SECTION 5.2: MONITORING		
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EXECUTIVE SUMMARY

This section outlines the monitoring programmes operational at the Duynefontyn site including those for the existing Koeberg Nuclear Power Station (KNPS). It covers meteorology, oceanography, hydrology and hydraulics, geohydrology, seismology and geotechnics. In the case of a site such as Duynefontyn, where there is already an operating nuclear installation, the available data on environmental radioactivity collected by the environmental surveillance programme, as required by the National Nuclear Regulator, will be included in the baseline for new nuclear installations.

The main objectives of the monitoring are to:

- collect reliable data to analyse and describe site parameters;
- provide sufficient understanding and assurance on the suitability of the site based on reliable analysis of monitored site parameters relevant for nuclear installation safety through the facility lifetime;
- provide input parameters into conceptual and numerical models;
- confirm the assumptions used in the conceptual and numerical models for the site;
- obtain a better understanding and management of uncertainties.

The monitoring programmes provide a documented basis from which it can be demonstrated that the relevant design parameters of the nuclear installation(s) are enveloped by the characteristics of the site and that the risks to the public are as low as reasonably achievable (ALARA).The various monitoring programmes are described herein in broad detail in terms of parameters measured and periodicity thereof. The locations of and types of monitoring stations are provided, but details on e.g. monitoring protocols and results are not given. These are provided in the specific sections supported by monitoring activities, i.e. ***5.8***, ***5.9***, ***5.10***, ***5.11***, ***5.14*** and ***5.15***. The new SSR monitoring programmes described cover the period 2008 to the third quarter of 2020, with some interruptions due to logistical issues. Seismic, meteorological and oceanographic monitoring records go back further in time mainly related to KNPS, i.e. to 1971, 1979 and *c.*1976, respectively.

Monthly, quarterly and annual monitoring reports are being produced and submitted to Eskom which will be used in the update of this SSR. KNPS monitoring reports are submitted separately. The monitoring reports that are gathered over the life of the site and used in the development and update of this SSR will be stored in the Nuclear Siting Studies archive and will be available to the regulator on request.

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5.2 MONITORING

5.2.1 Introduction

This section of this Site Safety Report (SSR) presents the rationale, purpose, scope and content of the various monitoring programmes implemented at the site. It covers monitoring undertaken up to the third quarter of 2020 and also that which will continue into the future. This monitoring is being carried out so that the site is sufficiently characterised to support construction and operation of nuclear installation(s), including Koeberg Nuclear Power Station (KNPS), over their lifetime in a manner that has minimal radiological impact on the safety of workers, the public and the environment, and that the site will not negatively impact the nuclear installation(s). The monitoring programmes provide a documented basis from which it can be demonstrated that the relevant design parameters of the nuclear installation(s) are bounded by the characteristics of the site and that the risks to the public are as low as reasonably achievable (ALARA). Protocols, justification for the location of monitoring stations and results are not presented herein but in the relevant sections of ***Chapter 5***.

5.2.2 Purpose and Scope

The site is a brownfield site, on which the KNPS has been in operation since 1984, where it is proposed to establish a new nuclear installation(s). Monitoring stations are concentrated around the KNPS and in and around the footprint area of the proposed new nuclear installation(s). They cover terrestrial, sea and atmospheric domains. End dates for monitoring data covered in this SSR vary according to the discipline as data download periods differ. Collection of data is continuing and databases are being updated and evaluated on a regular basis. The new information will be taken into account in scheduled updates of this SSR.

The monitoring programmes described herein are to assist in defining the baseline characteristics of the site for estimation of the nuclear installation(s) impact on the site and *vice versa* and to assist in the management of future uncertainties by allowing for long-term predictions of normal and extreme events. This is done by using state-of-the-art numerical modelling packages that have been verified and validated. The monitoring programmes are also related to specific requirements as listed and defined in the Plant Parameter Envelope (PPE) for this SSR (see ***Chapter 1***).

