL	80	Circulating Systems: Pulsation Dampener/Bladder	● Demonstrate how to perform maintenance of a pulsation dampener.											0	
				● Explain the operation and maintenance of a pulsation dampener.											0	
				● Explain the purpose of a pulsation dampener.											0	
66	DL	81	Circulating Systems: Shale shakers	● Demonstrate shale shaker maintenance.											0	
				● Demonstrate how to adjust shaker screens.											0	
				● Demonstrate how to change shaker screens.											0	
				● Explain how to adjust shaker screens.											0	
				● Explain how to change shaker screens.											0	
				● Explain shale shaker maintenance.											0	
				● Explain the purpose of a shale shaker.											0	
67	DL	82	Circulating Systems: Trip Tanks	● Demonstrate how to line up trip tank valves for filling or monitoring the hole.											0	
				● Explain how to line up trip tank valves for filling or monitoring the hole.											0	
				● Explain the purpose of the trip tank.											0	
68	DL	83	Circulating Systems: Mud Saver Bucket	● Demonstrate how to perform maintenance on the mud saver bucket.											0	
				● Demonstrate how to use the mud saver bucket.											0	
				● Explain the purpose of a mud saver bucket.											0	
				● Explain when to use the mud saver bucket.											0	
69	DL	84	Rotating System: Master Bushings	● Demonstrate how to perform maintenance of the master bushings.											0	
				● Explain how to perform maintenance of the master bushings.											0	
				● Explain the purpose of the master bushings.											0	
70	DL	85	Rotating System: Rotary Table	● Demonstrate the maintenance procedures for the rotary table.											0	
				● Demonstrate the procedure for locking and working around.											0	
				● Explain the maintenance procedures for the rotary table.											0	
				● Explain the procedure for locking and working around.											0	
				● Explain the purpose of the rotary table.											0	
71	DL	86	Well Control Equipment: BOP Handling Systems	● Demonstrate proper sling application and attachment methods between lifting device and BOP equipment.											0	
				● Explain JSA / Work Plan knowledge for each critical step.											0	
				● Explain proper application and use of BOP handling systems.											0	
72	DL	87	Well Control Equipment: BOP Control System And Accumulator	● Demonstrate how to connect the HCR valve, manual valve, coflex hose, for BOP and choke manifold.											0	
				● Demonstrate how to connect the kill line and check valve as designed.											0	
				● Demonstrate how to function test all BOP elements.											0	
				● Demonstrate how to install the Driller's and remote BOP control panels and function test same.											0	
				● Demonstrate that all valves and gauges are in good working condition and clearly marked as to their function.											0	
				● Demonstrate that resevoir is filled to proper fluid level with proper fluid.											0	
				● Explain how to connect the HCR valve, manual valve, coflex hose, for BOP and choke manifold.											0	
				● Explain how to function test all BOP elements.											0	
				● Explain how to install the Driller's and remote BOP control panels and function test same.											0	
				● Explain the designed arrangement foor kill line and check valve.											0	
				● Explain the importance of the condition of valves and gauges and their identification.											0	
				● Explain the requirements for BOPE hydraulic lines.											0	

Annex-11 : Competency Table: – Assistant Driller 7/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
73	DL	88	Well Control Equipment: BOP Preventers & Fail Safe Valves	● Demonstrate how to install bolt completely into the nut.											0	
				● Demonstrate how to select and install the appropriate ring gaskets in all connections.											0	
				● Demonstrate proper torque sequence to insure flange gap is even on all sides.											0	
				● Demonstrate that all BOP components have been inspected and certified in accordance with OEM specifications.											0	
				● Explain how to guide upper BOP sections onto lower sections.											0	
				● Explain how to open the BOP doors and change pipe rams and blind rams.											0	
				● Explain OEM specifications and certification for BOP components.											0	
				● Explain the importance of always using new and appropriate ring gaskets in all connections.											0	
				● Explain the importance of having the proper flange gap on all sides.											0	
				● Explain the importance of why all bolts need to be engaged comletely into the nut.											0	
				● Explain the proper assembly (stack-out) of all BOP components to be used per drilling program.											0	
74	DL	89	Well Control Equipment: BOP Testing Equipment	● Demonstrate how to connect the test lines andsecure from test unit to BOP.											0	
				● Demonstrate how to open the BOP doors and change rams.											0	
				● Demonstrate that hydraulic lines are of proper pressure rating.											0	
				● Demonstrate that the test unit is of adquate pressure rating to test the BOP.											0	
				● Explain how to connect the test lines and secure from test unit to BOP.											0	
				● Explain how to open the BOP doors and change rams.											0	
				● Explain test unit pressure requirements in relation to BOP testing.											0	
				● Explain the requirements for BOPE hydraulic lines.											0	
75	DL	90	Well Control Equipment: Full Opening Safety Valve, Kelly cock valve, IBOP	● Explain each tool, their function, storage position and location of each.											0	
				● Explain the importance all wrenches for each safety valve are kept orderly and are readily available.											0	
				● Explain the importance of inspecting valve connections in accordance with drill string requirements.											0	
76	DL	91	Well Control Equipment: Float Valve	● Demonstrate how to visually inspect float valves for damage.											0	
				● Demonstrate the installation of float valve in drill string.											0	
				● Explain how to visually inspect float valves for damage.											0	
				● Explain the installation of float valve in drill string.											0	
77	DL	93	Well Control Equipment: Wellhead Adaptor Spools and Risers	● Demonstrate sizing and pressure rating of spools for wellhead and BOP equipment meet requirements of drilling program.											0	
				● Demonstrate that flow lines are routed and secured at a location and distance to allow for flaring and/or fluid containment.											0	
				● Explain flow lines routing and anchoring for flaring and/or fluid containment.											0	
				● Explain sizing and pressure rating of spools for wellhead and BOP equipment per drilling program.											0	
78	DL	94	Well Control:Testing BOP: Pressure And Function Testing Of BOPs	● Demonstrate how to ensure tool joint space out within the BOP are adequate and a vent open below the wellhead test plug is open.											0	
				● Demonstrate that appropriate ring gaskets are used for each flange.											0	
				● Demonstrate the test sequence of valves and BOP's including identifying leaks and how to correct them.											0	
				● Explain how to identify ring gaskets in relation to BOP flanges.											0	
				● Explain the test sequence of valves and BOP's including identifying leaks and how to correct them.											0	
				● Explain tool joint placement (space out) within the BOP and the purpose of venting below the test plug.											0	

Annex-11 : Competency Table: – Assistant Driller 8/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
79	DL	95	Well Control:Testing BOP: Pressure And Function Testing Of BOPs Choke Manifold	● Demonstrate how to function the valves to their fully open and closed positions and align for drilling operations.											0	
				● Demonstrate how to lubricate valves with the high pressure grease.											0	
				● Demonstrate how to test to rated pressures and durations and how to bleed off test pressure after test.											0	
				● Explain how to test to rated pressures and durations and how to bleed off test pressure after test.											0	
				● Explain how to function the valves to their fully open and closed positions and align for drilling operations.											0	
				● Explain how to lubricate valves with the high pressure grease.											0	
80	DL	96	Well Control:Testing BOP: Pressure And Function Testing Of BOPs Kill and Chokeline Valves	● Demonstrate how to function the valves to their fully open and closed positions and align for drilling operations.											0	
				● Demonstrate how to lubricate valves with the high pressure grease.											0	
				● Demonstrate how to test to rated pressures and durations and how to bleed off test pressure after test.											0	
				● Explain how to test to rated pressures and durations and how to bleed off test pressure after test.											0	
				● Explain how to function the valves to their fully open and closed positions and align for drilling operations.											0	
				● Explain how to lubricate valves with the high pressure grease.											0	
81	DL	97	Well Control:Testing BOP: Pressure And Function Testing Of BOPs Pressure Test Standpipe manifold	● Demonstrate how to function the valves to their fully open and closed positions and align for drilling operations.											0	
				● Demonstrate how to lubricate valves.											0	
				● Demonstrate how to test to rated pressures and durations and how to bleed off test pressure after test.											0	
				● Explain how to test to rated pressures and durations and how to bleed off test pressure after test.											0	
				● Explain how to function the valves to their fully open and closed positions and align for drilling operations.											0	
				● Explain how to lubricate valves.											0	
82	DL	103	Diesel pumps	● Demonstrate the use and maintenance of diesel pumps.											0	
				● Explain the the importance of rig fuel filtering system.											0	
				● Explain the use and maintenance of diesel pumps.											0	
83	DL	104	Closed loop mud equipment	● Explain when the different types of closed loop mud cleaning equipment are used.											0	
84	DL	105	Centrifugal pumps	● Demonstrate how to prime and maintain a centrifugal pump.											0	
				● Explain how to prime and maintain a centrifugal pump.											0	
85	DL	106	Diaphram pumps	● Demonstrate how to prime and maintain a diaphram pump.											0	
				● Explain how to prime and maintain a diaphram pump.											0	
86	DL	107	Valve types	● Demonstrate how to operate low pressure and high pressure valves.											0	
				● Explain the different types of valves used in mud systems and where each type is applicable.											0	
87	DL	108	Rotary swivel	● Explain what a rotary swivel is and when it is used.											0	
88	DL	112	Tubulars: Tubular care and maintenance	● Demonstrate how to clean and inspect connections during drilling and tripping operations.											0	
				● Explain how the slips and rotary bushing relate to the care of tubulars.											0	
				● Explain how to break in new tool joints.											0	
				● Explain how to clean and inspect connections during drilling and tripping operations.											0	
				● Explain the different types of mechanical surface imperfections that should be monitored or prevented that could lead to failures.											0	
				● Explain the importance of cleaning and inspection of tubular connections.											0	
				● Explain the procedures for storing and transporting tubulars.											0	

Annex-11 : Competency Table: – Assistant Driller 9/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
89	DL	116	Completions: Completions string	● Demonstrate how to ensure tubing hanger lands appropriately on wellhead.											0	
				● Demonstrate the correct running order of completion tubulars and correct space-out with seal assembly.											0	
				● Explain the correct running order of completion tubulars and correct space-out with seal assembly.											0	
				● Explain the differences between handling tubing vs. drill pipe.											0	
90	DL	119	Forklift Operations	● Demonstrate how to operate forklift.											0	
				● Demonstrate the ability to perform rigging and determine lifting capacities for forklift.											0	
				● Demonstrate the inspection and general maintenance procedure for a forklift.											0	
				● Explain how to operate forklift.											0	
				● Explain rigging and lift capacities for forklift.											0	
				● Explain the inspection and general maintenance of forklift.											0	
91	DL	120	Cementing	● Rig-up cementing lines and line up valves/ transfer mud to cementing unit.											0	
92	DL	123	Other Operations: Conductor and Casings	● Demonstrate how to identify cross-threaded pipe.											0	
				● Demonstrate how to stab casing.											0	
				● Demonstrate visual inspection of casing threads for damage and cleanliness.											0	
				● Explain how to identify cross-threaded pipe.											0	
				● Explain how to stab casing.											0	
				● Explain visual inspection of casing threads for damage and cleanliness.											0	
93	DL	124	Other Operations: Casing Stabbing Board	● Demonstrate how to rig up and postition stabbing board.											0	
				● Explain how to rig up and postition stabbing board.											0	
94	DL	126	Other Operations: Mud Characteristics	● Demonstrate how to maintain correct mud properties mixing chemicals to mud as instructed by mud engineer.											0	
				● Demonstrate how to manage aerated or if it is gas-cut mud.											0	
				● Demonstrate how to monitor solids control equipment.											0	
				● Demonstrate how to record mud weight, viscosity, and volumes.											0	
				● Demonstrate the mixing of chemicals required for the operation.											0	
				● Explain how to identify if mud is aerated or if it is gas-cut.											0	
				● Explain how to record mud weight, viscosity, and volumes.											0	
				● Explain how to utilize the different solids control equipment for mud filtration.											0	
				● Explain the basic chemicals needed for the operation.											0	
				● Explain the characteristics of drilling fluids & their purpose.											0	
				● Explain the importance of communicating mud properties and all fluid changes to rig personnel.											0	
95	DL	127	Other Operations: Mud Transfer	● Demonstrate how to line up valves, hoses and hard piping for the mud system transfers.											0	
				● Demonstrate how to notify personnel of transfers, monitor mud volume sensors and re-set once completed.											0	
				● Explain the importance of communicating fluid transfers and resetting PVT system.											0	
				● Explain the process for mud system transfers.											0	
96	DL	128	Other Operations: Drill Water System	● Demonstate how to maintain adequate drill water.											0	
				● Explain the importance of maintaining adequate water volume for drilling operations.											0	
97	QHSE	01	Induction (Post Hire Corporate and Unit Specific)	● Demonstrate immediate response during coordinated drills (Including your assigned Muster Station(s) and location of your Lifeboat(s) (if applicable).											0	
				● Explain assigned roles and responsibilities according to the Emergency Response Plans or Station Bill.											0	
				● Explain the general duties of the Unit/Crew specific positions.											0	
				● Explain your company's position in regard to compliance with regulatory requirements (for applicable position).											0	
				● Explain your Company's specific Short Service Employee program (if applicable).											0	
				● Identify and explain the various components of the Rig or Unit.											0	
				● Provide evidence of completion of the Corporate and Unit Specific Induction/Orientation course.											0	

Annex-11 : Competency Table: – Assistant Driller 10/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
98	QHSE	04	Quality, Health, Safety, Environment and Security (QHSES) Policy	● Describe your role and responsibilities in order to comply with company's QHSES policies.											0	
				● Explain good housekeeping practices and personal hygiene practices in accordance with company policies.											0	
				● Explain the company's QHSES policies (as applicable).											0	
				● Explain the objectives and the importance of active participation in the various meetings held onsite/onboard (Induction meeting, Pre-shift meeting, Weekly safety meeting, Risk Assessment/Pre-job meeting).											0	
				● Identify where you would find the company QHSES Policies.											0	
99	QHSE	05	HSE Local Regulations and Relevant International Standards	● Explain the local HSE regulations (Standards, laws and regulations that apply to occupational health and safety).											0	
100	QHSE	06	Quality Safety & Management System	● Demonstrate the ability to navigate the company specific Quality Safety & Management System.											0	
101	QHSE	07	Station Bill/Emergency Response Plan and Emergency Drills	● Demonstrate the ability to perform the assigned duties as per the station bill/emergency response plan.											0	
				● Demonstrate the correct donning, doffing and stowing of emergency PPE.											0	
				● Describe all the emergency alarm sounds as well as the respective actions to take (H2S, Well Control, Fire Alarm, Abandon Alarm, Gas Alarm, Man overboard Alarm, Loss of Station Position etc).											0	
				● Describe and identify the location of your muster point(s).											0	
				● Describe the process to search and rescue personnel unaccounted for in an emergency situation.											0	
				● Identify the various site specific emergency equipment (Portable fire extinguishers, fixed fire systems such as CO2, Life Boat, Life Raft, Rescue Boat, Escape Ladder etc).											0	
102	QHSE	08	Emergency Preparedness and Response	● Demonstrate the assigned duties to be carried out during various emergencies/drills (for example: Fire Drill, Abandon Drill, Gas Drill, Man Overboard Drill, Man Down, Stability Drill, Well Control Drill, SOPEP Drill, Helpdesk Fire Drill, Blackout Drill).											0	
				● Demonstrate the proper recording and completion of all emergency response training and drills											0	
				● Describe and identify the escape routes, markings, signage systems and lighting systems as applicable.											0	
				● Describe and identify the location of all emergency alarm actuators.											0	
				● Describe how to react to well control situations and how often well control drills are conducted.											0	
				● Describe the rig (unit) emergency response abandonment and notification procedures.											0	
				● Explain the assigned duties to be carried out during various emergencies/drills (for example: Fire Drill, Abandon Drill, Gas Drill, Man Overboard Drill, Man Down, Stability Drill, Well Control Drill, SOPEP Drill, Helpdesk Fire Drill, Blackout Drill).											0	
				● Explain the oil spill emergency plan(s) (Shipboard Oil Pollution Emergency Plan/Spill Prevention Control and Countermeasures Plan).											0	
				● Explain the site specific emergency responses, exercises and training plans for all major hazardous situations											0	

Annex-11 : Competency Table: – Assistant Driller 11/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
103	QHSE	09	Risk Assessments (RA)	● Demonstrate the ability to verify that risk control measurements are implemented and demonstrate how to assess their effectiveness.											0	
				● Describe and demonstrate how safety critical equipment is tested and maintained.											0	
				● Describe how simultaneous operations (SIMOPS) are managed to ensure that risk control procedures are in place during the execution of related activities.											0	
				● Describe the operational boundaries and performance standards of the safety critical equipment.											0	
				● Describe the potential hazards on site and provide examples of what could trigger them and what could be their associated consequences.											0	
				● Describe the process by which potential or unforeseen risks are communicated to management and affected employees.											0	
				● Describe the process to systematically identify, evaluate, select and implement risk reducing controls											0	
				● Describe the roles and responsibilities of personnel participating in the risk assessment process.											0	
				● Describe the site specific risk assessment process.											0	
				● Explain adverse environmental conditions by which the unit should not operate and the alerting systems available on site.											0	
				● Explain and demonstrate how to stop and secure work or tasks in case of any unforeseen or unplanned changes or hazards, and how to further assess risks associated with these changes or hazards.											0	
				● Explain how the interaction of major hazards within your unit has been considered during normal or simultaneous operations.											0	
				● Explain how to apply the hazard recognition and risk assessment techniques and the ability to implement risk mitigation measurements and controls.											0	
				● Explain the maintenance and control of risk assessment documents.											0	
				● Explain when/if operations can continue when risk associated with simultaneous operations, inadequate equipment or lack of personnel are present.											0	
				● Identify and describe the safety critical equipment on site.											0	
104	QHSE	10	Permit To Work (PTW)/ Energy Isolations/L.O.T.O.	● Demonstrate control and execution of energy isolation.											0	
				● Describe a scenario where electrical/ mechanical isolations are required.											0	
				● Describe the objectives of energy isolation and why precautions are important.											0	
				● Describe what constitutes a critical lift and all the precautions that must be in place.											0	
				● Explain how electrical/mechanical isolation would be confirmed safe to work on.											0	
				● Explain the types of energy sources that could be released at the site and the precautions that need to be in place.											0	
105	QHSE	11	Behavioral Based Safety System (BBSS)	● Demonstrate the corrective action/feedback process in the BBSS program for an observed unsafe action/behavior.											0	
				● Demonstrate the process to record and track non conformities from BBSS Observations.											0	
				● Describe the difference between an unsafe action/behavior and an unsafe condition.											0	
				● Describe the importance of reviewing past BBSS observations and behaviors at safety meetings.											0	
				● Describe your role in the BBSS.											0	
				● Explain the company's BBSS.											0	

Annex-11 : Competency Table: – Assistant Driller 12/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
106	QHSE	12	General Housekeeping/Orderliness	● Demonstrate the ability to secure the current work area or operation before evacuating during an emergency or drill.											0	
				● Demonstrates ability to ensure that the work area is clean and orderly, prior to and upon completion of the work, task or repairs.											0	
				● Demonstrates ability to maintain and inspect hand and power tools in operationally safe condition, without any unauthorized modifications.											0	
				● Explain the hazards associated with using defective or modified hand or power tools.											0	
				● Explain the importance of closing out hazardous work activities before evacuating the area for an emergency or drill.											0	
				● Explain the importance of good housekeeping practices in the work areas and living quarters.											0	
				● Explain why it is important to keep tools put away and the work place clean in case of an emergency.											0	
				● Explain your role in the housekeeping practices in the work areas and living quarters.											0	
				● Demonstrate cleaning and organizing the work area upon completion of the work, task, or repairs											0	
				● Explain procedures personnel should follow if they observe worksite and water pollutants during lifting operations.											0	
107	QHSE	13	Environmental Management Plan	● Describe the company Environmental Management Plan (EMP).											0	
				● Describe the location specific sensitivities of the receiving environment.											0	
				● Describe the process for handling or discharging cuttings.											0	
108	QHSE	14	Ship Oil Pollution Emergency Plan (SOPEP)	● Describe the spill kit contents and how to use them.											0	
109	QHSE	15	Spill Prevention Control and Countermeasures Plan (SPCC)	● Describe the rig specific SPCC plan procedures to follow in case of a spill.											0	
				● Demonstrate the ability to locate the SPCC Plan.											0	
				● Demonstrate the ability to locate the Spill kit.											0	
				● Describe the SPCC inspection process for the location and equipment before spud in.											0	
				● Describe the spill kit contents and how to use them.											0	
				● Explain how the SPCC plan bridges to the operator's well site plan.											0	
				● Explain the process or requirements of training on the SPCC elements.											0	
				● Explain the reporting procedures in the event of a spill on or off the well site location.											0	
				● Explain the SPCC containment system including the layout, need and maintenance.											0	
				● Explain your role in a SPCC drill or an actual spill.											0	
110	QHSE	16	Waste Segregation	● Describe the company waste management plan.											0	
				● Describe the waste materials (either solid or liquid), and identify/categorize as one of the following: common waste, industrial waste, hazardous waste and recyclable materials.											0	
				● Describe what materials should be placed into the waste containers and why they need to be segregated.											0	
				● Explain the continuous improvement of waste handling on the unit/location.											0	
				● Explain the waste containers provided for common waste, industrial waste, hazardous waste and recyclable materials.											0	
111	QHSE	17	Dropped Objects Prevention	● Describe the hazards associated while work is being conducted overhead.											0	
				● Describe the main hazard areas/zones where dropped objects may occur.											0	
				● Explain how potential dropped objects are identified and how they should be reported.											0	
				● Explain how the restricted areas/zones are enforced.											0	
				● Explain precautionary measures required to avoid causing dropped objects and to protect personnel from those potential hazards.											0	
				● Explain the importance of a daily/weekly/monthly/annual dropped objects prevention inspection program.											0	
				● Explain why access should be restricted to all known dropped object areas/zones.											0	

