COMPETENCY BASED FRAMEWORK FOR DRILLING ENGINEER

Version 1.0

Department of Geology & Mines
Ministry of Economic Affairs
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1. Background

1.1 About the Department

The Department of Geology and Mines (DGM) was established in April 1981 after the 43rd resolution of Lhengye Zhungtshog. Prior to the establishment of the DGM in April 1981, most of the geological mapping and mineral exploration activities in the country were undertaken by the Geological Survey of India (GSI) who continued their work simultaneously with the DGM until their exit in 2002. The geoscience and mining activities in the country are governed by Mineral Development Policy 2017, Mines and Minerals Management Act of the Kingdom of Bhutan 1995, and Rules, Regulations and Guidelines thereof. The Department is responsible for administration, management and regulation of scarce & equitable mineral resources of the country through a sustainable mining development framework.

1.2 Vision of the Department/Agency

To contribute to sustainable socio-economic development through geo-scientific studies and scientific management of mineral resources in the kingdom

1.3 Missions of the Department

1. To enable optimal exploitation of the mineral resource in a scientific manner compatible with the social and economic policy of the Royal Government and within the framework of sustainable development, protection of environment, mineral conservation and preservation of the country's precious religious and cultural heritage;
2. To provide input for national development and social welfare to the citizens of Bhutan by opening up venue for investment and employment;
3. To apply geo-scientific expertise in prevention and mitigation of natural disasters resulting from geological hazards, thus contributing to the welfare of all Bhutanese citizens leading to Gross National Happiness.

1.4 Core Values

1. Integrity
2. Teamwork
3. Professionalism
4. Innovation
5. Quality

1.5 **Core Functions**

a) Develop plan and estimate budget for drilling activities.
b) Develop and implement SoP, guidelines and manuals related to drilling.
c) Select and purchase of drilling equipment, tools and accessories.
d) Supervise the execution of drilling activities and services.
e) Review the cause and effect of site problems and its mitigation measures.
f) Monitor and evaluate once the drilling activities are completed.

1.6 **Organogram**

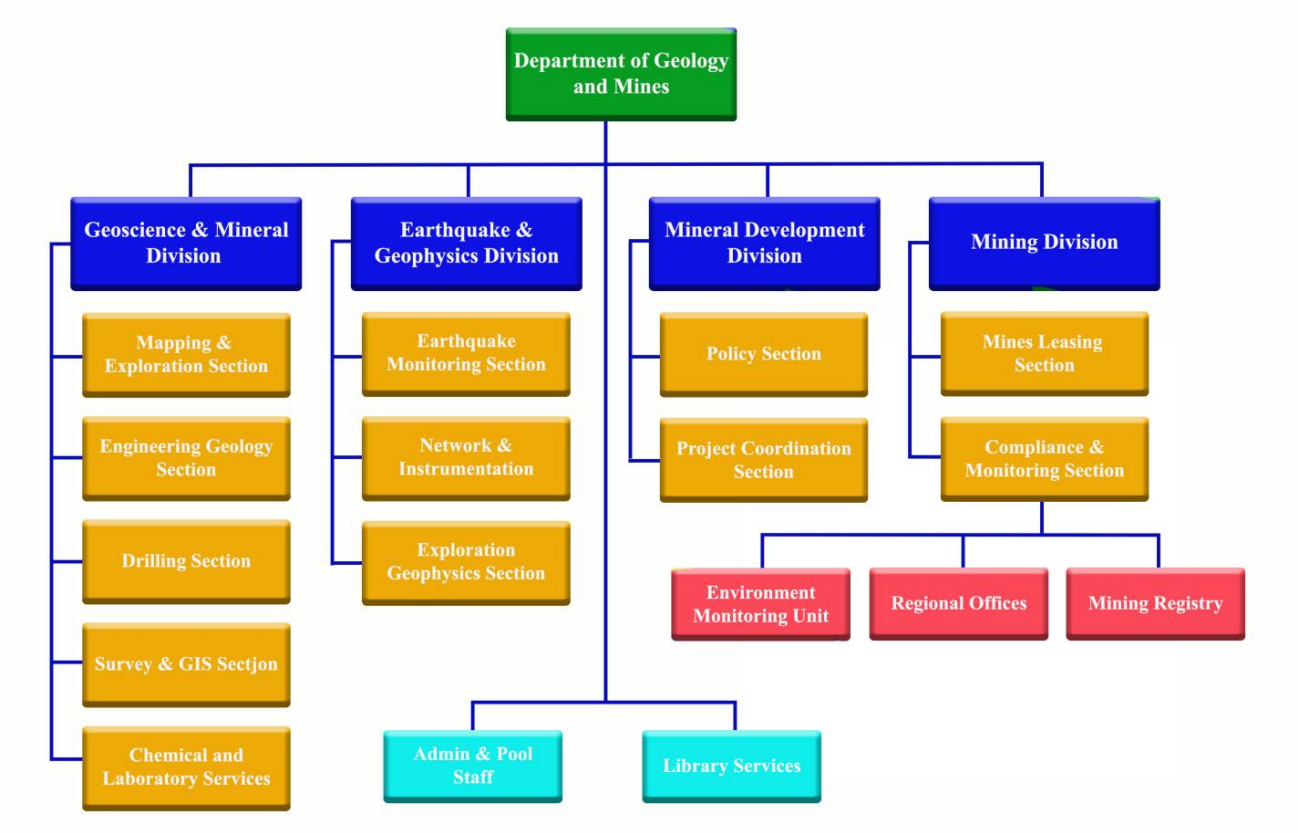

Figure 1. Organogram of DGM

2. Competency-Based Framework for Drilling Engineers

2.1 Introduction

The Royal Civil Service Commission (RCSC) has introduced Competency Based Framework (CBF) with the objective of enhancing service delivery of the civil servants through providing platform for desired professional development. In absence of a relevant framework to guide the professional development of the civil servants in the country, competency and efficiency at work place have always been a concern to realize the national goals and objectives. The RCSC has recognized the need to enhance service delivery of civil servants through professional and personal development which will have sustainable impact in the system. With introduction of CBF across all the major occupational groups, civil servants will be guided by the principles of knowledge, skills and ability and is expected to enhance performance and service delivery. The Competency Based Framework of the Drilling Engineer has been developed to enhance the capacity and competencies of the Drilling Engineer to improve the working efficiency and service delivery, in line with the Department's vision and mission and core values. Therefore, this Competency Based Framework is a living document and is subject to periodical review and improvement.