Monitoring of materials and events that could have an impact on the

nuclear installation(s) (e.g. degradation, corrosion) and monitoring of parameters for confirmation of estimates of public exposure are not covered here. However, corrosion is covered in ***Sections 5.8*** (Meteorology) and ***5.11*** (Geohydrology). Monitoring of the physical condition of safety structure components, intake pipes and other infrastructure is carried out for KNPS, the details of which are documented in the KNPS Safety Analysis Report.

5.2.3 Regulatory Framework

The development and implementation of the monitoring programmes covered in this section have been based on the PPE and current national legal and regulatory framework (see ***Chapter 2***, Legal and Regulatory Basis) at the time of this SSR development, i.e. first quarter of 2021. The National Nuclear Regulator [NNR] (National Nuclear Regulator, 2016) has issued RG-0011 which contains specifications for monitoring as follows:

- Section 11: Monitoring of site conditions:
  - background radiological characteristics;
  - groundwater and surface water;
  - background non-radiological characteristics.

Attachment C of RG-0011 contains a list of typical baseline water quality indicators to be determined during pre-operational data collection.

5.2.4 Guiding Documents

This section covers the site-specific monitoring that has been carried out to demonstrate site suitability. Therefore, only those monitoring activities that are required for the compilation and update of this SSR are covered here. Some further monitoring is necessary to reduce uncertainties, to provide input to design and safety assessment for facilities and for operational reasons. RG-0011 specifically guides pre-operational monitoring, which is to be implemented two to three years before actual nuclear operations begin at a site (National Nuclear Regulator, 2016).

This section also does not deal with the *ad hoc* type information gathering exercises that form part of the SSR compilation and update, e.g. population census and ecology (jellyfish). It presents the overall monitoring programme for the site based on the specific monitoring activities discussed in ***Sections 5.8*** (Meteorology), ***5.9*** (Oceanography and Coastal Engineering), ***5.10*** (Hydrology and Hydraulics), ***5.11*** (Geohydrology), ***5.14*** (Seismic Hazard), ***5.15*** (Geotechnical Characterisation) and ***Chapter 7*** (Potential Impact on the Public and Environment) of this SSR.

Only the types and general approaches to monitoring are discussed herein, with detail on specific monitoring protocols, quality control, results and implications thereof being presented in the various relevant chapters and sections.

A Method Statement and Quality Control Plan were drafted for this section and approved by Eskom. Specific quality documents for the monitoring programmes are listed in ***Subsection 5.2.8*** Management System.

