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GOVERNMENT NOTICES

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

No. 13 **29 January 2010**

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Task Team for

FABRICATION AND EXTRACTION

registered by Organising Field 06 – Manufacturing, Engineering and Technology, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at **www.saqa.org.za**. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and ***no later than 1 March 2010.*** All correspondence should be marked **Standards Setting – Task Team for Fabrication and Extraction** and addressed to

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ACTING DIRECTOR: STANDARDS SETTING AND DEVELOPMENT

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
FETC: Mining/Exploration Geology

SAQA QUAL ID	*QUALIFICATION TITLE*		
77963	FETC: Mining/Exploration Geology		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
QUALIFICATION TYPE	*FIELD*	*SUBFIELD*	
Further Ed and Training Cert	6 - Manufacturing, Engineering and Technology	Fabrication and Extraction	
ABET BAND	*MINIMUM CREDITS*	*NQF LEVEL*	*QUAL CLASS*
Undefined	160	Level 4	Regular-Unit Stds Based

New NQF Level: NQF Level 04

This qualification does not replace any other qualification and is not replaced by another qualification.

PURPOSE AND RATIONALE OF THE QUALIFICATION
Purpose:

This qualification will provide qualifying learners with the necessary skills, knowledge, understanding and competence, to competently and confidently undertake tasks pertinent to a Geological technician in their specific fields related to surface and underground mining and exploration; as well as provide an opportunity for learners to apply appropriate skills in relation to the workplace.

The Geological technician is vital to the smooth running of the geological disciplines within the mining industry. This covers a wide variety of fields such as Geological Exploration sampling, surface and underground mapping, grade control logging and hazard identification.

Learners achieving this qualification will be able to understand their role of applying required competencies consistently and effectively in the execution of their duties. They will also contribute to the mining geology discipline by effectively adhering to quality and occupational safety requirements.

This qualification will have a positive impact on society through assisting in the identification and delineation of potential mineral deposits; as well as improve the health and safety of people in and outside the mining environment through input to hazard identification programmes and helping protect the environment during mine closure procedures.

Qualified learners will, subject to the elected stream, be able to:

- Communicate and solve problems in a variety of ways.
- Adhere to occupational health, safety and environmental standards in the workplace.
- Understand mineralisation, geological features and procedures pertinent to the mining environment.
- Perform geological tasks within a mining environment.
- Perform basic evaluation functions pertinent to the mining environment.

- Apply a selection of Mining geological procedures.
- Apply a selection of Exploration geological procedures.

Rationale:

Mineral resource exploitation, beneficiation and export are key components of the South African economy. Historically the discovery of diamonds and gold formed the base of the South African economy and led to the development of the South African infrastructure. Today coal provides South Africa with the majority of its power and with platinum, chrome, gold, diamonds, iron and manganese are vital exports. Geologists have played a major role in the identification and delineation of these mineral deposits, the development of the mines and their safe, profitable and optimal exploitation.

Furthermore, the need for improved quality standards with maximization of efficiencies within the mining industry coupled with the increasing complexity and declining grades of many SA mining operations have resulted in greater need for geological skills. Maintenance of such standards has been recognised and emphasis has been placed on providing appropriate geological training at all levels. This serves to extend the life of mines providing employment both within the mining industry and the numerous support industries.

Learners entering this qualification will typically come from geology, survey or sampling operations, working as Technical Support Assistants. In some cases learners will come from other industries such as soil science or rock engineering. Learners from other industries would, however, have to become familiar with the mining environment, equipment and processes before they can proceed with this qualification. Qualifying learners will be competent geological technicians in all mining operations; and in particular underground or surface geological mapping and exploration mineral sampling procedures. Learners will obtain the basic theoretical knowledge pertinent to these mining related environments. This qualification has 2 specialisation streams for learners to follow.

A typical learning pathway in this field would start with the National Certificate: Mining Technical Support NQF Level 2 and proceed to the National Certificate: Mining Technical Support, NQF Level 5, then to the Further Education and Training Certificate (FETC): Minerals Surveying, Minerals Sampling or Mining/Exploration Geology (NQF Level 4). Learners could then progress onto a NQF Level 5 Qualification in one of the specialisation areas namely Surveying, Geology or Sampling. The qualification is designed to be flexible and accessible so that learners are able to demonstrate the competencies in Mining or Exploration Geology across the mining and minerals sectors.

This qualification will be a suitable and justified recognition for the skills and competencies of geological technicians who have not entered the industry through formal education institutions, but rather have been trained and developed on an informal basis only, with little chance of advancement. The associated status of a nationally recognised qualification will serve as a motivation for learners to further their skills by entering the field of Geology. Current Geological technicians in particular will benefit from the opportunities of assessment and subsequent recognition presented by RPL (Recognition of Prior Learning).

RECOGNIZE PREVIOUS LEARNING?
Y

LEARNING ASSUMED IN PLACE
Communication and Mathematical Literacy at NQF Level 3

Recognition of Prior Learning:

This qualification can be achieved wholly or in part through recognition of prior learning in terms of the criteria laid out.

Evidence can be presented in a variety of forms, including international or previous local qualifications, reports, testimonials mentioning functions performed, work records, portfolios, videos of practice and performance records.

Access to the Qualification:

Access is open; however it is preferable that learners have completed the National Certificate: Mining Technical Support-NQF Level 3.

QUALIFICATION RULES
A minimum of 160 Credits is required to complete the qualification.

Fundamental Component:

The Fundamental Component consists of:

- Mathematical Literacy at NQF Level 4 to the value of 16 Credits.
- Communication at NQF Level 4 in a First South African Language to the value of 20 Credits.
- Communication in a Second South African Language at NQF Level 3 to the value of 20 Credits.

It is compulsory therefore for learners to do Communication in two different South African languages, one at NQF Level 4 and the other at NQF Level 3.

Core Component:

- All 66 Credits are compulsory.

Electives Component:

- A minimum of 38 Elective Credits as specified below must be achieved.

There are two specialisations areas:

- A: Mining Geology.
- B: Exploration Geology.

For specialisation area A: Mining geology the following Unit Standards (25 Credits) must be achieved:

- Manually construct an underground geological plan of a geologically simple area from given data; NQF Level 3; 3 Credits.
- Demonstrate knowledge of rock-related hazards and consequences due to the geological environment; NQF Level 4; 4 Credits.
- Demonstrate an understanding of the relationship between geological structures and mining layouts; NQF Level 4; 3 Credits.
- Log and sample a face to obtain geological information for quality control purposes in the relevant deposit; NQF Level 5; 6 Credits.
- Identify and interpret simple structural and stratigraphic features on a geological plan; NQF Level 4; 4 Credits.
- Process geological information for grade control purposes; NQF Level 4; 5 Credits.

Total; 25 Credits.

A further 13 Credits are to be chosen from the rest of the Electives to make up a minimum of 160 Credits for the qualification.

For specialisation area B: Exploration geology the following Unit Standards (28 credits) must be achieved:

- Identify and interpret simple structural and stratigraphic features on a geological plan; NQF Level 4; 4 Credits.
- Manually construct and interpret a map of a geologically familiar area from given data; NQF Level 4; 3 Credits.
- Sample stream sediments for economic and environmental purposes; NQF Level 5; 3 Credits.
- Sample soil material for economic and environmental purposes; NQF Level 4; 3 Credits.
- Sample and describe surface rock types; NQF Level 5; 4 Credits.
- Demonstrate an understanding of prospecting methods; NQF Level 4; 8 Credits.
- Lay out an elementary grid on surface to conduct surface geological activities; NQF Level 3; 3 Credits.

Total; 28 Credits.

A further 10 Credits are to be chosen from the rest of the electives to make up a minimum of 160 Credits for the qualification.

EXIT LEVEL OUTCOMES

1. Communicate and solve problems in a variety of ways.

2. Adhere to occupational health, safety and environmental standards in the workplace.

3. Understand mineralisation, geological features and procedures pertinent to the mining environment.

4. Perform geological tasks within a mining environment.

5. Perform basic evaluation functions pertinent to the mining environment.

6. Apply a selection of Mining geological procedures.

or

7. Apply a selection of Exploration geological procedures.

Critical Cross-Field Outcomes:

Critical Cross-Field Outcomes have been addressed by the Exit Level Outcomes as follows:

- Identify and solve problems in which responses display that responsible decisions using critical thinking have been made, by:
  - Applying Mathematical principles and techniques while performing tasks in the operational context.
  - Responding to non-conformances and emergencies in a geological technical support environment.
  - Explaining and applying principles necessary to identify, record and report potentially hazardous geological features.

• Work effectively with others as a member of a team, group, organisation or community by:
o Contributing to team goals and achievements by adhering to agreed working methods and processes.
o Contributing to team efficiency by supporting other team members in the geological technical support environment.
o Adhering to team protocols, codes of conduct and generally promoting a positive team spirit.
o Coordinating work with that of others in the direct surrounding area.

• Organise and manage oneself and one's activities responsibly and effectively by:
o Performing activities in the geotechnical support environment.
o Conducting measurements and recording the results.
o Using, caring for and maintaining relevant tools and equipment.

• Collect, analyse, organise and critically evaluate information by:
o Accessing and interpreting Information related to work tasks from a range of written and oral sources to ensure that work requirements are understood.
o Determining the mineral content of a mining unit by applying elementary evaluation techniques.
o Measuring directions and distances on a map in accordance with work related standards.
o Plotting and evaluating information on a geological map or plan.
o Compiling and interpreting a grade distribution plan.
o Evaluating a mineral resource by applying basic evaluation techniques.

