Office 101A Windermere Centre, 163-177 Lilian Ngoyi Road, 4001
PO Box 37069, Overport, Durban, 4067

Tel: +27 (0)31 3032835
Fax: +27 (0)86 692 2547

WATER USE LICENCE APPLICATION SUMMARY REPORT

FARM LICHTENBURG TOWN AND TOWNLANDS 27, PORTION 1, 30, 32, 61 AND 71. ERF 1024 PORTION 0, ERF 960 PORTION 0, NORTHWEST PROVINCE

Water Use License Application Reference Number: WU20466

Lafarge Mining South Africa (Pty) Ltd

Prepared by: **Afzelia Environmental Consultants (Pty) Ltd.** **236 Ninth Avenue, Windermere, Durban, 4001** **Tel: 031 303 2835** **E-mail: info@afzelia.co.za**	**On behalf of:** **Greenmined Environmental** **Tel: 076 792 6327** **Email:** **Murchellin.S@greenmined.co.za**	**Prepared for:** **Lafarge Mining South Africa (Pty) Ltd** **Contact person: Uneysa Taljard** **Postal Address:** **P.O. Box 188** **Lichtenburg 2740** **uneysa.taljard@lafarge.com**

EAP Company Details	Report Writer	Signature	Date
Afzelia Environmental Consultants Environmental Assessment Practitioner Number is 2020/1067	Mrs Joleen Wilson		28th October 2022 Amended: 13 January 2023
Greenmined Environmental Environmental Assessment Practitioner Number is 2021/4203	Mrs Murchellin Saal		27th October 2022
Lafarge Mining South Africa	Mrs. Uneysa Taljard		25th October 2022

Table of Contents

1. Applicant Details

Name of applicant: Lafarge Industries South Africa (Pty) Ltd
Postal address: 1 Manana Road, Industrial Site, Lichtenburg, 2740
Cell phone number: 018 633 3011 | 065 913 1666
Office number: +27659131666
E-mail address: Uneysa.taljard@lafargeholcim.com

2. Person Submitting Application

Afzelia Environmental Consultants (Pty) Ltd was appointed by Greenmined Environmental on behalf of Lafarge Industries South Africa (Pty) Ltd to conduct a Water Use Authorisation Application (WUAA) process and obtain an authorisation for the existing Lichtenburg Cement Plant situated on Farm Lichtenburg and Townlands 27, Portion 1, 30, 32, 61 and 71. Erf 1024 Portion 0, Erf 960 Portion 0, Northwest Province.

3. Background and Purpose

3.1 Background

Lafarge South Africa (Pty) Ltd (Lafarge) operates a cement manufacturing facility at Lichtenburg, North West Province that includes the Tswana Lime Quarry and a manufacturing plant in Lichtenburg. The existing operation which includes the cement production and packaging, was authorised in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) by the Department of Minerals and Energy in 2001 (File Reference No. RDNW(KL) 6/2/2/101).

The Applicant (Lafarge) had applied for a conversion of an older mining right, which was granted on the 08th March 2013 (DMR Ref No: NW30/5/1/2/2/454MR) and is valid for a period of 30-years ending on the 07th March 2043..

The cement production plant in Lichtenburg receives limestone from its Tswana Quarry, which is used in the production of cement. The Quarry has a production capacity of 1 800 000 tons per annum (t/a) of limestone. The existing cement plant at Lichtenburg includes three (3) kilns and associated material storage, raw mills, coal mills, cement mills, cement silos and raw material preparation. Currently, the clinker produced at Lichtenburg is milled and packaged on site and distributed as cement. The cement plant also has an environmental authorisation to use secondary (waste) materials as alternative fuels and raw materials on site (DMR Reference: RDNW (KL) 6/2/2/101 and DEDECT Reference: NWP/WM/NM3/2011/06). Additionally, Lafarge has increased cement production at the plant by 50% and this requires the introduction of a third production line (new burning line and mill) at the plant and increased production activity at Tswana Quarry.

No General authorisations are present for the Lafarge Lichtenburg Cement Production Plant. No existing lawful water uses apply to the plant, however a previous water use authorisation ((Registration number: 26019718) exists. Registered activities are listed below:

- Section 21 (a) - Taking water from a water resource (From Townlands and Lovedale Borehole).
- Section 21 (b) - Storing water (For wastewater disposal and industrial residue in the Townlands Pit).
- Section 21 (f) - Discharging waste or water containing waste in a water resource through a pipe, canal, sewer, sea outfall or other conduit (Discharging domestic and biodegradable industrial wastewater into the Townlands Pit).

Lafarge South Africa (Pty) Ltd Lichtenburg site is in the process of applying for additional water uses though a water use licence application (WULA) from the Department of Water and Sanitation.

The water uses which will be applied for in terms of Section 21 of the NWA (Act 36 of 1998) include:
(a) Taking water from a water resource;
(c) Impeding or diverting the flow of water in a watercourse;

(e) Engaging in a controlled activity: Irrigation of any land which waste or water containing waste generated through any industrial activity or by a waterwork;
(g) Disposing of waste in a manner which may detrimentally impact on a water resource;
(h) Disposing in any manner of water which contains waste from, or which has been heated in any industrial or power generation process; and
(i) Altering the Bed, Banks, Course or Characteristics of a Watercourse.

Lafarge recognises the need to redress the imbalances of the past and regards Black Economic Empowerment (BEE) to be one of the supporting pillars of the Transformation Process in South Africa. Lafarge draws on Corporate Centre for its human resource management and development strategies and planning which supports employment equity. Employment opportunities are directed towards local people, upholding the affirmative action, equal employment policies of the company.

3.2 Location of Water Uses

The Lichtenburg cement production plant, in respect of which this water use licence application is submitted, is located in the North West Province, within Ward 6 of Ditsobotla Local Municipality, Ngaka Modiri Molema District Municipality, near Lichtenburg (Figure 1). The water uses will take place on Farm Lichtenburg Town and Townlands 27, portion 1, 30, 32, 61 and 71. Erf 1024 portion 0, erf 960 portion 0 (Figure 2, Table 1), which forms part of the Lower Vaal Water Management Area and the Upper Molopo Sub-Water Management Area. The area falls within the C31A quaternary drainage system also known as the Harts and Molopo River catchments. The entrance to the facility is approximately 600 metres from a tributary of the Harts River.

The geographic location at the property where the water uses will take place are **26° 8'11.24"S; 26°10'52.00"E.**

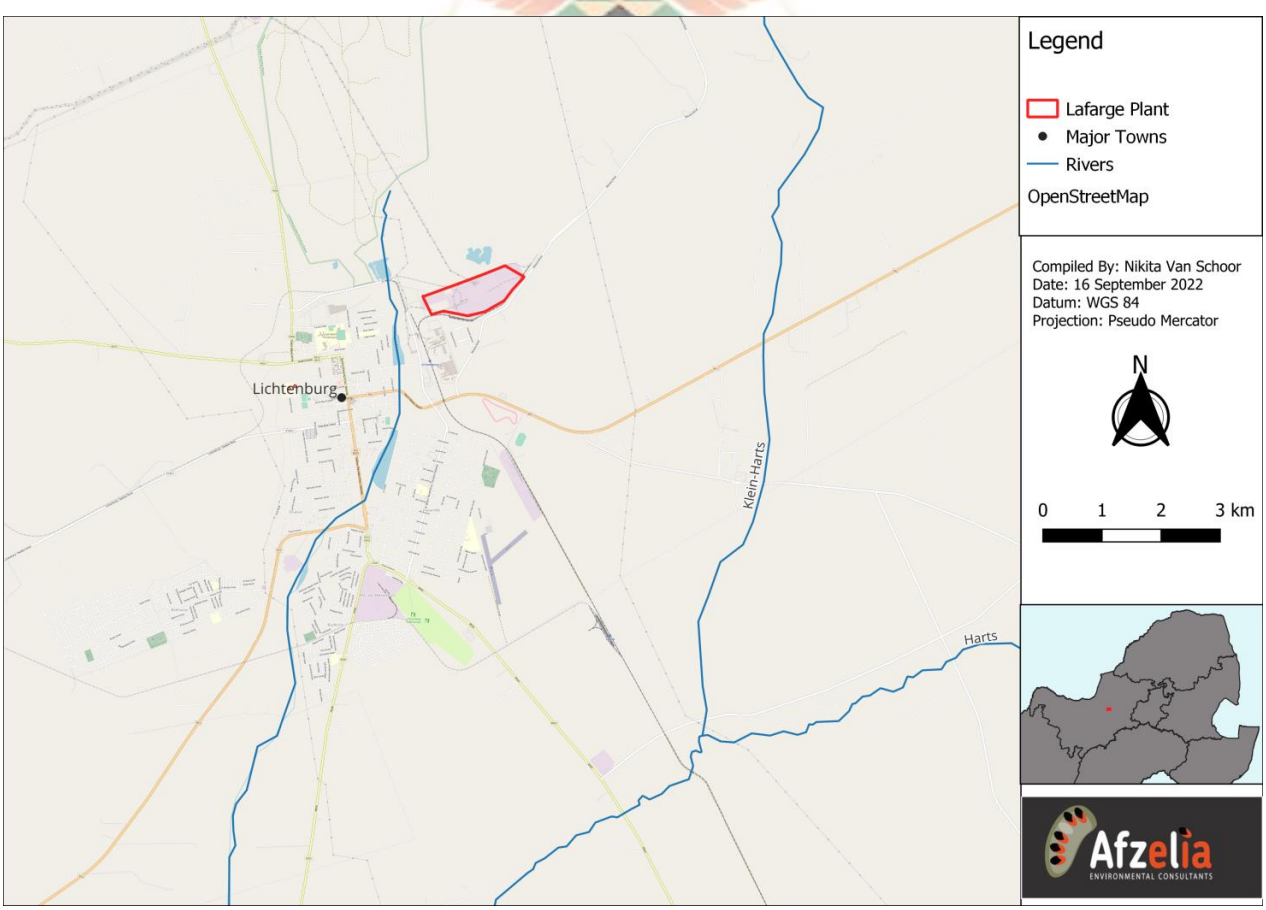

Figure 1: Location of the Lafarge Lichtenburg Cement Plant.

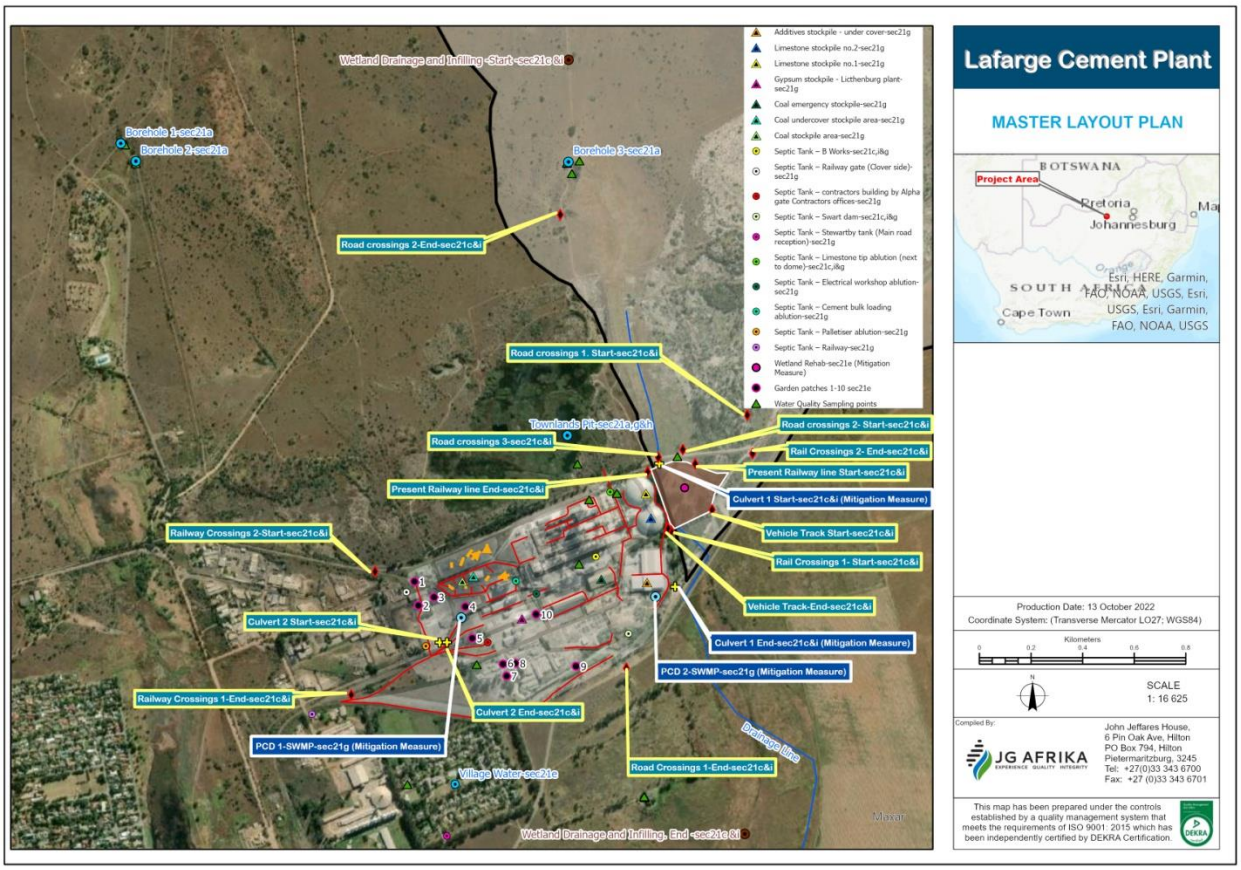

Figure 2: Location of water uses at Lafarge Lichtenburg Cement Factory.

