BQA NCQF QUALIFICATION TEMPLATE

SECTION A:	QUALIFICATION DETAILS
QUALIFICATION DEVELOPER (S)	Department of Teacher Training and Technical Education

TITLE	Diploma in Environmental Engineering			NCQF LEVEL	6
STRANDS (where applicable)	1. N/A 2. 3. 4.				
FIELD	Manufacturing, Engineering and Technology	SUB-FIELD	Engineering and Engineering Trades	CREDIT VALUE	370

New Qualification		✓							Legacy Qualification								
SUB-FRAMEWORK	General Education					TVET						Higher Education					
QUALIFICATION TYPE	Certificate	I		II		III		IV		V		Diploma	✓	Bachelor			
	Bachelor Honours					Post Graduate Certificate						Post Graduate Diploma					
	Masters									Doctorate/ PhD							

RATIONALE AND PURPOSE OF THE QUALIFICATION

RATIONALE:

Environmental Engineering has been identified as one of the occupations in high demand in Botswana and beyond. The occupations or skills are needed by energy, water, mining, transport management and logistics, fleet management, tourism, power, agriculture, construction, vocational and technical education, engineering, and most sectors. This is based on the Labour Market Analysis conducted by the HRDC.

The qualification Diploma in Environmental Engineering is developed as a response to the need established by the Human Resource Development Council Report (HRDC 2019) of Top Occupations

in Demand, which identified Environmental Technicians as one of the occupations in high demand in Botswana

Central to the rationale of this qualification is the development of a culture of professionalism and a deeper understanding of the Environment. Graduates will assist engineers in providing solutions to curb pollution, improve sanitation systems, help design water supply and wastewater treatment systems, and design plans to prevent waterborne diseases, encourage sustainable development and study the effects of technological growth on the environment. This is in line with Botswana's obligations to international treaties and other multilateral environmental agreements (MEAs) such as the Basel Convention on the trans-boundary movement of hazardous waste and their disposal. Furthermore, it will improve the health of communities and contribute towards improving and managing the environment and controlling environmental pollution.

Climate change issues render the occupation to be prioritised and technicians to be trained in this area. Botswana as a country is not spared on issues of climate change. There are no environmental engineering technicians, and so far, there is no course or programme for environmental science that is at the diploma level which will produce technicians. The country offers environmental science/ environmental engineering at the degree level only.

This qualification provides wide coverage and suppleness to match the needs of the industry, learners, employers and entrepreneurs. It gives learners key skills essential to function effectively and competitively as Technicians in Environmental Engineering. This is espoused in the National Vision 2036 and contributes to transforming Botswana from a Resource Based Economy to a Knowledge-Based Economy, HRDC, UNESCO, International Treaties and SDGs (number 4 on quality education, 13 on climate action and 15 on life on land).

PURPOSE:

The purpose of this qualification is to produce graduates with advanced knowledge, skills and competence to:

1. Review and implement environmental work plans according to specifications.
2. Use computer applications to maintain project records.
3. Conduct pollution surveys, collect and analyse samples of air, soil, surface water, groundwater and others to prevent and/or clean up environmental pollution.

4. Arrange for the safe disposal of hazardous materials.
5. Gather product specifications, identify vendors and suppliers, and procure materials and equipment for laboratories.
6. Inspect facilities for compliance with the regulations that govern the use of substances.

MINIMUM ENTRY REQUIREMENTS (including access and inclusion)

The minimum entry requirement for this qualification is as follows:

- Certificate IV, NCQF Level 4 (General Education or TVET Intermediate Certificate).
- Applicants who do not meet minimum entry will be absorbed through RPL and CAT according to ETP's policies aligned to BQA RPL and CAT policies.

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SECTION B	***QUALIFICATION SPECIFICATION***
GRADUATE PROFILE (LEARNING OUTCOMES)	***ASSESSMENT CRITERIA***
1. Solve current environmental problems to control all aspects of environmental pollution as per regulations (land, air and water)	1.1 Apply remediation practices to solve environmental problems. 1.2 Use modern devices, software, and equipment to analyse and solve environmental problems according to the set standards 1.3 Plan strategies to control, reduce and monitor pollution.
2. Apply sustainable development principles to ensure environmental protection.	2.1 Execute professional engineering solutions in societal, economic and environmental contexts. 2.2 Explore principles used in sustainable development 2.3 Carryout prevention measures against all aspects of environmental pollution 2.4 Execute clean-up methods of contaminated soil and water