Annex-11 : Competency Table: – Assistant Driller 13/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
112	QHSE	19	Fall Protection	● Demonstrate the ability to find the fall arrest or restraint gear/equipment's information tag.											0	
				● Demonstrate the ability to select the proper size and type as well as the donning of, and correct usage, of fall arrest gear.											0	
				● Demonstrate transferring from one location to another while maintaining 100 percent tie off while working at heights.											0	
				● Describe the difference between fall arrest and fall restraint.											0	
				● Describe the emergency equipment and procedures (rescue plan) when rescuing someone at heights.											0	
				● Describe the general requirements of the fall protection.											0	
				● Describe the limitations and the common misuse of fall arrest and restraint equipment.											0	
				● Describe the management of defective fall arrest equipment.											0	
				● Describe the proper maintenance, cleaning, inspection (including documentation) and storage of fall arrest equipment.											0	
				● Describe the proper use of ladders (fixed and portable) or scaffolds.											0	
				● Describe the proper work procedures and communication using fall protection while working in an aerial lift platform (man-lift/work basket).											0	
				● Describe the types of fall protection and fall arrest gear/equipment and how it is used.											0	
				● Explain the different types of fall protection and fall arrest systems and how each of them work.											0	
				● Explain the importance of maintaining the proper overhead anchorage point.											0	
113	QHSE	20	Safe Use Of Lifting Equipment	● Explain who is authorized to operate lifting equipment.											0	
				● Demonstrate proper hand and body placement when attaching the rigging to a load.											0	
				● Demonstrate the ability to properly operate lifting equipment.											0	
				● Demonstrate the ability to select the correct lifting equipment for the task at hand.											0	
				● Demonstrate the proper use of tag lines attached to loads including proper positioning.											0	
				● Demonstrate the verbal communications and hand signals used in lifting operations.											0	
				● Describe the basic work sequence/policy and precautions that must be in place prior to making a critical lift.											0	
				● Describe the lifting equipment available on location.											0	
				● Describe the maintenance, storage and inspection of all lifting equipment (rigging/slings/shackles, etc.).											0	
				● Describe the proper installation and rigging of all permanent and temporary lifting points (anchor points, pad eyes, etc.).											0	
				● Describe the proper use of tag lines attached to loads including proper positioning and quantity.											0	
				● Describe the verbal communications and hand signals used in lifting operations.											0	
				● Explain proper hand and body placement when attaching the rigging to a load.											0	
				● Explain the importance of a spotter during blind lifting operations.											0	
				● Explain the minimum number of personnel and special precautions to be used during critical lifting operations.											0	
				● Explain the pre-lift plan and inspections process.											0	
				● Explain the responsibilities of a rigger (banksman).											0	
				● Explain what constitutes a critical lift.											0	

Annex-11 : Competency Table: – Assistant Driller 14/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
114	QHSE	21	Lifting of Personnel	● Demonstrate the ability to properly utilize personnel lifting equipment.											0	
				● Demonstrate the ability to select the proper personnel lifting equipment/device.											0	
				● Demonstrate the inspection of personnel lifting equipment.											0	
				● Describe safety precautions necessary for the use of personnel lifting devices.											0	
				● Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.											0	
				● Explain the importance of using load balance, weight tolerances, and environmental conditions before and during personnel transfer.											0	
				● Explain the inspection of equipment necessary for lifting of personnel.											0	
				● Explain the precautions and pre-lift requirements before personnel are transferred or lifted.											0	
115	QHSE	22	Crane Safety	● Describe the maintenance, storage and inspection of all lifting equipment (rigging/slings/shackles, etc.).											0	
116	QHSE	23	Use and maintenance of utility winch	● Demonstrate rigging practices for safe lifting and movement of tubulars and irregular shaped equipment/materials.											0	
				● Demonstrate the hand signals used during winch operations.											0	
				● Demonstrate the operation of a utility winch.											0	
				● Describe the operational and safety responsibilities of a winch operator.											0	
				● Describe the specific locations where utility winches are installed on the unit.											0	
				● Explain rigging practices for safe lifting and movement of tubulars and irregular shaped equipment/materials.											0	
				● Explain the capacity and limitations of utility winches.											0	
				● Explain the pre-use inspection steps required before operating a utility winch.											0	
				● Explain the required maintenance for a utility winch and accessories.											0	
117	QHSE	25	Accident/Incident Investigation	● Explain the company's policies/procedures for reporting an incident resulting in personal injury, equipment damage, a near miss or any potential hazard.											0	
				● Explain the importance of active participation in an incident investigation.											0	
				● Explain the importance of following up and closing corrective actions.											0	
				● Explain what a corrective action is and why it is being implemented.											0	
				● Explain why facts are important to an incident investigation.											0	
118	QHSE	26	Chemical Handling & SDS (MSDS) (GHS)	● Demonstrate selection and correct use of PPE when handling chemicals in accordance with the SDS.											0	
				● Describe appropriate actions necessary in the event of exposure/contact with chemicals or spill.											0	
				● Describe the health and environmental risks associated with chemicals used at the work site.											0	
				● Describe the information contained in a SDS.											0	
				● Describe the storage and segregation process for chemicals.											0	
				● Explain the minimum requirements for labeling, documentation and packing of chemicals.											0	
				● Explain what NORM is, where NORM occurs and explain the precautions to be taken to prevent exposure.											0	
				● Explain where Safety Data Sheets (SDS) are located.											0	
119	QHSE	27	Equipment Safety	● Describe and give examples of various equipment guards and their purpose.											0	
				● Explain the hazards and precautions of working around moving (dynamic) equipment.											0	
				● Explain the hazards and precautions of working around rotating equipment.											0	
				● Explain the hazards and precautions to take when working with or near low or high pressurized equipment.											0	
				● Explain the importance of ensuring that proper fittings (hammer unions/quick connect/hydraulic fittings) are being used in piping, hoses and equipment.											0	

Annex-11 : Competency Table: – Assistant Driller 15/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
120	QHSE	29	Personal Protective Equipment (PPE)	● Demonstrate the proper selection and usage (donning/doffing) of PPE.											0	
				● Describe different types of PPE, appropriate selection, proper usage and its limitations for various work tasks.											0	
				● Describe the proper maintenance/care and storage of PPE in accordance with the manufacturer's instructions.											0	
				● Explain your responsibility and the importance of wearing PPE that is appropriate for the work-task.											0	
121	QHSE	30	Manual Handling/Ergonomics/Posture	● Demonstrate how to support a load when walking with various size loads.											0	
				● Demonstrate the ergonomic posture to take when physically lifting and setting a load.											0	
				● Describe when mechanical lifting is preferred to manual lifting and why.											0	
				● Describe where the force is concentrated on the spine when improperly lifting or setting a load.											0	
				● Explain the company's policy and procedures on the manual handling/lifting of materials.											0	
				● Explain the importance of planning your path of movement prior to lifting and carrying a load.											0	
				● Explain the proper manual lifting or setting techniques to prevent back injuries as well as the benefits of using mechanical lifting devices.											0	
				● Explain the value of manually "testing a load" before attempting to lift the load.											0	
122	QHSE	31	Confined Space Entry	● Describe what constitutes a confined space entry.											0	
				● Explain how environmental conditions can negatively impact working in a confined space.											0	
				● Explain the company's policy on confined space entry.											0	
				● Explain the hazards associated with a confined space.											0	
				● Explain the importance of using atmospheric monitoring equipment in a confined space.											0	
				● Explain the procedures to take before entering a confined space.											0	
				● Explain the procedures to take upon entering a confined space.											0	
				● Explain the required PPE needed when working in a confined space.											0	
				● Explain what a competent person is in the context of regulatory standards covering confined space entry.											0	
				● Explain what a qualified person is in the context of regulatory standards covering confined space entry.											0	
				● Explain what and how to identify a confined space and give some examples on your worksite.											0	
				● Explain why it is important to continually monitor the atmosphere of a confined space.											0	
				● Explain your role and responsibility during a confined space rescue operation.											0	
123	QHSE	32	Severe Weather Conditions	● Demonstrate the ability to recognize operational shut down point(s).											0	
				● Describe actions to be taken to protect personnel during severe weather conditions.											0	
				● Describe operations which may be impacted by severe weather and the actions taken to mitigate it.											0	
				● Describe the process to restart operations after a severe weather event.											0	
				● Describe the process to secure the unit, before evacuating, when a severe weather alert has been issued.											0	
				● Explain the company's policy and procedures to follow during a severe weather threat.											0	

Annex-11 : Competency Table: – Assistant Driller 16/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
124	QHSE	33	Fire Prevention, Fire Fighting and Fire Control and Gas/Fire Detection Equipment	● Demonstrate the use of portable fire extinguishers.											0	
				● Describe the company's policies and procedures for fire prevention.											0	
				● Describe the different types of portable fire extinguishers and their applications (Water, Carbon Dioxide and Dry Chemical).											0	
				● Describe the engine shutdown procedure in the event of a gas release.											0	
				● Describe the fire and gas detection systems, sensor locations and how they function.											0	
				● Describe the fixed and/or portable systems used to detect the presence of Oxygen (O2), Hydrocarbon (HC) and Hydrogen Sulphide (H2S), etc											0	
				● Describe the passive fire protection systems on the unit, including their location and rating.											0	
				● Describe the process and documentation needed for inspecting and maintaining portable fire extinguishers.											0	
				● Describe the process for inspecting, maintaining, testing and calibrating the fire and gas detection systems.											0	
				● Describe the testing and regulatory requirements for portable fire extinguishers.											0	
				● Describe the three elements to complete the fire triangle.											0	
				● Describe the thresholds and the actions automatically initiated on detection of HC and/or H2S.											0	
				● Explain the different levels of shutdown associated with the unit (if applicable).											0	
				● Explain the rig/unit emergency action (response) plan for a fire event.											0	
				● Explain the use of portable fire extinguishers.											0	
125	QHSE	34	Occupational Health Plan	● Explain the process for monitoring occupational health exposures.											0	
				● Explain the company occupational health protection plan.											0	
				● Explain the exposures (noise, vibration, heat, etc) that are unacceptable.											0	
				● Explain the process to identify, set, control and verify the exposure limits that could prevent potential acute and or chronic health hazards.											0	
126	QHSE	35	Simultaneous Operations	● Describe management of change and why it is important when conducting SIMOPS operations.											0	
				● Describe what constitutes a SIMOPS Plan.											0	
				● Explain Stop Work Authority and who is responsible to initiate when a potential risk is present.											0	
				● Explain the elements of the SIMOPS Plan.											0	
				● Explain the summary of operational boundaries and the difference between proceed, proceed with caution and stop operations.											0	
127	QHSE	36	Powered/Manual Tools	● Describe your company's powered/manual tool policy.											0	
				● Explain the importance of inspection, maintenance and storage of powered/manual tools.											0	
				● Explain the importance of removing defective or altered powered/manual tools.											0	
				● Explain the importance of using the proper powered/manual tool for the task at hand.											0	
				● Explain the required PPE and safe procedures for operating powered/manual tools.											0	

Annex-11 : Competency Table: – Assistant Driller 17/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
128	RM	A1	Document Control	● Demonstrate how handover records are filed and maintained.											0	
				● Demonstrate the ability to apply action items contained in the communication document (Alerts/Notifications/Best Practices) through closure.											0	
				● Demonstrate the ability to communicate to all current operations.											0	
				● Demonstrate the ability to complete a handover report, note and form.											0	
				● Demonstrate the ability to store inventory items including dangerous goods.											0	
				● Demonstrate the execution and application of a management of change request.											0	
				● Demonstrate the handover procedure.											0	
				● Describe the personnel involved in the development, implementation and maintenance of written policy and procedure standards.											0	
				● Describe where operational documentation is maintained.											0	
				● Explain how each business unit will utilize the quality and control system.											0	
				● Explain how written policy and procedure standards are implemented into the current workforce and new hire process.											0	
				● Explain the Company policy and procedure for the handover process.											0	
				● Explain the Company policy and procedures for the storage of inventory items including dangerous goods.											0	
				● Explain the Company policy and procedures on operations and HSE communications.											0	
				● Explain the Company policy on documentation control.											0	
				● Explain the Company process for issuing, distributing and responding to communication documents (Alerts/Notifications/Best Practices).											0	
				● Explain the Company process for maintaining the daily drilling reports.											0	
				● Explain the Company's material inventory and parts list including the vendor's nomenclature (name) of the part.											0	
				● Explain the Company's policies and procedures for quality control.											0	
				● Explain the Company's process for the development of written policy and procedure standards.											0	
				● Explain the Company's policy and procedures for inventory management.											0	
				● Explain the Company's policy for management of change.											0	
				● Explain the Company's procedure for document tracking and retention.											0	
				● Explain the Company's procedures for a management of change, including team member's roles and responsibilities.											0	
				● Explain the documentation control procedure and which personnel are involved in the filing of operational documentation.											0	
				● Explain the importance of effective document control.											0	
				● Explain the importance of ensuring that handover reports are understood and signed off by outgoing and incoming personnel.											0	
				● Explain the importance of handover reports.											0	
				● Explain the importance of operations and HSE communications throughout the Company.											0	
				● Explain what quality and control system is used by the Company.											0	
				● Explain who is responsible for revising documentation and describe how to recognize the latest version.											0	
				● Explain who is responsible for updating the HSE policy and procedures and what is the process.											0	
				● Explain why proper review, approval and document control are essential parts of management of change requests.											0	

Annex-11 : Competency Table: – Assistant Driller 18/18

Position: Assistant Driller

No	Code	No	Functional competency	Description of competency	Competency level required – Required Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	Proficiency Scale – Actual Score: Awareness 1	Application 2	Career Proficient 3	Advanced Level 4	Expert Level 5	GAP	Individual Development Plan
129	SS	17	Transportation	● Demonstrate the proper procedure to approach the helicopter when boarding and exiting the aircraft.											0	
				● Describe the Company's helicopter transportation policy.											0	
				● Describe the Company's motor vehicle policy.											0	
				● Describe the emergency response procedures and equipment associated with helicopter operations.											0	
				● Describe the importance of journey management (trip planning).											0	
				● Describe the proper procedure to approach the helicopter when boarding and exiting the aircraft.											0	
				● Describe what constitutes being fit for duty when operating a motor vehicle.											0	
				● Explain the importance of a "walk around" inspection (fluids, fuel, tire pressure etc.) before entering a vehicle and putting it into motion.											0	
				● Explain who is in total command of the helicopter and who will make decisions concerning the flight and personnel allowed onboard.											0	

Maximum Scor 0 **Actual Score 0** **0**

Annex-12 : Competency Table: – Driller 1/20

Position: Driller

No	Ref	Code	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	GAP	Individual Development Plan
1	CO	01	Crane Basics	● Describe the lifting equipment available on current location.											0	
				● Describe the type(s) of crane(s) by name and type, found on current location.											0	
2	CO	02	Rigger Basics	● Demonstrate ability to use all rigging hitches (e.g., basket, choker, vertical, bridle) needed for the current job.											0	
				● Demonstrate adhering to the permit-to-work for routine and non-routine rigging tasks, if applicable											0	
				● Demonstrate correct and safe use of taglines attached to loads, including proper positioning and quantity											0	
				● Demonstrate following the lift plan required for critical lift rigging tasks.											0	
				● Demonstrate how to correctly rig a load according to its specific center of gravity.											0	
				● Demonstrate the ability to control an area where lifting operations are being carried out.											0	
				● Demonstrate the ability to correctly and safely connect/disconnect loads.											0	
				● Demonstrate the ability to correctly secure cargo in various conditions.											0	
				● Demonstrate the ability to find the center of gravity of a load.											0	
				● Demonstrate the ability to select the appropriate rigging equipment for a specific job.											0	
				● Demonstrate the use of sling capacity tables.											0	
				● Determine and/or estimate weight of loads for the purpose of rigging safely											0	
				● Explain center of gravity as it relates to rigging.											0	
				● Explain how the tension or loading increases as sling angles decrease, especially the rapid increase in tension that occurs when slings are used below 30 degrees.											0	
				● Explain the different methods in which a slings are rigged or attached to load.											0	
				● Explain the importance of the eye of a synthetic web and why it should never be used or forced over a hook or pin.											0	
				● Explain the importance of using padding (protection over sharp edges).											0	
				● Explain the use of push poles, if required by company policy.											0	
				● Explain vertical and horizontal planes as they relate to rigging (e.g., how force is distributed based on the plane).											0	
				● Locate company policies and procedures that apply to rigging.											0	
				● Select correct slings, or other similar lifting devices, according to size, weight, and configuration.											0	
3	CO	03	General Rigger Qualifications and Role	● Explain the basic rigger's role in ensuring safe lifting operations.											0	
	CO	03	General Rigger Qualifications and Role	● Explain the basic rigger's role in ensuring that all lifting gear is certified to company and regulatory requirements.											0	
	CO	03	General Rigger Qualifications and Role	● Explain who at the jobsite is authorized to use rigging hardware.											0	
	CO	03	General Rigger Qualifications and Role	● List the recommended qualifications, experience, and training necessary to be able to rig a load (see API RP 1e, 2d, latest edition).											0	
4	CO	04	General Rigging Hardware Information	● Describe the proper installation and rigging of all permanent and temporary lifting points (anchor points, pad eyes, etc.).											0	
				● Describe the storage requirements for all rigging hardware (rigging/slings/shackles, etc.).											0	
5	CO	05	Rigging Hardware Inspection & Maintenance	● Demonstrate ability to maintain and inspect hand and power tools in operationally safe condition, without any unauthorized modifications.											0	
				● Explain procedures to follow when defective rigging hardware is identified.											0	
				● Explain the lifting gear color-coding system and how records are kept for each item											0	
6	CO	10	General Crane Operation HSE	● Explain why personnel should observe and report any fluid leaks from the crane that could be contaminating the work environment and affecting safe operations.											0	
				● Explain your Stop Work Authority when you observe an unsafe act during lifting operations											0	
7	CO	15	General Rigging HSE	● Demonstrate ability to ensure that deck personnel use safe lifting procedures (e.g., tag lines, escape routes).											0	
				● Demonstrate correct use of personal protective equipment.											0	
8	CO	16	Crane/Rigging Operations Communications	● Demonstrate ability to write clear and concise reports, such as those involving near-misses and incidents, involving lifting operations.											0	

Annex-12 : Competency Table: – Driller 2/20

Position:	Driller				Competency level required					Proficiency Scale					GAP	Individual Development Plan				
					Required Score					Actual Score										
No	Ref	Code	Functional competency	Description of competency	Awareness	Application	Career Proficien	Advanced Level	Expert Level	Awareness	Application	Career Proficie	Advanced Level	Expert Level						
9	CO	17	Personnel: Lifting Operations	● Demonstrate how to properly utilize personnel lifting equipment.											0					
				● Demonstrate how to select the proper personnel lifting equipment/device.											0					
				● Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.											0					
				● Explain the importance of load balance, weight tolerances, and environmental conditions before and during personnel transfer											0					
				● Explain the precautions and pre-lift requirements applicable before personnel are transferred or lifted.											0					
10	CO	18	Offboard/Onboard Supply Boat Lifting Operations	● Demonstrate how to properly utilize personnel lifting equipment.											0					
				● Demonstrate how to select the proper personnel lifting equipment/device.											0					
				● Describe the basic work sequence/policy followed prior to making a critical lift.											0					
				● Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.											0					
				● Explain the importance of load balance, weight tolerances, and environmental conditions before and during personnel transfer.											0					
				● Explain the precautions and pre-lift requirements applicable before personnel are transferred or lifted.											0					
11	CO	20	General Housekeeping/Orderliness	● Demonstrate cleaning and organizing the work area upon completion of the work, task, or repairs.											0					
				● Explain procedures personnel should follow if they observe worksite and water pollutants during lifting operations.											0					
11	DL	01	Rig Move (Skidding/Walking): Skidding Rig with BOP Suspended	● Demonstrate how to secure the BOP for transit.											0					
				● Explain the need to assign watchmen to important areas during transit											0					
12	DL	02	Rig Move (Skidding/Walking): Location of Hole Center	● Demonstrate ability to coach drill crews on how to be able to position rig on well center.											0					
				● Demonstrate ability to utilize correct measuring methods and techniques to position rig on well center											0					
13	DL	03	Rig Move (Skidding/Walking): Unload and installmatting boards	● Demonstrate ability to spot matting boards as per rig design.											0					
14	DL	04	Rig Move (Skidding/Walking): Well Control Equipment	● Demonstrate the ability to install choke, flow, flare, and diverter lines.											0					
15	DL	05	Rig Up: Unload and install matting boards	● Demonstrate ability to ensure only approved and certified lifting equipment is utilized.											0					
				● Demonstrate the ability to recognize approved and certified lifting eqiupment.											0					
16	DL	06	Rig Up: Spot & Assemble Subtructure Base & Associated Bracing	● Demonstrate ability to spot sub base on well center as per rig design.											0					
17	DL	07	Rig Up: Spot & Assemble Shaker Tanks, Intermediate Tanks, Suction Tanks &/or Reserve Tanks	● Demonstrate ability to inspect and tighten all hammer seal unions to equalizer and mud mixing lines.											0					
				● Demonstrate ability to properly earth ground equipment.											0					
				● Demonstrate ability to spot mud tanks level, in proper order and in line as per rig design.											0					
18	DL	08	Rig Up: Spot Mud Pumps & Assemble All Suction Lines, Pressure Release Lines & Braces	● Demonstrate the ability to spot mud pumps and rig up all associated plumbing and operating lines.											0					
19	DL	09	Spot & Assemble Suitcases and lines	● Demonstrate ability to inspect and tighten all hammer seal unions between suitcases to prevent fluid or air leaks											0					
				● Demonstrate ability to properly earth ground equipment.											0					
				● Demonstrate ability to spot suitcase level, in proper order and in line as per rig design.											0					
20	DL	10	Rig Up: Spot & Rig up Rig Power Package & Fuel Tank	● Demonstrate ability to properly install all electricity connections and fuel lines.											0					
				● Demonstrate ability to spot power package & fuel tank level, in proper order and in line as per rig design.											0					