2.2 Purpose

The CBF highlights the knowledge, skills and abilities required for Drilling Engineer to achieve a high level of professional competence and deliver the highest standard services. The framework is developed with the following aim and objectives.

2.3 Aim

Build a fraternity of Drilling Engineer who are highly knowledgeable, skillful and competent in delivering efficient and effective services of the highest standard.

2.4 Objectives

1. Delineate clear roles and responsibilities.
2. Enhance professional development and strengthen the capacity by identifying the performance gaps and applying the competency development interventions.
3. Set a benchmark for recruitment.
4. Assess, maintain, and monitor the KSA.
5. Ensure continuous process of learning to optimize work performance.
6. Identify and develop talent for leadership positions in the future.

2.5 Framework Development Processes

The development of the framework involved identifying Role Profiles, Competency Areas, Key Competencies, Behavioral Indicators and Proficiency Levels through a rigorous, consultative and inclusive process with key stakeholders. The framework is endorsed by the 43rd

Departmental Human Resource Committee (DHRC) held on April 1, 2022, 411th Ministrial Human Resource Committee (MHRC) meeting of the Ministry of Economic Affairs held on April 8, 2022 and subsequently final endorsement of the document by RCSC its 139th Commission meeting held on May 17, 2022.

2.6 **Structure**

Brief explanation and diagrammatic overview of the CBF

The framework has identified clear key roles, competencies, and behavioral indicators of each proficiency level to achieve professional excellence. The framework comprises of 3 Key Roles identifying 9 Competency areas. The 9 Competency domains cascades into 12 Key Competencies supported by 22 Behavioral Indicators spreading over 4 Level of Proficiencies (Foundation, Intermediate, Experienced & Advanced levels).

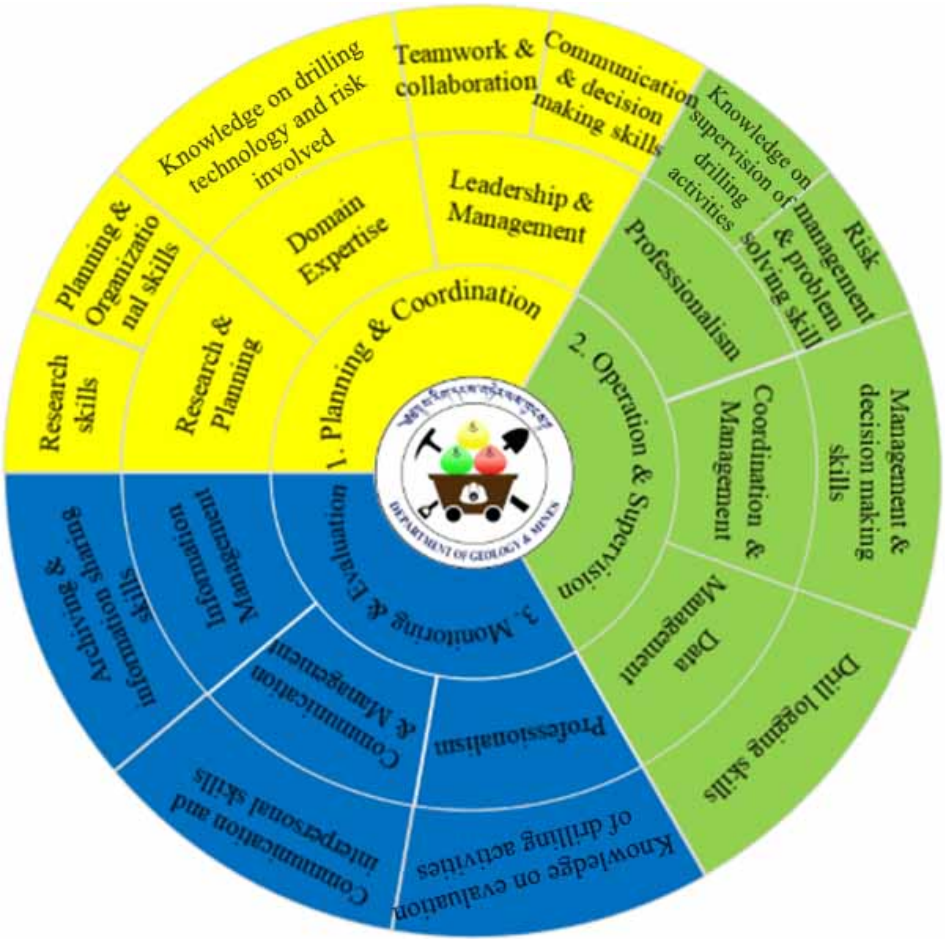

Figure 2. Diagrammatic overview of the CBF for Drilling Engineer

2.6.1 Identification of Key Role

The key role is an organized set of behaviors that are crucial to achieve the current and future goals of the Department of Geology and Mines. Following are the key roles expected to be performed by the Drilling Engineer:

a. Planning & Coordination
b. Operation & Supervision
c. Monitoring & Evaluation

2.6.1.1 Description of Role Profile

The role profile is the description of roles that Drilling Engineer are expected to demonstrate in achieving the outcomes of the Department of Geology and Mines. It defines outcomes and competencies for an individual role. It concentrates on outcomes rather than duties, which provides better guidance than a job description on expectations. It does not constrain Drilling Engineer to carry out a prescribed set of tasks.

