Appendix B: Phase I Site Assessment (SLR, 2022)

PHASE 1 ASSESSMENT AT FORMER PEARLY BEACH WASTE DISPOSAL SITE

Pearly Beach Waste Disposal Site

Prepared for: GIBB (Pty) Ltd

Authority References:

DEA&DP 19/2/5/1/E2/28/WL0048/14

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EXECUTIVE SUMMARY

SLR was appointed by GIBB (Pty) Ltd (GIBB) to complete a Phase I Environmental Site Assessment (ESA) at the Pearly Beach Wastewater Treatment Plant (WWTP) located on North Road, Pearly Beach (the Site). GIBB is supporting the Overstrand Local Municipality to comply with applicable regulatory processes for the closure of the former Pearly Beach Waste Disposal Facility (WDF) on which the WWTP was constructed.

The Pearly Beach WDF was established in ±1989 and received only building rubble and garden waste from the local community. The Site was closed in 2011, and the waste body was subsequently removed. A WWTP[1], encompassing three waste stabilisation ponds, was established at the Site. The WWTP deploys infiltration of effluent water to the aquifer through a series of well points. The Site, located approximately 500 m to the northeast of Eluxolweni Housing Project, is surrounded by open land to the north, east, west and the immediate south.

Hand augur completed four soil bores at strategic locations at the Site to collect representative soil samples within the footprint of the former WDF. In addition, one location (Control 1) was advanced outside the WDF's footprint area to assess background conditions. During the hand-auguring, the soil profile encountered consisted mainly of fine loose sands to the maximum depth of 2.0m bgl. Four soil samples were collected from the Site and submitted accredited laboratory for analysis of inorganic determinants considering the non-hazardous nature of the waste disposal that took place at the former WDF.

Two existing monitoring boreholes, BH1 and BH2, were identified on the Site. During the sampling, groundwater was encountered at 14.10 and 15.18 meters below ground level (m bgl) in BH1 and BH2, respectively. Two groundwater samples were obtained from the Site and were also submitted to an accredited laboratory for an analysis of a similar suite of determinants as per the soil samples

The analytical results of the soil samples indicated the presence of barium, calcium, chromium, magnesium, manganese, nickel, potassium, and sodium at concentrations below the soil screening criteria (SSVs). In addition, detected anions were registered at concentrations below the SSVs.

The groundwater analytical results indicated the presence of barium, calcium, magnesium, potassium, sodium, manganese, and zinc. The concentration of sodium, manganese, chloride, nitrate (as N) and the TDS exceeded the screening criteria (SANS 241). Since the groundwater is not used for portable purposes within a 1 km radius of the Site, groundwater ingestion was not considered a plausible pathway.

It should be noted that it was not possible to determine if soil/groundwater conditions at the Site are related to the historical operation of the WDF or the current WWTP operations, as a baseline assessment was not completed at the time of the WDF's decommissioning. However, based on the assessment and as per the preliminary CSM developed, no potentially complete S-P-R linkages were identified. Furthermore, following the risk-based decision support protocol, as presented in the South African Framework for the Management of Contaminated Land, the assessment did not identify any contaminants of potential concern in the soil and groundwater of the Site. As a result, no risks to human health or the environment were identified. Therefore, no further site assessment work is recommended.

[1]Related to Eluxolweni Sewerage Collection, Treatment & Reuse and Bulk Water Supply

CONTENTS

LIST OF TABLES

APPENDICES

ACRONYMS & ABBREVIATIONS

Acronym / Abbreviation	Definition
WDF	Waste Disposal Facility
WWTP	Waste Water Treatment Plant
ESA	Environmental Site Assessment
NEM:WA	National Environmental Management: Waste Act
B-BBEE	Broad-Based Black Economic Empowerment
HASP	Health and Safety Plan
EIA	Environmental Impact Assessment
TMG	Table Mountain Group
DWA	Department of Water Affairs
USEPA	United States Environmental Protection Agency
SOP	Standard Operating Procedures
SSVs	Soil Screening Values
EC	Electrical Conductivity
ORP	Oxidation -Reduction Potential
LOD	Limit of Detection
CSM	Conceptual Site Model
SANS	South African National Standard

Phase 1 Assessment at Former Pearly Beach Waste Disposal Site

1. INTRODUCTION

1.1 TERMS OF REFERENCE

GIBB (Pty) Ltd (GIBB) is supporting the Overstrand Local Municipality to comply with appliable regulatory processes for the closure of the former Pearly Beach Waste Disposal Facility (WDF). As a result, a Wastewater Treatment Plant (WWTP) was constructed within the footprint of the former landfill, located on North Road, Pearly Beach, Western Cape, South Africa, hereafter referred to as "the Site". The WWTP is associated with sewerage collection, treatment, reuse, and bulk water supply to the Eluxolweni Housing Project.

To comply with Part 8 of the National Environmental Management: Waste Act (NEM:WA), the regulatory authority requested that a remediation specialist undertake a Phase 1 Assessment at the Site.

In support of this process, GIBB requested SLR Consulting South Africa (Pty) Ltd (SLR) complete a Phase 1 Environmental Site Assessment (ESA) of the Site. The Scope of Work is further described in Section 1.3 below.

SLR is committed to Broad-Based Black Economic Empowerment (B-BBEE) as outlined in the Broad-Based Black Economic Empowerment Act (53/2003). An independent audit of SLR has acknowledged us as a Level Four contributor in terms of B-BBEE status. SLR is ISO 9001:2015 certified and has quality management systems that ensure the quality of the service delivered to our clients.

1.2 OBJECTIVES

The project's objective is to assess the soil and groundwater conditions at the Site by completing a Phase I investigation.

However, it should be noted that it is impossible to determine if soil/groundwater impacts at the Site are related to the historical operation of the WDF or the current WWTP operations as a baseline assessment was not completed at the time of the WDF's decommissioning.