Annex-12 : Competency Table: – Driller 3/20

Position: Driller

No	Ref	Code	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	GAP	Individual Development Plan
21	DL	11	Rig Up: Startup & Energize Rig Power	● Demonstrate the ability to start up generators and VFD/SCR systems.											0	
22	DL	12	Rig Up: Assemble Rig Floor structural supports	● Demonstrate ability to install structual supports.											0	
23	DL	13	Rig Up: Rotary system	● Demonstrate ability to rig up rotary and applicable drive system.											0	
24	DL	14	Rig Up: HPU	● Desmonstrate the ability to rig up the HPU system.											0	
25	DL	15	Rig Up: Energize Draw Works & Driller Control	● Demonstrate ability to function test the Draw Works operations and emergency shut down. ● Explain Draw Works & Drillers Console energizing procedures & requirements.											0 0	
26	DL	16	Rig Up: Pipe Handler Equipment	● Demonstrate ability to correctly connect all hydraulic lines. ● Explain the process for assembling derrick/mast, raising structure & equipment.											0 0	
27	DL	17	Rig Up: Derrick/Mast Assembly	● Demonstrate the ability to perform the Pre-Raise Mast/Derrick Inspection. ● Demonstrate the ability to raise and secure Mast/Derrick to Rig Floor . ● Demostrate the ability to string up lines & blocks in the mast/derrick. ● Desmonstrate the process for assembling derrick/mast, raising structure & equipment. ● Ensure derrick ladders are in proper position & stand pipe connected. ● Explain how to raise and secure Mast/Derrick to Rig Floor. ● Explain the Pre-Raise Mast/Derrick Inspection.											0 0 0 0 0 0 0 0	
28	DL	18	Rig Up: Rig Floor	● Demonstrate the ability to install & rig up winches and air tuggers. ● Explain how to install & rig up winches and air tuggers.											0 0	
29	DL	20	Rig Up: Mud Tanks	● Demonstrate the ability to Fill Mud Tanks, Check & Repair Leaks & Function Test All Associated Equipment. ● Demonstrate the ability to install flow line & associated equipment. ● Demonstrate the ability to install mud mix equipment. ● Demonstrate the ability to install solids/gas control equipment.											0 0 0 0	
30	DL	22	Rig Up: Drill Water Systems	● Demonstrate the ability to Install Trip TanK & Associated Equipment & lines. ● Demonstrate the ability to set Reserve Water Tanks, Rig Water Tanks, Check & Repair Leaks. ● Demonstrate the ability to position choke manifold/gas seperator.											0 0 0	
31	DL	27	Rig Down: Critical Steps	● Demonstrate ability to ensure all equipment has been removed from location. ● Demonstrate ability to ensure BOP and associated equipment is nippled down and loaded out.											0 0	
32	DL	28	Rig Down: Fall Protection	● Demonstrate ability to ensure anchor points are identified for crew lanyards. ● Explain pin removal and associated hazards. ● Explain procedures for working around the cellar/well head.											0 0 0	
33	DL	29	Rig Down: Inspection Process	● Explain inspection process for drill line. ● Explain pre-move inspection process for ancillary equipment.											0 0	
34	DL	30	Rig Down: Transportation	● Demonstrate ability to ensure drill line is prepared for travel. ● Demonstrate ability to separate and load out substructure. ● Explain how to secure all lines, piping and physical objects to prevent hazards during transporting. ● Explain mat cleaning requirement prior to load out.											0 0 0 0	
35	DL	31	Rig Down: Environmental	● Explain drilling fluid capture and transfer process. ● Explain, if applicable, the process for oil-based mud (OBM) rig clean up and containment.											0 0	
36	DL	32	Place in Storage (Stacked): Stacking rig	● Demonstrate ability to ensure rig components are stored in an appropriate location and secured. ● Explain the procedure to ensure rig components are stored in an appropriate location and secured.											0 0	
37	DL	33	Vertical/Conventional Drilling: Rig Math, Well Head and BOP Control Equipment	● Demonstrate how to measure, strap, & caliper all tubulars. ● Demonstrate how to check drilling fluids characteristics and measurement. ● Demonstrate how to measure from Rotary Kelly Bushings to Well Head/Rotary Kelly Bushings to all Blowout Preventor Rams and Annular. ● Demonstrate how to perform math calculations on pressure & volume. ● Explain the rig components and their limitations.											0 0 0 0 0	

Annex-12 : Competency Table: – Driller 4/20

Position: Driller					Competency level required					Proficiency Scale					GAP	Individual Development Plan
					Required Score					Actual Score						
No	Ref	Code	Functional competency	Description of competency	Awareness	Application	Career Proficien	Advanced Level	Expert Level	Awareness	Application	Career Proficie	Advanced Level	Expert Level		
38	DL	34	Vertical/Conventional Drilling: Drawworks & Associated Equipment	● Demonstrate how to operate drawworks and associated components.											0	
				● Explain the function of drawworks and all associated components (crown saving devices, brake systems & coolant lines, guards, chains, sprockets, gear boxes, shut downs, hoisting/lowering limits per rig design).											0	
39	DL	35	Vertical/Conventional Drilling: Drawworks & Associated Equipment	● Demonstrate how to ensure that moving equipment does not interfere with other equipment/machinery - Simulataneous Operations.											0	
				● Explain the importance of checking the equipment prior to use.											0	
40	DL	36	Vertical/Conventional Drilling: Drawworks & Associated Equipment	● Demonstrate how to follow the client's daily drilling plans.											0	
				● Demonstrate how to maintain an accurate pipe tally in relation to the well design.											0	
				● Demonstrate how to make trips.											0	
				● Demonstrate how to complete the daily tour sheet.											0	
41	DL	37	Vertical/Conventional Drilling: Drilling/Reaming	● Demonstrate how to ream at the correct RPM and GPM.											0	
	DL	37	Vertical/Conventional Drilling: Drilling/Reaming	● Explain the importance to maintain complete records of all tools and tubular run into the hole (including made-up lengths, tool-joints OD, ID, Serial numbers).											0	
42	DL	39	Vertical/Conventional Drilling: Pipe measurement, number and strapping of pipes	● Demonstrate correct measuring points on all tubular, casings and tools.											0	
				● Explain how to correctly read a strapping tape.											0	
				● Explain how to properly number stands in derrick when TIH or POOH.											0	
43	DL	40	Vertical/Conventional Drilling: Stuck Pipe Operation	● Demonstrate how to determine the drill string operating limits.											0	
44	DL	41	Vertical/Conventional Drilling: Downhole problems and equipment failure	● Explain downhole problems and potential equipment failures.											0	
45	DL	42	Vertical/Conventional Drilling: Standpipe and Bleed Off Line	● Demonstrate how to ensure all valves are in the "full open" or "closed" position.											0	
46	DL	44	Vertical/Conventional Drilling: Tripping	● Demonstrate how to correctly monitor and record mud return and fill volumes while tripping in/out to recognize warning signs for well control issues.											0	
				● Explain efficient tripping speeds in open hole and when bit/ stab go through BOPs.											0	
				● Explain how to monitor and record mud return and fill volumes while tripping in/out to recognize warning signs for well control issues.											0	
47	DL	47	Vertical/Conventional Drilling: Picking up drilling assembly	● Demonstrate the ability to caliper and measure the BHA.											0	
				● Demonstrate the method for strapping and counting the drill pipe.											0	
				● Explain the importance and how to caliper and measure the BHA.											0	
				● Explain the method for strapping and counting the drill pipe.											0	
48	DL	48	Vertical/Conventional Drilling: Trip in hole (TIH)	● Explain fluid displacement when TIH.											0	
				● Explain kick identification while TIH.											0	
				● Explain the importance of recognizing bridging conditions.											0	
				● Explain the importance of surge/swab hole conditions.											0	
				● Explain the procedure if a kick is detected during TIH.											0	
				● Explain displacement as drilling assembly is pulled out of hole.											0	
				● Explain kick identification while TOH.											0	
				● Explain procedure if a kick is detected during TOH.											0	
				● Demostrate how to maintain equivalent circulating density (ECD) during underbalanced drilling.											0	
				● Explain additional instrumentation used during underbalanced drilling.											0	
				● Explain pit volumes and flow characteristics.											0	
				● Explain the use of rotating control device (RCD).											0	
				● Explain the well control procedures and process during underbalanced drilling.											0	

Annex-12 : Competency Table: – Driller 5/20

Position: Driller

No	Ref	Code	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	GAP	Individual Development Plan
49	DL	51	Well Control: Riser/Diverter/ BOP (Run & Retrieve)	● Demonstrate how to install new wellhead gaskets.											0	
				● Explain how to identify ring gaskets in relation to BOP flanges.											0	
				● Explain how to install new wellhead gaskets.											0	
				● Explain the different phases of nippling up BOP and diverter based on hole section.											0	
50	DL	52	Well Control: Diverting	● Explain how to pump either kill mud or water.											0	
				● Explain the importance of operating the diverter.											0	
51	DL	53	Well Control: Management Well Control Systems	● Demonstrate function test of the BOP.											0	
				● Explain BOP components, their functions and their limitations.											0	
				● Explain the normal line up of BOP valves, Hydraulic chokes, Choke manifold and degasser in accordance to the well program.											0	
52	DL	54	Well Control: Well Integrity And Well Control	● Demonstrate how to take SPR's, complete kill sheet and take accurate and correct SIDPP and SICP gauge readings.											0	
				● Explain how to take SPR's, complete kill sheet and take accurate and correct SIDPP and SICP gauge readings.											0	
				● Explain the different methods for shutting the well and the killing procedures.											0	
				● Explan how to recognize influx and shut in well.											0	
53	DL	55	Unconventional Drilling: Air Drilling	● Explain instrumentation used during air drilling.											0	
				● Explain rig up of low pressure air system into high pressure mud system.											0	
				● Explain the differences between mud drilling and air drilling.											0	
				● Explain the function of blooie line and how to secure.											0	
				● Explain the importance of an igniter at the end of a blooie line.											0	
				● Explain the pressure differential between input air and return air.											0	
				● Explain the use of rotating control device (RCD).											0	
				● Explain well operations parameters and procedures for air drilling and the conditions that may require changes.											0	
54	DL	56	Unconventional Drilling: Coring	● Explain pick up and lay down procedures of the core barrel.											0	
				● Explain the differences between conventional coring and sidewall coring.											0	
				● Explain the hazards when retrieving cores.											0	
				● Explain the relationship of the outer and inner barrels for coring.											0	
55	DL	57	Directional Drilling: Mechanical Survey Tools	● Explain the application for Teledrift type drift indicators.											0	
				● Explain the application for Totco type drift indicators.											0	
56	DL	58	Directional Drilling: Magnetic Survey Tools	● Explain the application for Multi-shot film.											0	
				● Explain the application for Single shot film.											0	
57	DL	59	Directional Drilling: Gyroscopic Survey Tools	● Explain how information travels from the MWD to the surface to the computer system.											0	
				● Explain the application for Electronic single and multi-shot instruments.											0	
				● Explain the application for Magnetic and gyroscopic MWD surveys.											0	
				● Explain the application for Multi-shot.											0	
				● Explain the application for Single shot.											0	
				● Explain the MWD components.											0	
				● Explain the purpose and positioning of Non-magnetic drill collars and the BHA.											0	
58	DL	60	Directional Drilling: Wellbore Surveying and Record Keeping	● Demonstrate ability to solve problems associated with running a survey.											0	
				● Demonstrate application of the above.											0	
				● Demonstrate how to run a survey.											0	
				● Differentiate when survey data may be considered valid or invalid.											0	
				● Explain general practices to take to prevent survey data discrepencies.											0	
				● Explain problems associated with survey data.											0	
				● Explain the application for elements of a directional survey.											0	
				● Explain the concepts dogleg and how dogleg severity affects the wellbore.											0	

Annex-12 : Competency Table: – Driller 6/20

Position:	Driller				Competency level required					Proficiency Scale					GAP	Individual Development Plan
					Required Score					Actual Score						
No	Ref	Code	Functional competency	Description of competency	Awareness	Application	Career Proficien	Advanced Level	Expert Level	Awareness	Application	Career Proficie	Advanced Level	Expert Level		
59	DL	61	Directional Drilling: Directional Plots and Drilling Parameters	● Drilling Parameters & Directional Drilling: Explain hydraulics with and without downhole motors.											0	
				● Drilling Parameters & Directional Drilling: Explain mechanical limitations of downhole motors.											0	
				● Drilling Parameters & Directional Drilling: Explain rotary speed limitations.											0	
				● Drilling Parameters & Directional Drilling: Explain solids control and oil-based mud (OBM) considerations.											0	
				● Drilling Parameters & Directional Drilling: Explain weight on bit (WOB) considerations.											0	
				● Elements of the Directional Plot: Explain the intent/importance of plot details.											0	
				● Elements of the Directional Plot: Explain the plan view.											0	
				● Elements of the Directional Plot: Explain vertical section view.											0	
				● Elements of the Directional Plot: Explain wellpath and site legend details.											0	
60	DL	62	Directional Drilling: Motor Theory and Operations	● Explain chemical and fluid slide enhancement.											0	
				● Explain factors affecting slideability.											0	
				● Explain how a PDM (positive displacement motor) works and major mechanical assemblies.											0	
				● Explain micro doglegs and ledging when drilling with motors.											0	
				● Explain motor operating procedures and parameters.											0	
				● Explain reactive torque such as hole conditions and drill string design.											0	
				● Explain stabilizer use and effect on build rates.											0	
				● Identify & Explain bearing and housing types.											0	
61	DL	63	Directional Drilling: Hole Cleaning and Cuttings Transport in Horizontal Wells	● Explain clean up cycles.											0	
				● Explain helical cuttings path hole cleaning model in horizontal wells.											0	
				● Explain LGS (low gravity solids) and solids control considerations.											0	
62	DL	66	Hoisting/Rig Floor: Derrick Climbing Systems	● Demonstrate how to use equipment associated with personnel climbing systems (rig specific).											0	
				● Explain how to inspect equipment associated with personnel climbing systems.											0	
63	DL	70	Hoisting/Rig Floor: Manriding Winches & Belts	● Demonstrate correct hand signals associated with operating manriding winch.											0	
				● Demonstrate how to inspect manriding winch.											0	
				● Demonstrate how to inspect, wear & fasten manriding belt.											0	
				● Demonstrate correct hand signals associated with operating utility winch.											0	
				● Demonstrate how to safely operate and maintain utility winch.											0	
64	DL	72	Power Systems: Engine instrumentation	● Explain the purpose of engine instrumentation.											0	
65	DL	73	Power Systems: Engine report and log book	● Demostrate how to record engine gauge readings and maintain logs.											0	
				● Explain the purpose of record keeping.											0	
66	DL	74	Power Systems: Engine fluids	● Demonstrate how to check engines fluids levels and add as required.											0	
				● Explain types of engine fluids and level requirements.											0	
67	DL	75	Power Systems: Engine fuel system	● Demonstrate how to ensure pressure, filtation and line requirements will sustain engine operation.											0	
				● Explain pressures, filtration, and line inspection.											0	
68	DL	76	Power Systems: Engine cooling system	● Explain how to check engine coolant level.											0	
				● Explain radiator and cooling fan inspection.											0	
69	DL	77	Power Systems: Engine air intake systems	● Demonstate how to change air filters.											0	
				● Explain how to inspect air filters and intake differential pressures.											0	
70	DL	78	Circulating Systems: Low Pressure Mud System	● Demonstrate valve alignment to transfer mud and mix chemicals in each pit.											0	
				● Explain the layout of the pits including valve locations.											0	

Annex-12 : Competency Table: – Driller 7/20

Position:	Driller				Competency level required					Proficiency Scale					GAP	Individual Development Plan
					Required Score					Actual Score						
No	Ref	Code	Functional competency	Description of competency	Awareness	Application	Career Proficien	Advanced Level	Expert Level	Awareness	Application	Career Proficie	Advanced Level	Expert Level		
71	DL	79	Circulating Systems: High Pressure Mud System	● Demonstrate how to change out expendables.											0	
				● Demonstrate how to isolate the valves.											0	
				● Demonstrate how to monitor mud pumps during operating.											0	
				● Explain how to change out expendables.											0	
				● Explain the purpose and operation of mud pumps.											0	
				● Identify where valves are located.											0	
72	DL	80	Circulating Systems: Pulsation Dampener/Bladder	● Demonstrate how to perform maintenance of a pulsation dampener.											0	
				● Explain the operation and maintenance of a pulsation dampener.											0	
				● Explain the purpose of a pulsation dampener.											0	
73	DL	81	Circulating Systems: Shale shakers	● Demnostrate shale shaker maintenance.											0	
				● Demonstrate how to adjust shaker screens.											0	
				● Demonstrate how to change shaker screens.											0	
				● Explain how to adjust shaker screens.											0	
				● Explain how to change shaker screens.											0	
				● Explain shale shaker maintenance.											0	
				● Explain the purpose of a shale shaker.											0	
74	DL	82	Circulating Systems: Trip Tanks	● Demonstrate how to line up trip tank valves for filling or monitoring the hole.											0	
				● Explain how to line up trip tank valves for filling or monitoring the hole.											0	
				● Explain the purpose of the trip tank.											0	
75	DL	83	Circulating Systems: Mud Saver Bucket	● Demonstrate how to perform maintenance on the mud saver bucket.											0	
				● Demonstrate how to use the mud saver bucket.											0	
				● Explain the purpose of a mud saver bucket.											0	
				● Explain when to use the mud saver bucket.											0	
76	DL	84	Rotating System: Master Bushings	● Demonstrate how to identify wear of the master bushings.											0	
				● Demonstrate how to perform maintenance of the master bushings.											0	
				● Demonstrate how to pull and set master bushings.											0	
				● Explain how to identify wear of the master bushings.											0	
				● Explain how to perform maintenance of the master bushings.											0	
				● Explain the purpose of the master bushings.											0	
77	DL	85	Rotating System: Rotary Table	● Demonstrate the maintenance procedures for the rotary table.											0	
				● Demonstrate the procedure for locking and working around.											0	
				● Explain the maintenance procedures for the rotary table.											0	
				● Explain the procedure for locking and working around.											0	
				● Explain the purpose of the rotary table.											0	
78	DL	86	Well Control Equipment: BOP Handling Systems	● Demonstrate proper sling application and attachment methods between lifting device and BOP equipment.											0	
				● Explain JSA / Work Plan knowledge for each critical step.											0	
				● Explain proper application and use of BOP handling systems.											0	

Annex-12 : Competency Table: – Driller 8/20

Position: Driller

No	Ref	Code	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	GAP	Individual Development Plan
79	DL	87	Well Control Equipment: BOP Control System And Accumulator	● Demonstrate how to connect the HCR valve, manual valve, coflex hose, for BOP and choke manifold.											0	
				● Demonstrate how to connect the kill line and check valve as designed.											0	
				● Demonstrate how to function test all BOP elements.											0	
				● Demonstrate how to indentify that BOPE hydraulic lines meet OEM requirements and are connected and protected to ensure BOPE function as designed.											0	
				● Demonstrate how to install the Driller's and remote BOP control panels and function test same.											0	
				● Demonstrate that all valves and gauges are in good working condition and clearly marked as to their function.											0	
				● Demonstrate that resevoir is filled to proper fluid level with proper fluid.											0	
				● Demonstrate that the accumulator unit has the proper fluid volume capacity for the BOP application to which it is being connected.											0	
				● Demonstrate that the BOP Control system and accumulator unit has the proper working pressure rating for the BOP equipment to be installed.											0	
				● Explain accumulator unit fluid volume capacity as related to the BOP equipment to be installed.											0	
				● Explain BOP Control system and accumulator unit working pressure rating as related to the BOP equipment to be installed.											0	
				● Explain how to connect the HCR valve, manual valve, coflex hose, for BOP and choke manifold.											0	
				● Explain how to function test all BOP elements.											0	
				● Explain how to install the Driller's and remote BOP control panels and function test same.											0	
				● Explain the designed arrangement foor kill line and check valve.											0	
				● Explain the importance of the condition of valves and gauges and their identification.											0	
				● Explain the requirements for BOPE hydraulic lines.											0	
80	DL	88	Well Control Equipment: BOP Preventers & Fail Safe Valves	● Demonstrate how to install bolt completely into the nut.											0	
				● Demonstrate how to select and install the appropriate ring gaskets in all connections.											0	
				● Demonstrate proper torque sequence to insure flange gap is even on all sides.											0	
				● Demonstrate that all BOP components have been inspected and certified in accordance with OEM specifications.											0	
				● Explain how to guide upper BOP sections onto lower sections.											0	
				● Explain how to open the BOP doors and change pipe rams and blind rams.											0	
				● Explain OEM specifications and certification for BOP components.											0	
				● Explain the importance of always using new and appropriate ring gaskets in all connections.											0	
				● Explain the importance of having the proper flange gap on all sides.											0	
				● Explain the importance of why all bolts need to be engaged comletely into the nut.											0	
				● Explain the proper assembly (stack-out) of all BOP components to be used per drilling program.											0	
81	DL	89	Well Control Equipment: BOP Testing Equipment	● Demonstrate how to connect the test lines andsecure from test unit to BOP.											0	
				● Demonstrate how to open the BOP doors and change rams.											0	
				● Demonstrate that hydraulic lines are of proper pressure rating.											0	
				● Demonstrate that the test unit is of adquate pressure rating to test the BOP.											0	
				● Explain how to connect the test lines and secure from test unit to BOP.											0	
				● Explain how to open the BOP doors and change rams.											0	
				● Explain test unit pressure requirements in relation to BOP testing.											0	
				● Explain the requirements for BOPE hydraulic lines.											0	