Role Profile of Drilling Engineer

Table 1: Role profile of Drilling Engineer

SN	Key Role	Role Description
1	Planner & Coordinator	1. Plan and prepare drilling projects in consultation with the geologists and relevant stakeholders. 2. Prepare budget estimation for drilling activities. 3. Develop SoP, guidelines & manuals for operation of drilling machine and its allied operations. 4. Select and purchase equipment, tools & accessories. 5. Coordinate field activities with relevant stakeholders. 6. Mobilize manpower and machines to field. 7. Identify potential risks and prepare mitigation plans.
2	Operator & Supervisor	1. Execute drilling activities in consultation with the Geologists. 2. Manage operation and maintenance of machines and equipment in line with occupational health and safety guidelines. 3. Ensure safety. 4. Review the cause and effects of site problems and resolve. 5. Supervise proper handling and storage of cores until handed over to concerned officials. 6. Carries out compilation of information and data related to drilling activities.
3	Monitor & Evaluator	1. Monitor the clearing of camp site and drill sites once completed. 2. Conduct monitoring and documentation of equipment maintenance and servicing.

		3. Monitor, evaluate and prepare drilling report. 4. Sharing of drilling activity information. *5.* Monitor and evaluate risk mitigation plans. 6. Review and evaluate the drilling activities and suggest improvements.

2.6.2 Identification of Competency Areas

The competency area is the clustering of key competencies by related behavior and functions of each role. It comprises a set of Knowledge, Skills and Abilities (KSA) that result in essential behaviors expected from Drilling Engineer. The framework has identified 9 competency areas as follows:

Table 2: Key Role and Competency Areas

Role #	Key Role	Competency Area
1	Research & Coordination	1.1 Research and Planning
		1.2 Domain Expertise
		1.3 Leadership and Management
2	Operation & Supervision	2.1 Professionalism
		2.2 Coordination and management
		2.3 Data management
3	Monitoring & Evaluation	3.1 Professionalism
		3.2 Communication and Management
		3.3 Information management

2.6.3 Identification of Key Competencies

The key competency is an observable behavior that indicates the presence of the particular competency. Generally, it is broadly divided as core competency, leadership competency and technical or functional competency. The framework has identified 12 key competencies are presented as below: -

Table 3: Key Role, Competency Area and Key Competencies

SN	Key Role	Competency Area	Key Competencies
1	Planning & Coordination	1.1 Research and Planning	1.1.1 Research skills
			1.1.2 Planning and organizational skills
		1.2 Domain expertise	1.2.1 Knowledge on drilling technology and risk involved.
		1.3 Leadership and management	1.2.2 Teamwork and collaboration
			1.2.3 Communication and decision-making skills
2	Operation & Supervision	2.1 Professionalism	2.1.1 Knowledge on supervision of drilling activities
			2.1.2 Risk management and problem-solving skills
		2.2 Coordination and management	2.2.1 Management and decision-making skills
		2.3 Data management	2.3.1 Drill logging skills

3	Monitoring & Evaluation	3.1 Professionalism	3.1.1 Knowledge on evaluation of drilling activity.
		3.2 Communication and management	3.2.1 Communication and interpersonal skills
		3.3 Information management	3.3.1 Archiving and information sharing skills

2.6.4 Identification of Behavioral Indicators

The Behavioral Indicators is the description of competencies based on various proficiency levels. It outlines a collection of desired and observable motives, traits and behaviors when executing or carrying out the assigned task. It serves as a tool to guide evaluations of employee performance. The framework has identified 22 behavioral indicators.

Table 4: Behavior Indicators for the Key Roles.

Key Role 1: Planning and Coordination		
Competency Area	**Key Competency**	**Behavior Indicators (BIs)**
1.1 Research and Planning	1.1.1 Research skills	1.1.1.1 Possess sound research skill to select appropriate drilling technology and methods.
	1.1.2 Planning and Organizational skills	1.1.2.1 Demonstrate the ability to formulate and revise drilling SoP, guidelines and manuals.
		1.1.2.2 Ability to plan and estimate budgets for drilling projects and mobilize drilling team and equipment.
1.2 Domain Expertise	1.2.1 Knowledge on drilling technology and risk involved.	1.2.1.1 Possess adequate knowledge on drilling technology and accessories, inventory management and make required procurement.
		1.2.1.2 Demonstrate knowledge on suitable drilling methods based on geology and other requirement.
		1.2.1.3 Ability to foresee or identify risks, possess knowledge on assessment and mitigation of risk.
1.3 Leadership and Management	1.3.1 Teamwork and collaboration	1.3.1.1 Collaborates with geologists, drilling technicians and relevant stakeholders.
		1.3.1.2 Display team spirit, positive attitude and make appropriate decisions.
	1.3.2 Communication and decision-making	1.3.2.1 Demonstrate the ability to communicate and provide clear directions.

	skills.	
Key Role 2: Operation and Supervision		
2.1 Professionalism	2.1.1 Knowledge on supervision of drilling activities	2.1.1.1 Display knowledge and competency in supervision of drilling activities.
		2.1.1.2 Display ability to supervise the drilling activities as planned.
	2.1.2 Risk management and problem-solving skills	2.1.2.1 Ability to apply the mitigation measures to resolve the drilling issues.
		2.1.2.2 Ability to apply the Occupational Health and Safety (OHS).
2.2 Coordination and management	2.2.1 Management and decision-making skills	2.2.1.1 Display integrity, competence, emotional intelligence and ensure effective exchange of ideas and opinions.
		2.2.1.2 Demonstrate supervision for proper handling and storage of cores and handing over to geologists/concerned officials.
2.3 Data management	2.3.1 Drill logging skills	2.3.1.1 Ability to collect and maintain drilling log data.
Key Role 3: Monitoring and Evaluation		
3.1 Professionalism	3.1.1 Knowledge on evaluation of drilling activity.	3.1.1.1 Possess knowledge and competency to review drilling plan and determine way forward.
		3.1.1.2 Exhibit ability to prepare drilling report.
3.2 Communication and Management	3.2.1 Communication and interpersonal skills	3.2.1.1 Exhibits positive attitude and receptiveness to ensure effective exchange of views and knowledge for improvements.
		3.2.1.2 Ability to monitor and perform the site clean-up post drilling activity.
3.3 Information management	3.3.1 Archiving and information sharing skills	3.3.1.1 Able to store and share the drilling activity information.
		3.3.1.2 Possess ability to monitor and document the machine maintenance and servicing.

2.6.5 Classification of Proficiency Levels

The proficiency level is categorized based on the level of expertise. It describes the levels of a competency required to perform a specific job successfully. There is a progression of proficiencies at each level. The proficiency level of Drilling Engineer is categorized into four levels as;

i. Foundation (P4)
ii. Intermediate (P3)
iii. Experienced (P2)
iv. Advanced (P1)

The framework has identified 22 behavioral indicators across four levels of proficiency.