• Use science and technology effectively and critically, showing responsibility towards the environment and health of others by:
o Adhering to Occupational Health, Safety and Environmental polices, procedures and requirements at all times as per workplace requirements.
o Conducting activities in a geological technical support environment in accordance with Occupational Health, Safety and Environmental requirements.
o Using advanced instruments and technology to take and record measurements pertaining to geological structures and conditions.
o Using advanced technology to plot and extrapolate information onto geological maps and plans.
o Using Graphical User Interface computer technology to prepare and present documents.
o Demonstrating knowledge and understanding of geological structural geology, stratigraphy, global tectonic systems and mineral deposits.

The above are evident in all Exit Level Outcomes.

• Demonstrate an understanding of the world as a set of related systems by recognising that problem solving contexts do not exist in isolation by:
o Interpreting plans are interpreted in accordance with work and legal standards and requirements.
o Understanding the impact of geological technical support on upstream, downstream and parallel mining processes and his/her own role in each context.
o Requesting assistance from other team members and support personnel when required.
o Assisting other team members and work together with support personnel to provide technical support in the mining environment.

The above are evident in all the Exit Level Outcomes.

ASSOCIATED ASSESSMENT CRITERIA
Associated Assessment Criteria for Exit Level Outcome 1:

• Oral communication is maintained and adapted as required to promote effective interaction in a work context.
• Written communication skills are used effectively in the workplace.
• Oral and written communication is conducted at an appropriate level in a second language.
• Mathematical principles and techniques are applied while performing the tasks in the operational context.
• Mathematical problems are solved in relation to the operational context.

Associated Assessment Criteria for Exit Level Outcome 2:

• Occupational Health and Safety legislation applicable to the workplace is understood and applied at all times as per workplace requirements.
• Safe, healthy and environmentally related activities are conducted in the workplace according to the Occupational Health, Safety and Environmental requirements.

Associated Assessment Criteria for Exit Level Outcome 3:

• Concepts and principles pertaining to stratigraphy are understood and explained in accordance with mine specific requirements.
• An understanding of the relationship between global tectonic systems and mineral deposits are demonstrated in accordance with specified requirements.
• An understanding of drilling techniques are demonstrated in accordance with specified work standards and legal requirements.
• Knowledge of structural geology is demonstrated in accordance with specified work standards and legal requirements.
• Knowledge of the mineralisation within a South African mineral deposit is demonstrated in accordance with the requirements of mine specific requirements.
• An understanding of mineral resource types, their exploration, exploitation and rehabilitation is demonstrated in accordance with specified requirements.

Associated Assessment Criteria for Exit Level Outcome 4:

• Dips and strikes of in-situ geological structures are measured in accordance with work related requirements.
• Contour plans are constructed to determine the dip and strike of a plane in accordance with work standards and requirements.
• Geological cross sections are constructed and interpreted in accordance with work related standards.
• Borehole data and Grade distribution plans are compiled for geological interpretation purposes in accordance with work related standards.
• The logging of borehole cores is assisted with in accordance with work related standards and requirements.
• Geological information is plotted and extrapolated on a geological map or plan in accordance with work related requirements.

Associated Assessment Criteria for Exit Level Outcome 5:

• The mineral content of a mining unit is determined by applying basic evaluation techniques in accordance with work related requirements and standards.
• A mineral resource is evaluated by applying basic evaluation techniques in accordance with work requirements and standards.

Associated Assessment Criteria for Exit Level Outcome 6:

• An underground geological plan is manually constructed in accordance with specified requirements.

• Knowledge of rock related hazards are explained in accordance with legal and work related requirements and standards.
• An understanding of the relationship between geological structures and mining layouts is demonstrated in accordance with legal and specified work requirements.
• A face is logged and sampled for quality control purposes in accordance with specified requirements and standards.
• Structural and stratigraphic features are identified and interpreted on a geological underground plan in accordance with work related standards and requirements.
• Geological information is processed for grade control purposes in accordance with work related requirements.

Or

Associated Assessment Criteria for Exit Level Outcome 7:

• Structural and stratigraphic features are identified and interpreted on a geological map in accordance with work related standards and requirements.
• Stream sediments, soils and surface rocks are sampled in accordance with task related standards and requirements.
• An understanding of prospecting methods is demonstrated in accordance with work requirements and standards.
• A grid is laid out in accordance with work requirements and standards.

Integrated Assessment:

Integrated assessment at the level of the qualification provides an opportunity for learners to show they are able to integrate concepts, actions and ideas achieved across a range of unit standards and contexts.

Integrated assessment must evaluate the quality of observable performance as well as the thinking behind the performance, and must be based on a summative assessment guide. The guide will spell out how the assessor will assess different aspects of the performance and will include:

• Observing the learner at work (both in the primary activity as well as other interactions).
• Asking questions and initiating short discussions to test understanding.
• Looking at records and reports in the portfolio and reviewing previous assessments.

In some cases inference will be necessary to determine competence depending on the nature and context within which performance takes place.

It is necessary to ensure that the fundamental part of the qualification is also targeted to ensure that while the competence may have been achieved in a particular context, learners are able to apply it in a range of other contexts and for further learning. The assessment should also ensure that all the Critical Cross-Field Outcomes have been achieved.

The learner may choose in which language s/he wants to be assessed. This should be established as part of a process of preparing the learner for assessment and familiarising the learner with the approach being taken.

While this is primarily a workplace-based qualification, evidence from other areas of endeavour may be introduced if pertinent to any of the Exit-Level Outcomes. The assessment process should cover both the explicit tasks required for the qualification as well as the understanding of the concepts and principles that underpin the activities associated with the plating process.

INTERNATIONAL COMPARABILITY

International qualifications were compared to ensure that the qualification structure and unit standards are comparable in terms of level, scope of qualification and competencies covered.

A search was conducted for information pertaining to Qualifications, Courses and Programmes from several countries around the world, particularly those where mining takes place such as:

- Canada.
- United Kingdom.
- India.
- New Zealand.
- United States of America.
- SADC countries such as Zambia and Botswana.

We were not able to find a model similar to the proposed FETC Geology, i.e. a unit standard based qualification in a vocational environment, even in Australia and New Zealand which have systems very similar to ours.

Courses in geology are offered by hundreds of universities and colleges all over the world, with methods of delivery ranging from full-time through to distance learning and even online learning. Learning would start with general geology or earth science and would then progress to specialisation areas such as petrochemical, paleontology, stratigraphy and others.

Apart from the pure geological content, typical qualifications and courses would also include computer technology, as geologists use various instruments in practice, and rely heavily on computers for the recording, processing and presenting of information. "Computer skills are essential for prospective geoscientists; students who have experience with computer modelling, data analysis and integration, digital mapping, remote sensing, and geographic information systems will be the most prepared entering the job market. Knowledge of the Global Information System (GIS) and Global Positioning System (GPS)-a locator system that uses satellites-has also become essential" (Wikipedia).

Courses generally also include Interpersonal skills and communication, as geologists often work together with other people in teams. "Geoscientists must have excellent interpersonal skills, because they usually work as part of a team with other geoscientists and with environmental scientists, engineers, and technicians. Strong oral and written communication skills also are important, because writing technical reports and research proposals, as well as communicating research results to others, are important aspects of the work" (Wikipedia).

Some of the courses and programmes reviewed are:

Online Course-University of British Columbia:

- Online geology course usually tend to be a combined lab and lecture course which covers a basic introduction to geology. Various courses provide students with:
  - An introduction to the perspective of the Earth's place in the solar system, the Earth System approach and geologic time.
  - Traditionally covered topics include metric system, minerals, topographic maps, rocks, volcanism, weathering, geologic maps and crustal deformation, earth's interior, earthquakes, plate tectonics, water, and an overview of geology of the country where courses is physically located.

Distance Learning-The Open University (United Kingdom):

Introductory Course in Geology:

Block 1 Maps and landscape is mainly concerned with the interpretation of geological maps and the relationship between the landscape and underlying rocks. A DVD-ROM helps you to visualise and interpret geological structures in three dimensions. This block, supplemented by virtual field trips on the DVD-ROM, shows how the geological history of any area can be interpreted from a geological map.

Block 2 Earth materials explore the nature of common minerals and rocks and introduce techniques for describing and identifying them, including the use of the polarising (petrological) microscope. With the aid of DVD-ROMs, it shows how the internal structure of minerals is related to their physical and chemical characteristics. Digital rock specimens and thin sections on DVD-ROM supplement and enhance the teaching of the practical elements introduced in the home kit.

Block 3 Internal processes and its supporting material describe the formation of igneous rocks by crystallisation from a molten liquid or magma and the formation of metamorphic rocks by the recrystallisation of rocks under high temperatures and pressures. It also looks at the deformation of rocks by folding and faulting during crustal movements and mountain building. An experiment to simulate various lava flows and a virtual field trip are presented on DVD-ROM.

Block 4 Surface processes describes, with the aid of a full-colour poster and a DVD-ROM, the physical, chemical and biological processes that erode the land, and how transport and deposition of sediment lead to the formation of sedimentary rocks. It introduces the main groups of fossils, and uses both the fossils and the sedimentary features that can be observed in the geological record to reconstruct and understand past environments.