1.3 SCOPE OF WORK

SLR developed a site assessment approach that aligns with the *South African Framework for the Management of Contaminated Land*[2] , which provides a risk-based decision support protocol for assessing sites; numerical 'norms, and standards (for soil) for enabling the identification and registration of contaminated sites, and a set of guidelines for the submission of site assessment reports.

The scope included reviewing historical reports, limited supplemental soil and groundwater sampling and laboratory analysis for target compounds. It is noteworthy that the WWTP has been constructed over the former waste body's footprint area. Thus soil sample locations were limited to accessible areas on the perimeter of the settling ponds (see Figure 2.1 below).

[2]As promulgated in 2014 in support of Part 8 of NEM:WA

Before the commencement of the project, SLR followed internal protocols to ensure that Health and Safety (H&S) aspects of the project were addressed through a Health and Safety Plan (HASP).

2. DESK STUDY

2.1 BACKGROUND

The Pearly Beach WDF was established approximately in 1989 and was closed in 2011. Historically the Site received only building rubble and garden waste from the local community. The waste was generally disposed of in depressions or pits ranging from ±0.5 meters to an estimated 3 m depth. The pit was then covered with sand. The quantity of the waste disposed of at the then WDF is unknown. After the removal of the waste body in 2011 and a Wastewater Treatment Plant (WWTP[3]) encompassing three waste stabilisation ponds was established. The removal of the waste body and the development of the treatment facility took place simultaneously. Although the WDF was closed in 2011, the removal of the waste body took place in the beginning of 2015 where after the treatment facility was constructed and still completed in 2015. In addition, the WWTP deploys infiltration of effluent water to the aquifer through a series of injection well points.

Site details are presented in Table 2-1 below.

Table 2-1: Site Details

Site Name	Pearly Beach Waste Disposal Facility
Address	North Road, Pearly Beach (before Elhxolweni), Western Cape, South Africa
Site Co-ords	34°39'1.38"S 19°29'36.97"E

2.2 PREVIOUS ENVIRONMENTAL WORK

Below is a summary of the previous environmental work conducted at the Site.

SRK Consulting, Pearly Beach New WWTF EIA: Specialist Groundwater Baseline and Management Report Reference 460263, dated July 2013.

The scope of work undertaken by SRK included the following:

- Collection of desktop hydrogeological information for the area and reviewing other relevant published information.
- Conducting a hydrocensus of boreholes and springs in a 2 km radius around the proposed WWTP and treated effluent disposal sites.
- Installing three (up to 30 m deep) monitoring boreholes and conducting the initial monitoring round.
- Conducting soil sampling at Eluxolweni Housing Project's sports field located approximately 350 m southwest of the WWTP and submitting 10 soil samples to a laboratory.
- Reporting the groundwater and soil baseline conditions.
- Preparing a geohydrological and soil specialist report.

Based on the data and information obtained during the assessment, the following was concluded regarding the groundwater at the Site:

[3]Related to Eluxolweni Sewerage Collection, Treatment & Reuse and Bulk Water Supply

- No groundwater users were identified in a 1 km radius of the proposed WWTP.
- Groundwater users were identified some 2.7 km southeast of the planned WWTP.
- The area experiences warm summers with cold winters with an average yearly rainfall of c.484 mm/a.
- The Site is underlain by Quaternary age sediments of the Waenhuiskrans Formation of the Bredasdorp Group and is classified as a primary aquifer.
- Bedrock at the Site consists of quartzites of the Peninsula Formation of the Table Mountain Group (TMG) and can be broadly classified as a secondary aquifer.
- The primary aquifer is low-yielding, and salinities are high and not suitable for establishing a domestic water supply wellfield.
- Groundwater depths measured in the three newly drilled boreholes were between 5 and 14 mbgl, and
- The aquifers at the Site are classified as having “high vulnerability” to contamination.

2.3 SITE DESCRIPTION

The information in Table 2-2 was derived from a desktop review of previous reports and publicly published information.

Table 2-2: Desk Study Details

Site Land Use	Historic	The Pearly Beach WDF was established in ±1989 and was closed in 2011. Historically the Site received only building rubble and garden waste from the local community.
	Current	The waste body was subsequently removed, and a Wastewater Treatment Plant (WWTP[4]) encompassing three waste stabilisation ponds was established at the Site. In addition, the WWTP deploys infiltration of effluent water to the aquifer through a series of well points.
Surrounding Land Use	North	Open land
	East	Open land
	South	Open land, beyond which is an informal settlement (360 m) beyond which is Eluxolweni Housing Project (400 m), beyond which Pearly Beach (1 km).
	West	Open land.
Geography	Topography and gradient	The Site topography is relatively flat with a slope to the south.
	Elevation	The Site lies at an elevation of 27 m above mean sea level.
Geology	Superficial deposits	During the soil sampling, fine sands were observed from the surface to the maximum soil bore depth of 2.0 m bgl.
Hydrogeology	Aquifer classification	According to the Aquifer Classification Maps of South Africa (Department of Water Affairs (DWA), 2012/2013), the regional aquifer is classified as a major aquifer[5] with most vulnerability[6] and high susceptibility[7] to groundwater impact from a surface source. The groundwater quality is good, with electrical conductivity ranging from 0 – 70 mS/m.
	Groundwater depth	During the groundwater monitoring event on 8 June 2022, static water levels from the monitoring boreholes were recorded between 14.10 and 15.18 m bgl.

[4] Related to Eluxolweni Sewerage Collection, Treatment & Reuse and Bulk Water Supply
[5] The major aquifer region is a high yielding system of good water quality.
[6] The tendency or likelihood for contamination to reach a specified position in the groundwater system after introduction at some location above the uppermost aquifer.
[7] A qualitative measure of the relative ease with which a groundwater body can be potentially affected by anthropogenic activities and includes both aquifer vulnerability and the relative importance of the aquifer in terms of its classification.

Figure 2-1: Site locality Map Indicating the Soil Sampling and Borehole Locations

3. FIELDWORK METHODOLOGY

3.1 HEALTH AND SAFETY

SLR health and safety (H&S) protocols were adhered to in the preparation and implementation of the project. A comprehensive account of the SLR H&S methodology can be acquired in SLR's standard operating procedure (SOP) 4.1.