5.2.5 Monitoring Programmes

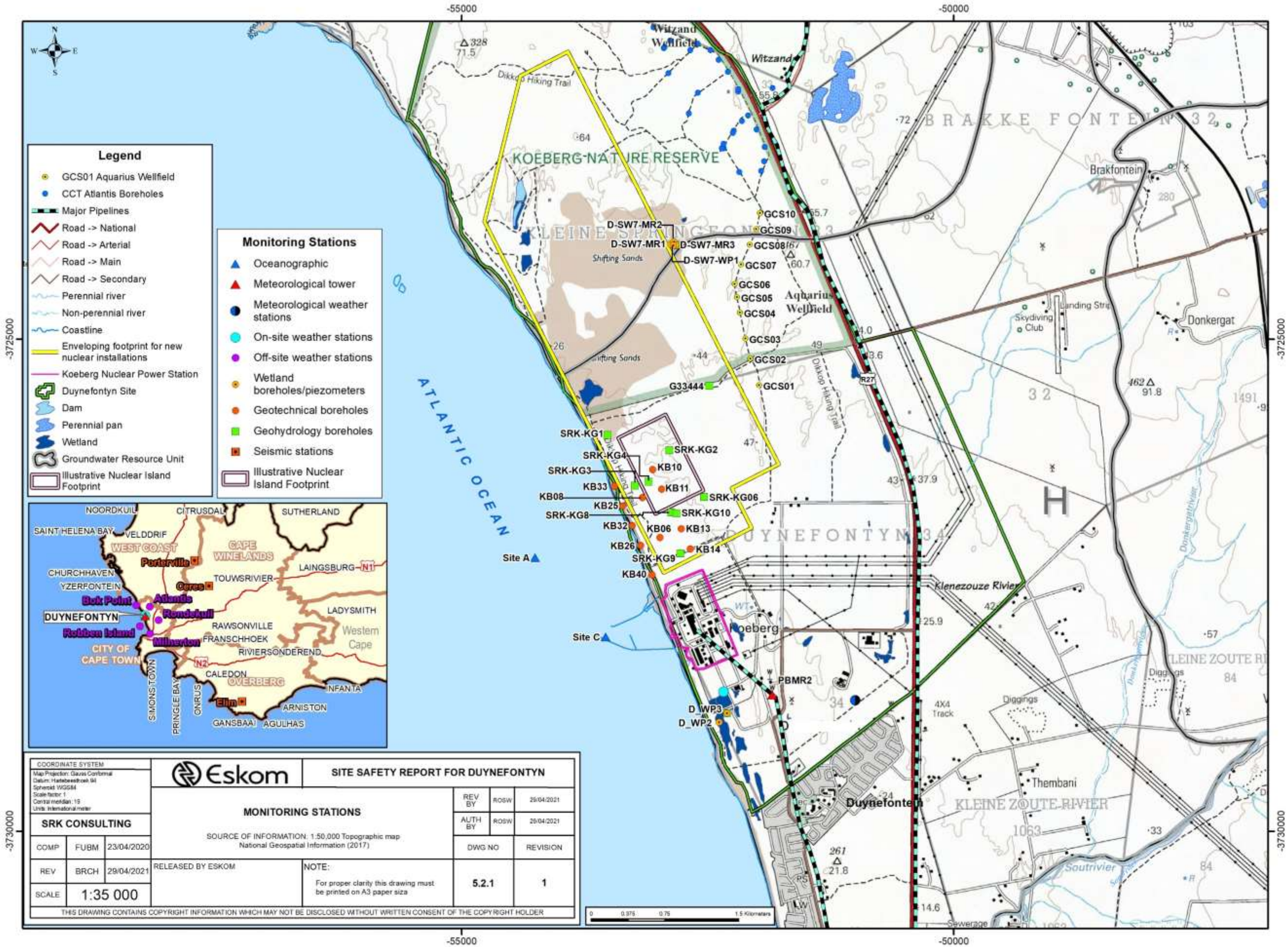
The monitoring programmes implemented for the KNPS and for this site investigation stage are designed to provide adequate and sufficient information about the characteristics of the site for approval of this SSR for licensing purposes and to support the continued safe operation of KNPS. The programme is based on measurements of site parameters requiring long-term data sets, i.e. two years or longer, as stipulated by the IAEA, (International Atomic Energy Agency, 2019). These monitoring programmes are intended to continue through the lifecycle phases of the site, with modifications as necessary depending on site development and trends established. The main objectives of the monitoring are to:

- collect reliable data to analyse and describe site parameters;
- provide sufficient understanding and assurance on the suitability of the site based on reliable analysis of site parameters relevant for nuclear installation and public safety and environmental protection through the facility lifetime;
- provide input parameters into conceptual and numerical models, the latter for predicting long-term trends and extreme events;
- assess the impacts of e.g. corrosion on site infrastructure;
- confirm the assumptions used in the conceptual and numerical models for the site;
- obtain a better understanding and management of uncertainties.

A summary of the site monitoring programmes, with justifications, is presented in ***Table 5.2.1*** and discussed in more detail thereafter, and in the appropriate sections of ***Chapter 5***. Monitoring stations are shown in ***Drawing 5.2.1*** and also on more detailed drawings in the appropriate sections of ***Chapter 5***.