Full-time Courses (India):

According to "Scholarships in India" various full-time courses are offered at more than 60 institutions in India with typical content being:

The term Earth Science is used to describe all the sciences concerned with the origin, evolution, structure and the behaviour of the Earth and its place in the universe, especially in the solar system. The study of earth sciences may be grouped into five major categories:

• The study of the (rocky) part of the Earth: Geology, the most well-Known of the earth sciences belongs to this category.

• The study of the aqueous part of the Earth: Oceanography, hydrology, glaciology and limnology constitute this group.

• The study of the gaseous outer regions of the Earth: Atmospheric science including *meteorology* (weather, meteorology, climatology), and aeronomy that deals with the outermost ionised part of the atmosphere fall in to this category.

• The study of the biosphere: Biosphere embodies all life on the earth. It includes also zoology, botany and ecology which, however, are distinctive science in their own rights.

• The study of the Earth in its entirety: this is the domain of geography which is study of spatial variation of the earth's surface and of humankind's relationship with its environment. The distinctiveness of geography lies in the fact that it is the convergence of physical and biological sciences (physical geography) and social sciences, such as, history (historical geography), political science (political geography), and economics (economic geography).

The deployment of earth-observing devices on satellites, both in geostationary and in low earth orbit, has revolutionized such branches of earth sciences as meteorology and oceanography. This has given rise to Remote Sensing, a new technology for gathering and recording of

information about the terrain and ocean surfaces by means of remote sensors install in satellites. Remote sensing technology is now widely used in the survey and management of natural resources and environment. Remote Sensing has, in turn, led to the development of Geographic Information System (GIS).

The emergence of the space age has unfolded yet another perspective for earth scientists. The exploration of moon and planets has made it possible for them to understand, by comparison, the origin of the Earth and its structure and composition. Earth Sciences have also close relationship with emergence of such subjects as Geophysics, Geochemistry and Astronomy. Mining, Engineering and Mineral Exploration Technology represent the practical application of geological science.

Full-Time courses:

Capilano College-British Columbia (Canada):

Physical Geology:

This course views the Earth as a heat engine which continuously recycles air, water and solid earth materials. It examines how nature's recycling of these materials results in both the origin and the eventual transformation of igneous, sedimentary and metamorphic rocks. Next, it investigates how lithospheric plates interact with each other and with external recycling (atmospheric and hydrospheric cycles). Finally it considers ways people may best adapt to these ever-changing Earth environments and act as stewards of Earth's environments and resources.

Historical Geology:

This course examines the methods geologists use to deduce the origin, age and evolution of Earth and its life. These methods are then used to investigate how Earth's lithosphere, hydrosphere and atmosphere evolved before giving rise to life, and how ever since, life has interacted with land, water and air. Next, the origin and growth of our home continent and adjacent ocean basins are studied. Finally, the processes and events that shaped (and are still shaping) our immediate environment are looked at in more detail. Uses and abuses of Earth resources and environments since the arrival of human beings also form part of the course.

University of Canterbury (New Zealand):

Example of content of one module.
GEOL111-10S1 (C) Semester One 2010.
Planet Earth: An Introduction to Geology.
15 points, 0.1250 EFTS.
22 Feb 2010-27 Jun 2010.

Description:

Course Content: This course deals with the composition and structure of Planet Earth and the geological processes which have shaped its surface.

The lecture course includes an overview of plate tectonics, showing how many features of the Earth's surface are directly, or indirectly, a result of plate tectonics. The course covers minerals and rocks, volcanoes and other igneous processes, sedimentary processes, and resources such as coal, oil, water found in sedimentary sequences, and metamorphism.

College of Wooster (United Kingdom)-Full-time Course:

Contents of one Geology Course:

- Sedimentology and Stratigraphy-(Geology 260).
- Sediments and Sedimentary Processes I and II.
- Principles of Stratigraphy-Introduction.
- Terrestrial Sedimentary Systems.
- Deltaic and Estuarine Systems.
- Coastal and Shallow Sea Systems.
- Carbonate Petrology.
- Carbonate Systems.
- Continental Margins, Deep Marine Systems.
- Evaporites and the Environments in Which They Form.
- Ironstones, Phosphates and Siliceous Sediments.
- Coal and Petroleum.
- Snowball Earth; Tectonics and Sedimentation.
- Sequence Stratigraphy and other topics.

Western Illinois University (United States):

Examples of geology courses offered by the university:

- 110 Introduction to the Earth. (4) (General Education/Natural Sciences) The study of the earth, its composition, structure, landscape development, internal processes, origin, and evolution. Laboratory includes introduction to minerals, rocks, and maps.

- 112 History of the Earth. (4) (General Education/Natural Sciences) Physical and biological history of the earth (North America emphasis). Origin of continents, mountains, oceans, etc.; evolution of plants and animals.

- 113 Energy and Earth Resources. (3) (General Education/Natural Sciences) Introduction to energy, water, soil, and mineral resources and the impact of their use on the environment. Does not count toward major or minor in geology.

- 200 Mineralogy. (4) Introduction to crystallography, origin, classification, identification, and occurrence of common minerals.

- 301 Igneous and Metamorphic Petrology. (3) Origin, texture, mineralogy, mode of emplacement, and alteration of igneous and metamorphic rocks. Phase rule and phase diagrams.

- 310 Geologic Field Methods. (2) Topographic and geologic mapping methods; measurement and description of stratigraphic sections; field identification of rocks and soils; use of Brunton compass, laser transit, GPS, and GIS software.

- 320 Structural Geology. (4) Physical properties of rocks, theories of flow and fracture, description of structural features, and origin of rock deformation. Geometric and stereographic diagrams. Interpretation of patterns.

- 340 Stratigraphy and Sedimentology. (4) Origin and identification of sedimentary rocks, depositional environments, sedimentary processes, principles of stratigraphy.

- 355 Geologic Hazards. (1-3, repeatable to 3 with change in topic) A study of the origin and effects of geologic hazards such as volcanoes, earthquakes, floods, landslides, and geologic hazardous materials. Prerequisite: consent of instructor. 1-3 hrs. lect.

• 375 Environmental Geology. (3) Application of geology to environmental problems. Land resource planning, solid and liquid waste disposal, mining, foundations structures, geologic hazards, mineral and energy resources.

• 380 Hydrogeology. (4) Study of water's interaction with geologic materials; principles of groundwater flow; aquifer testing; groundwater flow modeling programs; water chemistry and pollutants. Many labs are conducted in the field.

• 420 Geomorphology. (3) Advanced study of the landscape involving processes, geologic structure, and time. Map and air photo interpretation.

SADC Countries:

In SADC countries universities and colleges often function under the auspices of universities in the formal colonial mother countries. In practice, people working in geological technical support environment would have a suitable diplomas or degrees issued by institutions in countries such as France, the UK etc.

At operational level, people offering geological support (Assistants) would have been trained at operational level and would not have any qualification other than an in-company certificate.

Conclusions:

While we have not been able to find a course or programme structured entirely similarly to the proposed Further Education and Training Certificate: Geology, it can be concluded that the scientific or general components of the Level 4 qualification are in line with the academic qualifications and courses found, albeit at a lower level than many of the programmes listed above (which are but a sample of the hundreds that are available).

The approach of the FETC Geology is unique in that the theoretical (knowledge) components are learnt and applied in a workplace-based (mining) environment).

ARTICULATION OPTIONS

This qualification is the ideal platform for horizontal articulation in sampling, mine valuation and mine planning disciplines, and other mining industry related sub-fields.

Vertical articulation exists with:

• National Certificate: Geology, Level 5.
• National Certificate: Sampling, Level 5.

MODERATION OPTIONS

• Anyone assessing a learner or moderating the assessment of a learner against this Unit Standard must be registered as an assessor with the relevant Education, Training, Quality, Assurance (ETQA) Body, or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

• Any institution offering learning that will enable the achievement of this unit standard must be accredited as a provider with the relevant Education, Training, Quality, Assurance (ETQA) Body, or with an ETQA that has a Memorandum of Understanding with the relevant ETQA.

• The relevant Education, Training, Quality, Assurance (ETQA) Body will oversee assessment and moderation of assessment, or by an ETQA that has a Memorandum of Understanding with the relevant ETQA, according to the ETQA's policies and guidelines for assessment and moderation.

• Moderation must include both internal and external moderation of assessments, unless ETQA policies specify otherwise. Moderation should also encompass achievement of the competence described in the Unit Standard.

• Anyone wishing to be assessed against this Unit Standard may apply to be assessed by any assessment agency, assessor or provider institution that is accredited by the relevant ETQA.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

Assessors should be in possession of:

• An appropriate qualification above the level of this qualification and preferably relevant workplace practical experience.
• Registration as an assessor with the relevant ETQA.

UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Fundamental	119472	Accommodate audience and context needs in oral/signed communication	Level 3	5
Fundamental	119457	Interpret and use information from texts	Level 3	5
Fundamental	119467	Use language and communication in occupational learning programmes	Level 3	5
Fundamental	119465	Write/present/sign texts for a range of communicative contexts	Level 3	5
Fundamental	9015	Apply knowledge of statistics and probability to critically interrogate and effectively communicate findings on life related problems	Level 4	6
Fundamental	119462	Engage in sustained oral/signed communication and evaluate spoken/signed texts	Level 4	5
Fundamental	119469	Read/view, analyse and respond to a variety of texts	Level 4	5
Fundamental	9016	Represent analyse and calculate shape and motion in 2- and 3-dimensional space in different contexts	Level 4	4
Fundamental	119471	Use language and communication in occupational learning programmes	Level 4	5
Fundamental	7468	Use mathematics to investigate and monitor the financial aspects of personal, business, national and international issues	Level 4	6
Fundamental	119459	Write/present/sign for a wide range of contexts	Level 4	5
Core	376159	Construct a contour plan to determine the dip and strike of a plan	Level 3	3
Core	11118	Determine the mineral content of a mining unit applying elementary evaluation techniques	Level 3	2
Core	376161	Collate and interpret borehole data	Level 4	5
Core	376239	Compile and interpret a grade distribution plan	Level 4	4
Core	376282	Construct and interpret a geological cross-section in a familiar area	Level 4	3
Core	376199	Demonstrate an understanding of drilling techniques	Level 4	5
Core	376223	Demonstrate an understanding of structural geology	Level 4	6
Core	376221	Demonstrate an understanding of the mineralisation of a relevant economic deposit	Level 4	6
Core	376201	Demonstrate an understanding of the principles of stratigraphy	Level 4	6
Core	376160	Demonstrate an understanding of the relationship between global tectonic systems and mineral deposits	Level 4	4
Core	376200	Demonstrate an understanding of the typical phases of a mineral deposit	Level 4	4
Core	376227	Identify, measure and record the attitude of in situ geological structures	Level 4	7
Core	376139	Log borehole core	Level 4	4
Core	376163	Plot and extrapolate geological information on a geological map or plan	Level 4	4
Core	376181	Construct and interpret a geological cross-section in a deformed area	Level 5	3
Elective	376142	Conduct surface geological surveys	Level 3	3
Elective	9532	Demonstrate basic knowledge of computers	Level 3	6

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Elective	13915	Demonstrate knowledge and understanding of HIV/AIDS in a workplace, and its effects on a business sub-sector, own organisation and a specific workplace	Level 3	4
Elective	376281	Manage a geological core yard facility	Level 3	5
Elective	261758	Manually construct an underground geological plan of a geologically simple area from given data	Level 3	3
Elective	376225	Measure and record the yield of water in boreholes	Level 3	2
Elective	119078	Use a GUI-based word processor to enhance a document through the use of tables and columns	Level 3	5
Elective	116930	Use a Graphical User Interface (GUI)-based presentation application to enhance presentation appearance	Level 3	5
Elective	116940	Use a Graphical User Interface (GUI)-based spreadsheet application to solve a given problem	Level 3	6
Elective	242824	Apply leadership concepts in a work context	Level 4	12
Elective	376141	Conduct a ground magnetic survey on the sub surface strata	Level 4	8
Elective	242816	Conduct a structured meeting	Level 4	5
Elective	376245	Construct and interpret a map of a geologically familiar area	Level 4	3
Elective	376220	Demonstrate an understanding of Engineering Geology and Rock Mechanics	Level 4	10
Elective	376164	Demonstrate an understanding of fossils	Level 4	6
Elective	376140	Demonstrate an understanding of prospecting methods	Level 4	8
Elective	376224	Demonstrate an understanding of soil types and their characteristics	Level 4	6
Elective	376226	Demonstrate an understanding of surface processes	Level 4	5
Elective	115391	Demonstrate an understanding of the principles of the internet and the world-wide-web	Level 4	3
Elective	256848	Demonstrate an understanding of the relationship between geological structures and mining layouts	Level 4	3
Elective	256856	Demonstrate knowledge of rock-related hazards and consequences due to the geological environment	Level 4	4
Elective	14667	Describe and apply the management functions of an organization	Level 4	10
Elective	120372	Explain fundamentals of project management	Level 4	5
Elective	256844	Explain the interaction between rock strength, stress, and fracturing	Level 4	3
Elective	376162	Integrate borehole data for geological modeling	Level 4	5
Elective	376180	Interpret simple structural and stratigraphic features on a geological plan	Level 4	4
Elective	11473	Manage individual and team performance	Level 4	8
Elective	114589	Manage time productively	Level 4	4
Elective	263024	Plan and produce two dimensional (2D) Computer Aided Drawings (CAD)	Level 4	15
Elective	376222	Process geological information for grade control purposes	Level 4	5
Elective	376280	Sample soil material for economic and environmental	Level 4	3
Elective	117927	Use a Graphical User Interface (GUI)-based database application to solve a given problem	Level 4	6
Elective	376179	Log and sample a face to obtain geological information for quality control purposes in the relevant deposit	Level 5	6
Elective	376219	Sample and describe surface rock outcrops	Level 5	4
Elective	376247	Sample stream sediment material for economic and environmental purpose	Level 5	3

LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION
None

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Log borehole core

SAQA US ID	*UNIT STANDARD TITLE*		
376139	Log borehole core		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	4

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate knowledge of logging a borehole core in a geological environment.

SPECIFIC OUTCOME 2
Prepare to assist with the logging of the borehole core.

SPECIFIC OUTCOME 3
Log of the borehole core.

SPECIFIC OUTCOME 4
Conduct post-logging activities.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate an understanding of prospecting methods

SAQA US ID	UNIT STANDARD TITLE		
376140	Demonstrate an understanding of prospecting methods		
ORIGINATOR		PROVIDER	
Task Team - Fabrication and Extraction			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 4	8

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate an understanding of the principles of mineral prospecting.

SPECIFIC OUTCOME 2
Demonstrate an understanding of geophysical prospecting.

SPECIFIC OUTCOME 3
Demonstrate an understanding of geochemical prospecting.

SPECIFIC OUTCOME 4
Demonstrate an understanding of geobiological prospecting.

SPECIFIC OUTCOME 5
Demonstrate an understanding of geological prospecting utilising secondary indicators.

SPECIFIC OUTCOME 6
Demonstrate an understanding of the economic importance of mineral exploration to the South African mining industry.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Conduct a ground magnetic survey on the sub surface strata

SAQA US ID	*UNIT STANDARD TITLE*		
376141	Conduct a ground magnetic survey on the sub surface strata		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	8

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate knowledge of conducting a ground magnetic survey.

SPECIFIC OUTCOME 2
Prepare to conduct a ground magnetic survey.

SPECIFIC OUTCOME 3
Conduct the magnetic survey.

SPECIFIC OUTCOME 4
Perform post magnetic survey activities and compile a report.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Conduct surface geological surveys

SAQA US ID	*UNIT STANDARD TITLE*		
376142	Conduct surface geological surveys		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 3	3

New NQF Level: NQF Level 03

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate knowledge of elementary grid and the use of basic measuring instruments.

SPECIFIC OUTCOME 2
Lay out a grid on surface.

SPECIFIC OUTCOME 3
Compile and present completion report.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Construct a contour plan to determine the dip and strike of a plane

SAQA US ID	*UNIT STANDARD TITLE*		
376159	Construct a contour plan to determine the dip and strike of a plane		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 3	3

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate an understanding to construct a contour plan.

SPECIFIC OUTCOME 2
Construct a contour plan from predetermined elevation points.

SPECIFIC OUTCOME 3
Determine and document the dip and strike of a plane.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate an understanding of the relationship between global tectonic systems and mineral deposits

SAQA US ID	*UNIT STANDARD TITLE*		
376160	Demonstrate an understanding of the relationship between global tectonic systems and mineral deposits		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	4

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate an understanding of plate tectonics.

SPECIFIC OUTCOME 2
Demonstrate an understanding of the relationship between plate tectonics and mineralisation.

SPECIFIC OUTCOME 3
Demonstrate an understanding of plate tectonic activity during the geological evolution of South Africa.

SPECIFIC OUTCOME 4
Demonstrate a basic understanding of the relationship between plate tectonics and mineralization within South Africa.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Collate and interpret borehole data

SAQA US ID	*UNIT STANDARD TITLE*		
376161	Collate and interpret borehole data		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	5

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate knowledge of collating geologically related borehole data.

SPECIFIC OUTCOME 2
Collate raw data of borehole.

SPECIFIC OUTCOME 3
Validate raw data.

SPECIFIC OUTCOME 4
Archive the collated data and compile reports.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Integrate borehole data for geological modeling

SAQA US ID	*UNIT STANDARD TITLE*		
376162	Integrate borehole data for geological modeling		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	5

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate knowledge of collating geologically related borehole data for geological modelling purposes.

SPECIFIC OUTCOME 2
Source and collate raw data.

SPECIFIC OUTCOME 3
Validate raw data.

SPECIFIC OUTCOME 4
Archive the collated data and compile completion reports.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Plot and extrapolate geological information on a geological map or plan

SAQA US ID	*UNIT STANDARD TITLE*		
376163	Plot and extrapolate geological information on a geological map or plan		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	4

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate knowledge of plotting and extrapolating geological information on a geological map or plan.

SPECIFIC OUTCOME 2
Prepare to plot and extrapolate geological information on a geological map or plan.

SPECIFIC OUTCOME 3
Plot and extrapolate geological information on a geological map or plan.

SPECIFIC OUTCOME 4
Compile and present reports.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate an understanding of fossils

SAQA US ID	*UNIT STANDARD TITLE*		
376164	Demonstrate an understanding of fossils		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	6

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate knowledge of the mechanisms of fossilization.