Table 1: Property details

Property description	Title Deed number	Owner
ERF- Land parcel 1024 of the Minor Region Lichtenburg	T0IP00260000 1024000001	Lafarge South Africa (Pty) Ltd
Farm- Portion 1 of Land Parcel 27 of the Major Region IP	T0IP00000000002700001	Lafarge South Africa (Pty) Ltd
Farm - Portion 71 of Land Parcel 27 of the Major Region IP	T0IP00000000002700071	Lafarge South Africa (Pty) Ltd
Farm - Portion 32 of Land Parcel 27 of the Major Region IP	T0IP00000000002700032	Lafarge South Africa (Pty) Ltd
Farm - Portion 30 of Land Parcel 27 of the Major Region IP	T0IP00000000002700030	Lafarge South Africa (Pty) Ltd
Farm - Portion 61 of Land Parcel 27 of the Major Region IP	T0IP00000000002700061	Lafarge South Africa (Pty) Ltd
Farm – Portion 0 of Land Parcel 96 of the Major Region IP	T0IP00260000096000000	Lafarge South Africa (Pty) Ltd

3.3 Administrative Documents and Other Technical Reports Submitted to Support the WULA

3.3.1 Administrative documents

- Certified copies of ID documents
- Proof of payment Application Fee
- Title deeds
- Power of attorney statements
- BEE certificate
- Company Registration certificate

3.3.2 Reports and other technical documents

Table 2: List of reports and other technical documents submitted

Number	Report Title	Compiled by	Date of report
1	Integrated Water and Waste Management Plan (IWMP)	Afzelia Environmental	October 2022
2	Section 27 motivation	Afzelia Environmental	October 2022
3	Water Use License Application Report	Afzelia Environmental	October 2022
4	Hydrological Impact Assessment Report	JG Afrika	August 2022
5	Water Balance Final Report	JG Afrika	August 2022
6	Flood line Study Report	JG Afrika	March 2022
7	Wetland Specialist Report	JG Afrika	March 2022
8	Stormwater and PCD Preliminary Design Report	JG Afrika	May 2022
9	Stormwater Management Plan and GN 704 Audit	JG Afrika	August 2022
10	Wetland Rehabilitation Plan	JG Afrika	August 2022
11	Geohydrological Assessment Report	JG Afrika	September 2022
12	Monthly Water Quality Assessment Report	Aquatico Scientific	August 2022
13	Alternative Water Sources Study	JG Afrika	October 2022
14	Monthly Water Quality Report	Aquatico Scientific	August 2022
15	Environmental Management Plan	Metago Environmental Engineers	August 2011
16	Public Participation	Greenmined Environmental	June 2022
17	Master Layout Plan	JG Afrika	October 2022
18	Mining Permit	DMR	August 2013
19	Watercourse Impact Audit Report	Lafarge	October 2022
20	Financial Provision	Pear Environmental	2021

4. Project Description

Limestone is transported from the Lafarge Tswana Quarry to the Lafarge Lichtenburg cement plant. At the cement plant, the mined limestone material goes through a process of grinding and burning. Fine grinding produces a fine powder (known as raw meal) which is preheated and then sent to a Kiln. The material is heated to approximately 1 500°C before being rapidly cooled. The water required for the cooling process is extracted from the Townlands Pit and is returned to the Pit after use. The water used for cooling is piped and does not come into contact with any of the raw materials or products and therefore not chemically altered. This heated material produces clinker, the basic material required for the production of all cements. The final manufacturing process involves cement grinding and shipping. A small amount of gypsum (3-5%) is added to the clinker to regulate how the cement will set. The mixture is then very finely ground to obtain “pure cement”. During this phase, different mineral materials, called “cement additives”, may be added alongside the gypsum. Used in varying proportions, these additives, which are of natural or industrial origin, give the cement specific properties such as reduced permeability, greater resistance to sulphates and aggressive environments, improved workability, or higher-quality finishes. Finally, the cement is stored in silos before being shipped in bulk or in bags to the sites where it will be used. Lafarge has ensured minimum stress to groundwater resources by operating a dry process for the manufacturing of its cement. Water is extracted from three boreholes only, stored in a main tank and circulated throughout the additional softening plants and kilns.

Additionally, Lafarge plans to implement a number of pollution control dams (PCD’s) in which water will be purified and reused within the cement factory. These PCD’s will also prevent the transportation of sediments and stormwater runoff to the downstream watercourses.

Lafarge acknowledges the impacts imposed on the wetland system situated at the factory site (Wetland Map 5) and rehabilitation and management plans to restore this wetland area are underway. This includes the construction of culverts along road and railway crossings which will allow the water to flow freely again through this system improving its overall condition.

Please refer to **Figure 3** below which depicts the Master Layout Plan for the Lichtenburg Cement Plant.

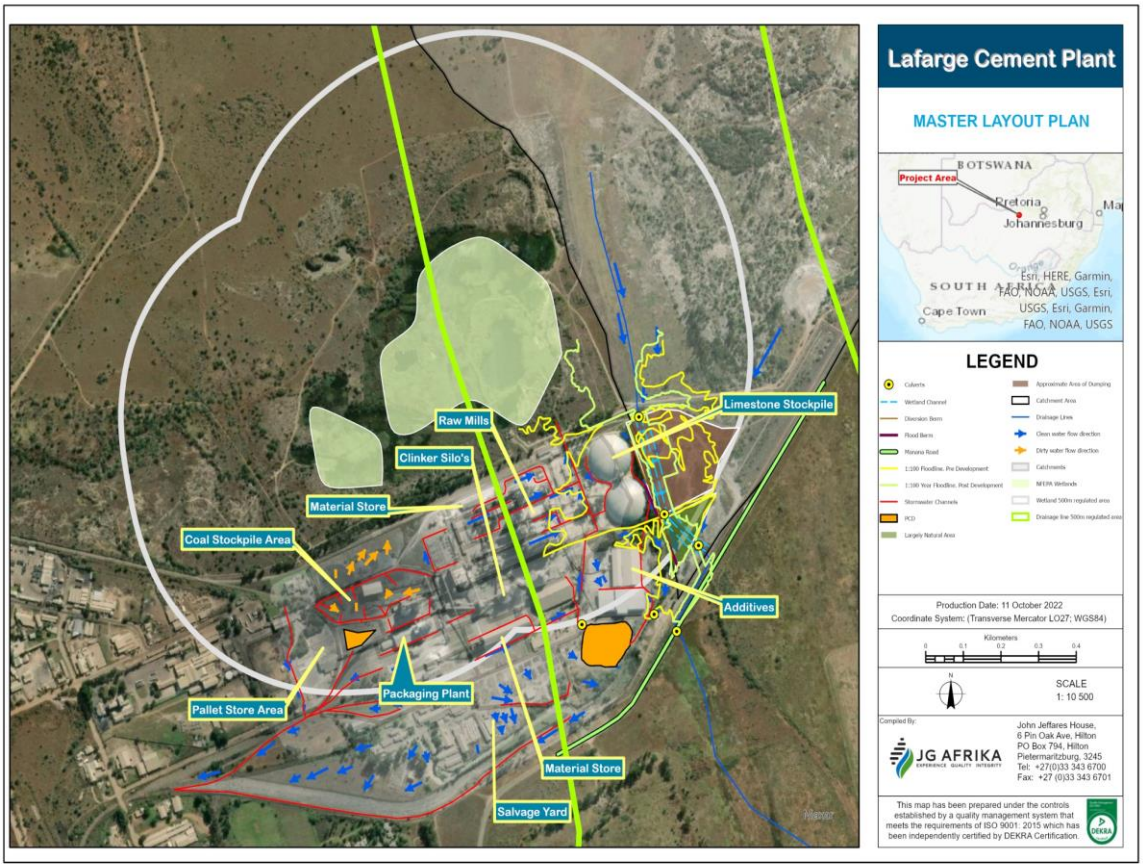

Figure 3: Lichtenburg Cement Plant Master Layout Plan (JG Afrika, October 2022)

5. Methods statement (only for 21 (c) and (i) activities)

Method statements are still to be development by the contractor for activities occurring across/within the drainage line.

6. Stormwater Management Plan

6.1 Stormwater Management Plan and General Audit Report

A Stormwater Management Plan was compiled by JG Afrika for the Lichtenburg Cement Plant. Refer to **Appendix 11** for the full report. A summary of the identified stormwater issues onsite and its associated management plans are listed below:

- Generally, it was noted that maintenance of stormwater infrastructure in and around the plant was poor. Numerous channels were partially or fully blocked by sediment. It was therefore recommended that all stormwater channels are excavated. In addition to this, minimum channel size requirements were provided as part of this study. The proposed channel sizes are based on the 1:50 year return period design flood event (as per GN704 requirements).
- The Stormwater runoff from Area A flows in a westerly direction, reporting to a channel located adjacent to the railway line, and eventually discharging into a tributary of the Harts River. A number of channels in this area were found to be blocked or undersized. Therefore, recommendations on the dimensions of the proposed infrastructure were made.
- Stormwater management around the Coal Stockyard (Area B) was found to be insufficient. Currently there are no interventions implemented to prevent contamination of the downstream environment through runoff from the Coal Stockyard area. It was therefore recommended that a channel is constructed around the perimeter of the Coal Stockyard. It was also recommended that a PCD is constructed downstream of the Coal Stockyard.
- Stormwater from Area C discharges in a northerly direction, through an underground stormwater channel, toward the Quarry (Townlands) Pit. No stormwater infrastructure interventions are proposed for Area C.
- The catchment area associated with Area D is relatively large and consists predominantly of hardened surfaces within the main process area of the cement plant. The main concern for stormwater management in this area

pertains to excessive volumes of fine sediment. The chemical characteristics (and therefore risk of contamination) of the fine material is not known, however, it is noted that stormwater runoff from this area will be contained within the Quarry sump. It is recommended that water quality sampling is undertaken, particularly from the channel leading to the Quarry Sump, to determine the risk of chemical contamination of the water resources in the Quarry Sump).

- Area E contains the additive storage units (amongst other facilities). Although the additive storage is roofed, it is possible that these additives may spill outside of their designated areas and contaminate downstream environments. Based on this, the area around the Additives Storage is considered as a dirty stormwater runoff catchment and should report to a pollution control dam. It is recommended that various channels within the area be constructed to direct stormwater runoff to the PCD.

(Stormwater Management Plan and General Notice 704 Audit, JG Afrika August 2022)

6.2 Stormwater Infrastructure and Pollution Control Dams Preliminary Design Report

Proposed Infrastructure Layouts

The SWMP for the Cement Plant includes the five stormwater management areas A through E (as discussed above) with interconnecting channels. The proposed layout of the channels can be seen in Figure 4 below as taken from the SWMP. Some of these channels are existing and will remain in place as is.