Table 5.2.1
Summary of the Duynefontyn SSR Monitoring Programmes

Discipline	Parameters Monitored	Frequency	Monitoring Stations/Method(s)	Justification
Geohydrology	Groundwater levels Electrical conductivity	Continuous (hourly)	Boreholes equipped with data loggers	Firm-up predictions on site groundwater level maximum/minimum fluctuations
	Groundwater quality: Macro- chemistry Selected trace elements Selected radionuclides	May and November From Jul-2017, April and October	Boreholes/springs	Establish baseline quality and corrosivity potential
Geotechnical characterisation	Groundwater levels	Bi-annually	Boreholes	Firm-up predictions on site groundwater level maximum/minimum fluctuations
Meteorology	Rainfall Wind velocity and direction Specific indications of atmospheric turbulence Air temperatures Humidity Atmospheric pressure Solar radiation Visibility Lightning activity	Continuous	a) 10 m mast b) 120 m met tower c) 50 m back-up tower and d) off-site weather stations	Establish site climatological regime and atmospheric dispersion potential. Prediction of extreme weather phenomena. Corrosion potential
Hydrology	Rainfall	Continuous	See Meteorology/ Oceanography	Predict run-off and flood levels/risk
	Surface water flows	Continuous	Perennial rivers (DHSWS stations)	Predict run-off and flood levels/risk
	Surface water quality: Macro-chemistry Selected trace elements Selected radionuclides	May and November	Rivers and wetlands	Baseline quality
Oceanography	Waves Currents Water level Water temperature Beach profiles	Continuous Beach profiles measured quarterly then annually	Acoustic Doppler Current Profilers at 10 m and 30 m water depth Temperature sensor Pressure sensor	Prediction of maximum wave run-up height. Cooling water intake and outfall suitability.
Seismology	Seismic signals (derived from seismic events)	Continuous	Seismic stations	Seismic hazard analysis.



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Meteorology

Meteorological monitoring for the site began in mid-November 1979 with establishment of an on-site meteorological station and five off-site automatic weather stations. The off-site stations are located at Bokpoint, Wesfleur (Atlantis), Rondekuil, Milnerton and Robben Island (see inset map in ***Drawing 5.2.1***). The on-site weather station comprises of two towers with 120 m and 50 m mast heights, the latter being for back-up to the main 120 m tower.

The following meteorological parameters are measured at the towers:

- wind speed;
- wind direction;
- standard deviation of wind direction;
- ambient air temperature;
- rainfall.

Relative humidity and solar radiation measurement do not form part of the current requirements for the KNPS, but since they are required to complete this SSR as per the PPE, these parameters have subsequently been included as a separate monitoring campaign, initiated in January 2009 and continued until September 2013. From October 2017, a separate weather station with a 10 m mast was commissioned that enables the measurement of the following meteorological parameters:

- wind speed;
- wind direction;
- standard deviation of wind direction;
- ambient air temperature at two heights;
- rainfall;
- solar radiation;
- relative humidity;
- barometric pressure;
- visibility;
- lightning activity.

The on-site 50 m and 120 m towers and five off-site weather stations are operated and maintained by KNPS personnel. Electronic data prior to 1997 cannot be retrieved due to obsolete tapes and hard drives and only hourly

hard copy is available from January 1980 until September 1997. All available maximum winds speeds, gusts and temperature (maximums and minimums) were extracted from hard copy records and hence a sufficiently long history of the site was obtained, which improves accuracy when predicting extreme values.

Concurrent measurements are being made at the South African Weather Services (SAWS) station at Cape Town International Airport, which is located approximately 35 km southeast of the site. Detailed meteorological monitoring data are presented in ***Section 5.8*** which will include integration of the data from KNPS, the new 10 m mast and the SAWS.