SPECIFIC OUTCOME 2
Demonstrate an understanding of the concepts of evolution and extinction in geological time.

SPECIFIC OUTCOME 3
Demonstrate an understanding of the use of fossils in dating and identifying rock strata.

SPECIFIC OUTCOME 4
Demonstrate knowledge of the identification and classification of fossils.

SPECIFIC OUTCOME 5
Demonstrate knowledge of the methods relevant to the collection of fossils.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Log and sample a face to obtain geological information for quality control purposes in the relevant deposit

SAQA US ID	*UNIT STANDARD TITLE*		
376179	Log and sample a face to obtain geological information for quality control purposes in the relevant deposit		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 5	6

New NQF Level: NQF Level 05

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate the knowledge required to log and sample faces in surface or underground mines to obtain geological information for quality control purposes in the relevant deposit.

SPECIFIC OUTCOME 2
Plan and prepare to log and sample faces in surface or underground mines to obtain geological information for quality control purposes in the relevant deposit.

SPECIFIC OUTCOME 3
Log the face.

SPECIFIC OUTCOME 4
Sample the face.

SPECIFIC OUTCOME 5
Conduct post-logging and sampling activities and compile and present reports.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Interpret simple structural and stratigraphic features on a geological plan

SAQA US ID	*UNIT STANDARD TITLE*		
376180	Interpret simple structural and stratigraphic features on a geological plan		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	4

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate knowledge of interpreting simple structural and stratigraphic features on a geological plan.

SPECIFIC OUTCOME 2
Plan and prepare structural and stratigraphic features on a geological plan.

SPECIFIC OUTCOME 3
Identify structural and stratigraphic features on a geological plan.

SPECIFIC OUTCOME 4
Interpret structural and stratigraphic features on a geological plan.

SPECIFIC OUTCOME 5
Compile and present a report.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Construct and interpret a geological cross-section in a deformed area

SAQA US ID	*UNIT STANDARD TITLE*		
376181	Construct and interpret a geological cross-section in a deformed area		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 5	3

New NQF Level: NQF Level 05

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate an understanding to construct and interpret a geological cross-section.

SPECIFIC OUTCOME 2
Plan to construct a geological cross section.

SPECIFIC OUTCOME 3
Construct a geological cross section.

SPECIFIC OUTCOME 4
Interpret a geological cross-section.

SPECIFIC OUTCOME 5
Compile and present a geological cross-section formulated reports.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate an understanding of drilling techniques

SAQA US ID	*UNIT STANDARD TITLE*		
376199	Demonstrate an understanding of drilling techniques		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	5

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate an understanding of the history and range of drilling.

SPECIFIC OUTCOME 2
Demonstrate an understanding of common drilling equipment.

SPECIFIC OUTCOME 3
Demonstrate an understanding of drilling procedures.

SPECIFIC OUTCOME 4
Demonstrate an understanding of the purpose of drilling operations.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate an understanding of the typical phases of a mineral deposit

SAQA US ID	*UNIT STANDARD TITLE*		
376200	Demonstrate an understanding of the typical phases of a mineral deposit		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	4

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate an understanding of typical mineral resource types.

SPECIFIC OUTCOME 2
Demonstrate an understanding of the common means of identification of the principle mineral resources.

SPECIFIC OUTCOME 3
Demonstrate an understanding of the common means of exploitation of mineral resources.

SPECIFIC OUTCOME 4
Demonstrate an understanding of the common means of rehabilitation of mineral resources.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate an understanding of the principles of stratigraphy

SAQA US ID	*UNIT STANDARD TITLE*		
376201	Demonstrate an understanding of the principles of stratigraphy		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	6

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate understanding of the principles of stratigraphy.

SPECIFIC OUTCOME 2
Demonstrate understanding of the history of the development of stratigraphy.

SPECIFIC OUTCOME 3
Demonstrate an understanding of the stratigraphic classification systems.

SPECIFIC OUTCOME 4
Demonstrate an understanding of South African stratigraphy.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Sample and describe surface rock outcrops

SAQA US ID	*UNIT STANDARD TITLE*		
376219	Sample and describe surface rock outcrops		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 5	4

New NQF Level: NQF Level 05

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate knowledge of sampling surface outcrops.

SPECIFIC OUTCOME 2
Plan and sample surface outcrops.

SPECIFIC OUTCOME 3
Describe the surface outcrop.

SPECIFIC OUTCOME 4
Compile and submit reports.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate an understanding of Engineering Geology and Rock Mechanics

SAQA US ID	***UNIT STANDARD TITLE***		
376220	Demonstrate an understanding of Engineering Geology and Rock Mechanics		
ORIGINATOR		***PROVIDER***	
Task Team - Fabrication and Extraction			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 4	10

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate an understanding of the basic principles of Engineering Geology.

SPECIFIC OUTCOME 2
Demonstrate an understanding of the basic principles of Rock Mechanics.

SPECIFIC OUTCOME 3
Demonstrate knowledge of the geotechnical information used in engineering geology and rock mechanics.

SPECIFIC OUTCOME 4
Collect and collate geotechnical information.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77963	FETC: Mi g/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate an understanding of the mineralisation of a relevant economic deposit

SAQA US ID	*UNIT STANDARD TITLE*		
376221	Demonstrate an understanding of the mineralisation of a relevant economic deposit		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	6

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate an understanding of the location and economic importance of a relevant economic deposit.

SPECIFIC OUTCOME 2
Demonstrate an understanding of the geological characteristics of a relevant economic deposit.

SPECIFIC OUTCOME 3
Demonstrate an understanding of the mineralisation of a relevant economic deposit.

SPECIFIC OUTCOME 4
Demonstrate an understanding of the geological characteristics of similar economic deposits.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Process geological information for grade control purposes

SAQA US ID	UNIT STANDARD TITLE		
376222	Process geological information for grade control purposes		
ORIGINATOR		PROVIDER	
Task Team - Fabrication and Extraction			
FIELD		SUBFIELD	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	UNIT STANDARD TYPE	NQF LEVEL	CREDITS
Undefined	Regular	Level 4	5

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate knowledge of processing basic geological data for grade control purposes.

SPECIFIC OUTCOME 2
Validate basic geological data for grade control purposes.

SPECIFIC OUTCOME 3
Process basic geological data for grade control purposes.

SPECIFIC OUTCOME 4
Compile and present reports.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate an understanding of structural geology

SAQA US ID	*UNIT STANDARD TITLE*		
376223	Demonstrate an understanding of structural geology		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	6

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate an understanding of the fundamental aspects of structural geology.

SPECIFIC OUTCOME 2
Demonstrate an understanding of primary structures.

SPECIFIC OUTCOME 3
Demonstrate an understanding of folds and folding.

SPECIFIC OUTCOME 4
Demonstrate an understanding of faults and faulting.

SPECIFIC OUTCOME 5
Demonstrate an understanding of joints.

SPECIFIC OUTCOME 6
Demonstrate an understanding of lineations.

SPECIFIC OUTCOME 7
Demonstrate an understanding of foliations.

SPECIFIC OUTCOME 8
Demonstrate an understanding of plate tectonics and its relationship with structural features.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate an understanding of soil types and their characteristics

SAQA US ID	***UNIT STANDARD TITLE***		
376224	Demonstrate an understanding of soil types and their characteristics		
ORIGINATOR		***PROVIDER***	
Task Team - Fabrication and Extraction			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 4	6

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate an understanding of the principle soil types.

SPECIFIC OUTCOME 2
Demonstrate an understanding of the characteristics of the principle soil types.

SPECIFIC OUTCOME 3
Demonstrate an understanding of the importance of soils.

SPECIFIC OUTCOME 4
Demonstrate an understanding of the tests performed on soils.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Measure and record the yield of water in boreholes

SAQA US ID	*UNIT STANDARD TITLE*		
376225	Measure and record the yield of water in boreholes		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 3	2

New NQF Level: NQF Level 03

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate knowledge of measuring and recording the yield of water in boreholes.

SPECIFIC OUTCOME 2
Prepare to measure the yield of water in boreholes.

SPECIFIC OUTCOME 3
Measure the yield of water in boreholes.

SPECIFIC OUTCOME 4
Clean up and compile and submit reports.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate an understanding of surface processes

SAQA US ID	*UNIT STANDARD TITLE*		
376226	Demonstrate an understanding of surface processes		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	5

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate an understanding of the principle processes of weathering and their associated landforms.

SPECIFIC OUTCOME 2
Demonstrate an understanding of the principal types of erosive processes and their associated landforms.

SPECIFIC OUTCOME 3
Demonstrate an understanding of the principle types of depositional processes and their associated landforms.

SPECIFIC OUTCOME 4
Demonstrate an understanding of the principal mineral deposits formed through weathering, erosion and deposition.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Identify, measure and record the attitude of in situ geological structures

SAQA US ID	***UNIT STANDARD TITLE***		
376227	Identify, measure and record the attitude of in situ geological structures		
ORIGINATOR		***PROVIDER***	
Task Team - Fabrication and Extraction			
FIELD		***SUBFIELD***	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	***UNIT STANDARD TYPE***	***NQF LEVEL***	***CREDITS***
Undefined	Regular	Level 4	7

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate the knowledge and understanding required to identify, measure and record the attitude of geological structures.