Preliminary level designs of the proposed stormwater channels and engineering drawings of the proposed stormwater infrastructure are detailed in the Lichtenburg Lafarge Cement Plant and Tswana Quarry Stormwater Infrastructure and Pollution Control Dams Preliminary Design Report. Refer to **Appendix 15** for this full report and details.

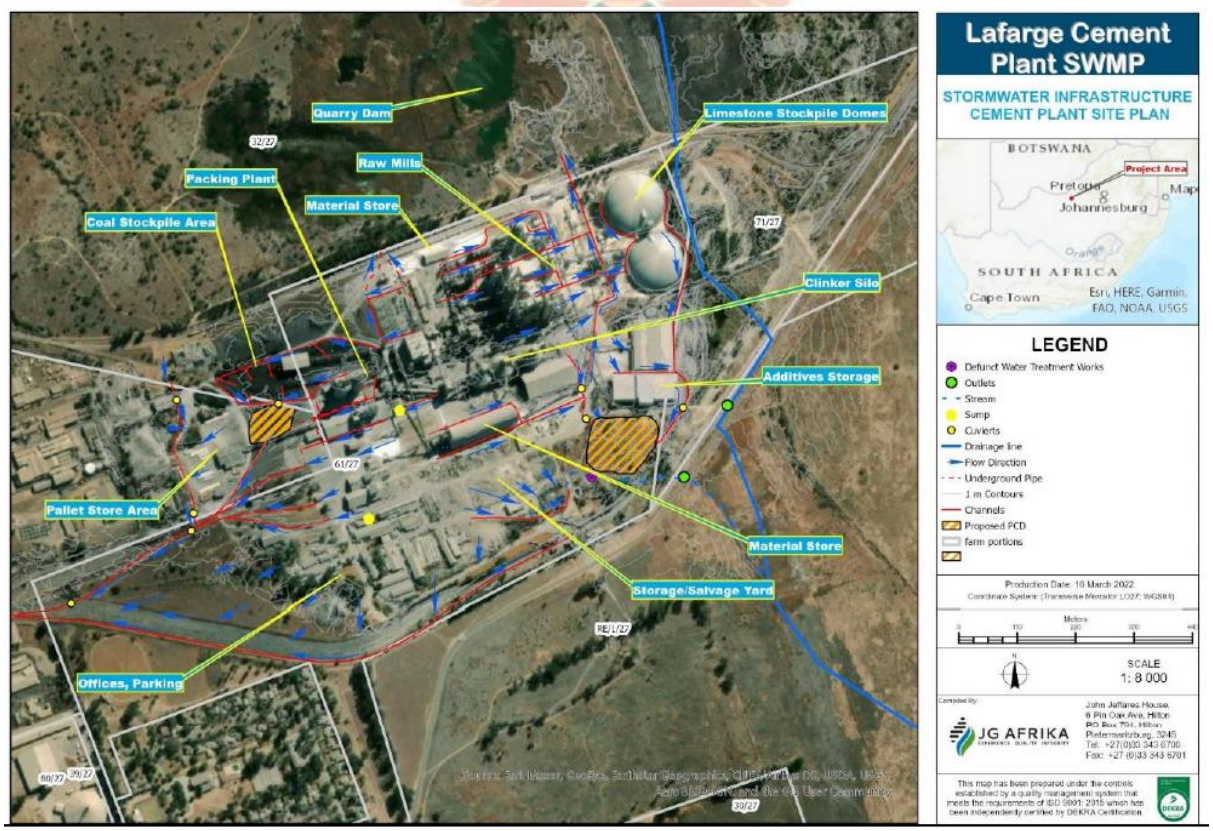

Figure 4: Lafarge Lichtenburg Cement Plant Proposed Stormwater Management Infrastructure

Figure 4 presents the channels as well as the delineated catchment areas for each stormwater management area. Not all areas require new infrastructure to be designed, therefore, for the purposes of this preliminary design report only areas A, B and E are the areas requiring new infrastructure. Refer to the full Stormwater Infrastructure and Pollution Control Dams Preliminary Design Report for detailed information on the proposed stormwater channel design, proposed culvert sizing

and flood calculations and detailed information regarding the stormwater management of each connecting to channels and PCD's.

Pollution Control Dam (PCD's)

At the Lafarge Cement Plant (LCP), two areas have been identified to require new PCD's to be constructed as per the Stormwater Management Plan. The primary purpose of the PCD's is to store the contaminated stormwater runoff passing through the additives area and the coal stockyard area. A pumpstation footprint has been included at each PCD, for the ultimate inclusion of a return water pump which recycles the water from the PCD back to the factory for reuse.

One of the PCD's is required to contain dirty water from the additive area of the factory, whilst the other is required to capture runoff from the coal stockyard.
The required sizes for these PCD's are:

- Additive PCD: 20 000m³
- Coal Stockyard PCD: 4 000m³

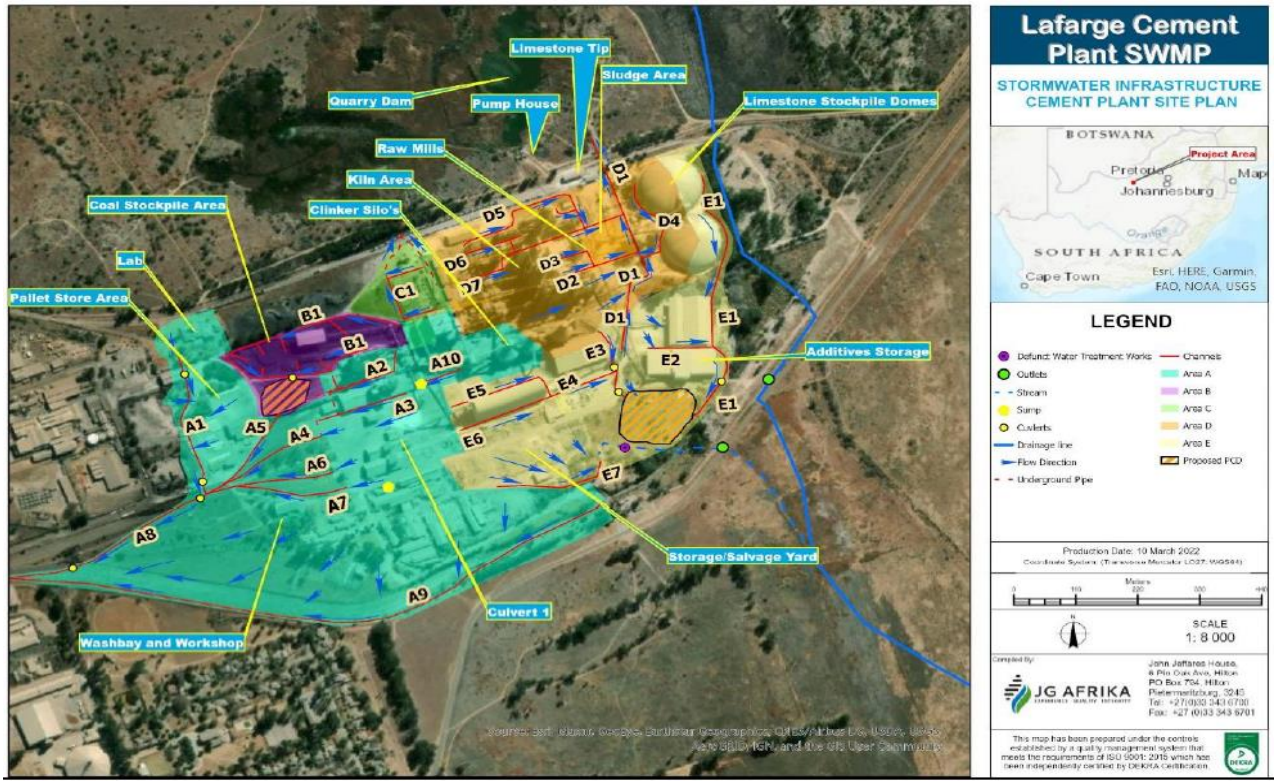

Figure 5: Lafarge Lichtenburg Cement Plant Proposed Stormwater Management Infrastructure

A waste classification has been done on the water to be received by the proposed PCD's, this waste has been classified as Waste Type 3. PCD's have been designed according to this waste classification. Refer to **Appendix 15.1, 15.3, 15.4 and 15.5** for further information regarding waste classification, design calculations and design drawings.

7. Rehabilitation Plan

A Wetland Rehabilitation Plan was compiled by JG Afrika. The components of the wetland rehabilitation as defined by DFFE are as follows (Refer to **Appendix 14** for this report):

- Clearance of alien vegetation from the area around the wetland as designated in a pre-compliance Notice issued by the DFFE as well as the areas classified as unimpacted by activities at Lafarge. This should include the removal of all Eucalyptus (Gum) trees in the project area.
- Removal of all cement factory wastes which have been dumped into the designated wetland area as apparent in historic aerial imagery.
- Re-establishment of soil profiles including a 30 m wide wetland channel which must be within the original wetland area. This will be achieved by removing all infill material from the wetland, which will be relocated to the abandoned

pit area located approximately 1000m north west of the rehabilitation area. Old and unused road and rail embankment should also be removed.

- Re-establishment of indigenous vegetation in the affected areas defined by the Pre-compliance Notice issued to Lafarge on 27/11/2020 as well as further area downstream towards the Manana Road. The entire area is to be grass seeded initially but some wetland plants may be introduced later. The latter plants may be taken (with appropriate permission) from the upstream and downstream areas of the wetland.
- Installation of a supplementary water supply to the wetland from a nearby disused mine pit. These mine pits have their own ecological values and so water must be used moderately. The water will be delivered to the wetland by means of a 75 mm pipe and will be powered by a solar pump.
- It is proposed that a diversion berm is constructed along the boundary between the rehabilitated wetland area and the Lafarge internal stormwater management infrastructure. This berm will ensure that flood waters generated during the 1:50 year storm event will not inundate factory infrastructure and will ensure the separation of clean water (from the upstream catchment area) and potentially contaminated water (runoff from the factory site).
- Culverts will be constructed at the intersection of the stream/wetland and the access roads both upstream and downstream of the wetland. These culverts are required to ensure that there is no impediment to the natural flow of water through the wetland area. A drift crossing will be used and will be in the form of a concrete slab shaped along the gravel.

The main objective of the wetland rehabilitation plan is for the restoration of water flow from the wetland area to the north of the factory area to the Klein Harts River and wetland system to the south of the factory area. Further to this, it is also intended that the wetland and terrestrial vegetation in the rehabilitated section of the factory wetland / watercourse system and surrounds will be restored (Wetland Rehabilitation Plan Report, JG Afrika, August 2022).

8. Water Uses applied for

The application includes the following water uses as detailed in Table 3.