Oceanography

The site is a coastal site bordered by the Atlantic Ocean. Monitoring of oceanographic parameters is therefore a key element in determining the site suitability. The following oceanographic parameters are being monitored (sites A, B and C in ***Drawing D-5.2.1***):

- waves;
- currents;
- water level;
- water temperature;
- beach profiles.

In this regard, a comprehensive data collection programme has been implemented at the site. The objective of this programme is to provide baseline data for the evaluation of the nuclear installation safety, the design of coastal structures at the site, and calibrating the numerical models to confirm that models are accurate and can thus be used for prediction of both frequent and rare events. The programme commenced in January 2008 and is scheduled to continue and be evaluated on an annual basis resulting in a sufficient data record for SSR purposes. Earlier monitoring data are available from 1976 related to KNPS. Detailed oceanographic monitoring data are presented in ***Section 5.9***.

Hydrology and hydraulics

There are no major or perennial water courses crossing the site and the only permanent water bodies at the site comprise wetlands. SSR monitoring is restricted to the site only, since there are no rivers crossing the site area. Major nearby catchment dams are being monitored by the

City of Cape Town and regional river flows and quality by the Department of Human Settlements, Water and Sanitation (DHSWS). The latter data are of main interest to ***Section 5.12*** Water Supply. Climatological (includes rainfall), wetlands and tidal monitoring are covered under ***Sections 5.8***, ***5.11*** and ***5.9***, respectively. More information on hydrological monitoring is presented in ***Section 5.10***.

Geohydrology

Groundwater forms an important component of the site physical characteristics and occurs at shallow depths throughout the site, including in the enveloping footprint area. Groundwater monitoring is therefore a key issue to assist in determination of site suitability and the safe operation of KNPS. For the latter, seven boreholes within the previously excavated area, two to the north of the plant and one near the sea water intake, monitor groundwater levels and quality (Advisian, 2016). Pre-construction monitoring for the new nuclear installation(s) is focussed on the following and started in June 2008:

- **groundwater levels** – monitored via boreholes drilled into the Sandveld (shallow) and Malmesbury (deep) aquifers to provide valuable information on seasonal trends and response to extreme weather conditions, e.g. high rainfall events and droughts - These data will be used to assist in prediction of e.g. foundation dewatering requirements and flooding potential, the latter in collaboration with ***Section 5.10*** Hydrology and Hydraulics. Monitoring borehole sites (includes geotechnical boreholes) were selected with reference to the likely position of the nuclear installation(s) within the enveloping footprint and the KNPS. These include geohydrological and geotechnical boreholes drilled for this SSR and some drilled as part of the Pebble Bed Modular Reactor investigation (SRK Consulting, 2008). In addition, boreholes in the Aquarius Wellfield are being monitored by Eskom and the City of Cape Town monitors boreholes in the Witzand and Silwerstroom wellfields (see ***Drawing 5.2.1***). These data are provided by the relevant authorities on request.
- **wetlands** – monitored via boreholes/piezometers to determine interaction with groundwater and the possible long-term effect (quality, water level) of site groundwater control measures during development of the nuclear installation(s);
- **groundwater quality** – monitoring of pH, electrical conductivity (EC), macro-chemistry (Na, K, Ca, Mg, Cl, SO_4 Total Alkalinity), selected trace elements/ions (NO_3 F, Fe, Mn) and heavy metals, environmental

isotopes (H-3) and radionuclides (Ra-226, -224 and -223, U, gross α and β emissions) to provide a baseline data set - Temperature is also measured. This monitoring is carried out bi-annually in May and October of each year. This baseline will be used to determine natural site groundwater quality variations against which any impacts from the nuclear installations will be able to be determined, plus corrosion potential to site infrastructure.

- **groundwater protection** - A groundwater protection programme (GPPRM) has been developed (Eskom, 2020). The intent of the programme is to establish prevention and mitigation measures for groundwater protection which includes early detection of groundwater contamination with the ultimate objective to ensure that groundwater contaminant levels are within acceptable levels. The GPPRM also includes conceptual site and numerical models.