SPECIFIC OUTCOME 2
Measure and record the attitude of geological structures.

SPECIFIC OUTCOME 3
Identify the attitude of a geological structure.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Compile and interpret a grade distribution plan

SAQA US ID	*UNIT STANDARD TITLE*		
376239	Compile and interpret a grade distribution plan		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	4

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate knowledge of compiling and interpreting a grade distribution plan.

SPECIFIC OUTCOME 2
Prepare to construct a grade distribution plan.

SPECIFIC OUTCOME 3
Compile a grade distribution plan.

SPECIFIC OUTCOME 4
Interpret a grade distribution plan.

SPECIFIC OUTCOME 5
Present a grade distribution plan.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Construct and interpret a map of a geologically familiar area

SAQA US ID	*UNIT STANDARD TITLE*		
376245	Construct and interpret a map of a geologically familiar area		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	3

New NQF Level: NQF Level 04

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Demonstrate an understanding to construct a map of a geologically familiar area.

SPECIFIC OUTCOME 2
Interpret a map of a geologically familiar area from given data.

SPECIFIC OUTCOME 3
Construct a map of a geologically familiar area from given data.

SPECIFIC OUTCOME 4
Interpret a map of a geologically familiar area from given data.

SPECIFIC OUTCOME 5
Present a geological map.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Sample stream sediment material for economic and environmental purpose

SAQA US ID	*UNIT STANDARD TITLE*		
376247	Sample stream sediment material for economic and environmental purpose		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 5	3

New NQF Level: NQF Level 05

This unit standard replaces:

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
9771	Sample stream sediment material for economic and environmental purposes	Level 5	15	Will occur as soon as 376247 is registered

SPECIFIC OUTCOME 1
Demonstrate an understanding to sample stream-sediment material.

SPECIFIC OUTCOME 2
Plan stream sediment material.

SPECIFIC OUTCOME 3
Sample the stream sediment material.

SPECIFIC OUTCOME 4
Clean up and compile a report.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Sample soil material for economic and environmental

SAQA US ID	*UNIT STANDARD TITLE*		
376280	Sample soil material for economic and environmental		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	3

New NQF Level: NQF Level 04

This unit standard replaces:

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
11691	Sample soil material for economic and environmental purposes	Level 4	12	Will occur as soon as 376280 is registered

SPECIFIC OUTCOME 1
Demonstrate knowledge to sample soil material.

SPECIFIC OUTCOME 2
Plan and prepare to sample soil material.

SPECIFIC OUTCOME 3
Sample soil material.

SPECIFIC OUTCOME 4
Clean up the sampling area and compile a reports.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Manage a geological core yard facility

SAQA US ID	*UNIT STANDARD TITLE*		
376281	Manage a geological core yard facility		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 3	5

New NQF Level: NQF Level 03

This unit standard replaces:

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
11692	Manage a geological core yard facility	Level 3	5	Will occur as soon as 376281 is registered

SPECIFIC OUTCOME 1
Demonstrate knowledge of managing a geological core yard facility.

SPECIFIC OUTCOME 2
Manage a geological core yard.

SPECIFIC OUTCOME 3
Compile and present activity reports.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77963	FETC: Mining/Exploration Geology	Level 4

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Construct and interpret a geological cross-section in a familiar area

SAQA US ID	*UNIT STANDARD TITLE*		
376282	Construct and interpret a geological cross-section in a familiar area		
ORIGINATOR		*PROVIDER*	
Task Team - Fabrication and Extraction			
FIELD		*SUBFIELD*	
6 - Manufacturing, Engineering and Technology		Fabrication and Extraction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 4	3

New NQF Level: NQF Level 04

This unit standard replaces:

US ID	Unit Standard Title	NQF Level	Credits	Replacement Status
115684	Construct and interpret a geological cross-section in a familiar area	Level 4	3	Will occur as soon as 376282 is registered

SPECIFIC OUTCOME 1
Demonstrate an understanding to construct and interpret a geological cross-section.

SPECIFIC OUTCOME 2
Plan a geological cross section.

SPECIFIC OUTCOME 3
Construct a geological cross section.

SPECIFIC OUTCOME 4
Interpret a geological cross-section.

SPECIFIC OUTCOME 5
Compile and present a geological cross-section report.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	77963	FETC: Mining/Exploration Geology	Level 4

No. 14 **29 January 2010**

SOUTH AFRICAN QUALIFICATIONS AUTHORITY (SAQA)

In accordance with Regulation 24(c) of the National Standards Bodies Regulations of 28 March 1998, the Task Team for

INDUSTRIAL WATER TREATMENT

registered by Organising Field 12 – Physical Planning and Construction, publishes the following Qualification and Unit Standards for public comment.

This notice contains the titles, fields, sub-fields, NQF levels, credits, and purpose of the Qualification and Unit Standards. The full Qualification and Unit Standards can be accessed via the SAQA web-site at **www.saqa.org.za**. Copies may also be obtained from the Directorate of Standards Setting and Development at the SAQA offices, SAQA House, 1067 Arcadia Street, Hatfield, Pretoria.

Comment on the Qualification and Unit Standards should reach SAQA at the address below and ***no later than 1 March 2010.*** All correspondence should be marked **Standards Setting – Task Team for Industrial Water Treatment** and addressed to

The Director: Standards Setting and Development
SAQA
Attention: Mr. E. Brown
Postnet Suite 248
Private Bag X06
Waterkloof
0145
or faxed to 012 – 431-5144
e-mail: ebrown@saqa.org.za

D. MPHUTHING
ACTING DIRECTOR: STANDARDS SETTING AND DEVELOPMENT

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

QUALIFICATION:
National Certificate: Industrial Water Treatment Support System Operations

SAQA QUAL ID	***QUALIFICATION TITLE***		
77163	National Certificate: Industrial Water Treatment Support System Operations		
ORIGINATOR		***PROVIDER***	
Task Team - Industrial Water Treatment			
QUALIFICATION TYPE	***FIELD***	***SUBFIELD***	
National Certificate	12 - Physical Planning and Construction	Civil Engineering Construction	
ABET BAND	***MINIMUM CREDITS***	***NQF LEVEL***	***QUAL CLASS***
Undefined	128	Level 2	Regular-Unit Stds Based

New NQF Level: NQF Level 02

This qualification does not replace any other qualification and is not replaced by another qualification.

PURPOSE AND RATIONALE OF THE QUALIFICATION
Learners obtaining this qualification will be recognised on a national level for performing operational activities using Industrial Water Treatment auxiliary systems and processes as well as related equipment. The qualification will ensure professionalism, proficiency and excellence in the operating of Industrial Water Treatment Systems.

The qualification will enable employers to employ operators who will be able to perform operations in a safe, sound and efficient manner. This qualification will provide for recognition of prior learning of existing operator competence throughout the industry and allows credits to be obtained in cross-functional learning fields.

A person acquiring this qualification will have skills, knowledge and behavioural competence in the following areas:

- Solving problems in an industrial water treatment environment.
- Communicating effectively in the workplace.
- Understanding of the fundamentals of Industrial Water Treatment Processes and Concepts.
- Understanding mechanical equipment related to Industrial Water Treatment Systems.
- Possessing knowledge of organisational and regulatory requirements related to Industrial Water Treatment Support Systems.
- Performing operations on Industrial Water Treatment Support Systems safely and efficiently.

Rationale:

This qualification is based on the need of the Water sector for building competencies in the workplace in Industrial Water Treatment Operations. The qualification sets national standards for field operators in Industrial related water treatment systems.

This qualification provides the learner with accessibility to employment in the functional areas of Industrial water treatment operations. The learning pathway for industrial water treatment processes is as follows:

- General Education and Training Certificate: Water Services.
- National Certificate: Industrial Water Treatment Support System Operations, Level 2.
- National Certificate: Water and Wastewater Treatment Control, Level 3.
- Further Education and Training Certificate: Water and Wastewater Treatment Process Control Supervision.
- National Certificate: Generic Management, Level 5 with specialisation in Water Management.

Other considerations of national interest addressed by this Qualification are:

- Setting national standards of practice in this specific learning field.
- Building individual capacity in this specialised profession.
- Ensuring entry, progression and mobility into Life Long Learning in this specific learning field.
- Addressing Industry specific employment requirements.
- Providing an avenue of upliftment for the previously disadvantaged into this field of learning.
- Enhancing social and economic development.
- Registration of successful learners by the Department of Water Affairs as a "Class III" operator.

RECOGNIZE PREVIOUS LEARNING?
Y

LEARNING ASSUMED IN PLACE
Learners should be competent in:

- Communication at NQF Level 1.
- Mathematical Literacy at NQF Level 1.

Recognition of Prior Learning:

- This qualification can be achieved in part or whole through recognised Recognition of Prior Learning learning processes.
- Evidence of prior learning must be assessed through formal Recognition of Prior Learning processes.
- Any other evidence of prior learning should be assessed through formal Recognition of Prior Learning processes to recognise achievement thereof.

Access to the Qualification:

There is open access to this qualification.

QUALIFICATION RULES
- All the Fundamental Unit Standards totalling 36 credits are compulsory.
- All the Core Unit Standards totalling 77 credits are compulsory.
- Learners are required to select elective standards for learning according to their specific industry needs. These Unit Standards allow the Learner to specialise in the water treatment process specific to his/her functional area. A minimum of 15 credits is required to complete the qualification.