Annex-12 : Competency Table: – Driller 9/20

Position: Driller

No	Ref	Code	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	GAP	Individual Development Plan
82	DL	90	Well Control Equipment: Full Opening Safety Valve, Kelly cock valve, IBOP	● Explain each tool, their function, storage position and location of each.											0	
				● Explain the importance all wrenches for each safety valve are kept orderly and are readily available.											0	
				● Explain the importance of inspecting valve connections in accordance with drill string requirements.											0	
83	DL	91	Well Control Equipment: Float Valve	● Demonstrate how to visually inspect float valves for damage.											0	
				● Demonstrate the installation of float valve in drill string.											0	
				● Explain how to visually inspect float valves for damage.											0	
				● Explain the installation of float valve in drill string.											0	
84	DL	92	Well Control Equipment: Diverter	● Demonstrate the ability to configuration all components in diverter system including flow lines, valves, and sizing for the application per the drilling program.											0	
				● Explain the configuration of all components in diverter system including flow lines, valves, and sizing for the application per the drilling program.											0	
				● Explain the purpose of a diverter system as opposed to a BOP.											0	
				● Demonstrate sizing and pressure rating of spools for wellhead and BOP equipment meet requirements of drilling program.											0	
				● Demonstrate that flow lines are routed and secured at a location and distance to allow for flaring and/or fluid containment.											0	
				● Explain flow lines routing and anchoring for flaring and/or fluid containment.											0	
				● Explain sizing and pressure rating of spools for wellhead and BOP equipment per drilling program.											0	
85	DL	94	Well Control:Testing BOP: Pressure And Function Testing Of BOPs	● Demonstrate how to ensure tool joint space out within the BOP are adequate and a vent open below the wellhead test plug is open.											0	
				● Demonstrate that appropriate ring gaskets are used for each flange.											0	
				● Demonstrate the test sequence of valves and BOP's including identifying leaks and how to correct them.											0	
				● Explain how to identify ring gaskets in relation to BOP flanges.											0	
				● Explain the test sequence of valves and BOP's including identifying leaks and how to correct them.											0	
				● Explain tool joint placement (space out) within the BOP and the purpose of venting below the test plug.											0	
86	DL	95	Well Control:Testing BOP: Pressure And Function Testing Of BOPs Choke Manifold	● Demonstrate how to function the valves to their fully open and closed positions and align for drilling operations.											0	
				● Demonstrate how to lubricate valves with the high pressure grease.											0	
				● Demonstrate how to test to rated pressures and durations and how to bleed off test pressure after test.											0	
				● Explain how to test to rated pressures and durations and how to bleed off test pressure after test.											0	
				● Explain how to function the valves to their fully open and closed positions and align for drilling operations.											0	
				● Explain how to lubricate valves with the high pressure grease.											0	
87	DL	96	Well Control:Testing BOP: Pressure And Function Testing Of BOPs Kill and Chokeline Valves	● Demonstrate how to function the valves to their fully open and closed positions and align for drilling operations.											0	
				● Demonstrate how to lubricate valves with the high pressure grease.											0	
				● Demonstrate how to test to rated pressures and durations and how to bleed off test pressure after test.											0	
				● Explain how to test to rated pressures and durations and how to bleed off test pressure after test.											0	
				● Explain how to function the valves to their fully open and closed positions and align for drilling operations.											0	
				● Explain how to lubricate valves with the high pressure grease.											0	

Annex-12 : Competency Table: – Driller 10/20

Position:	Driller				Competency level required					Proficiency Scale					GAP	Individual Development Plan
					Required Score					Actual Score						
No	Ref	Code	Functional competency	Description of competency	Awareness	Application	Career Proficien	Advanced Level	Expert Level	Awareness	Application	Career Proficie	Advanced Level	Expert Level		
88	DL	97	Well Control:Testing BOP: Pressure And Function Testing Of BOPs Pressure Test Standpipe manifold	● Demonstrate how to function the valves to their fully open and closed positions and align for drilling operations.											0	
				● Demonstrate how to lubricate valves.											0	
				● Demonstrate how to test to rated pressures and durations and how to bleed off test pressure after test.											0	
				● Explain how to test to rated pressures and durations and how to bleed off test pressure after test.											0	
				● Explain how to function the valves to their fully open and closed positions and align for drilling operations.											0	
				● Explain how to lubricate valves.											0	
89	DL	103	Diesel pumps	● Demonstrate the use and maintenance of diesel pumps.											0	
				● Explain the the importance of rig fuel filtering system.											0	
				● Explain the use and maintenance of diesel pumps.											0	
90	DL	104	Closed loop mud equipment	● Explain when the different types of closed loop mud cleaning equipment are used.											0	
91	DL	105	Centrifugal pumps	● Demonstrate how to prime and maintain a centrifugal pump.											0	
				● Explain how to prime and maintain a centrifugal pump.											0	
92	DL	106	Diaphram pumps	● Demonstrate how to prime and maintain a diaphram pump.											0	
				● Explain how to prime and maintain a diaphram pump.											0	
93	DL	107	Valve types	● Demonstrate how to operate low pressure and high pressure valves.											0	
				● Explain the different types of valves used in mud systems and where each type is applicable.											0	
94	DL	108	Rotary swivel	● Explain what a rotary swivel is and when it is used.											0	
95	DL	112	Tubulars: Tubular care and maintenance	● Demonstrate how to store and transport tubulars.											0	
				● Demonstrate how to clean and inspect connections during drilling and tripping operations.											0	
				● Explain how the slips and rotary bushing relate to the care of tubulars.											0	
				● Explain how to break in new tool joints.											0	
				● Explain how to clean and inspect connections during drilling and tripping operations.											0	
				● Explain the different types of mechanical surface imperfections that should be monitored or prevented that could lead to failures.											0	
				● Explain the importance of breaking in new tool joints.											0	
				● Explain the importance of cleaning and inspection of tubular connections.											0	
				● Explain the procedures for storing and transporting tubulars.											0	
				● Explain why thread compound is used.											0	
96	DL	114	Tubulars: Make Up/ Break Out of Drilling Bits	● Demonstrate how to apply the required torque for different thread connections on all tubular, subs and drill bits.											0	
				● Explain torque requirements for different thread connections on all tubular, subs and drill bits.											0	
97	DL	115	Completions: Coiled Tubing (CT)	● Explain the importance of ensuring why all surface equipment (BOP, coil tubing lines, etc.) must be tested.											0	
				● Explain the possible consequence of coil tubing failure (bursts, whiplash, etc.).											0	
98	DL	116	Completions: Completions string	● Demonstrate how to ensure tubing hanger lands appropriately on wellhead.											0	
				● Demonstrate the correct running order of completion tubulars and correct space-out with seal assembly.											0	
				● Explain the correct running order of completion tubulars and correct space-out with seal assembly.											0	
				● Explain the differences between handling tubing vs. drill pipe.											0	
99	DL	118	Fishing Equipment	● Demonstrate the ability to PU BHA assembly of fishing tools and run in hole.											0	
				● Demostrate how to POOH with fish engaged.											0	
				● Explain BHA assembly of fishing tools and knowledge of down-hole operations.											0	
				● Explain the procedure and precautions when POOH with fish.											0	

Annex-12 : Competency Table: – Driller 11/20

Position:	Driller			Competency level required					Proficiency Scale					GAP	Individual Development Plan
				Required Score					Actual Score						
No	Ref	Code	Functional competency	Description of competency	Awareness	Application	Career Proficien	Advanced Level	Expert Level	Awareness	Application	Career Proficie	Advanced Level	Expert Level		
100	DL	119	Forklift Operations	● Demonstrate how to operate forklift.											0	
				● Demonstrate the ability to perform rigging and determine lifting capacities for forklift.											0	
				● Demonstrate the inspection and general maintenance procedure for a forklift.											0	
				● Explain how to operate forklift.											0	
				● Explain rigging and lift capacities for forklift.											0	
				● Explain the inspection and general maintenance of forklift.											0	
101	DL	120	Cementing	● Calculate strokes required to bump the cement plug while displacing with rig pump.											0	
				● Explain the charactistics and importance of a proper cement job.											0	
				● Monitor returns to surface and distinguish the difference between cement and drilling fluid.											0	
				● Rig-up cementing lines and line up valves/ transfer mud to cementing unit.											0	
102	DL	121	Other Operations: Plug & Abandon Well	● Demonstrate how to follow the plug and abandon program.											0	
				● Demonstrate how to perform pressure testing after plug has cured.											0	
				● Demonstrate tripping after cement plug is set in place.											0	
				● Explain how to perform pressure testing after plug has cured.											0	
				● Explain the plug and abandon program.											0	
				● Explain tripping procedure after cement plug is set in place.											0	
103	DL	122	Other Operations: Drillstem Test	● Demonstate the ability to perform drillstem test procedure and related operations.											0	
				● Demonstrate how to make up and torque components of the drill stem test assembly.											0	
				● Demonstrate safe tripping speeds and procedures in cased and open hole.											0	
				● Explain how to make up and torque components of the drill stem test assembly.											0	
				● Explain safe tripping speeds and procedures in cased and open hole.											0	
				● Explain the drillstem test procedure and related operations.											0	
104	DL	123	Other Operations: Conductor and Casings	● Demonstrate how to determine the back-up tong line is sized and installed correctly.											0	
				● Demonstrate how to identify cross-threaded pipe.											0	
				● Demonstrate how to stab casing.											0	
				● Demonstrate visual inspection of casing threads for damage and cleanliness.											0	
				● Explain how to determine the back-up tong line is sized and installed correctly.											0	
				● Explain how to identify cross-threaded pipe.											0	
				● Explain how to stab casing.											0	
				● Explain visual inspection of casing threads for damage and cleanliness.											0	
104	DL	124	Other Operations: Casing Stabbing Board	● Demonstrate how to rig up and postition stabbing board.											0	
				● Explain how to rig up and postition stabbing board.											0	
105	DL	125	Other Operations: Logging	● Demonstate how to rig up the wireline sheaves, (in mast and V-door).											0	
				● Demonstrate how to monitor well conditions during logging operation.											0	
				● Demonstrate how to rig up packoff/lubricator assembly.											0	
				● Explain how to monitor well conditions during logging operation.											0	
				● Explain how to rig up the wireline sheaves, (in mast and V-door).											0	
				● Explain the procedure for rigging up packoff assembly.											0	
				● Explain well control shut in during wireline logging depending on type and length of packoff/lubricator assembly being used.											0	
106	DL	126	Other Operations: Mud Characteristics	● Demonstrate how to maintain correct mud properties mixing chemicals to mud as instructed by mud engineer.											0	
				● Demonstrate how to manage aerated or if it is gas-cut mud.											0	
				● Demonstrate how to monitor solids control equipment.											0	
				● Demonstrate how to record mud weight, viscosity, and volumes.											0	
				● Demonstrate the mixing of chemicals required for the operation.											0	
				● Explain how to identify if mud is aerated or if it is gas-cut.											0	
				● Explain how to record mud weight, viscosity, and volumes.											0	
				● Explain how to utilize the different solids control equipment for mud filtration.											0	
				● Explain the basic chemicals needed for the operation.											0	
				● Explain the characteristics of drilling fluids & their purpose.											0	
				● Explain the importance of communicating mud properties and all fluid changes to rig personnel.											0	

Annex-12 : Competency Table: – Driller 12/20

Position:	Driller				Competency level required					Proficiency Scale					GAP	Individual Development Plan				
					Required Score					Actual Score										
No	Ref	Code	Functional competency	Description of competency	Awareness	Application	Career Proficien	Advanced Level	Expert Level	Awareness	Application	Career Proficie	Advanced Level	Expert Level						
107	DL	127	Other Operations: Mud Transfer	● Demonstrate how to line up valves, hoses and hard piping for the mud system transfers.											0					
				● Demonstrate how to notify personnel of transfers, monitor mud volume sensors and re-set once completed.											0					
				● Explain the importance of communicating fluid transfers and resetting PVT system.											0					
				● Explain the process for mud system transfers.											0					
108	DL	128	Other Operations: Drill Water System	● Demonstate how to maintain adequate drill water.											0					
				● Explain the importance of maintaining adequate water volume for drilling operations.											0					
109	QHSE	01	Induction (Post-Hire Corporate and Unit Specific)	● Demonstrate immediate response during coordinated drills (Including your assigned Muster Station(s) and location of your Lifeboat(s) (if applicable).											0					
				● Explain assigned roles and responsibilities according to the Emergency Response Plans or Station Bill.											0					
				● Explain the general duties of the Unit/Crew specific positions.											0					
				● Explain your company's position in regard to compliance with regulatory requirements (for applicable position).											0					
				● Explain your Company's specific Short Service Employee program (if applicable).											0					
				● Identify and explain the various components of the Rig or Unit.											0					
				● Provide evidence of completion of the Corporate and Unit Specific Induction/Orientation course.											0					
110	QHSE	02	International Safety Management Code (ISM) - If applicable	● Demonstrate where you will find onboard reference resources for the ISM Code.											0					
				● Explain (in brief) the elements of the ISM code and their importance to ensure safe management and operation of ships and for pollution prevention.											0					
				● Explain the significance of ISM code and to which vessels it applies.											0					
				● Explain who is the DPA, his functions and importance thereof.											0					
111	QHSE	03	International Ship and Port Facility Security Code (ISPS)	● Explain the applicable local and flag state security requirements.											0					
				● Explain the ISPS security levels and the significance of each including expected response to it.											0					
				● Explain the significance of the ISPS code.											0					
				● Identify who the SSO is and briefly explain the SSO's function onboard.											0					
				● Provide evidence of completion of the onboard ISPS course.											0					
				● Provide evidence that the security assessment has been carried out and where it is maintained.											0					
112	QHSE	04	Quality, Health, Safety, Environment and Security (QHSES) Policy	● Describe your role and responsibilities in order to comply with company's QHSES policies.											0					
				● Explain good housekeeping practices and personal hygiene practices in accordance with company policies.											0					
				● Explain the company's QHSES policies (as applicable).											0					
				● Explain the objectives and the importance of active participation in the various meetings held onsite/onboard (Induction meeting, Pre-shift meeting, Weekly safety meeting, Risk Assessment/Pre-job meeting).											0					
				● Identify where you would find the company QHSES Policies.											0					
113	QHSE	05	HSE Local Regulations and Relevant International Standards	● Explain the local HSE regulations (Standards, laws and regulations that apply to occupational health and safety).											0					
114	QHSE	06	Quality Safety & Management System	● Demonstrate the ability to navigate the company specific Quality Safety & Management System.											0					

Annex-12 : Competency Table: – Driller 13/20

No	Ref	Code	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	GAP	Individual Development Plan
Position:	Driller															
115	QHSE	07	Station Bill/Emergency Response Plan and Emergency Drills	● Demonstrate the ability to perform the assigned duties as per the station bill/emergency response plan.											0	
				● Demonstrate the correct donning, doffing and stowing of emergency PPE.											0	
				● Describe all the emergency alarm sounds as well as the respective actions to take (H2S, Well Control, Fire Alarm, Abandon Alarm, Gas Alarm, Man overboard Alarm, Loss of Station Position etc).											0	
				● Describe and identify the location of your muster point(s).											0	
				● Describe the process to search and rescue personnel unaccounted for in an emergency situation.											0	
				● Identify the various site specific emergency equipment (Portable fire extinguishers, fixed fire systems such as CO2, Life Boat, Life Raft, Rescue Boat, Escape Ladder etc).											0	
116	QHSE	08	Emergency Preparedness and Response	● Demonstrate the assigned duties to be carried out during various emergencies/drills (for example: Fire Drill, Abandon Drill, Gas Drill, Man Overboard Drill, Man Down, Stability Drill, Well Control Drill, SOPEP Drill, Helpdesk Fire Drill, Blackout Drill).											0	
				● Demonstrate the proper recording and completion of all emergency response training and drills.											0	
				● Describe and identify the escape routes, markings, signage systems and lighting systems as applicable.											0	
				● Describe and identify the location of all emergency alarm actuators.											0	
				● Describe how to react to well control situations and how often well control drills are conducted.											0	
				● Describe the rig (unit) emergency response abandonment and notification procedures.											0	
				● Explain the assigned duties to be carried out during various emergencies/drills (for example: Fire Drill, Abandon Drill, Gas Drill, Man Overboard Drill, Man Down, Stability Drill, Well Control Drill, SOPEP Drill, Helpdesk Fire Drill, Blackout Drill).											0	
				● Explain the oil spill emergency plan(s) (Shipboard Oil Pollution Emergency Plan/Spill Prevention Control and Countermeasures Plan).											0	
				● Explain the site specific emergency responses, exercises and training plans for all major hazardous situations.											0	
117	QHSE	09	Risk Assessments (RA)	● Demonstrate the ability to verify that risk control measurements are implemented and demonstrate how to assess their effectiveness.											0	
				● Describe and demonstrate how safety critical equipment is tested and maintained.											0	
				● Describe how simultaneous operations (SIMOPS) are managed to ensure that risk control procedures are in place during the execution of related activities.											0	
				● Describe the operational boundaries and performance standards of the safety critical equipment.											0	
				● Describe the potential hazards on site and provide examples of what could trigger them and what could be their associated consequences.											0	
				● Describe the process by which potential or unforeseen risks are communicated to management and affected employees.											0	
				● Describe the process to systematically identify, evaluate, select and implement risk reducing controls.											0	
				● Describe the roles and responsibilities of personnel participating in the risk assessment process.											0	
				● Describe the site specific risk assessment process.											0	
				● Explain adverse environmental conditions by which the unit should not operate and the alerting systems available on site.											0	
				● Explain and demonstrate how to stop and secure work or tasks in case of any unforeseen or unplanned changes or hazards, and how to further assess risks associated with these changes or hazards.											0	
				● Explain how the interaction of major hazards within your unit has been considered during normal or simultaneous operations.											0	
				● Explain how to apply the hazard recognition and risk assessment techniques and the ability to implement risk mitigation measurements and controls.											0	
				● Explain the maintenance and control of risk assessment documents.											0	
				● Explain when/if operations can continue when risk associated with simultaneous operations, inadequate equipment or lack of personnel are present.											0	
				● Identify and describe the safety critical equipment on site.											0	

Annex-12 : Competency Table: – Driller 14/20

Position:	Driller				Competency level required					Proficiency Scale					GAP	Individual Development Plan				
					Required Score					Actual Score										
No	Ref	Code	Functional competency	Description of competency	Awareness	Application	Career Proficien	Advanced Level	Expert Level	Awareness	Application	Career Proficie	Advanced Level	Expert Level						
118	QHSE	10	Permit To Work (PTW)/ Energy Isolations/L.O.T.O.	● Demonstrate control and execution of energy isolation.											0					
				● Describe a scenario where electrical/ mechanical isolations are required.											0					
				● Describe the objectives of energy isolation and why precautions are important.											0					
				● Describe what constitutes a critical lift and all the precautions that must be in place.											0					
				● Explain how electrical/mechanical isolation would be confirmed safe to work on.											0					
				● Explain the types of energy sources that could be released at the site and the precautions that need to be in place.											0					
119	QHSE	11	Behavioral Based Safety System (BBSS)	● Demonstrate the corrective action/feedback process in the BBSS program for an observed unsafe action/behavior.											0					
				● Demonstrate the process to record and track non conformities from BBSS Observations.											0					
				● Describe the difference between an unsafe action/behavior and an unsafe condition.											0					
				● Describe the importance of reviewing past BBSS observations and behaviors at safety meetings.											0					
				● Describe your role in the BBSS.											0					
				● Explain the company's BBSS.											0					
120	QHSE	12	General Housekeeping/Orderliness	● Demonstrate the ability to secure the current work area or operation before evacuating during an emergency or drill.											0					
				● Demonstrates ability to ensure that the work area is clean and orderly, prior to and upon completion of the work, task or repairs.											0					
				● Demonstrates ability to maintain and inspect hand and power tools in operationally safe condition, without any unauthorized modifications.											0					
				● Explain the hazards associated with using defective or modified hand or power tools.											0					
				● Explain the importance of closing out hazardous work activities before evacuating the area for an emergency or drill.											0					
				● Explain the importance of good housekeeping practices in the work areas and living quarters.											0					
				● Explain why it is important to keep tools put away and the work place clean in case of an emergency.											0					
				● Explain your role in the housekeeping practices in the work areas and living quarters.											0					
				● Demonstrate cleaning and organizing the work area upon completion of the work, task, or repairs.											0					
				● Explain procedures personnel should follow if they observe worksite and water pollutants during lifting operations.											0					
121	QHSE	13	Environmental Management Plan	● Describe the company Environmental Management Plan (EMP).											0					
				● Describe the location specific sensitivities of the receiving environment.											0					
				● Describe the process for handling or discharging cuttings.											0					
122	QHSE	14	Ship Oil Pollution Emergency Plan (SOPEP)	● Describe the spill kit contents and how to use them.											0					
123	QHSE	15	Spill Prevention Control and Countermeasures Plan (SPCC)	● Describe the rig specific SPCC plan procedures to follow in case of a spill.											0					
				● Demonstrate the ability to locate the SPCC Plan.											0					
				● Demonstrate the ability to locate the Spill kit.											0					
				● Describe the SPCC inspection process for the location and equipment before spud in.											0					
				● Describe the spill kit contents and how to use them.											0					
				● Explain how the SPCC plan bridges to the operator's well site plan.											0					
				● Explain the process or requirements of training on the SPCC elements.											0					
				● Explain the reporting procedures in the event of a spill on or off the well site location.											0					
				● Explain the SPCC containment system including the layout, need and maintenance.											0					
				● Explain your role in a SPCC drill or an actual spill.											0					