  There are 10 boreholes on-site monitoring the primary aquifer, the secondary aquifer, soil-cement sub-foundations and the interface of the secondary aquifer with sea water. These boreholes are not optimally located and positioned (relative to contamination sources and depth-wise) but together with the GPPRM conceptual site and numerical models, give an approximation of the groundwater contamination. As part of the GPPRM, new boreholes will be drilled which will give more accurate results (pers. comm. Z. Mia, Eskom, July 2021).

More detail on geohydrological monitoring and recorded trends is described in ***Section 5.11***.

Seismicity

Seismic monitoring is aimed at reconfirming the suitability of an area for a nuclear installation(s), mapping seismicity within a selected study area and the identification of active geological features. It is important that sufficient data be gathered that can be used as input for a Seismic Hazard Analysis (SHA). The South African National Seismograph Network, managed by the Council for Geoscience (CGS) as part of its institutional mandate, forms the regional database and consists of the historic database covering the period 1620 to 1970 and an instrumental database spanning the period 1971 to 2020 (available in digital format since 1990). The closest monitoring stations to the site are at Ceres (established 1971), Elim (established 1996) and Porterville (established 2017) (see inset map in ***Drawing 5.2.1***).

A localised borehole seismic array is planned for a short campaign to help

quantify high-frequency attenuation to be used for a SHA for the site. In support of the design and licensing of the KNPS, a study and assessment of the geology and seismology of the Duynefontein site in the years 1973 to 1980 was undertaken (Dames and Moore, 1980). This is the currently accepted SHA by the NNR for the KNPS. Details on seismic monitoring are presented in ***Section 5.14***. This monitoring will only be completed after production of this revision of the SSR.

Background Radiological Characteristics

In the case of a site such as Duynefontyn, where there is already an operating nuclear installation, the available data on environmental radioactivity collected by the KNPS Environmental Surveillance Laboratory, as required by the NNR, will be included in the baseline for new nuclear installations. Ambient radiation monitoring was carried out under the previous SSR iteration and pre-operational monitoring is only required two to three years prior to operation of the new nuclear installation(s) (National Nuclear Regulator, 2016). Background radiation monitoring data are discussed in ***Chapter 7***.

Geotechnical Characterisation

Monitoring of groundwater levels and corrosion potential are important parameters required to adequately characterise the site geotechnical profile. These parameters are described in ***Section 5.11***, and the data used in the geotechnical characterisation of the site.

5.2.6 Reporting

Monthly, quarterly and annual monitoring reports are being produced for meteorology, oceanography and geohydrology, which are being issued to Eskom and used in the update of this SSR. KNPS monitoring reports are produced internally by Eskom. Reports on seismology and background radiation are produced on an *ad hoc* basis. The monitoring reports that are gathered over the life of the site and used in the development and update of this SSR are being stored in the Nuclear Siting Studies archive and will be available to the regulator on request.

The CGS used to publish data in seismological bulletins. Currently, the information is used to update a database that is maintained at the CGS. Information on new earthquakes are uploaded to the International Seismological Centre global database (www.isc.ac.uk) which is housed in the United Kingdom. Upload takes place either annually or quarterly (pers. comm. J. Neveling, CGS, July 2021).

5.2.7 Management of Uncertainties

The key uncertainties pertaining to the site with relevance to site safety and management actions to deal with them are the following:

- seismic hazard - The existing SHA (Dames and Moore, 1980) will be updated by conducting a probabilistic SHA using the latest monitoring data as input.
- medium-term monitoring period - The duration of some of the SSR site monitoring is a maximum of 13 years, which does not allow extrapolation of the data to extreme events with durations longer than approximately 10 years. For this reason, longer-term data sets obtained from the existing KNPS and from nearby sites have been added to input into numerical models in order to estimate extreme events (to 10^{-8} probability) in ***Chapters 5*** (Site Characteristics) and ***6*** (Evaluation of External Events). However, relatively extreme precipitation events have occurred during this monitoring period, covering 'wet' periods and extreme drought, as defined in ***Section 5.8*** and these are covered in ***Section 5.11***. with respect to recharge and groundwater levels.
- the inability to access electronic meteorology data prior to 1997 – This has been countered by extracting hard copy records for maximum wind speeds, gusts and temperature so that a sufficiently long history of the site exists in the database to improve the prediction of extreme values.