EXIT LEVEL OUTCOMES
1. Solve problems in an industrial water treatment environment.

2. Communicate effectively in the workplace.

3. Demonstrate understanding of the fundamentals of Industrial Water Treatment Processes and Concepts.

4. Demonstrate understanding of and use mechanical equipment related to Industrial Water Treatment Systems.

5. Demonstrate knowledge of organisational and regulatory requirements related to Industrial Water Treatment Support Systems.

6. Perform operations in Industrial Water Treatment Support Systems.

Critical Cross-Field Outcomes:

This qualification promotes, in particular, the following Critical Cross-Field Outcomes:

This qualification addresses the following Critical Cross-Field Outcomes, as detailed in the assessment criteria for each Exit Level Outcome and within the unit standards associated with each Exit Level Outcome:

a) Identifying and solving problems associated with malfunctioning of plant equipment in which responses display that responsible decisions using critical and creative thinking have been made to meet organisational goals and objectives.
b) Working effectively with others as a member of a team, group, organisation, and community in order maintain good working relationship with internal and external customers in a industrial waste water processing environment.
c) Planning, organising and managing oneself and one`s activities responsibly and effectively to ensure coherence with organisational schedules.
d) Collecting, analysing, organising and critically evaluating information relating to meter readings and process control.
e) Communicating effectively using visual, mathematical and/or language skills in the form of oral and/or written presentation to report relevant information to supervisors.
f) Using science and technology effectively and critically to understand the functioning of an industrial wastewater plant equipment and instrumentation showing responsibility towards the environment and health of others.
g) Demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation by observing the importance of industrial wastewater processing plant operational principles.

ASSOCIATED ASSESSMENT CRITERIA
Associated Assessment Criteria for Exit Level Outcome 1:

- Problems are identified and solved through using problem solving strategies that are appropriate to the problems at hand in real work situations.
- Root causes problems are identified and solutions derived that are appropriate to the problems.
- Solutions are validated in terms of the problem situation.
- Technology is used effectively to assist in problem solving as required.

Associated Assessment Criteria for Exit Level Outcome 2:

- Language structure and features are applied effectively to accommodate workplace requirements.
- Appropriate media is used to communicate in a clear and structured manner.
- Text in written and oral communication is interpreted and acted upon.

Associated Assessment Criteria for Exit Level Outcome 3:

• Operating equipment is described in terms of its application in the operating system.
• The principles of safe and effective operation of plant processes are described in terms of the safety of staff and ensuring a good quality product.
• Differences and similarities in water treatment processes and systems are explained.
• Chemicals used in water treatment processes are described in terms of Materials Safety Data Sheets (MSDS).

Associated Assessment Criteria for Exit Level Outcome 4:

• Mechanical equipment is explained and identified using established literature and engineering conventions.
oRange: Pumps and valves.
• Mechanical equipment for industrial water treatment systems and processes is used according to standard operating procedures.
• Problems encountered while using mechanical equipment in the process plant are described and solutions found are utilised.
oRange: Waste water processing plants.
• Equipment design and application theories are described in terms of the context of their application.
• Plant processes are operated safely and effectively.
o Range: Pumps and valves.

Associated Assessment Criteria for Exit Level Outcome 5:

• Regulatory requirements and workplace procedures are described and interpreted within the context of the Occupational Health and Safety Act.
• Non-compliance with statutory requirements is described in terms of the potential impact on the micro environment, clients, staff and the organisation.

Associated Assessment Criteria for Exit Level Outcome 6:

• Plant operations are performed according to standard operating procedures.
• Possible abnormal emergency conditions are identified, described and acted upon using Chemical and Engineering Principles.
• Principles of teamwork are applied according to operational requirements.

Integrated Assessment:

The applied competence (practical, foundational and reflective competencies) of this qualification will be achieved if a learner is able to achieve all Exit Level Outcomes of the qualification.

Applicable Critical Cross Field Outcomes must be assessed during any combination of practical, foundational and reflexive competencies. Assessment methods and tools used must determine the whole person's development and integration of applied knowledge and skills.

During integrated assessment, the assessor should make use of formative and summative assessment methods and should assess combinations of practical, foundational and reflective competencies.

Formative Assessment:

Assessment criteria for formative assessment are described in the various unit standards. Formative assessment takes place during the process of learning and assessors should use a range of appropriate assessment methods and tools that assess competence holistically.

These methods include but are not limited to the following: On-the-job observations, Role-play and/or simulations, Knowledge tests, exams, case studies, projects, logbooks, workbooks, Verbal report backs (presentations), Working in teams (360 degrees evaluations)and Scenario sketching Incident reports.

Summative Assessment:

Summative assessment is carried out at the end of each meaningful body of knowledge and skills.

Assessors and Moderators:

Work place assessors should develop and conduct integrated assessments by using appropriate methods and techniques. Moderation to be done according to laid down requirements.

INTERNATIONAL COMPARABILITY

The qualification is based on a study conducted by Industry on qualifications developed for industrial water treatment operations functioning in an industrial environment, in countries considered to be the leaders in industrial water treatment processes. Best practice is found in Australia, New Zealand and the United Kingdom.

The core and elective components have been developed taking into account the South African context, but also by looking at international best practice. On water and waste water purification international qualifications were examined to ensure that the qualification and associated unit standards are comparable in terms of qualification levels, scope and competencies covered.

Qualifications from the following countries were examined:

Australian Qualifications Framework (AQF):

- NWP01 Water Industry and the Certificate Course in Water and Wastewater.

Scottish Vocational Qualifications (SQA):

- Monitoring the Water Environment Level 2-Code G322.
- Operating Process Plant: Sludge Level 2-Code G31M.
- Operating Process Plant: Sludge Level 2-Code G5HC.
- Operating Process Plant: Water Level 2-Code G31J.
- Operating Process Plant: Water Level 2-Code G5HE.

New Zealand Qualifications Authority (NZQA):

- National Certificate in Water Treatment (Site Operator).
- National Certificate in Wastewater Treatment (Site Operator), NQF Ref 0879.

United Kingdom (QCA):

- City and Guilds Level 2 Certificate in Water Engineering, 500/1698/2.
- Certificate in Process Plant Operations Level 2.

Short Courses:

United States of America:

The USA has no qualifications at this level but the following short courses were found offered by different institutions and organisations targeting to a large extent Water and Wastewater Operations. The content of some of the short courses have been found to compare well with the South African qualifications although the level at which the course is pitched is not known. Some courses are at an undergraduate level, which form the basis for more advanced courses.

Alabama Rural Water Association:

Water and Wastewater Operator Certificate Training.

This association in conjunction with the Alabama Department of Environmental Management conducts free Primary, Secondary and Advanced Water and Wastewater Operator Certificate courses. The purpose of the course is to protect the public health and welfare and prevent pollution by classifying all water and wastewater treatment plants. The programme also aims to provide certification of the competency of operation to operators who operate such plants. The duration of the course 60 hours.

College Campus:

The college offer a short course for operators who work in different size plants, as there is no nationally mandated certification programme for operators. The course is aimed at improving the water and wastewater plants operators skills and knowledge thus enabling the operator to pass an examination to certify that they are capable of overseeing water and wastewater plant operators. The duration of the course is not known, however the course covers the following topics that compare with some of the unit standards contained in the South African qualification at Level 2. The following topics are covered:

- Principles of treatment processes and process control.
- Laboratory procedures.
- Maintenance of pumps.
- Safety.
- Chlorination.
- Sedimentation.
- Biological treatment.
- Sludge treatment and disposal.
- Flow measurements.
- Collection systems.

Virginia:

Virginia Tech, Blackburg:

Water and wastewater reticulation plant operator short course.

The Virginia Tech is providing a training programme aimed at developing more qualified plant operators. The programme duration is 10 days. The programme is designed to be introductory where learners learn about water and wastewater treatment and other relevant subject matter.

London:

Imperial College:

This is a certification course offered for people who work or intend to become a water or wastewater treatment plant operator. The course aims to provide basic description and understanding of unit processes used in the reticulation of water and wastewater. The duration

of the course is 20 hours of lectures over 10 sessions. The course however compares favourably well with this qualification in some of the unit standards contained in the qualification although topics such as coagulation, flocc separation and sedimentation are dealt with individually whilst the qualification cover them in one unit standard. The topics covered in the course compare favourably with some of the unit standards contained in the qualifications. These are:

- Introduction to water and wastewater treatment.
- Coagulation.
- Flocculation.
- Filtration.
- Disinfection.
- Sedimentation.
- Activated Sludge 1.
- Sludge Treatment and Dewatering.
- Biological filtration.

In the USA the condensate polishing, demineralising of water, water cooling and effluent treatment, the USA nuclear industry standard is governed by the NRC (Nuclear Regulatory Commission). The standard of training is ensured by accrediting all training programs to requirements as set out and evaluated by INPO. The Systematic Approach to training (SAT) is applied throughout all the US nuclear programs resulting in a structured training curriculum (task list) consisting of main objectives and specific outcomes similar to the core and electives of this qualification.