The proficiency will enable individual officials to distinguish the type of competencies expected in their career path, which will give them an opportunity to enhance competency in achieving current as well future career goals. Further, the proficiency level will set a benchmark for the recruitment and deployment. The proficiency levels of each key competency are detailed below:

Table 5: Number of Behavioral Indicators for the Proficiency Levels

Key Role 1: Planning & Coordination			
Competency Area: 1.1 Research and Planning			
Key Competency: 1.1.1 Research skills			
Behavior Indicator: 1. Possess sound research skill to select appropriate drilling technology and methods.			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**
Possess basic knowledge on research and understands the basic fundamental of drilling technology.	Able to perform basic research on appropriate drilling technology and able to identify the different methods, tools and accessories used.	Applies research skills in the exploring and understanding advance drilling technology. Select the best method for the particular field.	Provides guidance to undertake effective research and make decision on appropriate drilling technology. Understands on advance drilling technology
Key Competency: 1.1.2 Planning and organizational Skills			
Behavior Indicator: 1. Demonstrate the ability to formulate and revise drilling SoP, guidelines and manuals.			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**
Possess knowledge on the formulation of SoP, manuals and guideline.	Understands on the formulation SoP, manuals & guideline and provide input during revision.	Formulate and revise SoP, manuals and guidelines.	Guide the preparation and review of drilling SoP, manuals and guidelines.
Behavior Indicator: 2. Ability to plan and estimate budgets for drilling projects and mobilize drilling team and equipment.			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**
Assist in preparing budgets and mobilization.	Discuss and plan budgets and mobilization.	Provide input in the budget estimation and prepare field movement.	Finalization of budget estimation and field movement.
Competency Area 1.2 Domain Expertise			
Key Competency 1.2.1 Knowledge on drilling technology and risk involved.			
Behavior Indicator: 1. Possess knowledge on drilling technology and accessories, inventory management and make required procurement. 2. Demonstrate knowledge on suitable drilling methods based on geology and other requirement.			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**

Recognize the different machines and equipment, possess basic knowledge on inventory management and risks involved. Gain	Possess knowledge on the different drilling technology, accessories, basic geology and make requirements for procurement.	Know and recognize the different drilling technology and basic geology. Plan for procurement. Identify risks.	Possess knowledge on the advance drilling technologies, risks, and inventory management. Make required procurement. Review and take
Behavior Indicator: 3. Ability to foresee or identify risks, possess knowledge on assessment and mitigation of risk.			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**
Learn on the probable problems in drilling activity and how to mitigate it.	Possess some knowledge on the different problems faced and its mitigation measures.	Possess various knowledge on the issues faced in drilling activities, its assessment and the mitigation measures.	Possess knowledge on the different risks. Review the assessments and mitigation measures.
Competency Area 1.3 Leadership and Management			
Key Competency 1.3.1 Team work and collaboration.			
Behavior Indicator: 1. Collaborates with geologists, drilling technicians and relevant stakeholders. 2. Display team spirit, positive attitude and make appropriate decisions.			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**
Engages with stakeholders, take part in meeting and discussion, understand on appropriate decision making and sharing	Works collaboratively with team members, create team spirit and grasp inputs for good decisions.	Foster discussions and team spirit and provide information to make decisions.	Promote collaboration, forge team work, and take proper decisions.
Key Competency 1.3.2 Communication and decision making skills.			
Behavior Indicator: 1. Demonstrate the ability to communicate and provide clear directions.			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**
Maintain interpersonal relation, and understands importance of clear	Communicate, manage and involve the team members to participate in the discussion.	Initiate cooperation among the team members, and convey information.	Encourage exchange of ideas, effective communication and provide clear directions.
Key Role 2: Operation & Supervision			
Competency Area: 2.1 Professionalism			
Key Competency: 2.1.1 Knowledge on supervision of drilling activities			
Behavior Indicator: 1. Display knowledge and competency in supervision of drilling activities.			

2. Display ability to supervise the drilling activities as planned.			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**
Understands on drilling technology, display professionalism and supervise the drilling activities with guidance from senior	Know the different drilling technology, display competency and supervise as per activity plan independently.	Possess knowledge and skills on drilling technology. Supervise the activity independently while showcasing professionalism	Well versed in drilling technology. Supervise activity, initiate discussions and make decisions.
Key Competency: 2.1.2 Risk management and problem solving skills			
Behavior Indicator: 1. Ability to apply the mitigation measures to resolve the drilling issues. 2. Ability to apply the Occupational Health and Safety (OHS)			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**
Learn on the different problems in drilling activity, its mitigation measures and OHS.	Possess knowledge on the issues faced during drilling, its mitigation measures and usage of OHS, in discussion with seniors	Possess various knowledge on the issues faced in drilling activities, its assessment and mitigation measures. Application of OHS	Recognize the drilling issues, review the mitigation measures and OHS.
Competency Area: 2.2 Coordination and Management			
Key Competency: 2.2.1 Management and decision making skills			
Behavior Indicator: 1. Display integrity, competence, emotional intelligence and ensure effective exchange of ideas and opinions.			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**
Demonstrate and recognize the importance of integrity and collaboration	Facilitate to ensure team spirit among the team members and make informed decision	Facilitate participation, have clear idea and take effective decision.	Able to involve all the team members and make rational decision.
Behavior Indicator: 2. Demonstrate supervision for proper handling and storage of cores and handing over to geologists/concerned officials.			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**
Able to ensure proper core handling with guidance.	Able to ensure proper core handling independently.	Supervise for appropriate core handling and prepare for handing over to geologist/ concerned officials	Ensure proper handing over of the core to geologist/ concerned officials.
Competency Area: 2.3 Data Management			
Key Competency: 2.3.1 Drill logging skills			