Annex-12 : Competency Table: – Driller 15/20

Position: Driller					Competency level required					Proficiency Scale					GAP	Individual Development Plan
					Required Score					Actual Score						
No	Ref	Code	Functional competency	Description of competency	Awareness	Application	Career Proficien	Advanced Level	Expert Level	Awareness	Application	Career Proficie	Advanced Level	Expert Level		
124	QHSE	16	Waste Segregation	● Describe the company waste management plan.											0	
				● Describe the waste materials (either solid or liquid), and identify/categorize as one of the following: common waste, industrial waste, hazardous waste and recyclable materials.											0	
				● Describe what materials should be placed into the waste containers and why they need to be segregated.											0	
				● Explain the continuous improvement of waste handling on the unit/location.											0	
				● Explain the waste containers provided for common waste, industrial waste, hazardous waste and recyclable materials.											0	
125	QHSE	17	Dropped Objects Prevention	● Describe the hazards associated while work is being conducted overhead.											0	
				● Describe the main hazard areas/zones where dropped objects may occur.											0	
				● Explain how potential dropped objects are identified and how they should be reported.											0	
				● Explain how the restricted areas/zones are enforced.											0	
				● Explain precautionary measures required to avoid causing dropped objects and to protect personnel from those potential hazards.											0	
				● Explain the importance of a daily/weekly/monthly/annual dropped objects prevention inspection program.											0	
				● Explain why access should be restricted to all known dropped object areas/zones.											0	
126	QHSE	19	Fall Protection	● Demonstrate the ability to find the fall arrest or restraint gear/equipment's information tag.											0	
				● Demonstrate the ability to select the proper size and type as well as the donning of, and correct usage, of fall arrest gear.											0	
				● Demonstrate transferring from one location to another while maintaining 100 percent tie off while working at heights.											0	
				● Describe the difference between fall arrest and fall restraint.											0	
				● Describe the emergency equipment and procedures (rescue plan) when rescuing someone at heights.											0	
				● Describe the general requirements of the fall protection.											0	
				● Describe the limitations and the common misuse of fall arrest and restraint equipment.											0	
				● Describe the management of defective fall arrest equipment.											0	
				● Describe the proper maintenance, cleaning, inspection (including documentation) and storage of fall arrest equipment.											0	
				● Describe the proper use of ladders (fixed and portable) or scaffolds.											0	
				● Describe the proper work procedures and communication using fall protection while working in an aerial lift platform (man-lift/work basket).											0	
				● Describe the types of fall protection and fall arrest gear/equipment and how it is used.											0	
				● Explain the different types of fall protection and fall arrest systems and how each of them work.											0	
				● Explain the importance of maintaining the proper overhead anchorage point.											0	

Annex-12 : Competency Table: – Driller 16/20

Position: Driller

No	Ref	Code	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	GAP	Individual Development Plan
127	QHSE	20	Safe Use Of Lifting Equipment	● Explain who is authorized to operate lifting equipment.											0	
				● Demonstrate proper hand and body placement when attaching the rigging to a load.											0	
				● Demonstrate the ability to properly operate lifting equipment.											0	
				● Demonstrate the ability to select the correct lifting equipment for the task at hand.											0	
				● Demonstrate the proper use of tag lines attached to loads including proper positioning.											0	
				● Demonstrate the verbal communications and hand signals used in lifting operations.											0	
				● Describe the basic work sequence/policy and precautions that must be in place prior to making a critical lift.											0	
				● Describe the lifting equipment available on location.											0	
				● Describe the maintenance, storage and inspection of all lifting equipment (rigging/slings/shackles, etc.).											0	
				● Describe the proper installation and rigging of all permanent and temporary lifting points (anchor points, pad eyes, etc.).											0	
				● Describe the proper use of tag lines attached to loads including proper positioning and quantity.											0	
				● Describe the verbal communications and hand signals used in lifting operations.											0	
				● Explain proper hand and body placement when attaching the rigging to a load.											0	
				● Explain the importance of a spotter during blind lifting operations.											0	
				● Explain the minimum number of personnel and special precautions to be used during critical lifting operations.											0	
				● Explain the pre-lift plan and inspections process.											0	
				● Explain the responsibilities of a rigger (banksman).											0	
				● Explain what constitutes a critical lift.											0	
128	QHSE	21	Lifting of Personnel	● Demonstrate the ability to properly utilize personnel lifting equipment.											0	
				● Demonstrate the ability to select the proper personnel lifting equipment/device.											0	
				● Demonstrate the inspection of personnel lifting equipment.											0	
				● Describe safety precautions necessary for the use of personnel lifting devices.											0	
				● Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.											0	
				● Explain the importance of using load balance, weight tolerances, and environmental conditions before and during personnel transfer.											0	
				● Explain the inspection of equipment necessary for lifting of personnel.											0	
				● Explain the precautions and pre-lift requirements before personnel are transferred or lifted.											0	
129	QHSE	22	Crane Safety	● Describe the maintenance, storage and inspection of all lifting equipment (rigging/slings/shackles, etc.).											0	
130	QHSE	23	Use and maintenance of utility winch	● Demonstrate rigging practices for safe lifting and movement of tubulars and irregular shaped equipment/materials.											0	
				● Demonstrate the hand signals used during winch operations.											0	
				● Demonstrate the operation of a utility winch.											0	
				● Describe the operational and safety responsibilities of a winch operator.											0	
				● Describe the specific locations where utility winches are installed on the unit.											0	
				● Explain rigging practices for safe lifting and movement of tubulars and irregular shaped equipment/materials.											0	
				● Explain the capacity and limitations of utility winches.											0	
				● Explain the pre-use inspection steps required before operating a utility winch.											0	
				● Explain the required maintenance for a utility winch and accessories.											0	
131	QHSE	25	Accident/Incident Investigation	● Explain the company's policies/procedures for reporting an incident resulting in personal injury, equipment damage, a near miss or any potential hazard.											0	
				● Explain the importance of active participation in an incident investigation.											0	
				● Explain the importance of following up and closing corrective actions.											0	
				● Explain what a corrective action is and why it is being implemented.											0	
				● Explain why facts are important to an incident investigation.											0	

Annex-12 : Competency Table: – Driller 17/20

Position:			Driller		Competency level required						Proficiency Scale					GAP	Individual Development Plan				
					Required Score						Actual Score										
No	Ref	Code	Functional competency	Description of competency	Awareness	Application	Career Proficien	Advanced Level	Expert Level		Awareness	Application	Career Proficie	Advanced Level	Expert Level						
132	QHSE	26	Chemical Handling & SDS (MSDS) (GHS)	● Demonstrate selection and correct use of PPE when handling chemicals in accordance with the SDS.												0					
				● Describe appropriate actions necessary in the event of exposure/contact with chemicals or spill.												0					
				● Describe the health and environmental risks associated with chemicals used at the work site.												0					
				● Describe the information contained in a SDS.												0					
				● Describe the storage and segregation process for chemicals.												0					
				● Explain the minimum requirements for labeling, documentation and packing of chemicals.												0					
				● Explain what NORM is, where NORM occurs and explain the precautions to be taken to prevent exposure.												0					
				● Explain where Safety Data Sheets (SDS) are located.												0					
133	QHSE	27	Equipment Safety	● Describe and give examples of various equipment guards and their purpose.												0					
				● Explain the hazards and precautions of working around moving (dynamic) equipment.												0					
				● Explain the hazards and precautions of working around rotating equipment.												0					
				● Explain the hazards and precautions to take when working with or near low or high pressurized equipment.												0					
				● Explain the importance of ensuring that proper fittings (hammer unions/quick connect/hydraulic fittings) are being used in piping, hoses and equipment.												0					
134	QHSE	29	Personal Protective Equipment (PPE)	● Demonstrate the proper selection and usage (donning/doffing) of PPE.												0					
																0					
																0					
																0					
135	QHSE	30	Manual Handling/Ergonomics/Posture	● Demonstrate how to support a load when walking with various size loads.												0					
				● Demonstrate the ergonomic posture to take when physically lifting and setting a load.												0					
				● Describe when mechanical lifting is preferred to manual lifting and why.												0					
				● Describe where the force is concentrated on the spine when improperly lifting or setting a load.												0					
				● Explain the company's policy and procedures on the manual handling/lifting of materials.												0					
				● Explain the importance of planning your path of movement prior to lifting and carrying a load.												0					
				● Explain the proper manual lifting or setting techniques to prevent back injuries as well as the benefits of using mechanical lifting devices.												0					
				● Explain the value of manually "testing a load" before attempting to lift the load.												0					
136	QHSE	31	Confined Space Entry	● Describe what constitutes a confined space entry.												0					
				● Explain how environmental conditions can negatively impact working in a confined space.												0					
				● Explain the company's policy on confined space entry.												0					
				● Explain the hazards associated with a confined space.												0					
				● Explain the importance of using atmospheric monitoring equipment in a confined space.												0					
				● Explain the procedures to take before entering a confined space.												0					
				● Explain the procedures to take upon entering a confined space.												0					
				● Explain the required PPE needed when working in a confined space.												0					
				● Explain what a competent person is in the context of regulatory standards covering confined space entry.												0					
				● Explain what a qualified person is in the context of regulatory standards covering confined space entry.												0					
				● Explain what and how to identify a confined space and give some examples on your worksite.												0					
				● Explain why it is important to continually monitor the atmosphere of a confined space.												0					
				● Explain your role and responsibility during a confined space rescue operation.												0					

Annex-12 : Competency Table: – Driller 18/20

Position: Driller

No	Ref	Code	Functional competency	Description of competency	Competency level required – Required Score: Awareness	Application	Career Proficien	Advanced Level	Expert Level	Proficiency Scale – Actual Score: Awareness	Application	Career Proficie	Advanced Level	Expert Level	GAP	Individual Development Plan
137	QHSE	32	Severe Weather Conditions	● Demonstrate the ability to recognize operational shut down point(s).											0	
				● Describe actions to be taken to protect personnel during severe weather conditions.											0	
				● Describe operations which may be impacted by severe weather and the actions taken to mitigate it.											0	
				● Describe the process to restart operations after a severe weather event.											0	
				● Describe the process to secure the unit, before evacuating, when a severe weather alert has been issued.											0	
				● Explain the company's policy and procedures to follow during a severe weather threat.											0	
138	QHSE	33	Fire Prevention, Fire Fighting and Fire Control and Gas/Fire Detection Equipment	● Demonstrate the use of portable fire extinguishers.											0	
				● Describe the company's policies and procedures for fire prevention.											0	
				● Describe the different types of portable fire extinguishers and their applications (Water, Carbon Dioxide and Dry Chemical).											0	
				● Describe the engine shutdown procedure in the event of a gas release.											0	
				● Describe the fire and gas detection systems, sensor locations and how they function.											0	
				● Describe the fixed and/or portable systems used to detect the presence of Oxygen (O2), Hydrocarbon (HC) and Hydrogen Sulphide (H2S), etc											0	
				● Describe the passive fire protection systems on the unit, including their location and rating.											0	
				● Describe the process and documentation needed for inspecting and maintaining portable fire extinguishers.											0	
				● Describe the process for inspecting, maintaining, testing and calibrating the fire and gas detection systems.											0	
				● Describe the testing and regulatory requirements for portable fire extinguishers.											0	
				● Describe the three elements to complete the fire triangle.											0	
				● Describe the thresholds and the actions automatically initiated on detection of HC and/or H2S.											0	
				● Explain the different levels of shutdown associated with the unit (if applicable).											0	
				● Explain the rig/unit emergency action (response) plan for a fire event.											0	
				● Explain the use of portable fire extinguishers.											0	
139	QHSE	34	Occupational Health Plan	● Explain the process for monitoring occupational health exposures.											0	
				● Explain the company occupational health protection plan.											0	
				● Explain the exposures (noise, vibration, heat, etc) that are unacceptable.											0	
				● Explain the process to identify, set, control and verify the exposure limits that could prevent potential acute and or chronic health hazards.											0	
140	QHSE	35	Simultaneous Operations	● Describe management of change and why it is important when conducting SIMOPS operations.											0	
				● Describe what constitutes a SIMOPS Plan.											0	
				● Explain Stop Work Authority and who is responsible to initiate when a potential risk is present.											0	
				● Explain the elements of the SIMOPS Plan.											0	
				● Explain the summary of operational boundaries and the difference between proceed, proceed with caution and stop operations.											0	
141	QHSE	36	Powered/Manual Tools	● Describe your company's powered/manual tool policy.											0	
				● Explain the importance of inspection, maintenance and storage of powered/manual tools.											0	
				● Explain the importance of removing defective or altered powered/manual tools.											0	
				● Explain the importance of using the proper powered/manual tool for the task at hand.											0	
				● Explain the required PPE and safe procedures for operating powered/manual tools.											0	

Annex-12 : Competency Table: – Driller 19/20

Position: Driller

No	Ref	Code	Functional competency	Description of competency	Competency level required: Required Score – Awareness	Application	Career Proficiency	Advanced Level	Expert Level	Proficiency Scale: Actual Score – Awareness	Application	Career Proficiency	Advanced Level	Expert Level	GAP	Individual Development Plan
142	RM	A1	Document Control	● Demonstrate how handover records are filed and maintained.											0	
				● Demonstrate the ability to accurately complete the IADC Daily Drilling Report.											0	
				● Demonstrate the ability to apply action items contained in the communication document (Alerts/Notifications/Best Practices) through closure.											0	
				● Demonstrate the ability to communicate to all current operations.											0	
				● Demonstrate the ability to complete a handover report, note and form.											0	
				● Demonstrate the ability to order, receive, distribute and track inventory.											0	
				● Demonstrate the ability to store inventory items including dangerous goods.											0	
				● Demonstrate the execution and application of a management of change request.											0	
				● Demonstrate the handover procedure.											0	
				● Describe the personnel involved in the development, implementation and maintenance of written policy and procedure standards.											0	
				● Describe where operational documentation is maintained.											0	
				● Explain how each business unit will utilize the quality and control system.											0	
				● Explain how written policy and procedure standards are implemented into the current workforce and new hire process.											0	
				● Explain the Company policy and procedure for the handover process.											0	
				● Explain the Company policy and procedures for the storage of inventory items including dangerous goods.											0	
				● Explain the Company policy and procedures on operations and HSE communications.											0	
				● Explain the Company policy on documentation control.											0	
				● Explain the Company process for implementing and maintaining a bridging document.											0	
				● Explain the Company process for issuing, distributing and responding to communication documents (Alerts/Notifications/Best Practices).											0	
				● Explain the Company process for maintaining the daily drilling reports.											0	
				● Explain the Company process to ensure that all drawings, diagrams and procedures are current.											0	
				● Explain the Company's material inventory and parts list including the vendor's nomenclature (name) of the part.											0	
				● Explain the Company's policies and procedures for quality control.											0	
				● Explain the Company's policy and procedures on the completion of and distribution/filing of the IADC Daily Drilling Report.											0	
				● Explain the Company's process for the development of written policy and procedure standards.											0	
				● Explain the Company's policy and procedures for inventory management.											0	
				● Explain the Company's policy for management of change.											0	
				● Explain the Company's procedure for document tracking and retention.											0	
				● Explain the Company's procedures for a management of change, including team member's roles and responsibilities.											0	
				● Explain the documentation control procedure and which personnel are involved in the filing of operational documentation.											0	
				● Explain the importance of accurately completing the IADC Daily Drilling Report.											0	
				● Explain the importance of effective document control.											0	
				● Explain the importance of ensuring that handover reports are understood and signed off by outgoing and incoming personnel.											0	
				● Explain the importance of handover reports.											0	
				● Explain the importance of operations and HSE communications throughout the Company.											0	
				● Explain what quality and control system is used by the Company.											0	
				● Explain who is responsible for completing the IADC Daily Drilling Report.											0	
				● Explain who is responsible for revising documentation and describe how to recognize the latest version.											0	
				● Explain who is responsible for updating the HSE policy and procedures and what is the process.											0	
				● Explain why proper review, approval and document control are essential parts of management of change requests.											0	

Annex-12 : Competency Table: – Driller 20/20

Position: Driller					Competency level required						Proficiency Scale						GAP	Individual Development Plan				
					Required Score						Actual Score											
No	Ref	Code	Functional competency	Description of competency	Awareness	Application	Career Proficien	Advanced Level	Expert Level		Awareness	Application	Career Proficie	Advanced Level	Expert Level							
143	SS	17	Transportation	● Demonstrate the proper procedure to approach the helicopter when boarding and exiting the aircraft.													0					
				● Describe the Company's helicopter transportation policy.													0					
				● Describe the Company's motor vehicle policy.													0					
				● Describe the emergency response procedures and equipment associated with helicopter operations.													0					
				● Describe the importance of journey management (trip planning).													0					
				● Describe the proper procedure to approach the helicopter when boarding and exiting the aircraft.													0					
				● Describe what constitutes being fit for duty when operating a motor vehicle.													0					
				● Explain the importance of a "walk around" inspection (fluids, fuel, tire pressure etc.) before entering a vehicle and putting it into motion.													0					
				● Explain who is in total command of the helicopter and who will make decisions concerning the flight and personnel allowed onboard.													0					
					Maximum Scor		0				Actual Score		0				0					

Annex-13 : Competency Table: – Toolpusher 1/20

Position:			Toolpusher			Competency level required					Proficiency Scale					GAP	Individual Development Plan				
						Required Score					Actual Score										
No	Code	No	Functional competency		Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficien	Advanced Level	Expert Level						
1	CO	01	Crane Basics	●	Demonstrate ability to follow the permit-to-work and lockout/tagout procedures required for crane operations.											0					
				●	Describe the lifting equipment available on current location.											0					
				●	Describe the type(s) of crane(s) by name and type, found on current location.											0					
				●	Locate company policies and procedures that apply to crane operations.											0					
2	CO	02	Rigger Basics	●	Demonstrate ability to use all rigging hitches (e.g., basket, choker, vertical, bridle) needed for the current job.											0					
				●	Demonstrate adhering to the permit-to-work for routine and non-routine rigging tasks, if applicable.											0					
				●	Demonstrate correct and safe use of taglines attached to loads, including proper positioning and quantity.											0					
				●	Demonstrate following the lift plan required for critical lift rigging tasks.											0					
				●	Demonstrate how to correctly rig a load according to its specific center of gravity.											0					
				●	Demonstrate the ability to control an area where lifting operations are being carried out.											0					
				●	Demonstrate the ability to correctly and safely connect/disconnect loads.											0					
				●	Demonstrate the ability to correctly secure cargo in various conditions.											0					
				●	Demonstrate the ability to find the center of gravity of a load.											0					
				●	Demonstrate the ability to select the appropriate rigging equipment for a specific job.											0					
				●	Demonstrate the use of sling capacity tables.											0					
				●	Determine and/or estimate weight of loads for the purpose of rigging safely.											0					
				●	Explain center of gravity as it relates to rigging.											0					
				●	Explain how the tension or loading increases as sling angles decrease, especially the rapid increase in tension that occurs when slings are used below 30 degrees.											0					
				●	Explain the different methods in which a slings are rigged or attached to load.											0					
				●	Explain the importance of the eye of a synthetic web and why it should never be used or forced over a hook or pin.											0					
				●	Explain the importance of using padding (protection over sharp edges).											0					
				●	Explain the use of push poles, if required by company policy.											0					
				●	Explain vertical and horizontal planes as they relate to rigging (e.g., how force is distributed based on the plane).											0					
				●	Locate company policies and procedures that apply to rigging.											0					
				●	Select correct slings, or other similar lifting devices, according to size, weight, and configuration.											0					
3	CO	03	General Rigger Qualifications and Role	●	Explain the basic rigger's role in ensuring safe lifting operations.											0					
				●	Explain the basic rigger's role in ensuring that all lifting gear is certified to company and regulatory requirements.											0					
				●	Explain who at the jobsite is authorized to use rigging hardware.											0					
				●	List the recommended qualifications, experience, and training necessary to be able to rig a load (see API RP 1e, 2d, latest edition).											0					
4	CO	04	General Rigging Hardware Information	●	Describe the proper installation and rigging of all permanent and temporary lifting points (anchor points, pad eyes, etc.).											0					
				●	Describe the storage requirements for all rigging hardware (rigging/slings/shackles, etc.).											0					
5	CO	05	Rigging Hardware Inspection & Maintenance	●	Demonstrate ability to maintain and inspect hand and power tools in operationally safe condition, without any unauthorized modifications.											0					
				●	Explain procedures to follow when defective rigging hardware is identified.											0					
				●	Explain the lifting gear color-coding system and how records are kept for each item.											0					
6	CO	10	General Crane Operation HSE	●	Explain why personnel should observe and report any fluid leaks from the crane that could be contaminating the work environment and affecting safe operations.											0					
				●	Explain your Stop Work Authority when you observe an unsafe act during lifting operations.											0					
7	CO	15	General Rigging HSE	●	Demonstrate ability to ensure that deck personnel use safe lifting procedures (e.g., tag lines, escape routes).											0					
				●	Demonstrate correct use of personal protective equipment.											0					