Trends, ranges and any 'outliers' in recorded monitoring data, as well as more detail on the management of uncertainties, are discussed in detail in the various sections of ***Chapter 5*** as listed above. Any outliers deviating from these ranges/trends arising during future routine monitoring will be assessed and assumptions, models and contingencies adapted as necessary.

5.2.8 Management System

All the SSR-specific monitoring activities have been conducted in accordance with the overall approved management system for the production and update of this SSR (see ***Chapter 10***, Management System). This has included the development of a Method Statement and Quality Control Plan for this section, which have been approved by Eskom. Appropriate measures have been implemented to ensure the application of national standards and international best practice in the determination of the basis, scope and purpose of monitoring, as well as in the collection,

transfer, storage, analysis, interpretation and presentation of monitoring data. Where data sets have been obtained by one organisation and passed on to another for further processing/incorporation into models, validity and accuracy of the data sets have been verified by an accompanying verification and approval certificate and referral to the supplying organisation's project quality plan and method statement. Analysis, interpretation and verification are documented in the appropriate sections of this SSR and are not covered in this section as results are not presented herein.

Prior to the start of the meteorological, oceanography and geohydrological monitoring programmes described herein, the following documents were compiled by the relevant organisations and approved by Eskom to assist in quality assurance and to ensure that site work was carried out safely:

- Quality Control Plan;
- Method Statement;
- Risk Assessment (for site monitoring activities, not for site safety);
- Health, Safety and Environmental Management Plan.

Quality data packs accompanying each relevant section of ***Chapter 5*** include:

- calibration sheets for field equipment;
- list of approved suppliers used;
- certificates of accreditation for laboratories used;
- modelling rationale, benchmarking, validation and verification;
- peer review reports;
- monitoring protocols.

The organisations responsible for the monitoring of field parameters have adhered to all applicable regulatory requirements, in particular the requirements of the NNR requirements document RD-0034 (National Nuclear Regulator, 2008). Monitoring protocols complying with international best practice have been developed and used as part of this SSR management system (see ***Chapter 10*** and the applicable sections of ***Chapter 5*** and the accompanying appendices). Compliance matrices are included in the relevant sections of ***Chapter 5*** as listed herein.

Monitoring protocols specify the purpose of the sampling and minimum standards for sampling rates, data capture, storage, transfer and archiving,

which adhere to the minimum requirements for the collection, storage and transfer of data, as defined by RD-0034 (National Nuclear Regulator, 2008) or a Nuclear Siting Studies' approved alternative. This will ensure that the problem of non-accessibility of data, e.g. pre-1997 electronic meteorological data, will not recur. A summary of activities, links within this SSR and quality requirements is given in ***Table 5.2.2*** below. The relevant safety classifications for the various monitoring disciplines are also listed. Regulatory compliance tables are included in the relevant sections of ***Chapter 5***.

Use of up-to-date monitoring and recording systems ensures that all data are readable and will be for the site lifetime.

Electronic records are being stored in a secure central repository with regular off-site back-up procedures. The overall quality management system complies with that set out in ***Chapter 10*** of this SSR. All references cited are saved on the central repository.

The KNPS groundwater protection programme and the monitoring performed by the Environmental Survey Lab (ESL) occur within the KNPS quality and safety management system. As such it complies with and adheres to the applicable regulations and authorisations issued by the NNR. These include the establishment of a nuclear safety culture programme that encourages a questioning and learning attitude to nuclear safety and radiation protection and discourages complacency. The KNPS groundwater protection programme does not form part of the ESL Programme, since the groundwater on site is not used for drinking water and as such is not a dose pathway. However, the ESL Programme radiological monitoring requirements were used to develop the programme.