Behavior Indicator: 1. Ability to collect and maintain drilling log data.			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**
Understands and able to collect the drill core log under supervision.	Ability to collect drill core log independently.	Demonstrate supervision in the collection and maintenance of drill log data, prepare in appropriate format for sharing	Review the drill log and share to the geologist.
Key Role 3: Monitoring & Evaluation			
Competency Area: 3.1 Professionalism			
Key Competency: 3.1.1 Knowledge on evaluation of drilling activity.			
Behavior Indicator: 1. Possess knowledge and competency to review drilling plan and determine way forward.			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**
Demonstrate basic knowledge on monitoring of drilling activities and involve in discussions	Participate in evaluation of the drilling process and discuss on the changes	Coordinate the review of drilling plan and determine changes needed.	Provide technical insights during reviewing and evaluate the way forward discussions
Behavior Indicator: 2. Exhibit ability to prepare drilling report.			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**
Demonstrate basic knowledge on report writing.	Possess knowledge on technical report writing and assist in preparing drilling report	Prepare drilling report.	Verify and share the drilling report.
Competency Area: 3.2 Communication & Management			
Key Competency: 3.3.1 Communication and interpersonal skills			
Behavior Indicator: 1.Exhibits positive attitude and receptiveness to ensure effective exchange of views and knowledge for improvements.			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**
Displays positive attitude to learn and engage in effective communication.	Manages and analyses the views and ideas of others for improvements.	Collaborates and resolves any issues arising from interaction for improvements.	Provides direction for effective exchange of views and knowledge and ensure
Behavior Indicator: 2. Ability to monitor and perform the site clean-up post drilling activity.			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**

Understands and learns the importance of site clean up.	Facilitate in the final cleaning and closing of camp and drill site in discussion with senior.	Discuss and provide information for deciding on site cleanup post drilling activity.	Take decision and provide direction on site cleanup post drilling activity.
Competency Area: 3.3 Information Management			
Key Competency: 3.3.1 Archiving and information sharing skills			
Behavior Indicator: 1. Able to store and share the drilling activity information.			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**
Demonstrate knowledge on information technology and understands importance of proper	Applies the knowledge on information technology to keep records of the drilling activities.	Ensure proper handling of drilling activity information.	Evaluates and recommends changes in handling of drilling activity information and sharing it.
Behavior Indicator: 2. Possess ability to monitor and document the machine maintenance and servicing.			
Foundation (P4)	**Intermediate (P3)**	**Experienced (P2)**	**Advanced (P1)**
Understands on monitoring and proper documentation.	Monitor and record the maintenance and services carried out in consultation with seniors.	Mange and record the machine maintenance and services, find updated means of documentation.	Check the practices of monitoring and documentation and take decision.

2.7. Training Needs Analysis

The Training Needs is the difference between desired capability and current capability. The Training Needs Analysis is the process of recognizing the skills gap and needs of training. It is the procedure to determine whether the training will bring out the solution to the problem. It ensures that training is targeting the correct competencies, the correct employees and the needs of the Department. The training can reduce, if not eliminate, the gap by equipping the Drilling Engineer with knowledge and skills. It should be the shared responsibility of the employee and Department to build and enhance their capability and competency.

The training needs analysis is carried out in consultation with the stakeholders through virtual and face to face meetings. The participants were presented with the descriptors at 4 proficiency levels on Likert Scale of “Competent” and “Not Competent” followed by open ended questions asking the likely reasons for ‘Not Competent” and suggest interventions to address the gap. The behavioral indicators were assessed by proficiency level to identify the performance gaps.

2.7.1 Training Needs Assessment at Foundational Proficiency Level

Table 6: TNA for Foundational Proficiency level.

Key Role 1: Planning & Coordination				
Key Competencies	**Description of Proficiency Level**	**Performance(C/NC)**	**Likely reason for performance gap**	**Capacity Development Intervention**
Research skills	Possess basic knowledge on research and understands the basic fundamental of drilling technology.	NC	Limited exposure in applying research techniques. Mechanical Engineers are recruited as Drilling Engineers due to which there is lack of basic knowledge of Drilling technology.	e-learning, OJT, mentoring and in-house seminar.
Planning and Organizational Skills	Possess knowledge on the formulation of SoP, manuals and guideline.	NC	Limited or no exposure in formulation of SoP, manuals and guideline and preparation of budgets	Short term training on drafting skills of SoP, manuals & guideline, and OJT.
	Assist in preparing budgets and mobilization.	C	-NA-	-NA-
Knowledge on drilling technology and risk involved.	Recognize the different machines and equipment, possess basic knowledge on inventory management and risks involved. Gain knowledge on basic geology.	NC	Mechanical Engineers are recruited as Drilling Engineers due to which there is lack of basic knowledge of Drilling technology, its related problems and in geology.	OJT, attachment in the field, demonstration, orientation, mentoring and e-learning.
	Learn on the probable problems in drilling activity and how to mitigate it.	NC		
Teamwork and collaboration	Engages with stakeholders, take part in meeting and discussion, understand on	C	-NA-	-NA-

	appropriate decision making and sharing responsibility.			
Communication and decision-making skills.	Maintain interpersonal relation, and understands importance of clear direction.	C	-NA-	-NA-
Key Role 2: Operation & Supervision				
Key Competencies	**Description of Proficiency Level**	**Performance (C/NC)**	**Likely reason for performance gap**	**Capacity Development Intervention**
Knowledge on supervision of drilling activities	Understands on drilling technology, display professionalism and supervise the drilling activities with guidance from senior.	NC	Mechanical Engineers are recruited as Drilling Engineers due to which there is lack of basic knowledge of Drilling technology. No experienced personals. Limited experience in supervision.	OJT, training on drilling technology, institution/field visits. Leadership and management training.
Risk management and problem-solving skills	Learn on the different problems in drilling activity, its mitigation measures and OHS.	NC	Limited knowledge on OHS, risk assessment, and management.	STT on OHS, risk identification, evaluation & management and e-learning.
Management and decision-making skills.	Demonstrate and recognize the importance of integrity and collaboration.	C	-NA-	-NA-
	Ensure proper core handling with guidance.	NC	Lack of experience in handling of cores.	OJT, mentoring and hands on training.