3.2 SOIL SAMPLING

Soil strata were generally described following the *Guidelines for Soil and Rock Logging in SA, 2002*, with visual observations included in the profiling process.

Four soil bores (AH1, AH2, AH3, and Control 1) were advanced on 8 June 2022 by hand-auger at strategic locations at the Site to a maximum depth of ±2.0m bgl. At the target depth, soil samples were obtained, placed in laboratory-supplied containers and placed in a cool box. In addition, three soil bores (AH1, AH2, and AH3) were advanced within the former waste body's footprint area (see Figure 2-1). Finally, control 1 was advanced at an adjacent location, outside the waste body's footprint area, to collect a sample to assess "background" conditions.

A total of four soil samples, AH1, AH2, AH3, and Control 1, were collected and submitted for laboratory analysis.

3.3 GROUNDWATER SAMPLING

Groundwater sampling was completed on 8 June 2022. Two existing boreholes, BH1 and BH2, were identified at the Site. BH1 is located approximately 460 m to the southwest of the WWTP at coordinates 34°39'6.49 "S and 19°29'16.28 "E. BH2 is in the sports field approximately 440 m to the southwest of the Site. BH3 could not be located.

The existing monitoring boreholes were gauged with a Solinst™ electronic interface meter to determine the depth to groundwater and installation depth. Groundwater samples from the boreholes were collected using disposable bailers dedicated to the sampling location. Before sampling the monitoring boreholes, three well volumes were purged to remove stagnant water.

In-field parameters were captured using hand-held Hanna probes and a down-well Hanna Dissolved Oxygen (DO) probe during the purging process. The water samples to be analysed for metals were preserved in the field using nitric and hydrochloric acid.

A comprehensive summary of the groundwater sampling methodology is presented in SLR SOP 4.4.
All recovered samples were handled according to established protocols based on the United States Environmental Protection Agency (USEPA) methods and aligned with SLR's Standard Operating Procedures (SOPs). No duplicate soil samples were collected. Samples were collected in laboratory-supplied bottles, appropriately preserved, and stored for the specified analysis.

3.4 LABORATORY ANALYSIS

Soil and groundwater samples were submitted to Element Materials Technology Laboratory (Somerset West, South Africa)[8] for a comprehensive screening analysis of chemical determinants, as stated below:

Table 3-1: Desk Study Details

Sample Matrix	Sample Name	Analytes
Soil	AH1, AH2, AH3 & Control 1	As, Ba, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Se, Zn, Chlorides (Cl); Electrical Conductivity (EC); Nitrate (as N), Nitrite (NO3-N); pH; Potassium (K); Total Organic Carbon (TOC); Calcium (Ca); Fluoride (F); Magnesium (Mg); Sodium (Na); and Sulphate (SO4).
Groundwater	BH1 & BH2	As, Ba, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Se, Zn, Alkalinity (P. Alk); Ammonia (NH3-N); Chemical Oxygen Demand (COD); Chlorides (Cl); Electrical Conductivity (EC); Nitrate (as N); Nitrite (NO3-N); pH; Potassium (K); Total Dissolved Solids (TDS); Calcium (Ca); Fluoride (F); Magnesium (Mg); Sodium (Na); and Sulphate (SO4)

A QA/QC program was applied to evaluate if the sampling and analytical data were reliable based on current industry standards. The QA/QC program consisted of two stages, one stage completed by the laboratory and the other as part of the standard field procedures performed by SLR.

3.4.1 Laboratory QA/QC Program

As noted above, all samples were analysed by Element Materials Technology Laboratory. All time-sensitive analysis is done immediately (where preservation is not possible) or with method-specific holding to protect the sample's integrity. Results are also compared between independent test components/elements of overlap.

Laboratory equipment is calibrated and/or verified based on a predetermined maintenance schedule. The quality system is audited by the laboratory's quality manager and externally by UKAS and SANAS.

3.4.2 Field QA/QC Program

A comprehensive account of the groundwater QA/QC program is presented in SLR SOP 4.4.

3.5 REGULATORY FRAMEWORK

The determinants concentrations in the soil samples were evaluated using the Soil Screening Values (SSVs) from the Norms and Standards for the Remediation of Contaminated Land and Soil Quality in the Republic of South Africa, National Department of Environmental Affairs.

[8]United Kingdom Accreditation Service (UKAS), and South African National Accreditation System (SANAS) accredited laboratory.

SSV1 values are soil quality values that protect both human health and ecotoxicological risk for multi-exposure pathways, including contaminant migration to a water resource. SSV2 are soil quality values that are protective of risk to human health in the absence of a water resource.

Please note that, although groundwater is not used (potable or domestic uses) at or in the vicinity of the Site, and the local municipality supplies potable water, the South African National Standard SANS 241 (Drinking Water) was used as groundwater screening reference.

4. RESULTS OF THE INVESTIGATION

4.1 SOIL SAMPLING LOCATIONS

Four soil bores were advanced on 8 June 2022 to a maximum depth of 2.0 m bgl. Three of the soil bores were advanced on the footprint of the former WDF and Control 1 at a background location.

Soil Bore	Location Description	Coordinates
AH1	Located to the north of the three settling ponds	34°38’59.96 “S 19°29’32.15” E
AH2	Located to the northwest of the settling ponds	34°39’0.43 “S 19°29’28.65 “E.
AH3	Located to the west of the ponds inside the WWTP perimeter.	34°39'1.39"S 19°29'28.71"E.
Control 1	Located to the southwest of the ponds outside the former waste dump footprint	34°39’4.11 “S 19°29’28.07” E

The locations of the soil bores are shown *in, Figure 2.1.*

4.2 SITE STRATIGRAPHY

During the auguring, the soil profile encountered consisted mainly of fine loose sands. The local profiles are summarised in the table below.