Table 3: Water Uses Applied for

No.	Water use	Water source	Quaternary Catchment	Location	Quantity	Sector
21 A – TAKING WATER						
1.	Section 21 (a) Taking water from water resource	Lichtenburg Plant Borehole 1	C31A	26°07'06.00"S 26°10'04.01"E	75 727 m³ per annum Meter reading in place	Drinking water for village and plant
2.	Section 21 (a) Taking water from water resource	Lichtenburg Plant Borehole 2	C31A	26°07'03.7"S 26°10'02.0"E	27 941 m³ per annum Meter reading in place	Domestic and garden use and processing.
3.	Section 21 (a) Taking water from water resource	Lichtenburg Plant Borehole 3	C31A	26° 7'8.10"S 26°11'4.14"E	452 077 m³ per annum Meter reading in place	Top Up with BH 3 into the Townlands Dam (Process use) Watering livestock
4.	Section 21 (a) Taking water from water resource	Townlands Dam	C31A	26° 7'42.42"S 26°11'2.58"E	Kiln 3 = 407 340 m^3/y - Kiln 3: located at 26° 04 59 .70"S 25 ° 48'12.14"E Kiln 4 located at = 10 220 m^3/y Kiln 4: 26° 04'59.70"S 25°48'12.14"E Evaporation = 474 852 m^3/y Processing: 454536 m^3/y = 505 486mper year	The water is then used for cooling purposes. Above pipe leading to Quarry pump. Kiln 1 and 2 no longer in use.
21 G - STOCKPILES						
1.	Section 21 (g) Waste discharge related water	Undercover Coal Stockpiles:	C31A	26°7'59.57"S 26°10'48.80"E	19440m^3	Stockpile areas

No.	Water use	Water source	Quaternary Catchment	Location	Quantity	Sector
	use					
2.	Section 21 (g) Waste discharge related water use	Emergency Coal Stockpiles:	C31A	26° 8'0.52"S 26°11'6.55"E	96811.20m³	Stockpile areas
3.	Section 21 (g) Waste discharge related water use	Coal Stockpiles Area	C31A	26° 8'0.12"S 26°10'47.22"E	27000m³	Stockpile areas
4.	Section 21 (g) Waste discharge related water use	Limestone Stockpiles:dome 1	C31A	26° 7'49.97"S 26°11'13.21"E	112840m³	Stockpile areas
5.	Section 21 (g) Waste discharge related water use	Limestone Stockpiles:dome 2	C31A	26° 7'53.09"S 26°11'13.76"E	112840m³	Stockpile areas
6.	Section 21 (g) Waste discharge related water use	additive Stockpiles:	C31A	26° 8'1.14"S 26°11'12.90"E	24542.48m³	Stockpile areas
7.	Section 21 (g) Waste discharge related water use	Gypsum Stockpiles	C31A	26° 8'5.10"S 26°10'55.32"E	23600m³	Stockpile areas
21G – DAMS (Section 21 g Waste discharge related water use)						
1	Section 21 (g) Waste discharge related water use	PCD 1- SWMP Coal stockpile area	C31A	26°8'4.78" S 26°10'46.88" E	3268 m³	Coal stockpile
2	Section 21 (g) Waste discharge related water use	PCD2 – SWMP Additives area	C31A	26°8'3.5" S 26°11'14.01" E	13071 m³	Additives
3	Section 21 (g) Waste discharge related water use	Townlands Dam	C31A	26° 7.707'S 26° 11.043'E	Process = 454536 m³/y	Water pumped from the Townlands dam will be used for cooling purposes (Processing)
21 G - SEPTIC TANKS						
1.	Section 21 (g) Waste discharge related water use	Septic Tank Railway	C31A	26° 8'16.19"S 26°10'25.64"E	Maximum quantity: 30m³	Septic Tank
2.	Section 21 (g) Waste discharge related water use	Septic Tank – Palletiser ablution	C31A	26° 8'8.18"S 26°10'41.82"E	Maximum quantity: 30m³	Septic Tank
3.	Section 21 (g)	Septic Tank – Cement bulk	C31A	26° 8'0.44"S	Maximum quantity:	Septic Tank

No.	Water use	Water source	Quaternary Catchment	Location	Quantity	Sector
	Waste discharge related water use	loading ablution		26°10'54.68"E	$10m^3$	
4.	Section 21 (g) Waste discharge related water use	Septic Tank – Electrical workshop ablution	C31A	26° 8'2.14"S 26°10'57.45"E	Maximum quantity: $10m^3$	Septic Tank
5	Section 21 (g) Waste discharge related water use	Septic Tank – Limestone tip ablution	C31A	26°7'51.55"S 26°11'10.14"E	Maximum quantity: $10m^3$	Septic Tank
6	Section 21 (g) Waste discharge related water use	Septic Tank – Main road reception	C31A	26° 8'32.10"S 26°10'43.75"E	Maximum quantity: $10m^3$	Septic Tank
7	Section 21 (g) Waste discharge related water use	Septic Tank – Swart dam	C31A	26° 8'7.57"S 26°11'10.05"E	Maximum quantity: $10m^3$	Septic Tank
8.	Section 21 (g) Waste discharge related water use	Septic Tank – contractor building by alpha gate contractor office	C31A	26° 8'8.01"S 26°10'50.44"E	Maximum quantity: $10m^3$	Septic Tank
9	Section 21 (g) Waste discharge related water use	Septic Tank – Railway gate (clover side)	C31A	26° 8'1.32"S 26°10'39.40"E	Maximum quantity: $20m^3$	Septic Tank
10.	Section 21 (g) Waste discharge related water use	Septic Tank – B Works	C31A	26° 7'57.76"S 26°11'5.91"E	Maximum quantity: $10m^3$	Septic Tank
21E – IRRIGATION (wastewater in gardens)						
1	Section 21 (e) - Irrigation with water containing waste, artificial recharge of aquifer, modification of atmospheric precipitation and in-stream power generation activities.	Garden patch 1	C31A	26° 8'0.02"S 26°10'40.58"E	16.5m3 p year	Garden irrigation/Non edible
2	Section 21 (e)- Irrigation with water containing waste, artificial recharge of aquifer, modification of atmospheric precipitation and in-stream power generation	Garden patch 2	C31A	26° 8'3.04"S 26°10'41.01"	16.5m3 p year	Garden irrigation/Non edible

No.	Water use	Water source	Quaternary Catchment	Location	Quantity	Sector
	activities					
3	Section 21 (e)- Irrigation with water containing waste, artificial recharge of aquifer, modification of atmospheric precipitation and in-stream power generation activities	Garden patch 3	C31A	26° 8'2.06"S 26°10'43.20"E	16.5m3 p year	Garden irrigation/Non edible
4	Section 21 (e)- Irrigation with water containing waste, artificial recharge of aquifer, modification of atmospheric precipitation and in-stream power generation activities	Garden patch 4	C31A	26° 8'3.39"S 26°10'47.49"E	16.5m3 p year	Garden irrigation/Non edible
5	Section 21 (e)- Irrigation with water containing waste, artificial recharge of aquifer, modification of atmospheric precipitation and in-stream power generation activities	Garden patch 5	C31A	26° 8'7.40"S 26°10'48.31"E	16.5m3 p year	Garden irrigation/Non edible
6	Section 21 (e)- Irrigation with water containing waste, artificial recharge of aquifer, modification of atmospheric precipitation and in-stream power generation activities	Garden patch 6	C31A	26° 8'10.81"S 26°10'52.48"E	16.5m3 p year	Garden irrigation/Non edible
7	Irrigation with water containing waste, artificial recharge of aquifer, modification of atmospheric precipitation and in-stream power generation activities.	Garden patch 7	C31A	26° 8'12.29"S 26°10'52.89"E	16.5m3 p year	Garden irrigation/Non edible
8	Section 21 (e)- Irrigation with water containing waste, artificial recharge of aquifer, modification of atmospheric precipitation and	Garden patch 8	C31A	26° 8'10.76"S 26°10'54.18"E	16.5m3 p year	Garden irrigation/Non edible

No.	Water use	Water source	Quaternary Catchment	Location	Quantity	Sector
	in-stream power generation activities					
9	Section 21 (e)- Irrigation with water containing waste, artificial recharge of aquifer, modification of atmospheric precipitation and in-stream power generation activities	Garden patch 9	C31A	26° 8'11.42"S 26°11'2.62"E	16.5m3 p year	Garden irrigation/Non edible
10	Section 21 (e) Irrigation with water containing waste, artificial recharge of aquifer, modification of atmospheric precipitation and in-stream power generation activities.	Garden patch 10	C31A	26°8'4.71"S 26°10'57.32"E	16.5m3 p year	Garden irrigation/Non edible Effluent from waste water treatment works will be used for irrigation in gardens
11	Section 21 (e) Irrigation with water containing waste, artificial recharge or aquifer, modification of atmospheric precipitation and in-stream power generation activities	Village garden and domestic use	C31A	26°8'25.89"S 26°10'45.13"E	38 106 per year	Water will be used in the village area for domestic and garden use
12	Section 21 (e) Irrigation with water containing waste, artificial recharge of aquifer, modification of atmospheric precipitation and in-stream power generation activities	Wetland Rehabilitation	C31A	26°7'51.35"S 26°11'18.39"E	35.04m3 per year	Irrigation to assist in the wetland rehabilitation process

	LAFARGE LICHTENBURG SECTION (C) AND (I) APPLICATION				
No.	Water use	Description	Quaternary Catchment	Location	
				Start	End
1	Section 21 (c) Impeding or diverting the flow of water in a watercourse	Wetland Drainage and Infilling from start to end.	C31A	26° 6'55.30"S 26°11'4.68"E	26° 8'33.23"S; 26°11'25.19"E

	LAFARGE LICHTENBURG SECTION (C) AND (I) APPLICATION				
	Section 21 (i) Altering the Bed, Banks, Course or Characteristics of a watercourse				
2	Section 21 (c) Impeding or diverting the flow of water in a watercourse Section 21 (i) Altering the Bed, Banks, Course or Characteristics of a watercourse	Culvert 1	C31A	26° 7'46.36"S 26°11'15.20"E	26° 7'47.64"S; 26°11'15.77"E
3	Section 21 (c) Impeding or diverting the flow of water in a watercourse Section 21 (i) Altering the Bed, Banks, Course or Characteristics of a watercourse	Culvert 2	C31A	26° 8'7.80"S; 26°10'43.75"E	26°7'57.29"S 26°11'22.55"E
6	Section 21 (c) Impeding or diverting the flow of water in a watercourse Section 21 (i) Altering the Bed, Banks, Course or Characteristics of a watercourse	Road crossing 1	C31A	26° 7'40.69"S; 26°11'27.69"E	26° 8'11.88"S; 26°11'9.58"E
7	Section 21 (c) Impeding or diverting the flow of water in a watercourse Section 21 (i) Altering the Bed, Banks, Course or Characteristics of a watercourse	Road crossing 2	C31A	26° 7'44.73"S 26°11'18.56"E	26° 7'14.69"S 26°11'2.73"E
8	Section 21 (c) Impeding or diverting the flow of water in a watercourse Section 21 (i) Altering the Bed, Banks, Course or Characteristics of a watercourse	Road crossing 3	C31A	26° 7'45.59"S 26°11'15.12"E	26° 7'45.59"S 26°11'15.12"E
9	Section 21 (c) Impeding or diverting the flow of water in a watercourse Section 21 (i) Altering the Bed, Banks, Course or Characteristics of a watercourse	Rail Crossing 1	C31A	26° 7'54.90"S; 26°11'16.52"E	26° 8'13.96"S 26°10'31.19"E
10	Section 21 (c) Impeding or diverting the flow of water in a watercourse	Rail Crossing 2	C31A	26° 7'58.61"S; 26°10'35.14"E	26° 7'45.55"S 26°11'28.23"E

	LAFARGE LICHTENBURG SECTION (C) AND (I) APPLICATION				
	Section 21 (i) Altering the Bed, Banks, Course or Characteristics of a watercourse				
11	Section 21 (c) Impeding or diverting the flow of water in a watercourse Section 21 (i) Altering the Bed, Banks, Course or Characteristics of a watercourse	Present railway line	C31A	26° 7'46.58"S 26°11'20.21"E	26° 7'47.35"S 26°11'13.56"E
12	Section 21 (c) Impeding or diverting the flow of water in a watercourse Section 21 (i) Altering the Bed, Banks, Course or Characteristics of a watercourse	Present railway line 2	C31A	26° 7'46.58"S 26°11'20.21"E	26° 7'47.35"S 26°11'13.56"E
13	Section 21 (c) Impeding or diverting the flow of water in a watercourse Section 21 (i) Altering the Bed, Banks, Course or Characteristics of a watercourse	Vehicle Track	C31A	26° 7'52.41"S 26°11'22.32"E	26° 7'54.56"S 26°11'16.11"E
14	Section 21 (c) Impeding or diverting the flow of water in a watercourse Section 21 (i) Altering the Bed, Banks, Course or Characteristics of a watercourse	Septic Tank – Limestone tip ablution within 500m of wetland	C31A	26°7'51.55"S 26°11'10.14"E	26° 8'7.20"S 26°11'9.69"E
15	Section 21 (c) Impeding or diverting the flow of water in a watercourse Section 21 (i) Altering the Bed, Banks, Course or Characteristics of a watercourse	Septic Tank B Works Ablution within 500m of wetlands	C31A	26° 7'57.76"S 26°11'5.91"E	26° 7'57.36"S 26°11'6.19"E
16	Section 21 (c) Impeding or diverting the flow of water in a watercourse Section 21 (i) Altering the Bed, Banks, Course or Characteristics of a watercourse	Septic Tank Swart Dam ablution within 500m of wetlands	C31A	26° 8'7.57"S 26°11'10.05"E	26° 8'7.20"S 26°11'9.68"E

9. Description of the Environment

9.1 Climate

Lichtenburg has a mild climate with average maximum temperatures of 33ºC during the summer and 22ºC during winter. Average daily minimum temperatures are 18ºC mid-summer and 5 ºC mid-winter. Frost occurs during winter.