Drill logging skills	Understands and able to collect the drill core log under supervision.	NC	Lack of experience in maintaining drill logs.	OJT and mentoring.
Key Role 3: Monitoring & Evaluation				
Key Competencies	**Description of Proficiency Level**	**Performance (C/NC)**	**Likely reason for performance gap**	**Capacity Development Intervention**
Knowledge on evaluation of drilling activity.	Demonstrate basic knowledge on monitoring of drilling activities and involve in discussions.	NC	No such experiences.	Institute review/evaluation of the drilling activities.
	Demonstrate basic knowledge on report writing.	C	-NA-	-NA-
Communication and interpersonal skills	Displays positive attitude to learn and engage in effective communication.	C	-NA-	-NA-
	Understands and learns the importance of site clean-up.	C	-NA-	-NA-
Archiving and information sharing skills	Demonstrate basic knowledge on information technology and understands importance of proper record keeping.	C	-NA-	-NA-
	Understands on monitoring and proper documentation.	NC	Limited practical knowledge and skills in repair and maintenance of machines. Lack of knowledge and skills in data management	STT/hands on training on machine maintenance. Short term training on data management.

2.7.2 Training Needs Assessment at Intermediate Proficiency Level

Table 7: TNA for Intermediate Proficiency level.

Key Role 1: Planning & Coordination				
Key Competencies	**Description of Proficiency Level**	**Performance (C/NC)**	**Likely reason for performance gap**	**Capacity Development Intervention**
Research skills	Able to perform basic research on appropriate drilling technology and identify the different methods, tools and accessories used.	NC	Limited exposure in conducting research and drilling activity.	OJT, mentoring, and e-learning,
Planning and Organizational Skills	Understands on the formulation of SoP, manuals & guideline and provide input during formulation and revision.	NC	Limited exposure in formulation of law, SoP, manuals and guideline.	STT and OJT
	Discuss and plan budgets and mobilization.	C	-NA-	-NA-
Knowledge on drilling technology and risk involved.	Possess knowledge on the different drilling technology, accessories, basic geology and the requirements for procurement.	NC	Limited knowledge on drilling technology, its related problems and geology.	OJT and STT.
	Possess some knowledge on the different problems faced and its mitigation measures.	NC		
Teamwork and collaboration	Works collaboratively with team members, create team spirit	C	-NA-	-NA-

	and grasp inputs for good decisions.			
Communication and decision making skills.	Communicate, manage and involve the team members to participate in the discussion.	C	-NA-	-NA-
Key Role 2: Operation & Supervision				
Key Competencies	**Description of Proficiency Level**	**Performance (C/NC)**	**Likely reason for performance gap**	**Capacity Development Intervention**
Knowledge on supervision of drilling activities	Know the different drilling technology, display competency and supervise as per activity plan independently.	NC	Limited experience in supervision and knowledge on drilling technology.	Training on drilling technology, institution/field visits. Leadership and management training.
Risk management and problem solving skills	Possess knowledge on the issues faced during drilling, its mitigation measures and usage of OHS, in discussion with seniors.	NC	Limited knowledge on OHS, risk assessment, monitoring and mitigation.	STT on risk identification, assessment & mitigation and OHS.
Management and decision making skills.	Facilitate to ensure team spirit among the team members and make informed decision.	C	-NA-	-NA-
	Able to ensure proper core handling independently.	C	-NA-	-NA-

Drill logging skills	Ability to collect drill core log independently.	C	-NA-	-NA-
Key Role 3: Monitoring & Evaluation				
Key Competencies	**Description of Proficiency Level**	**Performance (C/NC)**	**Likely reason for performance gap**	**Capacity Development Intervention**
3.1.1 Knowledge on evaluation of drilling activity.	Participate in evaluation of the drilling process and discuss on the changes.	NC	No such practices and experiences.	Institute review of the activity, discussions and hands on practices.
	Possess knowledge on technical report writing and assist in preparing drilling report.	C	-NA-	-NA-
3.2.1 Communication and interpersonal skills	Manages and analyses the views and ideas of others for improvements.	C	-NA-	-NA-
	Facilitate in the final cleaning and closing of camp and drill site in discussion with senior.	C	-NA-	-NA-
3.3.1 Archiving and information sharing skills	Applies the knowledge on information technology to keep records of the drilling activities	C	-NA-	-NA-

	Monitor and record the maintenance and services carried out in consultation with seniors.	NC	Limited practical knowledge and skills in repair and maintenance of machines. Lack of knowledge and skills in	Hands on training on machine maintenance. Short term training on data management and sharing.

2.7.3 Training Needs Assessment at Experienced Proficiency Level

Table 8: TNA for Experienced Proficiency level.

Key Role 1: Planning & Coordination				
Key Competencies	**Description of Proficiency Level**	**Performance (C/NC)**	**Likely reason for performance gap**	**Capacity Development Intervention**
Research skills	Applies research skills in the exploring and understanding advance drilling technology. Select the best method for the particular field.	C	-NA-	Periodic upgradation
Planning and Organizational Skills	Formulate and revise SoP, manuals and guidelines.	C	-NA-	Periodic upgradation
	Provide input in the budget estimation and prepare field mobilization.	C	-NA-	-NA-
Knowledge on drilling technology and risk involved.	Know and recognize the different drilling technology and basic geology. Plan for procurement.	NC	The drilling equipment and technology keeps on	Short term training on current and advanced

	Possess various knowledge on the issues faced in drilling activities, risks, its assessment and the mitigation measures.	NC	upgrading and advancing. Limited experience in risk assessment. The geology and subsurface differs from one place to another and planning of one field cannot be applied to all other.	drilling technology, risk assessment of drilling activities and its its mitigation measures. Periodic training on basic geology.
Teamwork and collaboration	Foster discussions and team spirit and provide information to make decisions.	C	-NA-	Periodic enhancement of leadership and management.
Communication and decision making skills.	Initiate cooperation among the team members, and convey information.	C	-NA-	Periodic enhancement of leadership and management.
Key Role 2: Operation & Supervision				
Key Competencies	**Description of Proficiency Level**	**Performance (C/NC)**	**Likely reason for performance gap**	**Capacity Development Intervention**
Knowledge on supervision of drilling activities	Possess knowledge and skills on drilling technology. Supervise the activity independently while showcasing professionalism.	NC	There is continual upgradation in drilling technology.	STT on drilling equipment and technology.