Table 4-1: Summary of Strata Encountered

Soil Bore	Depth (m bgl)	Soil Profile	Strata
AH1	0.0 – 1.0	Dry, dark brown, loose loamy SAND	Unconsolidated soils
	1.0 – 2.0	Slightly moist, orange, brown, loose fine SAND	
AH2	0.0 – 1.0	Dry, yellow brown, loose fine SAND	Unconsolidated soils
	1.0 – 2.0	Slightly moist,	
AH3	0.0 – 2.0	Dry, yellow brown, loose fine SAND	Unconsolidated soils
Control 1	0.0 – 1.5	Dry, brown, very loose, silty SAND	Unconsolidated soils
	1.5 - 2.0	Dry, brown, very loose, fine SAND	

4.3 GROUNDWATER ANALYSIS

The monitoring results indicate groundwater occurs at 14.10 m and 15.18 m bgl.

The field parameters were measured following the purging process at the two monitoring boreholes. Groundwater parameters, including pH, temperature, EC, and ORP, were recorded following purging. In addition, all field meters were calibrated before site work. The field groundwater parameter results are presented in Table 4-2

Table 4-2: Summary of Groundwater Monitoring Data

Monitoring Borehole	Date	Depth to Water (m bgl)	DO (mg/L	pH	EC (mS/cm	ORP (mV)	Temp (oC)	Comments
BH1	8 June 2022	15.18	0.8	6.64	0.86	150	27.2	Turbid with a brown colour, no distinct odours
BH2	8 June 2022	14.10	0.5	6.61	0.84	-242	26.1	Turbid with a brown colour, no distinct odours
BH3	Borehole not found							

DO Dissolved Oxygen is measured in milligrams per litre and is measured *in-situ* down the well.
pH Power of Hydrogen
EC Electrical Conductivity measured in millisiemens per centimetre
ORP Oxidation Reduction Potential measured in millivolts
Temp Temperature measured in degrees Celsius

4.4 ANALYTICAL RESULTS

The soil and groundwater analytical results are discussed below and presented in Table 4-3 and Table 4-4 below. Copies of the laboratory certificates are attached in *Appendix A*.

Table 4-3: Soil Samples Analytical Results

Sample ID			NATIONAL NORMS AND STANDARDS FOR REMEDIATION OF CONTAMINATED LAND & SOIL QUALITY					AH 1	AH 2	AH 3	Control 1
Depth								2m	2m	2m	2m
Sample Type			SSV1	SSV2	SSV2	SSV2	SSVs	Soil	Soil	Soil	Soil
Sampled Date			All Land-Uses Protective of the Water Resource	Informal Residential	Standard Residential	Commercial/ Industrial	Anions	08/06/2022	08/06/2022	08/06/2022	08/06/2022
Determinants	**Units**	**LOD**									
Metals											
Arsenic*	mg/kg	<0.5	5,8	23	48	150	NV	<0.5	<0.5	<0.5	<0.5
Barium*	mg/kg	<1	NV	NV	NV	NV	NV	2,0	12,0	11,0	9,0
Cadmium*	mg/kg	<0.1	7,5	15	32	260	NV	<0.1	<0.1	<0.1	<0.1
Calcium*	mg/kg	<500	NV	NV	NV	NV	NV	16 660	238 700	228 200	135 300
Chromium*	mg/kg	<0.5	NV	NV	NV	NV	NV	9,2	12,2	9,5	7,1
Cobalt*	mg/kg	<0.5	300	300	630	5 000	NV	<0.5	<0.5	<0.5	<0.5
Copper*	mg/kg	<1	16	1 100	2 300	19 000	NV	<1	<1	<1	<1
Lead*	mg/kg	<5	20	110	230	1 900	NV	<5	<5	<5	<5
Magnesium*	mg/kg	<25	NV	NV	NV	NV	NV	223	2 433	2 555	1 939
Manganese*	mg/kg	<1	740	740	1 500	12 000	NV	5,0	8,0	7,0	6,0
Mercury*	mg/kg	<0.1	0,93	0,93	1	6,5	NV	<0.1	<0.1	<0.1	<0.1
Nickel*	mg/kg	<0.7	91	620	1 200	10 000	NV	1,0	<0.7	<0.7	1,0
Potassium*	mg/kg	<5	NV	NV	NV	NV	NV	84	109	108	188
Selenium*	mg/kg	<1	NV	NV	NV	NV	NV	<1	<1	<1	<1
Sodium*	mg/kg	<5	NV	NV	NV	NV	NV	165	2 224	2 059	775
Zinc*	mg/kg	<5	240	9 200	19 000	150 000	NV	<5	<5	<5	<5
Anions											
Fluoride	mg/kg	<0.3	NV	NV	NV	NV	30	<0.3	0,3	0,3	<0.3
Chloride [SA]	mg/kg	<2	NV	NV	NV	NV	12 000	25	<2	3,0	27
Sulphate as SO_4 (2:1 Ext) [SA]	mg/kg	<3	NV	NV	NV	NV	4 000	15	<3	3,0	27
Nitrite as N [SA]	mg/kg	<0.2	NV	NV	NV	NV	120	0,3	<0.2	<0.2	0,8
Nitrate as N [SA]	mg/kg	<2.5	NV	NV	NV	NV	120	<2.5	<2.5	<2.5	<2.5
Other											
Total Organic Carbon*	%	<0.02	NV	NV	NV	NV	NV	0,12	0,04	0,05	0,34
Electrical Conductivity @25C (5:1 ext)	uS/cm	<100	NV	NV	NV	NV	NV	111	<100	106	216
pH [SA]	pH units	<2.00	NV	NV	NV	NV	NV	8,21	8,61	8,46	8,75

NV - No Value
mg/g - milligrams per kilogram
uS/cm - microsiemens per centimeter
SA - ISO17025 (SANAS Ref No.T0729) accredited - South Africa
ug/kg - micrograms per kilogram
LOD - Limit of detection