The average rainfall is measured to be approximately 596mm. Rainfall usually occurs as thunderstorms and the rainy season lasts from November to March with the peak of the rainy season being in January. The evaporation in Lichtenburg exceeds the mean annual precipitation.

9.2 Mean Annual Runoff (MAR)

According to the Lower Vaal WMA Overview of Water Resources Availability Report, DWAF (2003a), "Flow in the Vaal River, which is the main source of water in the water management area, virtually all originates from the Upper Vaal and Middle Vaal water management area. A summary of the mean annual runoff (MAR), together with the estimated requirements for the ecological component of the Reserve, is provided in Table 4, below:

Table 4: Natural Mean Annual Runoff and Ecological Reserve (million m3/a)

Source: Lower Vaal Water Management Area: Overview of Water Resources Availability, November 2003

Sub-Catchment	Natural MAR[1]	Ecological Reserve [2] [3]
Harts	138	15
Vaal downstream of Bloemhof	43	5
Molopo	197 (3)	29
Total	**181**	**49**

9.3 Water Management Area

The study area is located in Quaternary Catchment C31A, within the Lower Vaal Water Management Area, on relatively flat terrain. A single natural drainage line is located along the eastern boundary of the project site. This drainage line stems from an area that was once mined, and has a catchment area of approximately 5.5 km^2 at the point where the drainage line intersects with the Lafarge property. The unnamed drainage line is a tributary of the Groot Harts River, which is a perennial river and contributes flow to the Barberspanand and Beiesiesvlei downstream of the Lafarge Cement Plant.

9.4 Wetland Assessment

A wetland assessment was carried out by JG Afrika in March 2022 focusing on two wetlands in the vicinity of the Lafarge Cement Factory in Lichtenburg, namely an unchannelled valley bottom (Wetland Map 5) wetland and an NFEPA wetland (**Appendix 7**).

The wetland surrounding the cement factory is a Wetland Map 5 wetland (CVB), which originates approximately 1.0 km to the North of the factory property and then flows southwards through the factory area before turning westwards to join another, and larger, wetland / watercourse system flowing southwards past the town of Lichtenburg. These two wetlands form a tributary of the Harts River. This wetland has been totally filled in with factory wastes and has been given a Present Ecological State Category E. The site is of intermediate ecological Importance and Sensitivity which is not unexpected since it has been subject to numerous impacts in the past. The presence of the reedbeds and other such aquatic vegetation in the lower area did raise the score slightly. It is to be expected that, once the factory section of the wetland has been rehabilitated, the score will be further improved.

[1] Quantities given are incremental and refer to the sub-catchment under consideration only.
[2] Total volume give, based on preliminary estimates. Impact on yield being a portion of this.
[3] Estimated runoff from catchment, which is lost through evaporation and infiltration before reaching the Orange River. This runoff therefore does not add to the total for the water management area.

A second, but artificial wetland, which is listed in the NFEPA wetland database, lies in a disused mine pit adjacent to the factory. The NFEPA wetlands lie on the northern side of the cement factory and, at the closest point, are approximately 70 m from the factory fence. These old mine pits have become filled in with water over time. While some of the inflow is natural, a portion of the surface water flows to the wetland is also from the factory. Water is abstracted from the wetland for use as a coolant water and is returned to the wetland. Despite this the water levels fluctuate substantially, however, sufficient water levels have remained long enough in the wetland area to allow for extensive reedbeds to have developed. In dry seasons the system shrinks into two separate pools but, because they join during the rainy season, allowing fish and other fauna to move between them, they are considered here to be a single entity. The site is rated to have a variable PES ranking that fluctuates between Category D and Category B. At times its functionality would suggest a PES Category A system but application of this score to an artificial wetland may be questionable.

9.5 Surface Water Quality

Aquatico was commissioned by Lafarge Industries to sample, analyse and evaluate the physical, chemical and bacteriological quality of drinking (monthly) and surface (monthly). The results of the August sampling period can be found below:

Potable Water

- Of the sampled potable water localities, Ants Hill, Tank and Village Recreation Club complied with the SANS 241-1:2015 limits in terms of all the analysed variables in August 2022.
- No bacteriological content in terms of E. coli and total coliforms were detected at any of the sampled localities.
- Elevated Total hardness, exceeding the Quality of Domestic Water Supplies Good (Class 1) water quality was recorded at all of the potable water localities.

Ant Hill

Based on the assessment of variables analysed in comparison to 'SANS 241-1:2015 Drinking Water Standard (SABS, 2015)' and 'Quality of Domestic water supplies' (WRC, 1998), Ants Hill can be classified as Marginal (Class 2) water quality and is Conditionally Fit for use as potable water and domestic use due to Total Hardness.

Tank

Based on the assessment of variables analysed in comparison to 'SANS 241-1:2015 Drinking Water Standard (SABS, 2015)' and 'Quality of Domestic water supplies' (WRC, 1998), Tank can be classified as Marginal (Class 2) water quality and is Conditionally Fit for use as potable water and domestic use due to Total Hardness.

Village Recreational Club

Based on the assessment of variables analysed in comparison to 'SANS 241-1:2015 Drinking Water Standard (SABS, 2015)' and 'Quality of Domestic water supplies' (WRC, 1998), Ants Hill can be classified as Marginal (Class 2) water quality and is Conditionally Fit for use as potable water and domestic use due to Total Hardness.

Process Water

Nearby quarry water (locality Process water) is pumped throughout the process system and utilised for the cooling processes at Lafarge industries. The Zinc Dam is utilised as a water storage facility. Alkaline pH values (pH > 8.5) were recorded at locality Zinc Dam, while a neutral pH (pH 6.0 - 8.5) prevailed at Process Water during August 2022. Exceedances of the SAWQG for Industrial Use at locality Process Water were recorded in terms of pH and electrical conductivity (EC), while Zinc Dam exceeded for the aforementioned variables as well as chloride (Cl), sulphate (SO4) and manganese (Mn) concentrations.

EC and Mn of the analysed variables at locality Zinc Dam also exceeded the General Authorisation Limits during August 2022 (Table 8). It should be noted that significantly high EC, Cl and SO4 concentrations prevail at locality Zinc Dam and should not be released into the receiving environment. The possible reason for the high concentrations of the variables mentioned above is the concentration effect taking place in the dam due to evaporation.

Townlands Pit

The water at the Townlands Pit can be described as saline and hard to very hard. All of the analysed variables complied with the General Authorisation limit at Townlands Pit during August 2022. The compliant ("unaffected") water quality might be as a result of the influx of fresh rain water that causes a dilution effect. No exceedances in terms of any analysed variables compared to the SAWQG for Livestock Watering limits (refer **to Appendix 8**).

9.6 Geohydrological Report

A Geohydrological Report was prepared by JG Afrika (Pty) Ltd, in support of the water use authorisation for Lafarge Cement Plant (**Appendix 2**). The aim of the assessment was to determine the sustainable yield of the current supply borehole designated LBH1, LBH2 and LBH3, conduct a hydrocensus to establish potential receptors, and to develop a numerical groundwater flow and mass transport model, to determine risk and impact. A summary of the findings of the assessment are found below:

Borehole Yield Assessment

The yield testing of the boreholes was carried out by JG Afrika (Pty) Ltd over the period 19 to 28 August 2022, in accordance with the guidelines of the South Africa National Standard SANS10299-4:2003 Part 4: Test Pumping of Water Boreholes. The observed operations were that LBH2 was the main supply borehole for the plant, while LBH1 served as a backup supply, and LBH3 was used for community stock watering. The sustainable yield for each borehole is depicted below:

Borehole LBH1 - The maximum daily volume that can be abstracted from the borehole at 2.5 l/s for 24 hours of pumping is 216 m3/d. The recommended daily volume on an 12 hour duty at 3.54 l/s is 153 m3/d.
Borehole LBH2 - The maximum daily volume that can be abstracted from the borehole at 21.1 l/s for 24 hours of pumping is 1823 m3/d. The recommended daily volume on an 12 hour duty at 29.8 l/s is 1289 m3/d.
Borehole LBH3 - The maximum daily volume that can be abstracted from the borehole at 17.1 l/s for 24 hours of pumping is 1478 m3/d. The recommended daily volume on a 12 hour duty at 24.19 l/s is 1045 m3/d.

This equates to approximately 78840, 665395 and 539105 m3/a for LBH1, LBH2 and LBH3 respectively. The cumulative annual volume is 1283340 m3/a.
(JG Afrika, Geohydrological Assessment, 2022).

Groundwater Quality

Groundwater samples was collected from the borehole for chemical analysis by JG Afrika (Pty) Ltd during the site assessment and tested for selected determinants of the Domestic Consumption SANS241 raw water suite. The results of analysis indicate that total coliforms exceeded the operational screening limits in LBH3, and heterotrophic plate counts exceeded the operational screening limits in LBH1 and LBH3. These results may be indicative of sample holding times and/or the increased activity in the boreholes associated with the yield testing. Shock treatment with a once off chlorine dose is recommended and future monitoring according to the groundwater monitoring plan will determine if these counts are persistent.

Borehole Management Plan

Based on the analysis of the yield test data and water quality, a summary of the borehole management plan is listed below:

Table 5: Borehole Management Plan

Borehole ID	LBH1	LBH2	LBH3
Water Quality	SANS241 operational limits have been exceeded	All within SANS241 limits	SANS241 operational limits have been exceeded
Compounds of Concern	Heterotrophic plate count	none	Total coliforms Heterotrophic plate count
Risk	operational	none	Operational
Treatment / Action	Once off shock treatment, biannual monitoring	Biannual monitoring	Once off shock treatment, biannual monitoring
Sustainable Yield (l/s)	2.5	21.1	17.1
Recommended Duty	12	12	12
Abstraction Rate for Duty Period (8 hrs)	3.54	29.85	24.19
Volume on Specified Duty (m^3/d)	152.76	1289.33	1044.90
Critical Drawdown (mbgl)	22	24	24
Anticipated Maximum Head (m)	46	47	43
Recommended Pump Installation Depth (mbgl)	22	24	24

Hydrocensus

A hydrocensus was required to determine existing groundwater use in the project area and to establish possible impacts on existing resources from the Lichtenburg Cement Plant activities. The hydrocensus further served to collect current water levels from known resources for the development of the groundwater model.

The National Groundwater Archive (NGA) of the Department of Water and Sanitation was interrogated to establish the existence of any groundwater resources and groundwater use in proximity to the site. The NGA reported 108 (No.) resources within 5 km of the site. A field verification hydrocensus was also carried out. A total of 54 (No.) resources were identified during the previous and current survey. Thirty-nine (39 No.) water supply boreholes, and fourteen (14 No.) unused boreholes were identified.

Numerical Groundwater Model

To determine the impact on the receiving environment, the groundwater flux into the mine pits was modelled through the numerical groundwater flow model, and the potential sources of pollution were modelled through the use of mass transport in 25 year increments.

The sustainable yield of the supply boreholes were determined as 78840, 665395 and 539105 m3/a for LBH1, LBH2 and LBH3 respectively through yield testing of the boreholes. The model results indicated that the net inflow is dependent on the water level in the pit such that the higher the pit level, the greater the net inflow, and groundwater is in continual balance with the evaporation component resulting in a near zero net flow for a particular pit level. The pit inflow reduces as the pit level drops.

The mass transport results showed a northerly plume migration as a result of the abstraction taking place north of the plant. It is evident that pumping borehole do have an influence on plume migration. It is also evident that the source concentrations increase over time as the evaporation process does not allow for mass transport out of the system. This leads to a concentration of salts over time.