Risk management and problem solving skills	Possess various knowledge on the issues faced in drilling activities, its assessment and mitigation measures. Application of OHS.	NC	Limited knowledge on OHS, risk assessment, monitoring and mitigation. There is continual upgradation in drilling technology. No related training or seminars.	STT on risk identification, assessment & mitigation, equipment maintenance and OHS. Training on drilling equipment and technology.
Management and decision making skills.	Facilitate participation, display competence and take effective decision.	C	-NA-	Periodic enhancement of leadership and management.
	Supervise for appropriate core handling and prepare for handing over to geologist/concerned officials.	C	-NA-	-NA-
Drill logging skills	Demonstrate supervision in the collection and maintenance of drill log data, prepare in appropriate format for sharing.	C	-NA-	-NA-
Key Role 3: Monitoring & Evaluation				
Key Competencies	**Description of Proficiency Level**	**Performance (C/NC)**	**Likely reason for**	**Capacity Development Intervention**

			performance gap	
Knowledge on evaluation of drilling activity.	Coordinate the review of drilling plan and determine changes needed.	NC	No such practices.	Start the evaluation of the drilling activity plan.
	Prepare drilling report.	C	-NA-	-NA-
Communication and interpersonal skills	Collaborates and resolves any issues arising from interaction for improvements.	C	-NA-	-NA-
	Discuss and provide information for deciding on site cleanup post drilling activity.	C	-NA-	-NA-
Archiving and information sharing skills	Ensure proper handling of drilling activity information.	C	-NA-	-NA-
	Mange and record the machine maintenance and services, find updated means of documentation.	NC	Limited practical knowledge and skills in repair and maintenance of machines. No proper maintenance of information and a platform for dissemination.	Hands on training on machine maintenance. Short term training on data management and sharing.

2.7.4 Training Needs Assessment at Advanced Level

Table 9: TNA for Advanced Proficiency level.

Key Role 1: Planning & Coordination				
Key Competencies	**Description of Proficiency Level**	**Performance (C/NC)**	**Likely reason for performance gap**	**Capacity Development Intervention**
Research skills	Provides guidance to undertake effective research and make decision on appropriate drilling technology. Understands on advance drilling technology.	C	-NA-	Periodic upgradation
Planning and Organizational Skills	Guide the preparation and review of drilling SoP, manuals and guidelines.	C	-NA-	Periodic upgradation
	Finalization of budget estimation and field movement.	C	-NA-	-NA-
Knowledge on drilling technology and risk involved.	Possess knowledge on the advance drilling technologies and inventory management. Make procurement. Review and take decisions	NC	The constant upgradation in drilling technology and lack of available	Short term training and refresher courses on basic geology and assessments.

	Possess knowledge on the different risks. Review the assessments and mitigation measures.	NC	information on new drilling methods. Old machines. The geology and subsurface differs from one place to another and	
Teamwork and collaboration	Promote collaboration, forge team work, and take appropriate	C	-NA-	Periodic enhancement of leadership and management.
Communication and decision-making skills.	Encourage exchange of ideas, effective communication and provide clear directions	C	-NA-	Periodic enhancement of leadership and management.
Key Role 2: Operation & Supervision				
Key Competencies	**Description of Proficiency Level**	**Performance (C/NC)**	**Likely reason for performance gap**	**Capacity Development Intervention**
Knowledge on supervision of drilling activities	Well versed in drilling technology. Supervise activity, initiate discussions and take decisions.	NC	There is continual upgradation in drilling technology.	Refresher course/training on drilling equipment and technology and management.
Risk management and problem solving skills	Recognize the drilling issues, review the mitigation measures and OHS.	NC	There is continual upgradation in drilling technology, limited knowledge on risk assessment, monitoring and mitigation. No related training.	Refresher training/workshop on OHS, risk assessment and management. Training risk reduction at work place.

Management and decision making skills.	Able to involve all the team members and make rational decision.	C	-NA-	Periodic enhancement of leadership and management.
	Ensure proper handing over of the core to geologist/concerned officials.	C	-NA-	-NA-
Drill logging skills	Review the drill log and share to the geologist.	C	-NA-	Refresher training on data management.
Key Role 3: Monitoring & Evaluation				
Key Competencies	**Description of Proficiency Level**	**Performance (C/NC)**	**Likely reason for performance gap**	**Capacity Development Intervention**
Knowledge on evaluation of drilling activity.	Provide technical insights during reviewing and evaluate the way forward discussions.	NC	No such practices and the drilling technology keeps updating.	Periodic refresher course on drilling technology.
	Verify and share the drilling report.	C	-NA-	-NA-
Communication and interpersonal skills	Provides direction for effective exchange of views and knowledge and ensure improvement.	C	-NA-	-NA-
	Discuss and provide information for deciding on site cleanup post drilling activity.	C	-NA-	-NA-

Archiving and information sharing skills	Evaluates and recommends changes in handling of drilling activity information and sharing it.	C	-NA-	-NA-
	Check the practices of monitoring and documentation and take decision.	C	-NA-	Periodic enhancement on machine maintenance.

2.8. Short-term Program and Learning Objectives

The framework has highlighted the likely reasons for the gaps and interventions proposed above. In order to provide a capacity building program, the following are the expected learning objectives. The respective proficiency level officials will be able to achieve the objectives mentioned against each of the training.

Table 10: Short-Term Training Program at different proficiency level

Foundation Proficiency Level			
Sl. #	**Training/Intervention**	**Methods of Implementation**	**Learning Objectives**
1.	Training on drilling project, basic operational and practical drilling technology.	Orientation & OJT and ex-country training.	1. Gain knowledge and skills in drilling technology. 2. Identify different drilling problem and solution. 3. Identify the different drilling tools and equipment.
2.	Institutional and field visit in exploration activity.	In-country / Ex-country	1. Obtain knowledge on the different methods employed in various drilling projects. 2. Incorporate the knowledge and skill gained in the work area.
3.	Training on machine and its maintenance.	In-country training	1. Gain practical experience and skills in machine maintenance and repair.
4.	Inventory management	In-country training	1. Understands on the inventory management.
5.	Occupational health and safety	In-country training / e-learning.	1. Understand on the importance of PPE and OHS.