Table 4-4: Groundwater Samples Analytical Results

Sample ID			SOUTH AFRICAN STANDARDS (DRINKING WATER)		BH 1	BH 2
Sample Type			SANS 241:2015[1]	SANS 241:2015[1]	Groundwater	Groundwater
Sampled Date			Aesthetic	Chronic Health	08/06/2022	08/06/2022
Determinants	**Units**	**LOD**				
Dissolved Arsenic	ug/l	<2.5	NV	10	<2.5	<2.5
Dissolved Barium	ug/l	<3	NV	700	3,0	20
Dissolved Cadmium	ug/l	<0.5	NV	3	<0.5	<0.5
Dissolved Calcium [SA]	mg/l	<0.3	NV	NV	73	26
Total Dissolved Chromium	ug/l	<1.5	NV	3	<1.5	<1.5
Dissolved Cobalt	ug/l	<2	NV	NV	<2	<2
Dissolved Copper	ug/l	<7	NV	2 000	<7	<7
Dissolved Magnesium [SA]	mg/l	<0.2	NV	NV	58	78
Dissolved Potassium [SA]	mg/l	<0.1	NV	NV	18,7	202
Dissolved Sodium [SA]	mg/l	<0.1	NV	NV	291	1 605
Dissolved Lead	ug/l	<5	NV	10	<5	<5
Dissolved Manganese	ug/l	<2	100	400	17	**2 42**
Dissolved Mercury	ug/l	<1	NV	6	<1	<1
Dissolved Nickel	ug/l	<2	NV	70	<2	<2
Dissolved Selenium	ug/l	<3	NV	40	<3	<3
Dissolved Zinc	ug/l	<3	5 000	NV	13	7,0
Anions						
Fluoride [SA]	mg/l	<0.3	NV	1.5	<0.3	<0.3
Chloride [SA]	mg/l	<0.3	300	NV	**456**	**2 650**
Sulphate [SA]	mg/l	<0.5	250	500	95	104
Nitrite as N [SA]	mg/l	<0.006	NV	11	<0.006	<0.006
Nitrate as N [SA]	mg/l	<0.05	NV	0,9	**2,5**	**2,0**
Other						
Total Alkalinity as CaCO3 [SA]	mg/l	<3	NV	NV	448	184
P Alkalinity as CaCO3	mg/l	<3	NV	NV	<3	<3
COD (Settled) [SA]	mg/l	<9	NV	NV	<9	33
Electrical Conductivity @25C [SA]	uS/cm	<2	170 000	NV	2 340	8 620
pH [SA]	pH units	<2.00	5 - 9.7	NV	7,8	8,0
Total Dissolved Solids [SA]	mg/l	<35	1 200	NV	**1 372**	**4 885**

NV - No Value
mg/l - milligrams per litre
uS/cm - micro siemens per centimetre
SA - ISO17025 (SANAS Ref No.T0729) accredited - South Africa
ug/l - micrograms per litre
LOD - Limit of detection

4.4.1 Soil Sampling Analytical Results

The results of the laboratory analysis of soil samples in Table 4-3 indicate the following[9]:

Metals

No SSVs exist for barium, calcium, chromium, magnesium, potassium, and sodium.

- Barium, calcium, chromium, magnesium, manganese, nickel, potassium, and sodium were detected in the soil samples above the laboratory detection limit. Barium was detected at a 2.0 mg/kg (AH1) to 11 mg/kg (AH3). A barium concentration of a similar magnitude of 9.0 mg/kg was reported in Control 1. Calcium was detected at 16 660 mg/kg (AH1) to 238 700 mg/kg (AH2), whereas concentrations of 135 300 mg/kg were reported for Control 1.
- Magnesium was detected at a concentration range of 223 mg/kg to 2 555 mg/kg (AH3), whilst the control sample indicated a concentration of 1 939 mg/kg.
- Manganese was detected at a concentration range of 8 mg/kg (AH2) to 5.0 mg/kg (AH1).
- Nickel was only detected in AH1 and Control 1 at 1.0mg/kg.
- Potassium was detected at a range of 84 mg/kg (AH1) to 188 mg/kg (Control 1).
- Sodium was detected at 165 mg/kg (AH1) to 2 224 mg/kg (AH2).
- Heavy metals zinc, arsenic, cadmium, cobalt, copper, lead, mercury, and selenium were not detected above the laboratory limit of reporting in the soil samples.

Other Determinants

- Fluoride, chloride, sulphates, and nitrite as N was detected in the soil samples as follows:
  - Fluoride was detected at a concentration of 0.3 mg/kg in AH2 and AH3
  - Chloride was detected at a range of 3.0 mg/kg (AH3) to 27 mg/kg (Control 1)
  - Sulphates (SO_4) were reported at a range of 3.0 mg/kg (AH3) to 27 mg/kg (Control 1)
- Nitrite (as N) concentrations ranged from 0.3 mg/kg (AH) to 0.8 mg/kg (Control 1).
- Nitrates as N was not detected above the laboratory detection limit.
- The TOC ranged from 0.04% (AH2) to 0.34% (Control 1).
- A narrow pH range from 8.21 -8.75 was reported.
- Electrical conductivity ranged from 106 µS/cm (AH3) to 216 µS/cm (Control 1).

[9]The following definitions were used to characterize the of levels of concentrations: trace concentrations are recorded values less than three time the Method Detection Limit (MDL); notable concentrations are values more than three times the MDL but less than the applicable screening criteria; and elevated concentrations are values greater than the screening criteria.

4.4.2 Groundwater Analytical Results

The results of the laboratory analysis of groundwater samples from monitoring boreholes BH1 and BH2 in Table 4-4 indicate the following:

Metals

Please note that no SANS screening values are provided for magnesium, potassium, sodium and zinc.

- Dissolved barium, calcium, magnesium, potassium, sodium, manganese, and zinc were all detected above the laboratory limit.
- Dissolved manganese was detected in the groundwater samples with a maximum concentration of 242 mg/kg (BH2) above the SANS 241 value aesthetic screening level.
- Dissolved arsenic, cadmium, total chromium, cobalt, copper, lead, mercury, nickel and selenium were reported below the laboratory detection limits.