Quantitative Environmental Risk Assessment and Mitigation

The quantitative environmental risk assessment (ERA) identifies operational phase activities that may impact on the groundwater receiving environments. Most activities identified scored LOW or MODERATE for the pre mitigation ratings.

Stockpiles and PCDs scored HIGH. Most scores can be reduced with the introduction of mitigation measures. The potential impacts include:

- Aquifer dewatering
- Deterioration of groundwater quality
- Recharge of the groundwater system
- Use of dam water for dust suppression and impacts on groundwater quality in surrounding areas
- Impacts on downstream users
- Future pit decant
- Salt loading through evaporation process
- Prolonged leaks from stockpiles/PCDs and impacts on groundwater
- Mobilisation of existing elevated compounds
- Major loss of contaminant dam overflows
- Sludge removal and impacts on groundwater quality

Additionally, the aquifer vulnerability was considered as medium to high, and the Parsons Groundwater Quality Management System gives the site a Medium Level of Protection index for the second variable vulnerability.

Groundwater Monitoring Programme

It is recommended that groundwater sampling be carried out in accordance with the Water Research Commission's Comprehensive Guide for Groundwater Sampling JG Afrika's standard operating procedures for environmental monitoring and field work.

The revised sampling plan to being applied at the Lichtenburg Cement Plant is summarized in Table 6 below.

Table 6: Sampling Plan

Frequency	Sample Locations	Analytical List	Comments
Bi-annually	P1 or P3	pH, EC, Ca, Mg, Na, K, Total Alkalinity, F, Cl, NH4(N), NO3(N), PO4, SO4, Al, Fe, Mn SANS241 Raw Water	Reinstate borehole
	P2		*Reinstate borehole*
	LBH1		Ongoing, include monthly water levels and meter readings
	LBH2		
	LBH3		
	NBH1		Proposed
	NBH2		*Proposed*
Annually	P1 or P3	Ba, As, Co, Cr, Ni, Pb, Se, Sr, V, Zn, Mn, Cu, Ga, Ge, Rb, Y, Zr, Sn, W, Bi, Th, U, Hg	Reinstate borehole
	P2		*Reinstate borehole*
	LBH1		Ongoing, include monthly water levels and meter readings
	LBH2		
	LBH3		
	NBH1		Proposed
	NBH2		*Proposed*

It is noted that existing monitoring boreholes P1 or P3 and P2 need to be reinstated as they are flagged as demolished or dry. Additional monitoring boreholes may include NBH1 and NBH2 to augment the data set. These borehole target the stockpile and PCD area and the regional structure north of the site.

10. Impacts and mitigation measures

The potential impacts and mitigation measures that are expected from the proposed activities are presented in Table 7.

Table 7: Summary of impacts and mitigation measures

Activity	Operation	
	Impacts	**Mitigation Measures**
Changes in Catchment Water resources due to	An increase in impervious areas	No mitigation measures are recommended, as this would require the impervious areas to be removed. It should, however, be noted that the impact of the impervious areas on the local and regional hydrology is insignificant
	Impeding or altering the flow of water in a drainage line	There are currently projects in place for the rehabilitation of the drainage line and the incorporation of culverts to ensure that there is no impediment to the natural flow of water. Once these projects are completed, there will be no impact on catchment water resources and therefore this significance rating has gone from high to low.
	Abstractions	There are no current or planned abstractions from surface water resources
	Limiting flow (capturing of contaminated stormwater)	The implementation of PCD's at the project site will reduce the volume of water to the downstream environment, however, in the context of the local and regional catchment this impact is low.
Reduction in Catchment Water Quality due to	Erosion from the project site and sedimentation of downstream water resources	There are currently projects in place that include the design and construction of PCD's downstream of the Coal Stockpile and Additives areas. Once implemented the likelihood of sediment discharging from the Cement Factory will be significantly reduced, hence the reduction in the significance rating of this identified potential impact.
Reduction in Catchment Water Quality due to	Discharging waste or contaminated water (i.e., contamination from the coal stockyard and additive areas, pit dewatering and sewage spills)	PCD's for the management of contaminated stormwater runoff from the project site will significantly reduce the risks associated with the contamination of downstream water resources
Changes in Flood Hydrology due to	An increase in impervious areas	Due to the incorporation of PCD's to the stormwater management infrastructure at the factory site, the impact of impervious areas increasing the discharge rate from the project site will be reduced. It is also noted that the stormwater management plan developed for the project site, will also assist in limiting the impact of the factory site on the downstream flood hydrology.
	Altering the bed, banks, course or characteristics of a watercourse	Rehabilitation of the drainage line. Once implemented, the drainage line will be restored to its natural condition, which result in the stream to flow freely across the project site.
	Disturbance of the soil and topography of the wetland area as a result of past mining activities in the area upstream of the cement factory.	The mined areas have been left largely undisturbed for over 10 years and have largely recovered in terms of establishing a vegetation cover which has wetland characteristics. Underlying the vegetation are soils that would appear to be typical of wetlands in the region. In the absence of any erosion and alien weed invasion, it is recommended that the site be left to continue self-repair as at present.
	Disturbance of the wetland in the lower area as a result of past draining and agricultural activities.	The area downstream of the mine is no longer used for agriculture and the recovery of the wetland vegetation is well advanced. The following recommendations are put forward: • It is recommended that it should be kept free of alien weeds; and • Any remaining drainage ditch should be plugged. NOTE: These actions are not the responsibility of Lafarge.

Activity	Operation	
	Impacts	**Mitigation Measures**
	Grazing by livestock in the upper section is reducing the plant biomass there and may be reducing plant diversity.	This impact is taking place but the removal of the cattle will be controversial. Since there is minimal impact on the hydrology of the site it would be acceptable to leave the *status quo*.
Infilling with factory wastes and road and rail crossings in the factory areas	Disruption of any surface flows through the wetland as a result of channel infilling. Possible loss of water from the greater wetland system	Remove all the infill material from the area identified. The material is to be properly disposed of and the area must be rehabilitated.
	The natural soil has been buried under the waste causing loss of indigenous plant biodiversity. The area is invaded by weed species,	Remove all the infill material from the area identified. The material is to be properly disposed of and the area must be rehabilitated. To establish a 30m wide channel for the wetland and to landscape the adjacent cleared areas. An earth berm to separate the wetland channel from the raw stormwater control system must be raised.
Stormwater and other surface flows entering the wetland	Contamination of system with fine sediment which could impact on aquatic biodiversity	A stormwater management plan for upgrading the surface stormwater in the factory has been compiled. This includes both improved movement of the water around the factory area and a number of new pollution control dams. Water from the dams will be reused once it is suitabily cleaned. If there is a surplus, and if the water is sufficiently clean to meet the DWS waste water standards, some may be returned to the open environment. To install a water supply system which will feed from the NFEPA wetland and boost flows in the factory wetland. The discharge point is to release the water approximately 25cm below ground level.
Future upgrades to the Cement Plant	Greater uptake of water from the wetland basin.	Future upgrades to the factory may require that a greater quantity of water is taken from the NFEPA wetland. The following mitigatory measures are recommended: • Future developments must be designed to be as water efficient as possible. Consideration must be given to re-use of water for different purposes before it is released from the system. • The pollution control dams must be as large as is feasible and design features such as labyrinth channels to improve circulation and surface contact should be considered. • Water pumping to the factory wetland must be stopped once the level in the NFEPA wetland drops below a specified level irrespective of the season or weather conditions. It is provisionally suggested that this level will be such that some connection between the two deepest parts of the old mine is retained.

11. Water demand and water supply Analysis

11.1 Water demand

Lafarge Lichtenburg's cement plant makes use of a dry process whereby water is only extracted from three boreholes and the Townlands Pit, and reused during some stages of the manufacturing process. Based on the water balance study, the water demand for the Lichtenburg Cement Plant equates to 248 m^3/ day for potable/domestic usage, and 1644 m^3/ day for process water requirements. This equates to a total water demand of 1900 m^3/ day.

11.2 Water supply analysis

Surface water

According to the Lower Vaal WMA Overview of Water Resources Availability Report, DWAF (2003a), "As a result of the low rainfall, flat topography and sandy soils over much of the water management area, little usable surface runoff is generated in the water management area" additionally, it mentions, "in the natural state the quality of surface water in the water management area is of acceptable standard, although typical of high turbidity."

Additionally, the development of surface water naturally occurring in the water management area has reached its potential and all the water is being fully utilised. The ISP also states that there are no feasible options for meaningful development of surface water resources in the water management area. Lafarge Lichtenburg, however, will not be extracting surface water from the nearby streams and will therefore have no impact on the surface water availability.

Groundwater

The ISP for this water management area explains that groundwater utilisation is of major importance in the Lower Vaal water management area and is the only source of water over much of the water management area. Groundwater is essentially used for mining, agriculture and domestic use in this water management area. Groundwater use at many mining sites within the water management area is limited and should any seepage occur into opencast pits or underground workings, the water is usually pumped and utilised in processes to minimise use of other water sources. It is estimated that the mining activities will affect the boreholes and that an additional amount of 30-50 Ml per month will be needed in the next 5 years.

Due to the sensitivity of groundwater resources within the Lower Vaal WMA, alternative sources of water were considered for the project, of which the recycling of water was deemed the most viable option. Implementing an effective water conservation and water recycling system will significantly reduce the Cement Plant's dependency on alternative water supply options. There are a number of areas from which water could be recycled. This includes the water discharged into the wetland area, water from the water treatment works and water from the PCD's. The potential total volume of water that can be recycled back into the Lafarge Cement Plan process water system equates to approximately 1 765 m^3/ day. If 80% of this water could effectively be recycled, the demand for outside water sources could potentially drop by as much as 74% (412 m^3/day divided by 1 900 m^3/day). This is a significant reduction on the Cement Plants dependence on outside sources of water. It is, however, noted that in order to implement the proposed recycling of water, particularly from the PCD's and process water currently discharged to the wetland area, effective water treatment processes would need to be implemented.

11.3 Water Balance

As presented in Figure 6., the annual average daily potable water requirement for the plant area equates to approximately 248 m^3/day (or 89 571 m^3/annum) Refer to **Appendix 13** for the full report.

- The most significant user of potable water is the Lafarge staff village, which is estimated to use 130.5 m^3/day (47 633 m^3/annum) on average for domestic consumption and approximately 104.4 m^3/day (38 106 m^3/annum) for irrigation and washing purposes (i.e. water estimated to be lost to the environment). The majority of water used for domestic purposes is sourced from Softening Plant A (with the exception of water sent to the Packaging Plant Ablutions).

- The average volume of wastewater generated from the plant and village equates to 144.15 m^3/day (or 52 615 m^3/annum). Currently this water is collected by service providers and transferred to the municipal sewage treatment works.
- Water treated at the Softening Plant B is used predominantly for water supply to Kiln 3 and the Cement/Raw Mills for cooling water. The estimated water used from Softening Plant B equates to 1 643.98 m^3/day (approximately 600 053 m^3/annum). This water is used predominantly at the Cement/Raw Mills (1 467.6 m^3/day or 89% of the water treated at Softening Plant B).
- Water used at Kiln 3, which is sourced from the Softening Plant A (equating to 176.11 m^3/day), is returned to the Quarry (Townlands) Pit. A portion of this water (from the Townlands Pit) is then recycled for product cooling at the Cement Mill (0.48 m^3/day) and is also used at Kiln 4 for cooling purposes.
- A significant volume of water (1 467.6 m^3/day or 535 680 m^3/annum) is discharged from the Cement/Raw Mills to the wetland area located at the back of the cement plant. Based on the location of the discharge point, water discharged from the Cement/Raw Mills may eventually link into the Townlands Pit, however, based on discussions with Lafarge, it was indicated that this linkage is uncertain.
- The majority of water used at Kiln 4 for cooling processes is returned to the Townlands Pit. Some water is lost to evaporation along the length of the channel linking Kiln 4 to the Townlands Pit.
- Analysis of the proposed Additives and Coal Stockyard PCD's indicated that in order for the Pits not to result in a spillage to the environment, water from these Pits needs to be recycled and reused in the cement plant. Based on a proposed storage of approximately 20 000 m^3 at the Additives PCD and 4 000 m^3 at the Coal Stockyard PCD, the total volume of water that should be returned to the process water system equates to 153.2 m^3/day (or 4 660 m^3/month).