			2. Reduce risks and hazards at work sites. 3. Learn about drilling risk management concepts. 4. Understand how to identify and manage risk.
6.	Basic geology	In-house seminar/ OJT	1. Acquire knowledge on basic geology which can be utilized during planning and operation of drilling.
Intermediate Proficiency Level			
Sl. #	**Methods of Intervention/Training Requirement**	**Methods of Implementation**	**Learning Objectives**
1.	Training on operational and advanced drilling technology, stuck pipe & fishing and hole stability.	OJT and ex-country/In-country STT	1. Keep updated with the latest drilling technology, the problems and its solutions. 2. Understand how to keep the hole clear, causes of deviation & stuck pipe and the philosophy & methods of fishing. 3. Supervision of drilling activities and reducing drilling problems.
2.	Training on risk management	OJT and ex-country/In-country STT	1. Identify, and manage risk. 2. Refresh the knowledge on the usage and importance of OHS. 3. Reduce risk and mitigate hazards. 4. Proper application of OHS.
3.	Training on machine and its maintenance	OJT and ex-country/In-country STT	1. Practical experience and skills in machine maintenance. 2. Reduce accidents and equipment downtimes.
4.	Leadership and management training	In-country training /seminars	1. Planning, execution and evaluation of drilling fields. 2. Enable development of skills and abilities on planning, resource management, risk management, critical

			thinking, building team spirits, communication and interpersonal abilities.
5.	Institutional and field visit in exploration activity.	OJT and ex-country/In-country	1. Understand the different methods employed in various drilling projects. 2. Incorporation of the knowledge and skill in the work area.
Experienced Proficiency Level			
Sl. #	**Methods of Intervention/Training Requirement**	**Methods of Implementation**	**Learning Objectives**
1.	Refresher training on operational and advanced drilling technology, stuck pipe & fishing, and hole stability.	In-country/Ex-country training.	1. Update and understand how to keep the hole clear, causes of deviation & stuck pipe and the philosophy & methodology of fishing. 2. Keep updated with the advanced development in drilling technology, solutions to different problems. 3. Supervision of drilling activities and reducing drilling problems.
2.	Refresher training on drilling project and Occupational Health and Safety	In-country/Ex-country training.	1. Learn the use of planning software and the importance of drilling programming and analysis. 2. Understand how to identify and manage risk. 3. Provide guidance. 4. Reduce risk and mitigate hazards.
3.	Refresher training on machine and its maintenance	In-country training	1. Practical experience and skills in machine maintenance. 2. Provide guidance. 3. Reduce accidents and equipment downtimes.
4.	Refresher course on leadership and management	In-country training / seminars	1. Enable better supervision, fostering teamwork &

			cooperation, decision making and interpersonal skills. 2. Efficient planning, execution and evaluation of drilling fields. 3. Develop skills on planning, resource management, risk management, critical thinking, communication and field management.
Advanced Proficiency Level			
Sl. #	**Methods of Intervention/Training Requirement**	**Methods of Implementation**	**Learning Objectives**
1.	Refresher training on operational and advanced drilling technology, stuck pipe & fishing and hole stability.	In-country/Ex-country training.	1. Keep up to date with the advance development in drilling technology, solutions to different problems. 2. Update and understand how to keep the hole clear, causes of deviation & stuck pipe and the philosophy & methodology of fishing. 3. Supervision of drilling activities and reducing drilling problems.
2.	Refresher training on machine and its maintenance	In-country training	1. Practical experience and skills in machine maintenance. 2. Reduce accidents and equipment downtimes.
3.	Advanced Leadership and management course	In-country training / seminars.	1. Enable effective decision making, communication and provide guidance. 2. Enable better supervision, fostering teamwork & cooperation, decision making, interpersonal skills. 3. Efficient planning, execution and evaluation of drilling fields. 4. Enable development of skills and abilities on planning,

			resource management, risk management, critical thinking, communication and field management.
4.	Refresher course on Occupational Health and Safety	In-country training/workshop	1. Provide guidance. 2. Reduce risk and mitigate hazards.

2.9 Proposed Long-term Program (Specialization)

Table 11: Long-term program

Program	Remarks
Master of Science in Drilling and Well Engineering	Ex-country
Masters in Mechanical Engineer	

2.10 Implementation of Competency based Framework

The implementation of training and other intervention has to be based on the mandatory **program/interventions** listed under section under the training needs analysis (Section 2.8) of this document. The mandatory list of training/intervention includes all the programs against the behavior indicators that are found to be "Not Competent" under the Training Needs Analysis. However, for implementation, it has to be prioritized based on the following:

a. Annual prioritization
b. Most critical area of intervention
c. Rationalization of selection of participants
d. Availability of the resource allocation

Implementation has to be initiated and spearheaded by the concerned department or parent agency in close coordination and collaboration with the respective HR Division.

2.11 Recommendations

a. Raise awareness on the CBF.
b. CBF should be a living document and should be updated periodically as per the requirements.
c. Implementation has to be initiated and spearheaded by the concerned department or parent agency in coordination and collaboration with respective HR division.
d. The department should prioritize and implement the proposed interventions to improve the competencies.
e. Perform the Training Needs Analysis (TNA) periodically.
f. Build capacity with optimal utilization of resources within the country. The parent and working agencies to facilitate ex-country training in case of shortage of technical expertise in-country.

2.12 Conclusion

The CBF for Drilling Engineers has been developed to build a team who are equipped with the knowledge, skills and abilities to deliver the efficient and high standard of services. This CBF has identified 3 key roles, 9 competency areas, 12 key competencies and 22 behavioral indicators. The proficiency level is distributed into 4 level; foundation, intermediate, experienced and advance level. It has been developed through constant consultation (online and face to face) with the drilling engineers in the department.

The CBF would contribute to enhance and strengthen the capabilities of the drilling engineers by providing the required training and professional development interventions identified through the TNA and the mandatory short term & long-term training. In the past there has been limited capacity building opportunities due to lack of training institutes within the country, lack of resources and also due to lack of experienced personnel. With this

framework, it would ensure capacity developments to carry out the responsibilities and duties with high standards, efficiency and professionalism.

References

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