Other Determinants

- Chloride was detected at a concentration of 456 mg/l at BH1 and 2 650 mg/l at BH2 exceeding the SANS 241 values in both samples.
- Nitrate (as N) was detected at a concentration of 2.5 mg/l at BH1 and 2.0 mg/l at BH2 exceeding the SANS 241 in both samples.
- Nitrites (as N) were not detected above the laboratory limits.
- Sulphates were detected at a maximum of 104 mg/l (BH2) below the SANS 241 values.
- Total dissolved solids (TDS) were measured at a concentration of 1 372 mg/l at BH1 and a concentration of 4 885 mg/l at BH2 exceeding the SANS 241 aesthetic screening values in both samples.

5. ENVIRONMENTAL EVALUATION

5.1 PRELIMINARY CONCEPTUAL MODEL

As part of the evaluation and following current best practice, the Site has been considered in terms of a Conceptual Site Model (CSM) using the principles of a risk assessment comprising an evaluation of the potential Source-Pathway-Receptor (S-P-R) model potential pollutant linkages.

Table 5-1 lists the potential sources, pathways and receptors identified at the Site in the context of possible pollutant linkages, i.e., a situation where the source(s), pathway(s) and receptor(s) are all present at a site, and therefore an actual (as opposed to a perceived) risk of potential impact exists.

The historical activities at the Site, which included the disposal of waste (mainly building rubble and garden waste), were identified in the CSM as the primary potential source of pollutants at the Site. Although the waste body was excavated and removed in 2015, the potential existence of residual soil impacts cannot be discounted.

The current activities at the Site, i.e., treating domestic wastewater from the Eluxolweni Housing Project and re-injecting the treated effluent into the aquifer, have also been considered a potential source of pollutants.

Although no domestic groundwater use has been identified within a 1km, the aquifer has been identified as a receptor.

5.2 OVERALL RISK SUMMARY

An overview of the potential risks associated with current soil and groundwater conditions reported at the Site are summarised below:

- The soil analytical results indicated the presence of barium, calcium, chromium, magnesium, manganese, nickel, potassium, and sodium; however, the reported concentrations are well below all the soil screening criteria (SSVs). Detected anions in the soil samples were at concentrations below the SSVs and are not considered to represent a risk to human health or the environment
- The groundwater analytical results indicated the presence of barium, calcium, magnesium, potassium, sodium, manganese, and zinc. The concentration of sodium, manganese, chloride, nitrate (as N) and the TDS exceeded the screening criteria (SANS 241). Since the groundwater is not used for portable purposes within a 1 km radius of the Site, groundwater ingestion is not considered a plausible pathway. As such there is no risk was identified.
- Comparisons of SRK's May 2013 and the June 2020 analytical data from BH1 and BH2 indicate no significant or apparent changes in the detectable determinants.

Table 5-1: Qualitative Risk Evaluation

Sources	Pathways		Receptors			Risk Evaluation
Site History & Analytical Results	**Medium**	**Release Mechanism**	**Type**	**Description**	**Exposure**	**Potentially complete S-P-R linkage?**
The Pearly Beach WDF was established in ±1989 and was closed in 2011. Historically the Site received only building rubble and garden waste from the local community. The waste body was removed in 2011, and a Wastewater Treatment Works (WWTP[10]) encompassing three waste stabilisation ponds was established at the Site. In addition, the WWTP deploys infiltration of effluent water to the aquifer through a series of well points. An assessment by SRK in May 2013 indicated the following: • Groundwater levels ranged between 5 and 14 mbgl in the three drilled boreholes. • No groundwater users were identified within a 1km radius of the Site. Irrigation well points were identified at residential premises 2.7 km southeast of the Site. The groundwater flow direction was inferred to be in a south-easterly direction. • The superficial deposits of the Bredasdorp Group form the primary aquifer, which is low yielding with high salinities and unsuitable for domestic use. • The Table Mountain Group bedrock can be broadly classified as a secondary aquifer. • The aquifers at the Site are classified as highly vulnerable to contamination. During the assessment by SLR in June 2022, the following was observed: • The soil analytical results indicated the presence of barium, calcium, chromium, magnesium, manganese, nickel, potassium and sodium in the soil samples obtained from the Site at concentrations below all the soil screening criteria (SSVs). • The groundwater analytical results indicated the presence of barium, calcium, magnesium, potassium, sodium, manganese, and zinc. The concentration of sodium, manganese, chloride, nitrate (as N) and the TDS exceeded the aesthetic screening criteria (SANS 241).	Soil	Leaching of metals and anions	Groundwater (Aquifer)	The concentrations of the metals and anions detected in the soil samples were below the SSVs. As such, no risk to the aquifer was identified.	Impact to groundwater	This S-P-R linkage is considered incomplete.

[10]Related to Eluxolweni Sewerage Collection, Treatment & Reuse and Bulk Water Supply

6. CONCLUSIONS & RECOMMENDATIONS

SLR visited the Pearly Beach WWTP located on North Road, Pearly Beach, to conduct a Phase 1 assessment on 8 June 2022 as part of GIBB's support of the Overstrand Local Municipality to comply with appliable regulatory processes for the closure of the former Pearly Beach Waste Disposal Facility (WDF), which is now operating as Wastewater Treatment Plant (WWTP). The objective of the assessment was to assess the soil and groundwater conditions at the Site and provide a baseline evaluation of the Site so as to comply with Part 8 of the National Environmental Management: Waste Act (NEM:WA).

The Pearly Beach WWTP was formerly operated as Pearly Beach WDF, established in 1989 and was closed in 2011. The Site received only building rubble and garden waste from the local community. The waste body was subsequently removed in 2015, and a WWTP encompassing three waste stabilisation ponds was established at the Site. The removal of the waste body and the development of the treatment facility took place simultaneously. The removal of the waste body took place in the beginning of 2015 where after the treatment facility was constructed and still completed in 2015. In addition, the WWTP deploys infiltration of effluent water to the aquifer through a series of well points. The Site is located approximately 500 m to the northeast of the Eluxolweni Housing Project and is surrounded by open land to the north, east, west and the immediate south.