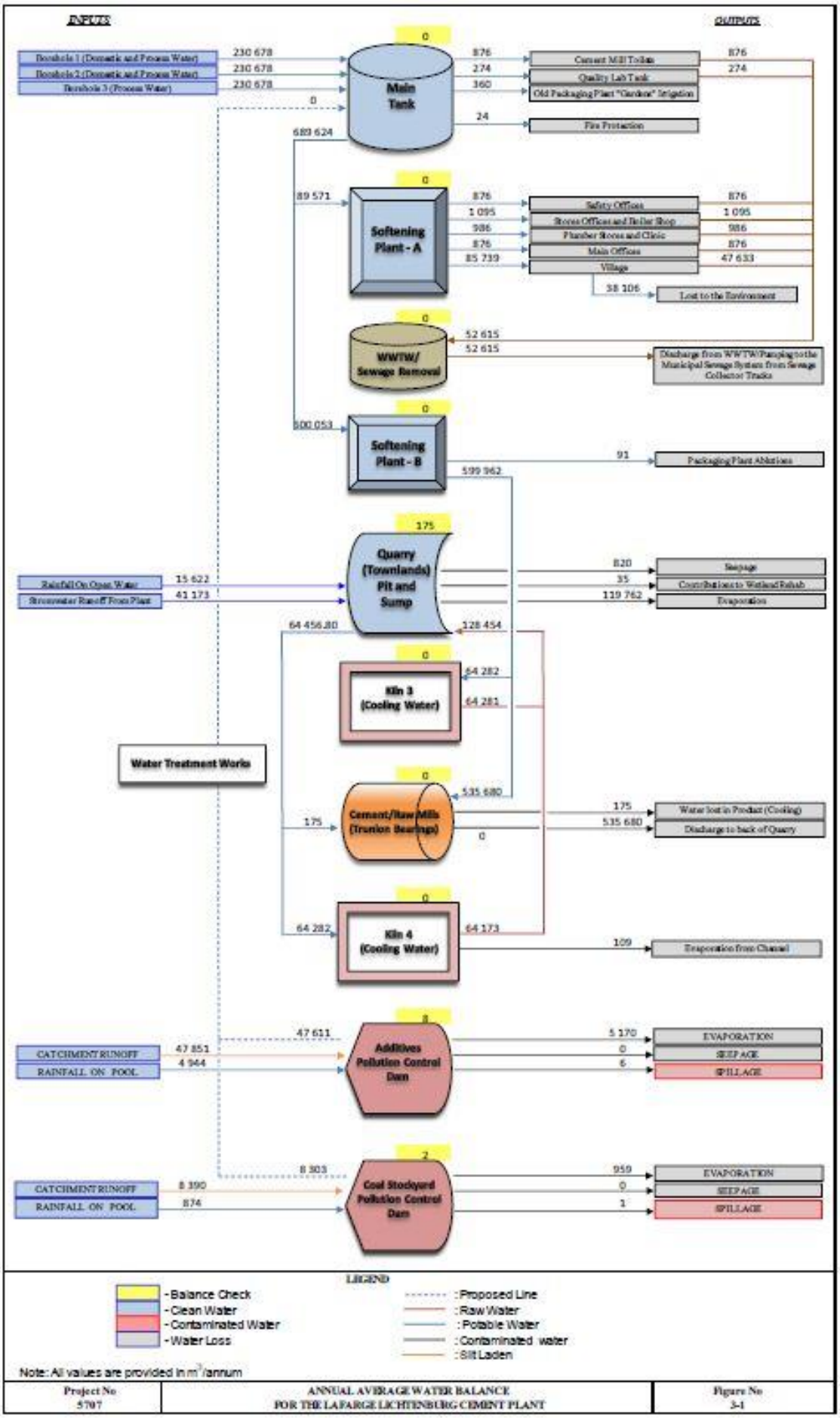

Figure 6: Lafarge Lichtenburg Cement Plant Average Annual Water Balance.

11.4 Water Quality

The ISP: Lower Vaal Water Management Area, 2004 explains that the water quality in the Vaal River is seriously impacted on by urban and industrial use as well as mining activities in the Upper and Middle Vaal Water Management area and is of relative high salinity.

Through statements provided in the EIA/EMP which sourced information through pre-project water quality analysis, in general the surface water qualities taken from the quarry north of the plant are of good quality. Additionally, the monthly water quality report indicated that water within the Townlands Pit complied with the General authorisation limits (Aquatico Scientifc Water Quality Report, 2022). However, during a site visit by JG Afrika, it was noted that Stormwater management around the coal stockpile was insufficient. Runoff from this stockpile has the potential to negatively affect downstream environments. Fine sediments located throughout the project site and especially in the area of the Additives Stores, contaminated runoff from the Coal Stockpiles, hydrocarbon spills (through fuel stores and machinery on site) and domestic and sewage waste could potentially contaminant surface water resources. The incorporation of pollution control dams will significantly reduce the risk of contamination to downstream environments and water quality.

The August water quality report also identified an exceedance of certain water quality variables (electrical conductivity and pH) in terms of the SAWQG for Industrial Use at the Process Water locality (to the left of the limestone stockpile area), and exceedances (electrical conductivity and manganese) according to the General Authorisation limits at the Zinc Storage Pit. It was noted that significantly high EC, Chloride (Cl) and (Sulphate) SO4 concentrations prevailed at the Zinc Storage Pit locality and should not be released into the receiving environment. The possible reason for the high concentrations of the variables mentioned above is the concentration effect taking place in the pit due to evaporation (Aquatico Scientifc Water Quality Report, 2022).

Groundwater is currently of good quality and it is anticipated that operations, run-off from the plant and seepage from the unlined coal and gypsum stockpiles will not negatively impact this resource. Impacts from these sources have not yet been felt by the well field after more than 50 years of operation, but require close monitoring. Measures are in place or planned to prevent water resource impacts (JG Afrika Stormwater Management Plan, 2022)

11.5 Environmental Management Programme

In accordance with the Mineral and Petroleum Resources Development Act No 28 of 2002 (MPRDA), an amendment to the EMPR 2001 was required for the proposed modifications at the Lichtenburg Cement Plant, namely the use of alternative fuels and raw material/resources (AFRs). The amended EMPR was undertaken by Metago Environmental Engineers in 2011 (refer to **Appendix 1**). Key features of this plan are summarized below:

Monitoring of AFRs as they arrive at the Lichtenburg plant will be undertaken by plant personnel. This will comprise a visual inspection of the transport facilities and materials where possible to ensure no tampering has taken place en-route and ad hoc sampling and analysis of AFR materials. The visual inspection will be undertaken for every wagon and tanker entering the site and a record of the inspection kept for auditing purposes.

Ad hoc sampling of AFR materials and more specifically the blended liquid wastes and SSWs will be done. As a general approach, Lafarge will ensure that the monitoring programme comprises:

- A formal procedure;
- The use of a an accredited, independent, commercial laboratory for undertaking sample analyses;
- Parameters to be monitored will be identified in consultation with a specialist in the field and/or the relevant authority;
- The results will be stored in a structured database;
- Reports on the data and its compliance with set criteria will be compiled by an appropriately qualified person on a quarterly basis; and
- Both the data and the reports will be kept on record for the life of project.

Groundwater

- Lafarge will ensure that polluting materials are handled in a manner which does not pollute groundwater
- Storage facilities will be on impermeable floors, have appropriate runoff containment measures, bunded areas capable of holdings 125% spill volume.
- All project activities will take place within bounds of a surface dirty water management system that complies with R704.
- Continue to implement waste management practices.

Air Quality

- The conditions of the sites' atmospheric emissions license (AEL) and requirements of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004) (NEM:AQA) will be included in Lafarge's air monitoring programme.
- A sampling programme for ambient particulate matter will be implemented to the west of the plant close to the Lafarge residential area. This should include measurement of meteorological parameters, dust deposition rate and regular measurements of daily average PM10 concentration. Should these screening measurements indicate frequent exceedences of the proposed SA standards, more sophisticated measurements methods such as continuous monitoring will be instituted.

General

The environmental manager will conduct internal management audits against the commitments in the EIA/EMP amendment report. During the construction phase, these audits will be conducted every two weeks. In the operational phase, these audits will be conducted on a quarterly basis. The audit findings will be documented for both record keeping purposes and for informing continual improvement. In addition, and in accordance with mining regulation R527, an independent professional will conduct an EMP performance assessment every 2 years. The site's compliance with the provisions of the EMP and the adequacy of the EIA/EMP amendment report relative to the on-site activities will be assessed in the performance assessment. It was concluded that provided all the objectives, actions and procedures included in the EMP are implemented, there is no environmental reason why the project and the associated activities should not be approved.

Provided that all the objectives, actions and procedures included in the EIA/EMP report are implemented, Metago is of the view that there is no environmental reason why this project and the associated activities should not be approved. Key to this is compliance with the National Policy for the Thermal Treatment of General and Hazardous Waste (Government Notice 777, DEA 2009), careful planning on the sourcing and blending of AFRs that meet the required specifications, responsible implementation of the project by Lafarge and monitoring to confirm predicted impacts and where necessary, provide input on additional management measures if required.

Financial Provision

The financial provisions for 2021 for the Lichtenburg Cement Plant were determined from the EMPr (refer to **Appendix 1**) and an approved financial guarantee was provided by a financial institution.

11.6 Environmental Audit

An environmental audit regarding water management was required as part of the water use licence application for the Lichtenburg Cement Plant. The assessment focused on compliance with legal requirements and the site's own systems and procedures, as well as on impacts with regards to watercourse characteristics namely surface flow, interflow, groundwater flow, water quality, geomorphology, habitat and biota. Site visits and document reviewing was conducted and information from recently conducted specialist studies were used to reach conclusions.

Lafarge had unlawfully carried out the following activities in terms of regulations under NEMA without prior authorisation:

• Infilling of a watercourse, and or a wetland, with more than 10 cubic metres of material; and
• The clearing of indigenous vegetation.

The non-compliance was based on a time series of Google Earth images. At the time of a site visit by a wetland specialist on 30 March 2021 it was observed that the area in question had indeed been used as a spoil site, and the progression of the infilling could be confirmed through the assessment of historical aerial imagery.

The following table describes the matters which require attention in respect of waste and waste management

Table 8: Matters which require attention as per the Watercourse Impact Audit

Theme	Matter
Access control at high risk areas and/or pollution control equipment	No warning signs were in place at the partially flooded pits outside the electric perimeter fence, which contained screenings from the Sewage Plant, as well as burning garden and other waste. Ponding has also occurred outside the electric perimeter fence, which may present health hazards and even a risk of drowning to smaller children.
Water Conservation and Water Demand Management	A water efficiency evaluation should as a minimum be done by appropriately skilled persons. Lafarge Cement Plant and Quarries are however located in an area where most of the users are dependent on groundwater as their sole source of supply, therefore water management is critical to minimise over abstraction from boreholes. A pipe leakage was noted at Lovedale Quarry which was pointed out to the Lovedale workshop manager and immediately repaired.
Water Use Authorisations	Although various water use activities are undertaken at Lafarge, no IWUL is yet in place to authorise the activities. An application was submitted to DWS in 2011, which had to be re-submitted in 2018. After various discussions, specialist studies to inform the water use licence application had to be reconducted and the application will be submitted before end October 2022.
Alignment of water management strategies	An IWUL has not been issued yet. Water use strategies should be aligned after the approval of the IWUL and IWWMP with the EMPr and its amendments.
Management of possible risks to groundwater resources	According to the Geohydrological Study 2017, the aquifers in the Lichtenburg area are highly sensitive to pollution risks and over abstraction. The current groundwater monitoring network was assessed during the geohydrological assessment conducted in 2022 which included yield testing of boreholes and updating of the numeric and transport flow model.
Surface water resources	The wetland to the east of the Cement Plant has been impacted upon with “infilling” / backfilling in the Quarry Area, as well as within the Cement Plant area. No evidence of protection of the regulated area of 500 m at the Wetland could be verified; apart from infilling, no bufferzone was identified around the wetland (500 m), therefore roads and other activities were and are taking place within the wetland system. Mining activities also occurred in 2003 on both sides of the wetland together with subsequent backfilling; the “Townlands Pit” forms part of a Wetland System with affected storm water from the Cement Plant running off into the system. The Wetland to the east of the Cement Plant is located within a tributary to the Groot Harts River, which tributary was diverted with the expansion of the Cement Plant without any EIA and WUL in terms of Section 21(c) and (i). The diversion was also not maintained to ensure effective flow and as discussed above, backfilled with inert plant material. This issue forms part of an enforcement process with both DFFE and DWS and is still in process.
Compliance Audit to and Exemption required in terms of GN 704 of 4 June 1999	Lafarge appointed Greenmined/JG Afrika to undertake a compliance audit against the conditions of GN 704 of 4 June 1999 and the development of a Stormwater Management Plan for the Cement Plant and the Tswana Quarry.
Diversion of clean storm water from dirty areas and capacity of diversion structures	Lovedale and Townlands Quarries will be rehabilitated for closure. Pollution control dams are recommended in the stormwater management plan to divert clean storm water from the Coal Stockpile area and from the additives storage area to minimise pollution of stormwater. If not practical, affected storm water must be contained in a proper affected storm water system.