Table 5.2.2
Summary of Activities, Links and Quality Documentation

Programme	Links		Safety Classification	Quality Documentation
	Inputs	Outputs		
Geohydrology	Groundwater levels Groundwater quality Rainfall	Information on groundwater levels and quality will provide essential input into Ecology, Hydrology, Geohydrology, Water Supply and Geotechnical SSR sections (***Sections 5.3*** (Ecology), ***5.10***, ***5.11***, ***5.12*** (Water Supply) and ***5.15*** (Geotechnical Characterisation)), and ***Chapter 6***.	C	Project Quality Plan Method statement Monitoring protocol Calibration of field equipment, e.g. pH, EC and dip meters, data loggers, Global Positioning System (GPS). Laboratory accreditation
Geotechnics	Groundwater levels	Information on groundwater levels will provide essential input into ***Sections 5.11*** Geohydrology and ***5.15*** Geotechnical Characterisation	C	Project Quality Plan Method statement Monitoring protocol (combined under 5.11) Calibration of field equipment, e.g. dip meters, GPS.
Meteorology	Rainfall Humidity Wind velocity and direction Temperature	Meteorological data will form input to the Meteorological, Hydrological, Geohydrological and Water Supply SSR sections (***Sections 5.8***, ***5.10***, ***5.11*** and ***5.12***) and ***Chapters 6*** and ***7***.	C	Project Quality Plan Monitoring protocol Method Statement
Oceanography	Coastal accretion/erosion Water level Water temperature Currents Wave height	Oceanographic data will form input to the Oceanography & Coastal Engineering and Hydrology SSR sections (***Sections 5.9*** and ***5.10***)	D	Project Quality Plan Method statement Monitoring protocol
Hydrology	Maximum flood heights SA Weather	Hydrology data will form input to the Hydrology, Geohydrology and	B	Project Quality Plan Method statement

Programme	Links		Safety Classification	Quality Documentation
	Inputs	Outputs		
	Bureau data DHSWS flow gauging station data Rainfall	Water Supply SSR sections (***Sections 5.10, 5.11*** and ***5.12***)		
Seismology	Seismic event record	Seismic data will form input to SSR ***Section 5.14*** and ***Chapter 6***.	A	Covered by the Senior Seismic Hazard Analysis Committee process

5.2.9 Conclusions

With respect to the monitoring programmes implemented and operational at the site, the following general conclusions are drawn:

- The programmes adequately cover the key activities required to fully describe the physical characteristics of the site to demonstrate compliance with licensing requirements, some interruptions to the monitoring programmes notwithstanding.
- The monitoring programmes are contributing valuable information for the reduction of uncertainties at the site. This is done by determining long-term trends and prediction of extreme events (to a probability of 10^{-8}) by use of verified and validated state-of-the-art numerical modelling packages.
- The adequacy and need for the various monitoring programmes will be assessed on an annual basis.
- Monitoring data will be incorporated into scheduled revisions of this SSR. Any outliers deviating from trends/ranges so far established will be investigated and the results used to modify predictions/designs as necessary and appropriate.
- An adequate management system has been implemented and followed in the operation of the monitoring programmes and acquisition and storage of monitoring data, including establishment of monitoring protocols, to fulfil all quality assurance requirements for a nuclear site.
- Monthly, quarterly and annual monitoring reports are produced which are used in the update of this SSR. The monitoring reports that are gathered over the life of the site and used in the development and

update of this SSR are being stored in the Nuclear Siting Studies archive and will be available to the regulator on request.

Detailed conclusions related to specific monitoring data and trends are given in ***Sections 5.3*** to ***5.15*** and ***Chapter 7***.

5.2.10 References

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