SADC:

Zimbabwe:

The institute of Water and Sanitation Development in a UNDP-World Bank Programme established in 1989 with a strong emphasis on the building and promotion of urban and rural water supplies and sanitation. The Institute has sister organisations in Ghana, Burkina Faso, Mozambique and South Africa. The Institute offers courses aimed at building a career in the water and sanitation sector. The only possibility relevant courses offered found were:

- National Certificate in Water and Wastewater qualification, which is a first level towards a National Diploma in Water and Wastewater Management.
- National Diploma in Water and Wastewater Management which is a distance learning course aimed at enhancing the capacity to manage water and wastewater for those in individuals who are either aspiring to or are already working for local authorities.
- Postgraduate Diploma in Water Supplies and Sanitation for personnel working in both urban and rural water supplies.

Botswana:

The Botswana Training Authority (BOTA), was inaugurated in October 2000 which is mandated to monitor and regulate Vocational Education and Training (VET) within Botswana. Unfortunately there is limited number of qualifications and the unit standards developed by BOTA hence none could currently be found relating to Industrial water qualifications.

Tanzania:

The Vocational Education and Training Act was enacted by the Parliament in 1994 to guide the vocational education and training (VET) system in Tanzania. The Act established the Vocational Education and Training Authority (VETA) as an autonomous government agency charged with an overall responsibility of Coordinating, Regulating, Financing, Providing and Promoting

vocational education and training. According to the Annual Conference held in Tanzania in 1998, it was stated that more than 80 percent of Tanzania's population live in rural areas. Therefore the government aims for sustainable rural water supply. Unfortunately no reference was found to any type of relevant developed qualifications or unit standards including short courses that could compare with this qualifications.

Conclusion:

A substantial degree of similarity was found in most of the qualifications examined. The South African qualification and its associated unit standards are generally comparable to the Scottish, Australian, New Zealand courses in terms of levels, scope and range of competencies covered. There was less similarity with the United Kingdom qualification. This was probably due to the difference in the water situation in the UK.

ARTICULATION OPTIONS

Vertical Articulation:

- National Certificate: Industrial Water Treatment Field Operations, NQF Level 3.

Horizontal Articulation:

- ID 60169: National Certificate: Water and Wastewater Reticulation Services, NQF Level 2.
- ID 58951: National Certificate: Water and Wastewater Treatment Process Operations, NQF Level 2.

MODERATION OPTIONS

- Anyone assessing a learner or moderating the assessment of a learner against this Qualification must be registered with the relevant ETQA.

- Any institution offering learning that will enable the achievement of this Qualification must be accredited as a provider with the relevant ETQA.

- Assessment and moderation of assessment will be overseen by the relevant ETQA according to the ETQA policies and guidelines for assessment and moderation; in terms of agreements reached around assessment and moderation between ETQA's (including professional bodies); and in terms of the moderation guideline.

CRITERIA FOR THE REGISTRATION OF ASSESSORS

The assessor must be:

- Registered as an assessor with the relevant ETQA.
- Have at least a minimum of 1 year on the job relevant experience.
- Have a similar qualification above the Level of the qualification.

NOTES

National schedule for water and waste water plant operators.

UNIT STANDARDS

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Fundamental	119463	Access and use information from texts	Level 2	5
Fundamental	9009	Apply basic knowledge of statistics and probability to influence the use of data and procedures in order to investigate life related problems	Level 2	3
Fundamental	7480	Demonstrate understanding of rational and irrational numbers and number systems	Level 2	3

	ID	UNIT STANDARD TITLE	LEVEL	CREDITS
Fundamental	9008	Identify, describe, compare, classify, explore shape and motion in 2-and 3-dimensional shapes in different contexts	Level 2	3
Fundamental	119454	Maintain and adapt oral/signed communication	Level 2	5
Fundamental	119460	Use language and communication in occupational learning programmes	Level 2	5
Fundamental	7469	Use mathematics to investigate and monitor the financial aspects of personal and community life	Level 2	2
Fundamental	9007	Work with a range of patterns and functions and solve problems	Level 2	5
Fundamental	119456	Write/present for a defined context	Level 2	5
Core	113940	Demonstrate basic water related sampling techniques	Level 1	3
Core	13963	Demonstrate Knowledge and Understanding Towards Occupational health and safety Regulatory Requirements	Level 2	2
Core	13962	Demonstrate Knowledge and Understanding of The Organisation	Level 2	2
Core	13961	Demonstrate Knowledge and Use of Hand Operated Fire Fighting Equipment	Level 2	4
Core	246460	Demonstrate basic knowledge of the wastewater treatment process	Level 2	8
Core	365262	Demonstrate knowledge and understanding of basic operating principles and concepts related to waste water treatment	Level 2	6
Core	246473	Demonstrate knowledge of elementary biology in the water wastewater environment	Level 2	3
Core	246463	Demonstrate knowledge of water cycle, water and wastewater systems and processes	Level 2	5
Core	246466	Operate water and wastewater chemical dosage systems	Level 2	10
Core	12483	Perform basic first aid	Level 2	4
Core	10598	Differentiate between valve designs and application theories associated with process plants	Level 3	1
Core	10488	Interpret liquid transfer theories in a process plant	Level 3	3
Core	365261	Operate an industrial waste water processing plant	Level 3	18
Core	12057	Demonstrate knowledge of wastewater related legislation	Level 4	8
Elective	246464	Conduct sampling for water and wastewater treatment processes	Level 2	4
Elective	7572	Demonstrate knowledge of and produce computer spreadsheets using basic functions	Level 2	3
Elective	7568	Demonstrate knowledge of and produce word processing documents using basic functions	Level 2	3
Elective	246450	Demonstrate knowledge of the water treatment process	Level 2	8
Elective	7571	Demonstrate the ability to use electronic mail software to send and receive messages	Level 2	3
Elective	7547	Operate a personal computer system	Level 2	6
Elective	365260	Transport and store gas cylinders within an industrial work site	Level 2	2
Elective	14102	Apply Radiation Requirements for Activities in Radiologically Controlled Zones at a Nuclear Power Plant	Level 3	2
Elective	365259	Describe and use techniques for safe handling and usage of chlorine	Level 3	3
Elective	10587	Describe the working principle of compressed air systems associated with process plant	Level 3	2

LEARNING PROGRAMMES RECORDED AGAINST THIS QUALIFICATION
None

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Describe and use techniques for safe handling and usage of chlorine

SAQA US ID	*UNIT STANDARD TITLE*		
365259	Describe and use techniques for safe handling and usage of chlorine		
ORIGINATOR		*PROVIDER*	
Task Team - Industrial Water Treatment			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Civil Engineering Construction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 3	3

New NQF Level: NQF Level 03

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Explain best practices for safe handling and usage of chlorine.

SPECIFIC OUTCOME 2
Handle portable chlorine containers safely.

SPECIFIC OUTCOME 3
Demonstrate knowledge of the use and distribution of chlorine.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77163	National Certificate: Industrial Water Treatment Support System Operations	Level 2

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Transport and store gas cylinders within an industrial work site

SAQA US ID	*UNIT STANDARD TITLE*		
365260	Transport and store gas cylinders within an industrial work site		
ORIGINATOR		*PROVIDER*	
Task Team - Industrial Water Treatment			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Civil Engineering Construction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 2	2

New NQF Level: NQF Level 02

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Store gas cylinders.

SPECIFIC OUTCOME 2
Transport gas cylinders.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Elective	77163	National Certificate: Industrial Water Treatment Support System Operations	Level 2

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Operate an industrial waste water processing plant

SAQA US ID	*UNIT STANDARD TITLE*		
365261	Operate an industrial waste water processing plant		
ORIGINATOR		*PROVIDER*	
Task Team - Industrial Water Treatment			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Civil Engineering Construction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 3	18

New NQF Level: NQF Level 03

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Monitor and control inlet system.

SPECIFIC OUTCOME 2
Control waste water aeration process.

SPECIFIC OUTCOME 3
Control sedimentation process.

SPECIFIC OUTCOME 4
Control maturation process.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	77163	National Certificate: Industrial Water Treatment Support System Operations	Level 2

SOUTH AFRICAN QUALIFICATIONS AUTHORITY

UNIT STANDARD:

Demonstrate knowledge and understanding of basic operating principles and concepts related to waste water treatment

SAQA US ID	*UNIT STANDARD TITLE*		
365262	Demonstrate knowledge and understanding of basic operating principles and concepts related to waste water treatment		
ORIGINATOR		*PROVIDER*	
Task Team - Industrial Water Treatment			
FIELD		*SUBFIELD*	
12 - Physical Planning and Construction		Civil Engineering Construction	
ABET BAND	*UNIT STANDARD TYPE*	*NQF LEVEL*	*CREDITS*
Undefined	Regular	Level 2	6

New NQF Level: NQF Level 02

This unit standard does not replace any other unit standard and is not replaced by another unit standard.

SPECIFIC OUTCOME 1
Explain the basic operating principles of valves.

SPECIFIC OUTCOME 2
Explain basic operating principles of pumps.

SPECIFIC OUTCOME 3
Explain basic operating principles of filters, screens and strainers.

SPECIFIC OUTCOME 4
Explain principles of pipes and pipe fittings.

SPECIFIC OUTCOME 5
Demonstrate knowledge and understanding of basic lubrication principles.

SPECIFIC OUTCOME 6
Demonstrate knowledge and understanding of general operating routines and activities.

QUALIFICATIONS UTILISING THIS UNIT STANDARD

	ID	QUALIFICATION TITLE	LEVEL
Core	77163	National Certificate: Industrial Water Treatment Support System Operations	Level 2