Annex-13 : Competency Table: – Toolpusher 2/20

Position:			Toolpusher			Competency level required					Proficiency Scale					GAP	Individual Development Plan				
						Required Score					Actual Score										
No	Code	No	Functional competency		Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficien	Advanced Level	Expert Level						
8	CO	16	Crane/Rigging Operations Communications	●	Demonstrate ability to write clear and concise reports, such as those involving near-misses and incidents, involving lifting operations.											0					
9	CO	17	Personnel: Lifting Operations	●	Demonstrate how to properly utilize personnel lifting equipment.											0					
				●	Demonstrate how to select the proper personnel lifting equipment/device.											0					
				●	Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.											0					
				●	Explain the importance of load balance, weight tolerances, and environmental conditions before and during personnel transfer.											0					
				●	Explain the precautions and pre-lift requirements applicable before personnel are transferred or lifted.											0					
10	CO	18	Offboard/Onboard Supply Boat Lifting Operations	●	Demonstrate how to properly utilize personnel lifting equipment.											0					
				●	Demonstrate how to select the proper personnel lifting equipment/device.											0					
				●	Describe the basic work sequence/policy followed prior to making a critical lift.											0					
				●	Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.											0					
				●	Explain the importance of load balance, weight tolerances, and environmental conditions before and during personnel transfer.											0					
				●	Explain the precautions and pre-lift requirements applicable before personnel are transferred or lifted.											0					
11	CO	20	General Housekeeping/Orderliness	●	Demonstrate cleaning and organizing the work area upon completion of the work, task, or repairs.											0					
				●	Explain procedures personnel should follow if they observe worksite and water pollutants during lifting operations.											0					
12	DL	01	Rig Move (Skidding/Walking): Skidding Rig with BOP Suspended	●	Demonstrate how to secure the BOP for transit.											0					
				●	Explain the need to assign watchmen to important areas during transit.											0					
				●	Demonstrate ability to coach drill crews on how to be able to position rig on well center.											0					
				●	Demonstrate ability to utilize correct measuring methods and techniques to position rig on well center.											0					
13	DL	03	Rig Move (Skidding/Walking): Unload and install matting boards	●	Demonstrate ability to spot matting boards as per rig design.											0					
14	DL	04	Rig Move (Skidding/Walking): Well Control Equipment	●	Demonstrate the ability to install choke, flow, flare, and diverter lines.											0					
15	DL	05	Rig Up: Unload and install matting boards	●	Demonstrate ability to ensure only approved and certified lifting equipment is utilized.											0					
	DL	05	Rig Up: Unload and install matting boards	●	Demonstrate the ability to recognize approved and certified lifting eqiupment.											0					
16	DL	06	Rig Up: Spot & Assemble Subtructure Base & Associated Bracing	●	Demonstrate ability to spot sub base on well center as per rig design.											0					
17	DL	07	Rig Up: Spot & Assemble Shaker Tanks, Intermediate Tanks, Suction Tanks &/or Reserve Tanks	●	Demonstrate ability to inspect and tighten all hammer seal unions to equalizer and mud mixing lines.											0					
				●	Demonstrate ability to properly earth ground equipment.											0					
				●	Demonstrate ability to spot mud tanks level, in proper order and in line as per rig design.											0					
18	DL	08	Rig Up: Spot Mud Pumps & Assemble All Suction Lines, Pressure Release Lines & Braces	●	Demonstrate the ability to spot mud pumps and rig up all associated plumbing and operating lines.											0					
19	DL	09	Spot & Assemble Suitcases and lines	●	Demonstrate ability to inspect and tighten all hammer seal unions between suitcases to prevent fluid or air leaks.											0					
				●	Demonstrate ability to properly earth ground equipment.											0					
				●	Demonstrate ability to spot suitcase level, in proper order and in line as per rig design.											0					
20	DL	10	Rig Up: Spot & Rig up Rig Power Package & Fuel Tank	●	Demonstrate ability to properly install all electricity connections and fuel lines.											0					
				●	Demonstrate ability to spot power package & fuel tank level, in proper order and in line as per rig design.											0					

Annex-13 : Competency Table: – Toolpusher 3/20

Position:			Toolpusher			Competency level required					Proficiency Scale					GAP	Individual Development Plan				
						Required Score					Actual Score										
No	Code	No	Functional competency		Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficien	Advanced Level	Expert Level						
21	DL	11	Rig Up: Startup & Energize Rig Power	●	Demonstrate the ability to start up generators and VFD/SCR systems.											0					
22	DL	12	Rig Up: Assemble Rig Floor structural supports	●	Demonstrate ability to install structual supports.											0					
23	DL	13	Rig Up: Rotary system	●	Demonstrate ability to rig up rotary and applicable drive system.											0					
24	DL	14	Rig Up: HPU	●	Desmonstrate the ability to rig up the HPU system.											0					
25	DL	15	Rig Up: Energize Draw Works & Driller Control	●	Demonstrate ability to function test the Draw Works operations and emergency shut down.											0					
	DL	15	Rig Up: Energize Draw Works & Driller Control	●	Explain Draw Works & Drillers Console energizing procedures & requirements.											0					
26	DL	16	Rig Up: Pipe Handler Equipment	●	Demonstrate ability to correctly connect all hydraulic lines.											0					
				●	Explain the process for assembling derrick/mast, raising structure & equipment.											0					
27	DL	17	Rig Up: Derrick/Mast Assembly	●	Demonstrate the ability to perform the Pre-Raise Mast/Derrick Inspection.											0					
				●	Demonstrate the ability to raise and secure Mast/Derrick to Rig Floor.											0					
				●	Demostrate the ability to string up lines & blocks in the mast/derrick.											0					
				●	Desmonstrate the process for assembling derrick/mast, raising structure & equipment.											0					
				●	Ensure derrick ladders are in proper position & stand pipe connected.											0					
				●	Explain how to raise and secure Mast/Derrick to Rig Floor.											0					
				●	Explain the Pre-Raise Mast/Derrick Inspection.											0					
28	DL	18	Rig Up: Rig Floor	●	Demonstrate the ability to install & rig up winches and air tuggers.											0					
				●	Explain how to install & rig up winches and air tuggers.											0					
29	DL	20	Rig Up: Mud Tanks	●	Demonstrate the ability to Fill Mud Tanks, Check & Repair Leaks & Function Test All Associated Equipment.											0					
				●	Demonstrate the ability to install flow line & associated equipment.											0					
				●	Demonstrate the ability to install mud mix equipment.											0					
				●	Demonstrate the ability to install solids/gas control equipment.											0					
30	DL	22	Rig Up: Drill Water Systems	●	Demonstrate the ability to Install Trip TanK & Associated Equipment & lines.											0					
	DL	22	Rig Up: Drill Water Systems	●	Demonstrate the ability to set Reserve Water Tanks, Rig Water Tanks, Check & Repair Leaks.											0					
	DL	22	Rig Up: Well Control Equipment	●	Demonstrate the ability to position choke manifold/gas seperator.											0					
31	DL	23	Prepare for Rig Down: Preparation	●	Explain what can be prepared for move prior to rig release.											0					
32	DL	24	Prepare for Rig Down: Inspection	●	Explain pre-move inspection/check list.											0					
33	DL	25	Prepare for Rig Down: Workplan	●	Explain pre-move JSA/Work Plan, including 3rd party involvement.											0					
34	DL	26	Prepare for Rig Down: Crew Deployment	●	Explain supervision/crew deployment for rig down.											0					
35	DL	27	Rig Down: Critical Steps	●	Demonstrate ability to ensure all equipment has been removed from location.											0					
				●	Demonstrate ability to ensure BOP and associated equipment is nippled down and loaded out.											0					
				●	Demonstrate ability to ensure only approved and certified lifting equipment is used.											0					
				●	Demonstrate ability to lower and prepare mast for transport.											0					
				●	Demonstrate ability to shut down power for ancillary equipment.											0					
				●	Explain ability to ensure correct order for shut down of ancillary equipment.											0					
				●	Explain critical steps for rig down and move.											0					
				●	Explain JSA / Work Plan knowledge for each critical step.											0					
				●	Explain load out procedure / order of equipment to be moved.											0					
				●	Explain Repair & Maintenance plan (if applicable).											0					
				●	Explain required coordination between rig crew, supervisor, move crew, and 3rd party vendor.											0					
36	DL	28	Rig Down: Fall Protection	●	Demonstrate ability to ensure anchor points are identified for crew lanyards.											0					
				●	Explain pin removal and associated hazards.											0					
				●	Explain procedures for working around the cellar/well head.											0					
37	DL	29	Rig Down: Inspection Process	●	Explain inspection process for drill line.											0					
				●	Explain pre-move inspection process for ancillary equipment.											0					

Annex-13 : Competency Table: – Toolpusher 4/20

Position:			Toolpusher			Competency level required					Proficiency Scale					GAP	Individual Development Plan				
						Required Score					Actual Score										
No	Code	No	Functional competency		Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficien	Advanced Level	Expert Level						
38	DL	30	Rig Down: Transportation	●	Demonstrate ability to ensure drill line is prepared for travel.											0					
				●	Demonstrate ability to separate and load out substructure.											0					
				●	Explain how to secure all lines, piping and physical objects to prevent hazards during transporting.											0					
				●	Explain mat cleaning requirement prior to load out.											0					
39	DL	31	Rig Down: Environmental	●	Explain drilling fluid capture and transfer process.											0					
				●	Explain, if applicable, the process for oil-based mud (OBM) rig clean up and containment.											0					
40				●	Demonstrate ability to complete a stack out inventory list.											0					
				●	Demonstrate ability to ensure rig components are stored in an appropriate location and secured.											0					
				●	Explain procedure for ensuring power equipment is prepared for storage.											0					
				●	Explain the procedure to ensure rig components are stored in an appropriate location and secured.											0					
41	DL	33	Vertical/Conventional Drilling: Rig Math, Well Head and BOP Control Equipment	●	Demonstrate how to measure, strap, & caliper all tubulars.											0					
				●	Demonstrate how to check drilling fluids characteristics and measurement.											0					
				●	Demonstrate how to measure from Rotary Kelly Bushings to Well Head/Rotary Kelly Bushings to all Blowout Preventor Rams and Annular.											0					
				●	Demonstrate how to perform math calculations on pressure & volume.											0					
				●	Explain the rig components and their limitations.											0					
42	DL	34	Vertical/Conventional Drilling: Drawworks & Associated Equipment	●	Demonstrate how to operate drawworks and associated components.											0					
				●	Explain the function of drawworks and all associated components (crown saving devices, brake systems & coolant lines, guards, chains, sprockets, gear boxes, shut downs, hoisting/lowering limits per rig design).											0					
43	DL	35	Vertical/Conventional Drilling: Automated Pipe Handling	●	Demonstrate how to ensure that moving equipment does not interfere with other equipment/machinery - Simulataneous Operations.											0					
				●	Explain the importance of checking the equipment prior to use.											0					
44	DL	36	Vertical/Conventional Drilling: Execution Of Drilling And Well Operations	●	Demonstrate how to follow the client's daily drilling plans.											0					
				●	Demonstrate how to maintain an accurate pipe tally in relation to the well design.											0					
				●	Demonstrate how to make trips.											0					
				●	Demonstrate how to complete the daily tour sheet..											0					
45	DL	37	Vertical/Conventional Drilling: Drilling/Reaming	●	Demonstrate how to ream at the correct RPM and GPM.											0					
				●	Explain the importance to maintain complete records of all tools and tubular run into the hole (including made-up lengths, tool-joints OD, ID, Serial numbers).											0					
46	DL	39	Vertical/Conventional Drilling: Pipe measurement, number and strapping of pipes	●	Demonstrate correct measuring points on all tubular, casings and tools.											0					
				●	Explain how to correctly read a strapping tape.											0					
				●	Explain how to properly number stands in derrick when TIH or POOH.											0					
47	DL	40	Vertical/Conventional Drilling: Stuck Pipe Operation	●	Demonstrate how to determine the drill string operating limits.											0					
48	DL	41	Vertical/Conventional Drilling: Downhole problems and equipment failure	●	Explain downhole problems and potential equipment failures.											0					
49	DL	42	Vertical/Conventional Drilling: Standpipe and Bleed Off Line	●	Demonstrate how to ensure all valves are in the "full open" or "closed" position.											0					
50	DL	44	Vertical/Conventional Drilling: Tripping	●	Demonstrate how to correctly monitor and record mud return and fill volumes while tripping in/out to recognize warning signs for well control issues.											0					
				●	Explain efficient tripping speeds in open hole and when bit/ stab go through BOPs.											0					
				●	Explain how to monitor and record mud return and fill volumes while tripping in/out to recognize warning signs for well control issues.											0					

Annex-13 : Competency Table: – Toolpusher 5/20

Position:			Toolpusher		Competency level required					Proficiency Scale					GAP	Individual Development Plan
					Required Score					Actual Score						
No	Code	No	Functional competency	Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficient	Advanced Level	Expert Level		
51	DL	45	Vertical/Conventional Drilling: Drilling Program	● Explain how to plan and carry out all aspects of the client's well program.											0	
52	DL	47	Vertical/Conventional Drilling: Picking up drilling assembly	● Demonstrate the ability to caliper and measure the BHA.											0	
				● Demonstrate the method for strapping and counting the drill pipe.											0	
				● Explain the importance and how to caliper and measure the BHA.											0	
				● Explain the method for strapping and counting the drill pipe.											0	
53	DL	48	Vertical/Conventional Drilling: Trip in hole (TIH)	● Explain fluid displacement when TIH.											0	
				● Explain kick identification while TIH.											0	
				● Explain the importance of recognizing bridging conditions.											0	
				● Explain the importance of surge/swab hole conditions.											0	
				● Explain the procedure if a kick is detected during TIH.											0	
54	DL	49	Vertical/Conventional Drilling: Trip out of hole (TOH)	● Explain displacement as drilling assembly is pulled out of hole.											0	
				● Explain kick identification while TOH.											0	
				● Explain procedure if a kick is detected during TOH.											0	
55	DL	50	Vertical/Conventional Drilling: Underbalanced Drilling	● Demonstrate how to maintain equivalent circulating density (ECD) during underbalanced drilling.											0	
				● Explain additional instrumentation used during underbalanced drilling.											0	
				● Explain pit volumes and flow characteristics.											0	
				● Explain the use of rotating control device (RCD).											0	
				● Explain the well control procedures and process during underbalanced drilling.											0	
56	DL	51	Well Control: Riser/Diverter/ BOP (Run & Retrieve)	● Demonstrate how to install new wellhead gaskets.											0	
				● Explain how to identify ring gaskets in relation to BOP flanges.											0	
				● Explain how to install new wellhead gaskets.											0	
				● Explain the different phases of nippling up BOP and diverter based on hole section.											0	
57	DL	52	Well Control: Diverting	● Explain how to pump either kill mud or water.											0	
				● Explain the importance of operating the diverter.											0	
58	DL	53	Well Control: Management Well Control Systems	● Demonstrate function test of the BOP.											0	
				● Explain BOP components, their functions and their limitations.											0	
				● Explain the normal line up of BOP valves, Hydraulic chokes, Choke manifold and degasser in accordance to the well program.											0	
59	DL	54	Well Control: Well Integrity And Well Control	● Demonstrate how to take SPR's, complete kill sheet and take accurate and correct SIDPP and SICP gauge readings.											0	
				● Explain how to take SPR's, complete kill sheet and take accurate and correct SIDPP and SICP gauge readings.											0	
				● Explain the different methods for shutting the well and the killing procedures.											0	
				● Explan how to recognize influx and shut in well.											0	
60	DL	55	Unconventional Drilling: Air Drilling	● Explain instrumentation used during air drilling.											0	
				● Explain rig up of low pressure air system into high pressure mud system.											0	
				● Explain the differences between mud drilling and air drilling.											0	
				● Explain the function of blooie line and how to secure.											0	
				● Explain the importance of an igniter at the end of a blooie line.											0	
				● Explain the pressure differential between input air and return air.											0	
				● Explain the use of rotating control device (RCD).											0	
61	DL	56	Unconventional Drilling: Coring	● Explain pick up and lay down procedures of the core barrel.											0	
				● Explain the differences between conventional coring and sidewall coring.											0	
				● Explain the hazards when retrieving cores.											0	
				● Explain the relationship of the outer and inner barrels for coring.											0	

Annex-13 : Competency Table: – Toolpusher 6/20

Position: Toolpusher

No	Code	No	Functional competency	Description of competency	Competency level required / Required Score: Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Proficiency Scale / Actual Score: Awareness	Application	Career Proficient	Advanced Level	Expert Level	GAP	Individual Development Plan
62	DL	57	Directional Drilling: Mechanical Survey Tools	● Explain the application for Teledrift type drift indicators.											0	
				● Explain the application for Totco type drift indicators.											0	
63	DL	58	Directional Drilling: Magnetic Survey Tools	● Explain the application for Multi-shot film.											0	
	DL	58	Directional Drilling: Magnetic Survey Tools	● Explain the application for Single shot film.											0	
64	DL	59	Directional Drilling: Gyroscopic Survey Tools	● Explain how information travels from the MWD to the surface to the computer system.											0	
				● Explain the application for Electronic single and multi-shot instruments.											0	
				● Explain the application for Magnetic and gyroscopic MWD surveys.											0	
				● Explain the application for Multi-shot.											0	
				● Explain the application for Single shot.											0	
				● Explain the MWD components.											0	
				● Explain the purpose and positioning of Non-magnetic drill collars and the BHA.											0	
65	DL	60	Directional Drilling: Wellbore Surveying and Record Keeping	● Demonstrate ability to solve problems associated with running a survey.											0	
				● Demonstrate application of the above.											0	
				● Demonstrate how to run a survey.											0	
				● Differentiate when survey data may be considered valid or invalid.											0	
				● Explain general practices to take to prevent survey data discrepencies.											0	
				● Explain problems associated with survey data.											0	
				● Explain the application for elements of a directional survey.											0	
				● Explain the concepts dogleg and how dogleg severity affects the wellbore.											0	
66	DL	61	Directional Drilling: Directional Plots and Drilling Parameters	● Drilling Parameters & Directional Drilling: Explain hydraulics with and without downhole motors.											0	
				● Drilling Parameters & Directional Drilling: Explain mechanical limitations of downhole motors.											0	
				● Drilling Parameters & Directional Drilling: Explain rotary speed limitations.											0	
				● Drilling Parameters & Directional Drilling: Explain solids control and oil-based mud (OBM) considerations.											0	
				● Drilling Parameters & Directional Drilling: Explain weight on bit (WOB) considerations.											0	
				● Elements of the Directional Plot: Explain the intent/importance of plot details.											0	
				● Elements of the Directional Plot: Explain the plan view.											0	
				● Elements of the Directional Plot: Explain vertical section view.											0	
				● Elements of the Directional Plot: Explain wellpath and site legend details.											0	
67	DL	62	Directional Drilling: Motor Theory and Operations	● Explain chemical and fluid slide enhancement.											0	
				● Explain factors affecting slideability.											0	
				● Explain how a PDM (positive displacement motor) works and major mechanical assemblies.											0	
				● Explain micro doglegs and ledging when drilling with motors.											0	
				● Explain motor operating procedures and parameters.											0	
				● Explain reactive torque such as hole conditions and drill string design.											0	
				● Explain stabilizer use and effect on build rates.											0	
				● Identify & Explain bearing and housing types.											0	
68	DL	63	Directional Drilling: Hole Cleaning and Cuttings Transport in Horizontal Wells	● Explain clean up cycles.											0	
				● Explain helical cuttings path hole cleaning model in horizontal wells.											0	
				● Explain LGS (low gravity solids) and solids control considerations.											0	
69	DL	66	Hoisting/Rig Floor: Derrick Climbing Systems	● Demonstrate how to use equipment associated with personnel climbing systems (rig specific).											0	
				● Explain how to inspect equipment associated with personnel climbing systems.											0	
70	DL	70	Hoisting/Rig Floor: Manriding Winches & Belts	● Demonstrate correct hand signals associated with operating manriding winch.											0	
				● Demonstrate how to inspect manriding winch.											0	
				● Demonstrate how to inspect, wear & fasten manriding belt.											0	

Annex-13 : Competency Table: – Toolpusher 7/20

Position:			Toolpusher			Competency level required					Proficiency Scale					GAP	Individual Development Plan				
						Required Score					Actual Score										
No	Code	No	Functional competency		Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficien	Advanced Level	Expert Level						
71	DL	71	Hoisting/Rig Floor: Utility Winches	●	Demonstrate correct hand signals associated with operating utility winch.											0					
				●	Demonstrate how to safely operate and maintain utility winch.											0					
72	DL	72	Power Systems: Engine instrumentation	●	Explain the purpose of engine instrumentation.											0					
73	DL	73	Power Systems: Engine report and log book	●	Demostrate how to record engine gauge readings and maintain logs.											0					
				●	Explain the purpose of record keeping.											0					
74	DL	74	Power Systems: Engine fluids	●	Demonstrate how to check engines fluids levels and add as required.											0					
				●	Explain types of engine fluids and level requirements.											0					
75	DL	75	Power Systems: Engine fuel system	●	Demonstrate how to ensure pressure, filtation and line requirements will sustain engine operation.											0					
				●	Explain pressures, filtration, and line inspection.											0					
76	DL	76	Power Systems: Engine cooling system	●	Explain how to check engine coolant level.											0					
				●	Explain radiator and cooling fan inspection.											0					
77	DL	77	Power Systems: Engine air intake systems	●	Demonstate how to change air filters.											0					
				●	Explain how to inspect air filters and intake differential pressures.											0					
78	DL	78	Circulating Systems: Low Pressure Mud System	●	Demonstrate valve alignment to transfer mud and mix chemicals in each pit.											0					
				●	Explain the layout of the pits including valve locations.											0					
79	DL	79	Circulating Systems: High Pressure Mud System	●	Demonstrate how to change out expendables.											0					
				●	Demonstrate how to isolate the valves.											0					
				●	Demonstrate how to monitor mud pumps during operating.											0					
				●	Explain how to change out expendables.											0					
				●	Explain the purpose and operation of mud pumps.											0					
				●	Identify where valves are located.											0					
80	DL	80	Circulating Systems: Pulsation Dampener/Bladder	●	Demonstrate how to perform maintenance of a pulsation dampener.											0					
				●	Explain the operation and maintenance of a pulsation dampener.											0					
				●	Explain the purpose of a pulsation dampener.											0					
81	DL	81	Circulating Systems: Shale shakers	●	Demnostrate shale shaker maintenance.											0					
				●	Demonstrate how to adjust shaker screens.											0					
				●	Demonstrate how to change shaker screens.											0					
				●	Explain how to adjust shaker screens.											0					
				●	Explain how to change shaker screens.											0					
				●	Explain shale shaker maintenance.											0					
				●	Explain the purpose of a shale shaker.											0					
82	DL	82	Circulating Systems: Trip Tanks	●	Demonstrate how to line up trip tank valves for filling or monitoring the hole.											0					
				●	Explain how to line up trip tank valves for filling or monitoring the hole.											0					
				●	Explain the purpose of the trip tank.											0					
83	DL	83	Circulating Systems: Mud Saver Bucket	●	Demonstrate how to perform maintenance on the mud saver bucket.											0					
				●	Demonstrate how to use the mud saver bucket.											0					
				●	Explain the purpose of a mud saver bucket.											0					
				●	Explain when to use the mud saver bucket.											0					
84	DL	84	Rotating System: Master Bushings	●	Demonstrate how to identify wear of the master bushings.											0					
				●	Demonstrate how to perform maintenance of the master bushings.											0					
				●	Demonstrate how to pull and set master bushings.											0					
				●	Explain how to identify wear of the master bushings.											0					
				●	Explain how to perform maintenance of the master bushings.											0					
				●	Explain the purpose of the master bushings.											0					
85	DL	85	Rotating System: Rotary Table	●	Demonstrate the maintenance procedures for the rotary table.											0					
				●	Demonstrate the procedure for locking and working around.											0					
				●	Explain the maintenance procedures for the rotary table.											0					
				●	Explain the procedure for locking and working around.											0					
				●	Explain the purpose of the rotary table.											0					