Four soil bores were completed by hand augured at strategic locations at the Site to collect representative soil samples. Three of the soil bores were advanced within the footprint of the former WDF. Control 1 was advanced at a background location. During the auguring, the soil profile encountered consisted mainly of fine loose sands to the maximum sample depth of 2.0m bgl. A total of four soil samples were collected from the Site for laboratory analysis.

Two existing monitoring boreholes, BH1 and BH2, were identified on the Site. During the sampling, groundwater was encountered at 14.10 and 15.18 m bgl in BH1 and BH2, respectively. In addition, two groundwater samples were obtained from the Site for laboratory assessment.

The analytical results of the soil samples indicated the presence of barium, calcium, chromium, magnesium, manganese, nickel, potassium, and sodium at concentrations below the soil screening criteria (SSVs). In addition, detected anions were registered at concentrations below the SSVs.

The groundwater analytical results indicated the presence of barium, calcium, magnesium, potassium, sodium, manganese, and zinc. The concentration of sodium, manganese, chloride, nitrate (as N) and the TDS exceeded the screening criteria (SANS 241). Since the groundwater is not used for portable purposes within a 1 km radius of the Site, groundwater ingestion was not considered a realistic exposure pathway.

Based on the assessment and as per the preliminary CSM developed, no potentially complete S-P-R linkages were identified. Following the risk-based decision support protocol presented in the South African Framework for the Management of Contaminated Land, the assessment did not identify any contaminants of potential concern in the soil and groundwater at the Site.

As a result, no risks to human health or the environment were identified. Therefore, no further site assessment work is recommended.

APPENDIX A: LABORATORY CERTIFICATES

Element Materials Technology
Unit D2 & D5
9 Quantum Road
Firgrove Business Park
Somerset West
7130
South Africa

W: www.element.com

SLR Consulting (South Africa) (Pty) Ltd
Unit 3, Building 5
Fairways Office Park, Niblick Way
Somerset West
Cape Town
Western Cape
South Africa
7137

Attention :	Teboho Maidza
Date :	22nd June, 2022
Your reference :	72.07035.00013
Our reference :	Test Report 22/546 Batch 1
Location :	Pearly Beach
Date samples received :	8th June, 2022
Status :	Final report
Issue :	1

Seven samples were received for analysis on 8th June, 2022 of which six were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Analysis was undertaken at either Element Materials Technology UK, which is ISO 17025 accredited under UKAS (4225) or Element Materials Technology (SA) which is ISO 17025 accredited under SANAS (T0729) or a subcontract laboratory where specified.

NOTE: Under International Laboratory Accreditation Cooperation (ILAC), ISO 17025 (UKAS) accreditation is recognised as equivalent to SANAS (South Africa) accreditation.

Authorised By:

Jeanri Stevens
Laboratory Supervisor

Inorganics Laboratory:

Greg Ondrejkovic
Technical Supervisor

Element Materials Technology

Client Name: SLR Consulting (South Africa) (Pty) Ltd
Reference: 72.07035.00013
Location: Pearly Beach
Contact: Teboho Maidza
EMT Job No: 22/546

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

EMT Sample No.	1	2	3	4							LOD/LOR	Units	Method No.
Sample ID	AH 1	AH 2	AH 3	Controle 1									
Depth	2m	2m	2m	2m									
COC No / misc													
Containers	B	B	B	B									
Sample Date	08/06/2022	08/06/2022	08/06/2022	08/06/2022									
Sample Type	Soil	Soil	Soil	Soil									
Batch Number	1	1	1	1									
Date of Receipt	08/06/2022	08/06/2022	08/06/2022	08/06/2022									
Arsenic*	<0.5	<0.5	<0.5	<0.5							<0.5	mg/kg	UK_TM30/UK_PM15
Barium*	2	12	11	9							<1	mg/kg	UK_TM30/UK_PM15
Cadmium*	<0.1	<0.1	<0.1	<0.1							<0.1	mg/kg	UK_TM30/UK_PM15
Calcium*	16660	238700	228200	135300							<500	mg/kg	UK_TM30/UK_PM15
Chromium*	9.2	12.2	9.5	7.1							<0.5	mg/kg	UK_TM30/UK_PM15
Cobalt*	<0.5	<0.5	<0.5	<0.5							<0.5	mg/kg	UK_TM30/UK_PM15
Copper*	<1	<1	<1	<1							<1	mg/kg	UK_TM30/UK_PM15
Lead*	<5	<5	<5	<5							<5	mg/kg	UK_TM30/UK_PM15
Magnesium*	223	2433	2555	1939							<25	mg/kg	UK_TM30/UK_PM15
Manganese*	5	8	7	6							<1	mg/kg	UK_TM30/UK_PM15
Mercury*	<0.1	<0.1	<0.1	<0.1							<0.1	mg/kg	UK_TM30/UK_PM15
Nickel*	1.0	<0.7	<0.7	1.0							<0.7	mg/kg	UK_TM30/UK_PM15
Potassium*	84	109	108	188							<5	mg/kg	UK_TM30/UK_PM15
Selenium*	<1	<1	<1	<1							<1	mg/kg	UK_TM30/UK_PM15
Sodium*	165	2224	2059	775							<5	mg/kg	UK_TM30/UK_PM15
Zinc*	<5	<5	<5	<5							<5	mg/kg	UK_TM30/UK_PM15
Fluoride	<0.3	0.3	0.3	<0.3							<0.3	mg/kg	SA_TM27/SA_PM20
Chloride [SA]	25	<2	3	27							<2	mg/kg	SA_TM27/SA_PM20
Sulphate as SO4 (2:1 Ext) [SA]	15	<3	3	27							<3	mg/kg	SA_TM27/SA_PM20
Nitrite as N [SA]	0.3	<0.2	<0.2	0.8							<0.2	mg/kg	SA_TM27/SA_PM20
Nitrate as N [SA]	<2.5	<2.5	<2.5	<2.5							<2.5	mg/kg	SA_TM27/SA_PM20
Total Organic Carbon*	0.12	0.04	0.05	0.34							<0.02	%	UK_TM21/UK_PM24
Electrical Conductivity @25C (5:1 ext)	111	<100	106	216							<100	uS/cm	SA_TM28/SA_PM58
pH [SA]	8.21	8.61	8.46	8.75							<2.00	pH units	SA_TM19/SA_PM11