3 Apply engineering mathematics skills to design environmental engineering systems	3.1 Perform calculations in order to solve problems within the environmental engineering field 3.2 Employ engineering mathematical concepts and principles to design environmental systems 3.3 Perform technological-related mathematical calculations to solve environmental system problems
4 Use engineering software to design and develop engineering drawings as per the set standards.	4.1 Examine the symbols associated with environmental engineering systems to produce engineering drawings 4.2 Produce engineering components in pictorial and orthographic projection to analyse designs 4.3 Employ the skill to use environmental engineering software to produce drawings as per the requirements
5 Execute professional skills applicable in the environmental engineering discipline	5.1 Employ ICT skills in environmental engineering to execute the assigned tasks 5.2 Communicate effectively and efficiently in engineering in the environmental engineering field 5.3 Apply entrepreneurship practical skills in a business setup 5. 4 Comprehend and write effective reports and design documentation, impact assessment reports, and make effective presentations. 5.5 Employ research, project management skills and ethics in an environmental engineering discipline to carry out an integrated project

6 Apply health and safety measures to ensure a health and safety compliant environment	6.1 Adhere to health and safety regulations in the workplace to minimise risks and accidents 6.2 Monitor occupational, health and safety regulations, codes and practices in the workplace to ensure best safety practices 6.3 Report injuries and accidents in the workplace to comply with health and safety reporting procedures
7 Provide support services to engineers for the design of environmental engineering systems using applicable standards, codes of practice and legislation	7.1 Carryout the support services to engineers for the design of environmental hazard management systems 7.2 Execute alternative environmental remediation technologies and conservation solutions to solve environmental engineering problems 7.2 Enforce environmental bylaws as per the set standards
8 Apply professional skills (ethics) applicable to the Environmental Engineering discipline	8.1 Conduct Environmental Impact assessment and reporting to address environmental issues in projects 8.2 Interpret and utilise environmental management/ affairs statutes to ensure adherence 8.3 Apply code of ethics for engineers in the work environment
9 Carry out quality measurements in Environmental Engineering Discipline to ensure compliance with standards	1.9.1 Develop water quality sampling protocols to ensure consistency in sampling 1.9.2 Perform different environmental water and air parameters quality tests to ensure adherence 1.9.3 Conduct standard tests, measurements, experiments and interpret the results to improve processes.

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SECTION C	***QUALIFICATION STRUCTURE***				
COMPONENT	***TITLE***	***Credits Per Relevant NCQF Level***			***Total Credits***
		Level [ ]	***Level [5]***	***Level [6]***	
FUNDAMENTAL COMPONENT *Subjects/ Courses/ Modules/Units*	Introduction to Computing		8		**8**
	Communication skills		8		**8**
	Occupational Health & Safety			6	**6**
	Introduction to Research Methodology			8	**8**
	Entrepreneurship		8		**8**
CORE COMPONENT *Subjects/Courses/ Modules/Units*	Engineering Mathematics		18	18	**36**
	Engineering Ethics			8	**8**
	AutoCAD for Civil Engineering		10		**10**
	Engineering Drawing		6		**6**
	Chemistry		14		**14**
	Biology		14		**14**
	Fundamentals of Environmental Science		15		**15**

	Solid Waste Management			14	**14**
	Water Pollution & Quality Management			13	**13**
	Computer Application in Environmental Engineering			10	**10**
	Surface and Groundwater Hydrology			12	**12**
	Environmental Pollution			8	**8**
	Water Supply Systems Management			12	**12**
	Wastewater Treatment & Disposal			14	**14**
	Environmental Law			12	**12**
	Environmental Impact Assessment			8	**8**
	Water Analysis			8	**8**
	Hazardous Waste Management			8	**8**
	Building and Industrial Pollution			8	**8**
	Environmental Remote Sensing and GIS			12	**12**
	Integrated Project			30	**30**
	Work Placement			60	**60**

STRANDS/ SPECIALIZATION	*Subjects/ Courses/ Modules/Units*	***Credits Per Relevant NCQF Level***			***Total Credits***
		Level [ ]	***Level [ ]***	***Level [ ]***	
1.	***N/A***				
2.	***N/A***				
Electives	***N/A***				

SUMMARY OF CREDIT DISTRIBUTION FOR EACH COMPONENT PER NCQF LEVEL	
TOTAL CREDITS PER NCQF LEVEL	
NCQF Level	***Credit Value***
Level 5	***120***
Level 6	***250***
TOTAL CREDITS	***370***

Rules of Combination:

(Please Indicate combinations for the different constituent components of the qualification)

Fundamentals NCQF 5= 30
Fundamental NCQF 6 = 16

Core NCQF 5 = 81
Core NCQF 6=243

Total Credits 370

The candidate must pass all core modules and fundamentals modules.