Annex-13 : Competency Table: – Toolpusher 8/20

Position:			Toolpusher			Competency level required					Proficiency Scale					GAP	Individual Development Plan				
						Required Score					Actual Score										
No	Code	No	Functional competency		Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficien	Advanced Level	Expert Level						
86	DL	86	Well Control Equipment: BOP Handling Systems	●	Demonstrate proper sling application and attachment methods between lifting device and BOP equipment.											0					
				●	Explain JSA / Work Plan knowledge for each critical step.											0					
				●	Explain proper application and use of BOP handling systems.											0					
87	DL	87	Well Control Equipment: BOP Control System And Accumulator	●	Demonstrate how to connect the HCR valve, manual valve, coflex hose, for BOP and choke manifold.											0					
				●	Demonstrate how to connect the kill line and check valve as designed.											0					
				●	Demonstrate how to function test all BOP elements.											0					
				●	Demonstrate how to indentify that BOPE hydraulic lines meet OEM requirements and are connected and protected to ensure BOPE function as designed.											0					
				●	Demonstrate how to install the Driller's and remote BOP control panels and function test same.											0					
				●	Demonstrate that all valves and gauges are in good working condition and clearly marked as to their function.											0					
				●	Demonstrate that resevoir is filled to proper fluid level with proper fluid.											0					
				●	Demonstrate that the accumulator unit has the proper fluid volume capacity for the BOP application to which it is being connected.											0					
				●	Demonstrate that the BOP Control system and accumulator unit has the proper working pressure rating for the BOP equipment to be installed.											0					
				●	Explain accumulator unit fluid volume capacity as related to the BOP equipment to be installed.											0					
				●	Explain BOP Control system and accumulator unit working pressure rating as related to the BOP equipment to be installed.											0					
				●	Explain how to connect the HCR valve, manual valve, coflex hose, for BOP and choke manifold.											0					
				●	Explain how to function test all BOP elements.											0					
				●	Explain how to install the Driller's and remote BOP control panels and function test same.											0					
				●	Explain the designed arrangement foor kill line and check valve.											0					
				●	Explain the importance of the condition of valves and gauges and their identification.											0					
				●	Explain the requirements for BOPE hydraulic lines.											0					
88	DL	88	Well Control Equipment: BOP Preventers & Fail Safe Valves	●	Demonstrate how to install new ring and wellhead gaskets.											0					
				●	Demonstrate how to install bolt completely into the nut.											0					
				●	Demonstrate how to select and install the appropriate ring gaskets in all connections.											0					
				●	Demonstrate proper torque sequence to insure flange gap is even on all sides.											0					
				●	Demonstrate that all BOP components have been inspected and certified in accordance with OEM specifications.											0					
				●	Explain how to guide upper BOP sections onto lower sections.											0					
				●	Explain how to install new ring and wellhead gaskets.											0					
				●	Explain how to open the BOP doors and change pipe rams and blind rams.											0					
				●	Explain OEM specifications and certification for BOP components.											0					
				●	Explain the importance of always using new and appropriate ring gaskets in all connections.											0					
				●	Explain the importance of having the proper flange gap on all sides.											0					
				●	Explain the importance of why all bolts need to be engaged comletely into the nut.											0					
				●	Explain the proper assembly (stack-out) of all BOP components to be used per drilling program.											0					

Annex-13 : Competency Table: – Toolpusher 9/20

Position:			Toolpusher			Competency level required					Proficiency Scale					GAP	Individual Development Plan				
						Required Score					Actual Score										
No	Code	No	Functional competency		Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficien	Advanced Level	Expert Level						
89	DL	89	Well Control Equipment: BOP Testing Equipment	●	Demonstrate how to connect the test lines andsecure from test unit to BOP.											0					
				●	Demonstrate how to open the BOP doors and change rams.											0					
				●	Demonstrate that hydraulic lines are of proper pressure rating.											0					
				●	Demonstrate that the test unit is of adquate pressure rating to test the BOP.											0					
				●	Explain how to connect the test lines and secure from test unit to BOP.											0					
				●	Explain how to open the BOP doors and change rams.											0					
				●	Explain test unit pressure requirements in relation to BOP testing.											0					
				●	Explain the requirements for BOPE hydraulic lines.											0					
90	DL	90	Well Control Equipment: Full Opening Safety Valve, Kelly cock valve, IBOP	●	Demonstrate how to function test each valve.											0					
				●	Explain each tool, their function, storage position and location of each.											0					
				●	Explain the importance all wrenches for each safety valve are kept orderly and are readily available.											0					
				●	Explain the importance of inspecting valve connections in accordance with drill string requirements.											0					
91	DL	91	Well Control Equipment: Float Valve	●	Demonstrate how to visually inspect float valves for damage.											0					
				●	Demonstrate the installation of float valve in drill string.											0					
				●	Explain how to visually inspect float valves for damage.											0					
				●	Explain the installation of float valve in drill string.											0					
92	DL	92	Well Control Equipment: Diverter	●	Demonstrate a function test and operation of diverter and valves.											0					
				●	Demonstrate the ability to configuration all components in diverter system including flow lines, valves, and sizing for the application per the drilling program.											0					
				●	Explain a function test and operation of diverter and valves.											0					
				●	Explain the configuration of all components in diverter system including flow lines, valves, and sizing for the application per the drilling program.											0					
				●	Explain the purpose of a diverter system as opposed to a BOP.											0					
93	DL	93	Well Control Equipment: Wellhead Adaptor Spools and Risers	●	Demonstrate sizing and pressure rating of spools for wellhead and BOP equipment meet requirements of drilling program.											0					
				●	Demonstrate that flow lines are routed and secured at a location and distance to allow for flaring and/or fluid containment.											0					
				●	Explain flow lines routing and anchoring for flaring and/or fluid containment.											0					
				●	Explain sizing and pressure rating of spools for wellhead and BOP equipment per drilling program.											0					
94	DL	94	Well Control:Testing BOP: Pressure And Function Testing Of BOPs	●	Demonstrate how to ensure tool joint space out within the BOP are adequate and a vent open below the wellhead test plug is open.											0					
				●	Demonstrate that appropriate ring gaskets are used for each flange.											0					
				●	Demonstrate the test sequence of valves and BOP's including identifying leaks and how to correct them.											0					
				●	Explain how to identify ring gaskets in relation to BOP flanges.											0					
				●	Explain the test sequence of valves and BOP's including identifying leaks and how to correct them.											0					
				●	Explain tool joint placement (space out) within the BOP and the purpose of venting below the test plug.											0					

Annex-13 : Competency Table: – Toolpusher 10/20

Position:			Toolpusher			Competency level required					Proficiency Scale					GAP	Individual Development Plan				
						Required Score					Actual Score										
No	Code	No	Functional competency		Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficien	Advanced Level	Expert Level						
95	DL	95	Well Control:Testing BOP: Pressure And Function Testing Of BOPs Choke Manifold	●	Demonstrate how to function the valves to their fully open and closed positions and align for drilling operations.											0					
				●	Demonstrate how to lubricate valves with the high pressure grease.											0					
				●	Demonstrate how to test to rated pressures and durations and how to bleed off test pressure after test.											0					
				●	Explain how to test to rated pressures and durations and how to bleed off test pressure after test.											0					
				●	Explain how to function the valves to their fully open and closed positions and align for drilling operations.											0					
				●	Explain how to lubricate valves with the high pressure grease.											0					
96	DL	96	Well Control:Testing BOP: Pressure And Function Testing Of BOPs Kill and Chokeline Valves	●	Demonstrate how to function the valves to their fully open and closed positions and align for drilling operations.											0					
				●	Demonstrate how to lubricate valves with the high pressure grease.											0					
				●	Explain how to test to rated pressures and durations and how to bleed off test pressure after test.											0					
				●	Explain how to function the valves to their fully open and closed positions and align for drilling operations.											0					
				●	Explain how to lubricate valves with the high pressure grease.											0					
97	DL	97	Well Control:Testing BOP: Pressure And Function Testing Of BOPs Pressure Test Standpipe manifold	●	Demonstrate how to function the valves to their fully open and closed positions and align for drilling operations.											0					
				●	Demonstrate how to lubricate valves.											0					
				●	Demonstrate how to test to rated pressures and durations and how to bleed off test pressure after test.											0					
				●	Explain how to test to rated pressures and durations and how to bleed off test pressure after test.											0					
				●	Explain how to function the valves to their fully open and closed positions and align for drilling operations.											0					
				●	Explain how to lubricate valves.											0					
98	DL	103	Diesel pumps	●	Explain when the different types of closed loop mud cleaning equipment are used.											0					
				●	Demonstrate the use and maintenance of diesel pumps.											0					
				●	Explain the the importance of rig fuel filtering system.											0					
				●	Explain the use and maintenance of diesel pumps.											0					
99	DL	105	Centrifugal pumps	●	Demonstrate how to prime and maintain a centrifugal pump.											0					
				●	Explain how to prime and maintain a centrifugal pump.											0					
100	DL	106	Diaphram pumps	●	Demonstrate how to prime and maintain a diaphram pump.											0					
				●	Explain how to prime and maintain a diaphram pump.											0					
101	DL	107	Valve types	●	Demonstrate how to operate low pressure and high pressure valves.											0					
				●	Explain the different types of valves used in mud systems and where each type is applicable.											0					
102	DL	108	Rotary swivel	●	Explain what a rotary swivel is and when it is used.											0					
103	DL	112	Tubulars: Tubular care and maintenance	●	Demonstrate how to store and transport tubulars.											0					
				●	Demonstrate how to clean and inspect connections during drilling and tripping operations.											0					
				●	Explain how the slips and rotary bushing relate to the care of tubulars.											0					
				●	Explain how to break in new tool joints.											0					
				●	Explain how to clean and inspect connections during drilling and tripping operations.											0					
				●	Explain the different types of mechanical surface imperfections that should be monitored or prevented that could lead to failures.											0					
				●	Explain the importance of breaking in new tool joints.											0					
				●	Explain the importance of cleaning and inspection of tubular connections.											0					
				●	Explain the procedures for storing and transporting tubulars.											0					
				●	Explain why thread compound is used.											0					

Annex-13 : Competency Table: – Toolpusher 11/20

Position:			Toolpusher			Competency level required					Proficiency Scale					GAP	Individual Development Plan				
						Required Score					Actual Score										
No	Code	No	Functional competency		Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficien	Advanced Level	Expert Level						
104	DL	114	Tubulars: Make Up/ Break Out of Drilling Bits	●	Demonstrate how to apply the required torque for different thread connections on all tubular, subs and drill bits.											0					
				●	Explain torque requirements for different thread connections on all tubular, subs and drill bits.											0					
105	DL	115	Completions: Coiled Tubing (CT)	●	Explain the importance of ensuring why all surface equipment (BOP, coil tubing lines, etc.) must be tested.											0					
				●	Explain the possible consequence of coil tubing failure (bursts, whiplash, etc.).											0					
106	DL	116	Completions: Completions string	●	Demonstrate how to ensure tubing hanger lands appropriately on wellhead.											0					
				●	Demonstrate the correct running order of completion tubulars and correct space-out with seal assembly.											0					
				●	Explain the correct running order of completion tubulars and correct space-out with seal assembly.											0					
				●	Explain the differences between handling tubing vs. drill pipe.											0					
107	DL	118	Fishing Equipment	●	Demonstrate the ability to PU BHA assembly of fishing tools and run in hole.											0					
				●	Demostrate how to POOH with fish engaged.											0					
				●	Explain BHA assembly of fishing tools and knowledge of down-hole operations.											0					
				●	Explain the procedure and precautions when POOH with fish.											0					
108	DL	119	Forklift Operations	●	Demonstrate how to operate forklift.											0					
				●	Demonstrate the ability to perform rigging and determine lifting capacities for forklift.											0					
				●	Demonstrate the inspection and general maintenance procedure for a forklift.											0					
				●	Explain how to operate forklift.											0					
				●	Explain rigging and lift capacities for forklift.											0					
				●	Explain the inspection and general maintenance of forklift.											0					
109	DL	120	Cementing	●	Calculate strokes required to bump the cement plug while displacing with rig pump.											0					
				●	Explain the charactistics and importance of a proper cement job.											0					
				●	Monitor returns to surface and distinguish the difference between cement and drilling fluid.											0					
				●	Rig-up cementing lines and line up valves/ transfer mud to cementing unit.											0					
110	DL	121	Other Operations: Plug & Abandon Well	●	Demonstrate how to follow the plug and abandon program.											0					
				●	Demonstrate how to perform pressure testing after plug has cured.											0					
				●	Demonstrate tripping after cement plug is set in place.											0					
				●	Explain how to perform pressure testing after plug has cured.											0					
				●	Explain the plug and abandon program.											0					
				●	Explain tripping procedure after cement plug is set in place.											0					
111	DL	122	Other Operations: Drillstem Test	●	Demonstate the ability to perform drillstem test procedure and related operations.											0					
				●	Demonstrate how to make up and torque components of the drill stem test assembly.											0					
				●	Demonstrate safe tripping speeds and procedures in cased and open hole.											0					
				●	Explain how to make up and torque components of the drill stem test assembly.											0					
				●	Explain safe tripping speeds and procedures in cased and open hole.											0					
				●	Explain the drillstem test procedure and related operations.											0					
112	DL	123	Other Operations: Conductor and Casings	●	Demonstrate how to determine the back-up tong line is sized and installed correctly.											0					
				●	Demonstrate how to identify cross-threaded pipe.											0					
				●	Demonstrate how to stab casing.											0					
				●	Demonstrate visual inspection of casing threads for damage and cleanliness.											0					
				●	Explain how to determine the back-up tong line is sized and installed correctly.											0					
				●	Explain how to identify cross-threaded pipe.											0					
				●	Explain how to stab casing.											0					
				●	Explain visual inspection of casing threads for damage and cleanliness.											0					

Annex-13 : Competency Table: – Toolpusher 12/20

Position:			Toolpusher		Competency level required					Proficiency Scale					GAP	Individual Development Plan
					Required Score					Actual Score						
No	Code	No	Functional competency	Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficient	Advanced Level	Expert Level		
113	DL	124	Other Operations: Casing Stabbing Board	● Demonstrate how to rig up and postition stabbing board.											0	
				● Explain how to rig up and position stabbing board.											0	
114	DL	125	Other Operations: Logging	● Demonstate how to rig up the wireline sheaves, (in mast and V-door).											0	
				● Demonstrate how to monitor well conditions during logging operation.											0	
				● Demonstrate how to rig up packoff/lubricator assembly.											0	
				● Explain how to monitor well conditions during logging operation.											0	
				● Explain how to rig up the wireline sheaves, (in mast and V-door).											0	
				● Explain the procedure for rigging up packoff assembly.											0	
				● Explain well control shut in during wireline logging depending on type and length of packoff/lubricator assembly being used.											0	
115	DL	126	Other Operations: Mud Characteristics	● Demonstrate how to maintain correct mud properties mixing chemicals to mud as instructed by mud engineer.											0	
				● Demonstrate how to manage aerated or if it is gas-cut mud.											0	
				● Demonstrate how to monitor solids control equipment.											0	
				● Demonstrate how to record mud weight, viscosity, and volumes.											0	
				● Demonstrate the mixing of chemicals required for the operation.											0	
				● Explain how to identify if mud is aerated or if it is gas-cut.											0	
				● Explain how to record mud weight, viscosity, and volumes.											0	
				● Explain how to utilize the different solids control equipment for mud filtration.											0	
				● Explain the basic chemicals needed for the operation.											0	
				● Explain the characteristics of drilling fluids & their purpose.											0	
				● Explain the importance of communicating mud properties and all fluid changes to rig personnel.											0	
116	DL	127	Other Operations: Mud Transfer	● Demonstrate how to line up valves, hoses and hard piping for the mud system transfers.											0	
				● Demonstrate how to notify personnel of transfers, monitor mud volume sensors and re-set once completed.											0	
				● Explain the importance of communicating fluid transfers and resetting PVT system.											0	
				● Explain the process for mud system transfers.											0	
117	DL	128	Other Operations: Drill Water System	● Demonstate how to maintain adequate drill water.											0	
				● Explain the importance of maintaining adequate water volume for drilling operations.											0	
118	QHSE	01	Induction (Post Hire Corporate and Unit Specific)	● Demonstrate immediate response during coordinated drills (Including your assigned Muster Station(s) and location of your Lifeboat(s) (if applicable).											0	
				● Explain assigned roles and responsibilities according to the Emergency Response Plans or Station Bill.											0	
				● Explain the general duties of the Unit/Crew specific positions.											0	
				● Explain your company's position in regard to compliance with regulatory requirements (for applicable position).											0	
				● Explain your Company's specific Short Service Employee program (if applicable).											0	
				● Identify and explain the various components of the Rig or Unit.											0	
				● Provide evidence of completion of the Corporate and Unit Specific Induction/Orientation course.											0	
119	QHSE	04	Quality, Health, Safety, Environment and Security (QHSES) Policy	● Describe your role and responsibilities in order to comply with company's QHSES policies.											0	
				● Explain good housekeeping practices and personal hygiene practices in accordance with company policies.											0	
				● Explain the company's QHSES policies (as applicable).											0	
				● Explain the objectives and the importance of active participation in the various meetings held onsite/onboard (Induction meeting, Pre-shift meeting, Weekly safety meeting, Risk Assessment/Pre-job meeting).											0	

Annex-13 : Competency Table: – Toolpusher 13/20

Position:			Toolpusher			Competency level required					Proficiency Scale					GAP	Individual Development Plan				
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No	Code	No	Functional competency		Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficien	Advanced Level	Expert Level						
120	QHSE	04	Quality, Health, Safety, Environment and Security (QHSES) Policy	●	Identify where you would find the company QHSES Policies.											0					
121	QHSE	05	HSE Local Regulations and Relevant International Standards	●	Explain the local HSE regulations (Standards, laws and regulations that apply to occupational health and safety).											0					
122	QHSE	06	Quality Safety & Management System	●	Demonstrate the ability to navigate the company specific Quality Safety & Management System.											0					
123	QHSE	07	Station Bill/Emergency Response Plan and Emergency Drills	●	Demonstrate the ability to perform the assigned duties as per the station bill/emergency response plan.											0					
				●	Demonstrate the correct donning, doffing and stowing of emergency PPE.											0					
				●	Describe all the emergency alarm sounds as well as the respective actions to take (H2S, Well Control, Fire Alarm, Abandon Alarm, Gas Alarm, Man overboard Alarm, Loss of Station Position etc).											0					
				●	Describe and identify the location of your muster point(s).											0					
				●	Describe the process to search and rescue personnel unaccounted for in an emergency situation.											0					
				●	Identify the various site specific emergency equipment (Portable fire extinguishers, fixed fire systems such as CO2, Life Boat, Life Raft, Rescue Boat, Escape Ladder etc).											0					
124	QHSE	08	Emergency Preparedness and Response	●	Demonstrate the assigned duties to be carried out during various emergencies/drills (for example: Fire Drill, Abandon Drill, Gas Drill, Man Overboard Drill, Man Down, Stability Drill, Well Control Drill, SOPEP Drill, Helpdesk Fire Drill, Blackout Drill).											0					
				●	Demonstrate the proper recording and completion of all emergency response training and drills.											0					
				●	Describe and identify the escape routes, markings, signage systems and lighting systems as applicable.											0					
				●	Describe and identify the location of all emergency alarm actuators.											0					
				●	Describe how to react to well control situations and how often well control drills are conducted.											0					
				●	Describe the rig (unit) emergency response abandonment and notification procedures.											0					
				●	Explain the assigned duties to be carried out during various emergencies/drills (for example: Fire Drill, Abandon Drill, Gas Drill, Man Overboard Drill, Man Down, Stability Drill, Well Control Drill, SOPEP Drill, Helpdesk Fire Drill, Blackout Drill).											0					
				●	Explain the oil spill emergency plan(s) (Shipboard Oil Pollution Emergency Plan/Spill Prevention Control and Countermeasures Plan).											0					
				●	Explain the site specific emergency responses, exercises and training plans for all major hazardous situations.											0					