Please see attached notes for all abbreviations and acronyms

Client Name: SLR Consulting (South Africa) (Pty) Ltd
Reference: 72.07035.00013
Location: Pearly Beach
Contact: Teboho Maidza
EMT Job No: 22/546

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	5-9	10-14											
Sample ID	BH 1	BH 2											
Depth													
COC No / misc													
Containers	HN HCL P G	HN HCL P G											
Sample Date	08/06/2022	08/06/2022											
Sample Type	Ground Water	Ground Water											
Batch Number	1	1											
Date of Receipt	08/06/2022	08/06/2022											
												LOD/LOR	Units	Method No.
Dissolved Arsenic*	<2.5	<2.5										<2.5	ug/l	UK_TM30/UK_PM14
Dissolved Barium*	3	20										<3	ug/l	UK_TM30/UK_PM14
Dissolved Cadmium*	<0.5	<0.5										<0.5	ug/l	UK_TM30/UK_PM14
Dissolved Calcium SA	72.7	25.5										<0.3	mg/l	SA_TM27/SA_PM0
Total Dissolved Chromium*	<1.5	<1.5										<1.5	ug/l	UK_TM30/UK_PM14
Dissolved Cobalt*	<2	<2										<2	ug/l	UK_TM30/UK_PM14
Dissolved Copper*	<7	<7										<7	ug/l	UK_TM30/UK_PM14
Dissolved Magnesium SA	58.1	77.5AB										<0.2	mg/l	SA_TM27/SA_PM0
Dissolved Potassium SA	18.7	201.5AB										<0.1	mg/l	SA_TM27/SA_PM0
Dissolved Sodium SA	290.8AA	1605.3AB										<0.1	mg/l	SA_TM27/SA_PM0
Dissolved Lead*	<5	<5										<5	ug/l	UK_TM30/UK_PM14
Dissolved Manganese*	17	242										<2	ug/l	UK_TM30/UK_PM14
Dissolved Mercury*	<1	<1										<1	ug/l	UK_TM30/UK_PM14
Dissolved Nickel*	<2	<2										<2	ug/l	UK_TM30/UK_PM14
Dissolved Selenium*	<3	<3										<3	ug/l	UK_TM30/UK_PM14
Dissolved Zinc*	13	7										<3	ug/l	UK_TM30/UK_PM14
Fluoride SA	<0.3	<0.3										<0.3	mg/l	SA_TM27/SA_PM0
Chloride SA	456.3AA	2649.9AB										<0.3	mg/l	SA_TM27/SA_PM0
Sulphate SA	94.8	103.7										<0.5	mg/l	SA_TM27/SA_PM0
Nitrite as N SA	<0.006	<0.006										<0.006	mg/l	SA_TM27/SA_PM0
Nitrate as N SA	2.46	1.97										<0.05	mg/l	SA_TM27/SA_PM0
Total Alkalinity as CaCO3 SA	448	184										<3	mg/l	SA_TM32/SA_PM0
P Alkalinity as CaCO3	<3	<3										<3	mg/l	SA_TM32/SA_PM0
COD (Settled) SA	<9	33										<9	mg/l	SA_TM57/SA_PM0
Electrical Conductivity @25C SA	2340	8620										<2	uS/cm	SA_TM28/SA_PM0
pH SA	7.81	7.95										<2.00	pH units	SA_TM19/SA_PM0
Total Dissolved Solids SA	1372	4885										<35	mg/l	SA_TM20/SA_PM31

Client Name: SLR Consulting (South Africa) (Pty) Ltd
Reference: 72.07035.00013
Location: Pearly Beach
Contact: Teboho Maidza

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 22/546						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/546

SOILS and ASH

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range
AA	x10 Dilution
AB	x50 Dilution

EMT Job No: 22/546

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
SA_TM19	Determination of pH by bench pH meter	SA_PM0	No preparation is required.	Yes			
SA_TM19	Determination of pH by bench pH meter	SA_PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
SA_TM20	Modified BS 1377-3: 1990 Gravimetric determination of Total Dissolved Solids	SA_PM31	Sample is filtered	Yes			
SA_TM27	Major ions by Ion Chromatography	SA_PM0	No preparation is required.	Yes			
SA_TM27	Major ions by Ion Chromatography	SA_PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a orbital shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a orbital shaker.			AD	Yes
SA_TM27	Major ions by Ion Chromatography	SA_PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a orbital shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a orbital shaker.	Yes		AD	Yes
SA_TM28	Determination of Electrical Conductivity with hand held manual conductivity probe.	SA_PM0	No preparation is required.	Yes			
SA_TM28	Determination of Electrical Conductivity with hand held manual conductivity probe.	SA_PM58	Dried and ground solid samples are extracted with water in a 5:1 water to solid ratio, the samples are shaken on an orbital shaker.			AD	Yes
SA_TM32	Determination of Alkalinity by titration of the sample with a standard solution of acid by visual detection of end points.	SA_PM0	No preparation is required.				
SA_TM32	Determination of Alkalinity by titration of the sample with a standard solution of acid by visual detection of end points.	SA_PM0	No preparation is required.	Yes			

EMT Job No: 22/546

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
SA_TM57	Modified US EPA Method 410.4. Chemical Oxygen Demand is determined by hot digestion with Potassium Dichromate and measured spectrophotometerically.	SA_PM0	No preparation is required.	Yes			
UK_TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	UK_PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.				Yes
UK_TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	UK_PM14	Analysis of waters and leachates for metals by ICP OES/ICP MS. Samples are filtered for dissolved metals and acidified if required.				
UK_TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7, 6010B and BS EN ISO 11885 2009	UK_PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.				Yes

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