N.B. There are no electives for this qualification

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ASSESSMENT ARRANGEMENTS
Documentation All necessary documents, including the qualification document, alignment matrices, assessment instruments, and Assessment criteria/rubrics, should be available. **Formative (60%)** The contribution of formative assessment to the final grading shall be 60% **Summative Assessment (40%)** The contribution of summative assessment to the final grade shall be 40% Assessment shall be carried out by BQA-registered and accredited Assessors
MODERATION ARRANGEMENTS
Internal and external moderators to be engaged will be BQA-accredited subject specialists in relevant fields with relevant industry experience and academic qualifications. The moderators should be holders of Bachelor Degree in Environmental Engineering relevant/similar qualifications with industrial experience.
RECOGNITION OF PRIOR LEARNING
Recognition of Prior Learning (RPL) will be considered for the award of the credits according to applicable RPL policies
CREDIT ACCUMULATION AND TRANSFER
Credit Accumulation and Transfer will be considered for the award of the credits according to applicable RPL policies
PROGRESSION PATHWAYS (LEARNING AND EMPLOYMENT)
Horizontal Articulation • Diploma in Geomatics • Diploma in Wastewater Engineering • Diploma in Civil and Building Engineering • Diploma in Mechanical Engineering • Diploma in Water Engineering • Diploma in Groundwater Engineering

Vertical Articulation

- Bachelor of Science in Geomatics
- Bachelor of Engineering in Civil Engineering
- Bachelor of Water and Environmental Engineering

Employment Pathways

- Environmental Engineering Technician
- Sanitation Technician
- Industrial Pollution Inspector

QUALIFICATION AWARD AND CERTIFICATION

Qualification Award

- Candidates who meet the required minimum of 370 credits will be awarded a Diploma in Environmental Engineering in accordance with the qualification composition rules and applicable policies.

Certification

- There will be certification upon awarding of a Diploma in Environmental Engineering qualification.

SUMMARY OF REGIONAL AND INTERNATIONAL COMPARABILITY

Title of Qualifications

This qualification has the same title as the Diploma in Environmental Engineering qualification offered by Loyalist College of Applied Arts and Technology. The title differs from the Diploma of Environmental Monitoring and Technology qualification TAFE International - Western Australia offers. While title for the TAFE qualification is different, it is considered as it also aims to produce a Technician with similar competence to the other two.

Duration

The duration of the qualification for TAFE International- Western Australia is 2 years whereas for Loyalist College of Applied Arts and Technology is 3 years. The credit value (370) for this qualification translates to 3 years, making it more comparable to qualification offered by Loyalist College of Applied Arts and Technology.

Entry:

TAFE International - Western Australia entry level is for graduates at NQF level 4(Artisans), whereas Loyalist College of Applied Arts and Technology qualification entry is for high school graduates (Grade 12). This is similar to the minimum entry for this qualification, which is Certificate IV, NCQF Level 4.

Main Exit outcomes

The benchmarked qualifications and the proposed qualification have similar competencies such as adherence to health and safety measures, sampling and analysis, carrying out tests, processing and presenting environmental data and others. Therefore, they are similar.

Modules

The proposed and the benchmarked qualifications share some similar modules, as shown in the table below:

Proposed	**TAFE International Western Australia**	**University: Loyalist College of Applied Arts and Technology**
Communication Skills	Communications	Communication
Occupational Health & Safety	Occupational hygiene monitoring	
Engineering Mathematics		Mathematics for Biosciences
AutoCAD for Civil Engineering	CAD	
Biology	Biology	Microbiology
Solid Waste Management	Solid and hazardous waste management	
Environmental Pollution	Environmental monitoring, sampling and field testing	Air Sampling and Monitoring Techniques
Chemistry	Chemistry	Applied Chemistry
Environmental Law	Environmental Law	Environmental Protection Legislation
Environmental Remote Sensing and GIS	Environmental -Remote Sensing and GIS	
Surface & Groundwater Hydrology		Hydrology and Watershed Management
Work placement		Placement(One week)

Wastewater Treatment & Disposal	Water supply and treatment, storm and wastewater management	Water/Wastewater Treatment
Environmental Impact Assessment	Environmental Impact Assessment	Environmental Assessment and Planning
Water Analysis	Water Analysis	
Hazardous Waste Management		Waste Management
Integrated Research Project		Applied Projects

Articulation and Comparability

The qualification allows for horizontal articulation (NQF Level 6) or transfer to institutions offering similar qualifications. Horizontal articulation qualifications include, but are not limited to , a Diploma in Environmental Engineering, a Diploma in Environmental Monitoring and Technology, or a Diploma in Water and Environmental Engineering.

Learners can articulate vertically to NQF Level 7(bachelor's degree) since the benchmarked institutions offer a Bachelor of Science in Environmental Engineering and a Bachelor of Science in Environmental Monitoring and Technology. Vertical articulation qualifications include a bachelor's in water and environmental engineering.

Graduates of this qualification can be employed as Environmental Engineering Technicians, Environmental Officers, or Natural Resource Management Officers.

In conclusion, this qualification compares well and is similar to the regional and international Benchmarks.

REVIEW PERIOD

The qualification will be reviewed every five (5) years or as and when required, depending on the changing needs of the market.

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For Official Use Only:

CODE (ID)			
REGISTRATION STATUS	**BQA DECISION NO.**	**REGISTRATION START DATE**	**REGISTRATION END DATE**
LAST DATE FOR ENROLMENT		**LAST DATE FOR ACHIEVEMENT**	
REVISION DATE:		**NAME OF PROFESSIONAL BODIES/REGULATORY**	