Annex-13 : Competency Table: – Toolpusher 14/20

Position:			Toolpusher			Competency level required					Proficiency Scale					GAP	Individual Development Plan				
						Required Score					Actual Score										
No	Code	No	Functional competency		Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficien	Advanced Level	Expert Level						
125	QHSE	09	Risk Assessments (RA)	●	Demonstrate the ability to verify that risk control measurements are implemented and demonstrate how to assess their effectiveness.											0					
				●	Describe and demonstrate how safety critical equipment is tested and maintained.											0					
				●	Describe how simultaneous operations (SIMOPS) are managed to ensure that risk control procedures are in place during the execution of related activities.											0					
				●	Describe the operational boundaries and performance standards of the safety critical equipment.											0					
				●	Describe the potential hazards on site and provide examples of what could trigger them and what could be their associated consequences.											0					
				●	Describe the process by which potential or unforeseen risks are communicated to management and affected employees.											0					
				●	Describe the process to systematically identify, evaluate, select and implement risk reducing controls.											0					
				●	Describe the roles and responsibilities of personnel participating in the risk assessment process.											0					
				●	Describe the site specific risk assessment process.											0					
				●	Explain adverse environmental conditions by which the unit should not operate and the alerting systems available on site.											0					
				●	Explain and demonstrate how to stop and secure work or tasks in case of any unforeseen or unplanned changes or hazards, and how to further assess risks associated with these changes or hazards.											0					
				●	Explain how the interaction of major hazards within your unit has been considered during normal or simultaneous operations.											0					
				●	Explain how to apply the hazard recognition and risk assessment techniques and the ability to implement risk mitigation measurements and controls.											0					
				●	Explain the maintenance and control of risk assessment documents.											0					
				●	Explain when/if operations can continue when risk associated with simultaneous operations, inadequate equipment or lack of personnel are present.											0					
				●	Identify and describe the safety critical equipment on site.											0					
126	QHSE	11	Behavioral Based Safety System (BBSS)	●	Demonstrate the corrective action/feedback process in the BBSS program for an observed unsafe action/behavior.											0					
				●	Demonstrate the process to record and track non conformities from BBSS Observations.											0					
				●	Describe the difference between an unsafe action/behavior and an unsafe condition.											0					
				●	Describe the importance of reviewing past BBSS observations and behaviors at safety meetings.											0					
				●	Describe your role in the BBSS.											0					
				●	Explain the company's BBSS.											0					
				●	Demonstrate the ability to secure the current work area or operation before evacuating during an emergency or drill.											0					
127	QHSE	12	General Housekeeping/Orderliness	●	Demonstrates ability to ensure that the work area is clean and orderly, prior to and upon completion of the work, task or repairs.											0					
				●	Demonstrates ability to maintain and inspect hand and power tools in operationally safe condition, without any unauthorized modifications.											0					
				●	Explain the hazards associated with using defective or modified hand or power tools.											0					
				●	Explain the importance of closing out hazardous work activities before evacuating the area for an emergency or drill.											0					
				●	Explain the importance of good housekeeping practices in the work areas and living quarters.											0					
				●	Explain why it is important to keep tools put away and the work place clean in case of an emergency.											0					
				●	Explain your role in the housekeeping practices in the work areas and living quarters.											0					
				●	Demonstrate cleaning and organizing the work area upon completion of the work, task, or repairs.											0					
				●	Explain procedures personnel should follow if they observe worksite and water pollutants during lifting operations.											0					

Annex-13 : Competency Table: – Toolpusher 15/20

Position:			Toolpusher			Competency level required					Proficiency Scale					GAP	Individual Development Plan				
						Required Score					Actual Score										
No	Code	No	Functional competency		Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficien	Advanced Level	Expert Level						
128	QHSE	13	Environmental Management Plan	●	Describe the company Environmental Management Plan (EMP).											0					
				●	Describe the location specific sensitivities of the receiving environment.											0					
				●	Describe the process for handling or discharging cuttings.											0					
				●	Describe the process for maintaining environmental discharge or emission records and their location.											0					
				●	Describe the process for monitoring discharges and emissions.											0					
129	QHSE	14	Ship Oil Pollution Emergency Plan (SOPEP)	●	Describe the spill kit contents and how to use them.											0					
130	QHSE	15	Spill Prevention Control and Countermeasures Plan (SPCC)	●	Describe the rig specific SPCC plan procedures to follow in case of a spill.											0					
				●	Demonstrate the ability to locate the SPCC Plan.											0					
				●	Demonstrate the ability to locate the Spill kit.											0					
				●	Describe the SPCC inspection process for the location and equipment before spud in.											0					
				●	Describe the spill kit contents and how to use them.											0					
				●	Explain how the SPCC plan bridges to the operator's well site plan.											0					
				●	Explain the process or requirements of training on the SPCC elements.											0					
				●	Explain the reporting procedures in the event of a spill on or off the well site location.											0					
				●	Explain the SPCC containment system including the layout, need and maintenance.											0					
				●	Explain your role in a SPCC drill or an actual spill.											0					
131	QHSE	16	Waste Segregation	●	Describe the company waste management plan.											0					
				●	Describe the waste materials (either solid or liquid), and identify/categorize as one of the following: common waste, industrial waste, hazardous waste and recyclable materials.											0					
				●	Describe what materials should be placed into the waste containers and why they need to be segregated.											0					
				●	Explain the continuous improvement of waste handling on the unit/location.											0					
				●	Explain the waste containers provided for common waste, industrial waste, hazardous waste and recyclable materials.											0					
132	QHSE	17	Dropped Objects Prevention	●	Describe the hazards associated while work is being conducted overhead.											0					
				●	Describe the main hazard areas/zones where dropped objects may occur.											0					
				●	Explain how potential dropped objects are identified and how they should be reported.											0					
				●	Explain how the restricted areas/zones are enforced.											0					
				●	Explain precautionary measures required to avoid causing dropped objects and to protect personnel from those potential hazards.											0					
				●	Explain the importance of a daily/weekly/monthly/annual dropped objects prevention inspection program.											0					
				●	Explain why access should be restricted to all known dropped object areas/zones.											0					
133	QHSE	19	Fall Protection	●	Demonstrate the ability to find the fall arrest or restraint gear/equipment's information tag.											0					
				●	Demonstrate the ability to select the proper size and type as well as the donning of, and correct usage, of fall arrest gear.											0					
				●	Demonstrate transferring from one location to another while maintaining 100 percent tie off while working at heights.											0					
				●	Describe the difference between fall arrest and fall restraint.											0					
				●	Describe the emergency equipment and procedures (rescue plan) when rescuing someone at heights.											0					
				●	Describe the general requirements of the fall protection.											0					
				●	Describe the limitations and the common misuse of fall arrest and restraint equipment.											0					
				●	Describe the management of defective fall arrest equipment.											0					
				●	Describe the proper maintenance, cleaning, inspection (including documentation) and storage of fall arrest equipment.											0					
				●	Describe the proper use of ladders (fixed and portable) or scaffolds.											0					
				●	Describe the proper work procedures and communication using fall protection while working in an aerial lift platform (man-lift/work basket).											0					
				●	Describe the types of fall protection and fall arrest gear/equipment and how it is used.											0					
				●	Explain the different types of fall protection and fall arrest systems and how each of them work.											0					
				●	Explain the importance of maintaining the proper overhead anchorage point.											0					

Annex-13 : Competency Table: – Toolpusher 16/20

Position:			Toolpusher			Competency level required					Proficiency Scale					GAP	Individual Development Plan				
						Required Score					Actual Score										
No	Code	No	Functional competency		Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficien	Advanced Level	Expert Level						
134	QHSE	20	Safe Use Of Lifting Equipment	●	Explain who is authorized to operate lifting equipment.											0					
				●	Demonstrate proper hand and body placement when attaching the rigging to a load.											0					
				●	Demonstrate the ability to properly operate lifting equipment.											0					
				●	Demonstrate the ability to select the correct lifting equipment for the task at hand.											0					
				●	Demonstrate the proper use of tag lines attached to loads including proper positioning.											0					
				●	Demonstrate the verbal communications and hand signals used in lifting operations.											0					
				●	Describe the basic work sequence/policy and precautions that must be in place prior to making a critical lift.											0					
				●	Describe the lifting equipment available on location.											0					
				●	Describe the maintenance, storage and inspection of all lifting equipment (rigging/slings/shackles, etc.).											0					
				●	Describe the proper installation and rigging of all permanent and temporary lifting points (anchor points, pad eyes, etc.).											0					
				●	Describe the proper use of tag lines attached to loads including proper positioning and quantity.											0					
				●	Describe the verbal communications and hand signals used in lifting operations.											0					
				●	Explain proper hand and body placement when attaching the rigging to a load.											0					
				●	Explain the importance of a spotter during blind lifting operations.											0					
				●	Explain the minimum number of personnel and special precautions to be used during critical lifting operations.											0					
				●	Explain the pre-lift plan and inspections process.											0					
				●	Explain the responsibilities of a rigger (banksman).											0					
				●	Explain what constitutes a critical lift.											0					
135	QHSE	21	Lifting of Personnel	●	Demonstrate the ability to properly utilize personnel lifting equipment.											0					
				●	Demonstrate the ability to select the proper personnel lifting equipment/device.											0					
				●	Demonstrate the inspection of personnel lifting equipment.											0					
				●	Describe safety precautions necessary for the use of personnel lifting devices.											0					
				●	Explain conditions, authority, and hand signals necessary to stop personnel lifting operations.											0					
				●	Explain the importance of using load balance, weight tolerances, and environmental conditions before and during personnel transfer.											0					
				●	Explain the inspection of equipment necessary for lifting of personnel.											0					
				●	Explain the precautions and pre-lift requirements before personnel are transferred or lifted.											0					
136	QHSE	22	Crane Safety	●	Describe the maintenance, storage and inspection of all lifting equipment (rigging/slings/shackles, etc.).											0					
137	QHSE	23	Use and maintenance of utility winch	●	Demonstrate rigging practices for safe lifting and movement of tubulars and irregular shaped equipment/materials.											0					
				●	Demonstrate the hand signals used during winch operations.											0					
				●	Demonstrate the operation of a utility winch.											0					
				●	Describe the operational and safety responsibilities of a winch operator.											0					
				●	Describe the specific locations where utility winches are installed on the unit.											0					
				●	Explain rigging practices for safe lifting and movement of tubulars and irregular shaped equipment/materials.											0					
				●	Explain the capacity and limitations of utility winches.											0					
				●	Explain the pre-use inspection steps required before operating a utility winch.											0					
				●	Explain the required maintenance for a utility winch and accessories.											0					

Annex-13 : Competency Table: – Toolpusher 17/20

Position:			Toolpusher			Competency level required					Proficiency Scale					GAP	Individual Development Plan				
						Required Score					Actual Score										
No	Code	No	Functional competency		Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficien	Advanced Level	Expert Level						
138	QHSE	25	Accident/Incident Investigation	●	Describe the company policy on determining the actual and potential risk of an incident or near miss.											0					
				●	Explain the company's policies/procedures for reporting an incident resulting in personal injury, equipment damage, a near miss or any potential hazard.											0					
				●	Explain the importance of active participation in an incident investigation.											0					
				●	Explain the importance of following up and closing corrective actions.											0					
				●	Explain the processes used to identify incident causes.											0					
				●	Explain what a corrective action is and why it is being implemented.											0					
				●	Explain why facts are important to an incident investigation.											0					
139	QHSE	26	Chemical Handling & SDS (MSDS) (GHS)	●	Demonstrate selection and correct use of PPE when handling chemicals in accordance with the SDS.											0					
				●	Describe appropriate actions necessary in the event of exposure/contact with chemicals or spill.											0					
				●	Describe the health and environmental risks associated with chemicals used at the work site.											0					
				●	Describe the information contained in a SDS.											0					
				●	Describe the storage and segregation process for chemicals.											0					
				●	Explain the minimum requirements for labeling, documentation and packing of chemicals.											0					
				●	Explain what NORM is, where NORM occurs and explain the precautions to be taken to prevent exposure.											0					
				●	Explain where Safety Data Sheets (SDS) are located.											0					
140	QHSE	27	Equipment Safety	●	Describe and give examples of various equipment guards and their purpose.											0					
				●	Explain the hazards and precautions of working around moving (dynamic) equipment.											0					
				●	Explain the hazards and precautions of working around rotating equipment.											0					
				●	Explain the hazards and precautions to take when working with or near low or high pressurized equipment.											0					
				●	Explain the importance of ensuring that proper fittings (hammer unions/quick connect/hydraulic fittings) are being used in piping, hoses and equipment.											0					
141	QHSE	29	Personal Protective Equipment (PPE)	●	Demonstrate the proper selection and usage (donning/doffing) of PPE.											0					
				●	Describe different types of PPE, appropriate selection, proper usage and its limitations for various work tasks.											0					
				●	Describe the proper maintenance/care and storage of PPE in accordance with the manufacturer's instructions.											0					
				●	Explain your responsibility and the importance of wearing PPE that is appropriate for the work-task.											0					
142	QHSE	30	Manual Handling/Ergonomics/Posture	●	Demonstrate how to support a load when walking with various size loads.											0					
				●	Demonstrate the ergonomic posture to take when physically lifting and setting a load.											0					
				●	Describe when mechanical lifting is preferred to manual lifting and why.											0					
				●	Describe where the force is concentrated on the spine when improperly lifting or setting a load.											0					
				●	Explain the company's policy and procedures on the manual handling/lifting of materials.											0					
				●	Explain the importance of planning your path of movement prior to lifting and carrying a load.											0					
				●	Explain the proper manual lifting or setting techniques to prevent back injuries as well as the benefits of using mechanical lifting devices.											0					
				●	Explain the value of manually "testing a load" before attempting to lift the load.											0					

Annex-13 : Competency Table: – Toolpusher 18/20

Position:			Toolpusher			Competency level required					Proficiency Scale					GAP	Individual Development Plan				
						Required Score					Actual Score										
No	Code	No	Functional competency		Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficien	Advanced Level	Expert Level						
143	QHSE	31	Confined Space Entry	●	Describe what constitutes a confined space entry.											0					
				●	Explain how environmental conditions can negatively impact working in a confined space.											0					
				●	Explain the company's policy on confined space entry.											0					
				●	Explain the hazards associated with a confined space.											0					
				●	Explain the importance of using atmospheric monitoring equipment in a confined space.											0					
				●	Explain the procedures to take before entering a confined space.											0					
				●	Explain the procedures to take upon entering a confined space.											0					
				●	Explain the required PPE needed when working in a confined space.											0					
				●	Explain what a competent person is in the context of regulatory standards covering confined space entry.											0					
				●	Explain what a qualified person is in the context of regulatory standards covering confined space entry.											0					
				●	Explain what and how to identify a confined space and give some examples on your worksite.											0					
				●	Explain why it is important to continually monitor the atmosphere of a confined space.											0					
				●	Explain your role and responsibility during a confined space rescue operation.											0					
144	QHSE	32	Severe Weather Conditions	●	Demonstrate the ability to recognize operational shut down point(s).											0					
				●	Describe actions to be taken to protect personnel during severe weather conditions.											0					
				●	Describe operations which may be impacted by severe weather and the actions taken to mitigate it.											0					
				●	Describe the process to restart operations after a severe weather event.											0					
				●	Describe the process to secure the unit, before evacuating, when a severe weather alert has been issued.											0					
				●	Explain the company's policy and procedures to follow during a severe weather threat.											0					
145	QHSE	33	Fire Prevention, Fire Fighting and Fire Control and Gas/Fire Detection Equipment	●	Demonstrate the use of portable fire extinguishers.											0					
				●	Describe the company's policies and procedures for fire prevention.											0					
				●	Describe the different types of portable fire extinguishers and their applications (Water, Carbon Dioxide and Dry Chemical).											0					
				●	Describe the engine shutdown procedure in the event of a gas release.											0					
				●	Describe the fire and gas detection systems, sensor locations and how they function.											0					
				●	Describe the fixed and/or portable systems used to detect the presence of Oxygen (O2), Hydrocarbon (HC) and Hydrogen Sulphide (H2S), etc											0					
				●	Describe the passive fire protection systems on the unit, including their location and rating.											0					
				●	Describe the process and documentation needed for inspecting and maintaining portable fire extinguishers.											0					
				●	Describe the process for inspecting, maintaining, testing and calibrating the fire and gas detection systems.											0					
				●	Describe the testing and regulatory requirements for portable fire extinguishers.											0					
				●	Describe the three elements to complete the fire triangle.											0					
				●	Describe the thresholds and the actions automatically initiated on detection of HC and/or H2S.											0					
				●	Explain the different levels of shutdown associated with the unit (if applicable).											0					
				●	Explain the rig/unit emergency action (response) plan for a fire event.											0					
				●	Explain the use of portable fire extinguishers.											0					
146	QHSE	34	Occupational Health Plan	●	Explain the process for monitoring occupational health exposures.											0					
				●	Explain the company occupational health protection plan.											0					
				●	Explain the exposures (noise, vibration, heat, etc) that are unacceptable.											0					
				●	Explain the process to identify, set, control and verify the exposure limits that could prevent potential acute and or chronic health hazards.											0					

Annex-13 : Competency Table: – Toolpusher 19/20

Position:			Toolpusher		
No	Code	No	Functional competency		Description of competency
147	QHSE	35	Simultaneous Operations	●	Describe management of change and why it is important when conducting SIMOPS operations.
				●	Describe what constitutes a SIMOPS Plan.
				●	Explain Stop Work Authority and who is responsible to initiate when a potential risk is present.
				●	Explain the elements of the SIMOPS Plan.
				●	Explain the summary of operational boundaries and the difference between proceed, proceed with caution and stop operations.
148	QHSE	36	Powered/Manual Tools	●	Describe your company's powered/manual tool policy.
				●	Explain the importance of inspection, maintenance and storage of powered/manual tools.
				●	Explain the importance of removing defective or altered powered/manual tools.
				●	Explain the importance of using the proper powered/manual tool for the task at hand.
				●	Explain the required PPE and safe procedures for operating powered/manual tools.

Competency level required					Proficiency Scale					GAP	Individual Development Plan				
Required Score					Actual Score										
Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficien	Advanced Level	Expert Level						
										0					
										0					
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Annex-13 : Competency Table: – Toolpusher 20/20

Position:			Toolpusher		Competency level required					Proficiency Scale					GAP	Individual Development Plan				
					Required Score					Actual Score										
No	Code	No	Functional competency	Description of competency	Awareness 1	Application 2	Career Proficient	Advanced Level	Expert Level	Awareness	Application	Career Proficien	Advanced Level	Expert Level						
149	RM	A1	Document Control	● Demonstrate how handover records are filed and maintained.											0					
				● Demonstrate the ability to accurately complete the IADC Daily Drilling Report.											0					
				● Demonstrate the ability to apply action items contained in the communication document (Alerts/Notifications/Best Practices) through closure.											0					
				● Demonstrate the ability to communicate to all current operations.											0					
				● Demonstrate the ability to complete a handover report, note and form.											0					
				● Demonstrate the ability to order, receive, distribute and track inventory.											0					
				● Demonstrate the ability to secure inventory items including dangerous goods for transportation.											0					
				● Demonstrate the ability to store inventory items including dangerous goods.											0					
				● Demonstrate the execution and application of a management of change request.											0					
				● Demonstrate the handover procedure.											0					
				● Describe the personnel involved in the development, implementation and maintenance of written policy and procedure standards.											0					
				● Describe where operational documentation is maintained.											0					
				● Explain how each business unit will utilize the quality and control system.											0					
				● Explain how written policy and procedure standards are implemented into the current workforce and new hire process.											0					
				● Explain the business units and personnel involved in developing the budget plan.											0					
				● Explain the business units and personnel that participate in the budget management plan.											0					
				● Explain the Company policy and procedure for the handover process.											0					
				● Explain the Company policy and procedures for the storage of inventory items including dangerous goods.											0					
				● Explain the Company policy and procedures for the transportation of inventory items Including dangerous goods.											0					
				● Explain the Company policy and procedures on operations and HSE communications.											0					
				● Explain the Company policy on documentation control.											0					
				● Explain the Company process for implementing and maintaining a bridging document.											0					
				● Explain the Company process for issuing, distributing and responding to communication documents (Alerts/Notifications/Best Practices).											0					
				● Explain the Company process for maintaining the daily drilling reports.											0					
				● Explain the Company process to ensure that all drawings, diagrams and procedures are current.											0					
				● Explain the Company's material inventory and parts list including the vendor's nomenclature (name) of the part.											0					
				● Explain the Company's policies and procedures for quality control.											0					
				● Explain the Company's policy and procedures for budget management.											0					
				● Explain the Company's policy and procedures on the completion of and distribution/filing of the IADC Daily Drilling Report.											0					
				● Explain the Company's process for the development of written policy and procedure standards.											0					
				● Explain the Company's quality and control procedures on the purchase or fabrication of equipment.											0					
				● Explain the Company's policy and procedures for inventory management.											0					
				● Explain the Company's policy for management of change.											0					
				● Explain the Company's procedure for document tracking and retention.											0					
				● Explain the Company's procedures for a management of change, including team member's roles and responsibilities.											0					
				● Explain the documentation control procedure and which personnel are involved in the filing of operational documentation.											0					
				● Explain the importance of accurately completing the IADC Daily Drilling Report.											0					
				● Explain the importance of effective document control.											0					
				● Explain the importance of ensuring that handover reports are understood and signed off by outgoing and incoming personnel.											0					
				● Explain the importance of following the budget plan.											0					
				● Explain the importance of handover reports.											0					
				● Explain the importance of operations and HSE communications throughout the Company.											0					
				● Explain the process of maintaining a daily and long term logistics plan.											0					
				● Explain what quality and control system is used by the Company.											0					
				● Explain who is responsible for completing the IADC Daily Drilling Report.											0					
				● Explain who is responsible for revising documentation and describe how to recognize the latest version.											0					
				● Explain who is responsible for updating the HSE policy and procedures and what is the process.											0					
				● Explain why proper review, approval and document control are essential parts of management of change requests.											0					
					Maximum Score		0			Actual Score		0			0					