Theme	Matter
	The affected stormwater system will be able to contain the 1:50 year flood event volume.
Inspection and maintenance on clean and affected water channels	Inspections and maintenance currently done on the clean and affected water systems will need to be expanded once the recommended infrastructure is built, in order to ensure proper operation of these systems.
Biodiversity Management	The Lichtenburg Cement Plant lies within sensitive areas. The biodiversity assessment was updated in 2022. The updated biodiversity assessment is critical in the rehabilitation on closure planning and future management of all identified sensitive areas and protected plants, species and ecosystems.
Weeds and invader plant management	Implementation of a detailed eradication and control plan for the identification of weeds and invader plants is needed.

According to the Watercourse Impact Audit Report (October 2022), Lafarge will need to commence implementation of the recommendations of the specialist studies and closing of the findings identified during the audit, so long as legal authorisation for implementation of the recommendations of the specialist studies and closing of the findings identified during the audit do not require authorisation. Please refer to **Appendix 19** for the full Watercourse Impact Audit Report.

12. Public participation

A pre-application meeting for the Water Use Authorisation/Licence Application process was held with the DWS Regional Office on the 10th of February 2022.

English and Tswana site notices were erected at strategic points in the vicinity of the site (Lichtenburg Cement Plant main gate, Superspar mini market, Superspar Palm Sands, Game Store, Natah Health Shop) on the 29th of April 2022 to inform the surrounding local residents and other Interested and Affected Parties (I&APs) of the Cement Plant Activities (refer to **Appendix 4**). Registration and commenting notification letters were also sent to inform stakeholders and I&AP's about the Lichtenburg Cement Plant WULA on the 29th April 2022.

An advert was placed in a local newspaper namely, The Noordwester Newspaper, for English advertisement on 29th April 2022 (refer to **Appendix 4**).

A public meeting invite was circulated in June 2022. The meeting was held on the 28th June 2022 at the Lafarge Recreational Club, Lafarge Village, Lichtenburg. No comments were received (refer to **Appendix 4**).

The initial Public Participation Process of 60days was from the 29th April to the 24th June 2022, however, as per the DWS requirement letter dated 17th March 2022, specialist studies were still to be completed for the WULA Process for the Tswana Limestone Quarry. The specialist studies have now been completed and an email was circulated to all I&APs on the 18th October 2022 which can now be obtained from Greenmined Environmental (Pty) Ltd upon request or downloaded from the company website at https://www.greenmined.com/water-use-applications/ .

Table 9: Outcome of the public participation

Person who commented	Comments (support/ object/ concerns)	Reasons for objections/ concerns	Applicant's response to the objection/concerns
Johann Pistor	An objection to the operations at Lichtenburg Cement Plant was submitted.	The reasoning's were related to: • Illegal operations; • Unsafe health practices; • Conditions which pose a danger to human life; and • Corruption	Greenmined acknowledged the receipt of the objections and stated that comments would be incorporated into the Public Participation Report.

12.1 Inputs/Authorisations from other Departments /Stakeholders

An Environmental Impact Assessment was done for the Lafarge Industries South Africa (Pty) Ltd, Lichtenburg premises regarding the use of Secondary (waste) materials as alternative fuels and raw materials. The authorisation has been granted and the reference numbers for this project are:

- DMR Reference: RDNW (KL) 6/2/2/101
- DEDECT Reference: NWP/WM/NM3/2011/06

Lafarge Mining South Africa Pty (Ltd) is also in possession of a mining right (reference number: NW30/5/1/2/2/454MR), for the Lichtenburg Cement Plant and its Quarry Mines, which was issued by the Department of Mineral Resources on the 8th March 2013**.**

Letter dated May 2022 - Department of forestry, Fisheries, and Environment (DFFE) submitted comments on the wetland rehabilitation project at Lafarge Lichtenburg.

13. Motivation in terms of Section 27 (1) of the National Water Act, 1998

The requirements contained in Section 27(1) of the National Water Act, 1998 (Act 36 of 1998) have been considered and are discussed further below.

a) Existing lawful water uses

An existing lawful water use licence refers to the use of water which has taken place anytime during a period of two years before the establishment of the National Water Act. Lafarge Industries Ltd has been operational for over 60 years. No existing lawful water uses apply to the plant, however a previous water use authorisation ((Registration number: 26019718) exists. Registered activities are listed below:

- Section 21 (a) - Taking water from a water resource (From Townlands and Lovedale Borehole).
- Section 21 (b) - Storing water (For wastewater disposal and industrial residue in the Townlands Pit).
- Section 21 (f) - Discharging waste or water containing waste in a water resource through a pipe, canal, sewer, sea outfall or other conduit (Discharging domestic and biodegradable industrial wastewater into the Townlands Pit).

In addition to the above mentioned water uses, the following activities have been operational and are being applied for through a new Water Use License Application:

- Section 21 (a) of Act - Taking water from a water resource (three boreholes from the plant, drinking water for the village, garden use and water taken from the NFEPA wetland for the kilns cooling process).
- Section 21 (c) of Act – Impeding or diverting the flow of a watercourse (Drainage and infilling of Wetland Map 5 which runs through the factory, rail and road crossings though Wetland Map 5).
- Section 21 (e) of Act – Engaging in a controlled activity: Irrigation of any land which waste or water containing waste generated through any industrial activity or by a waterworks (For garden patches).
- Section 21 (g) of Act - Disposing of waste in a manner which may detrimentally impact on a water resource (coal stockpile, returned water from cement processing to NFEPA wetland (Townlands Pit), treated effluent from sewage works, and stormwater runoff into NFEPA wetland).
- Section 21 (h) of Act - Disposing of water in any manner of which contains waste from, or which has been heated in any industrial or power generation process (Returning heated water to the NFEPA wetland).
- Section 21 (i) of Act – Altering the bed, banks, course or characteristics of a watercourse (Vehicle tracks, rail and road crossings through wetlands).

b) Need to redress the results of past racial and gender discrimination

Lafarge recognises the need to redress the imbalances of the past and regards Black Economic Empowerment (BEE) to be one of the supporting pillars of the Transformation Process in South Africa. Lafarge draws on Corporate Centre for its human resource management and development strategies and planning which supports employment equity. Employment opportunities are directed towards local people, upholding the affirmative action, equal employment policies of the company. The following plans are implemented at Lafarge to assist in the implementation of Mining Charter objectives to redress imbalances of the past.

Lafarge has ensured the upliftment of historically disadvantaged groups by securing the positions of Director and EFO with women of colour. Additionally, Lafarge prioritise ethical suppliers while minimising overproduction and waste through efficient supply and demand management processes.

c) Efficient and beneficial use of water in the public interest

Within the town of Lichtenburg, groundwater is used extensively for municipal, domestic, industrial and agricultural practices. Water demands from groundwater sources are therefore highly stressed. Lafarge has ensured minimum additional stress on this resource by operating a dry process for the manufacturing of cement. During this process, water is abstracted for the main tank and circulated throughout the additional softening plants and kilns. Additional water for cooling purposes is extracted from the NFEPA wetland (Townlands Pit) but is returned after use.

Lafarge acknowledges the impacts imposed on the wetland system situated at the factory site (Wetland Map 5) and rehabilitation and management plans to restore this wetland area are underway. The result of this process will be that water will flow freely again through this system improving its overall condition. The improvement in this wetland condition will provide vital ecosystem services to the surrounding area such as; stream flow regulation, sediment trapping, nitrate assimilation, toxicant assimilation, biodiversity maintenance, and grazing for livestock.

Additionally, Lafarge plans to implement a number of pollution control dams in which water will be purified and reused within the cement factory. Surplus water produced from this process after sufficient purification, has the potential to be released into the receiving environment which will be highly beneficial to the largely arid area.

d) Socio-economic impact –

i) Of water use or uses if authorised:

The authorisation of water uses for the Lafarge cement plant will provide the flowing socio-economic benefits:

- The North West Province is a growing market surpassing national trends in the cement industry and, as such, demand for Lafarge's products in the North West Province has already exceeded existing production capacity. The proposed expansion is therefore required to meet the growing product demand and ensure that provincial and national economic development is not hampered;
- Job retention – No new jobs will be created, however, approximately 345 people are employed on a permanent basis in addition to temporary and contract employment. These jobs will be retained;
- Local economic benefits are derived as a result of wage income and increased demand for goods;
- Training is provided to employees resulting in an improvement of the local skills base;
- Support is given to the local and national economy by the purchase of goods and services;
- Lafarge will achieve profits from the increase in the production of cement resulting in increased tax revenues for the government;
- Lafarge will continue to support projects that will benefit the local community leading to improved living conditions and improvement of skills;
- Support to local municipality in terms of road repairs, road construction, upgrading of youth centres, town clean-up, water supply etc;
- Support to schools in terms of adopt a school, fundraising campaigns, sport activities, giving books to learners, waste recycling projects;

- Support to small enterprises namely historically disadvantage communities, courier services, tent hiring, shirt printing, gardening services, maintenance contractors etc; and
- Initiation of historically disadvantaged community business forums.

ii) Of the failure to authorise water use or uses:

If the water uses are not approved the continuation and future expansion of the Lafarge cement production line will not occur. As such the socio-economic benefits outlined above will not be achieved. Consequently, the South African economy will be negatively affected and the livelihood of communities will not improve as expected.

e) Any catchment management strategy applicable to the relevant water resource

The Lafarge cement production facility is situated within the upper reaches of the Harts River Catchment (C31A) and falls under the Lower Vaal Water Management Area. A drainage line can be found along the eastern boundary of the cement factory which drains into an unnamed tributary, and eventually discharges into the Harts River. The Harts River flows along the south west of the factory discharging into the Hart River which then flows southwards to the Vaal Dam (downstream of the Vaal River) and then to the Orange River. The Lower Vaal catchment management strategy highlights the importance of groundwater in this area and suggests that the quality and quantity of this water resource be monitored (DWAF, 2004). Lafarge has upheld this policy through a Water Balance report for Lichtenburg Cement Factory which has indicated recommendations for borehole use to reduce stress to groundwater supplies.

f) Likely effect of the water use to be authorized on the water resource and on other water users.

Lafarge has been operational for over 60 years. As such, few new risks are posed to the surrounding wetlands and watercourses. The wetland situated within the cement factory property (Wetland Map 5) has experienced a disruption of surface water flows as a result of infilling from the factory waste. However, Lafarge is currently in the process of rectifying this non-compliance which will improve the overall condition of the wetland (JG Afrika Wetland Assessment Report, 2022).

The most prominent new impacts may be directed towards changes in water quality and quantity; particularly of the NFEPA wetland (Townlands Pit) situated 70m outside the factory boundary. Possible impacts to this system include:

- Some stormwater from the factory currently flows into the NFEPA wetland (Townlands Pit). If stormwater runoff and the separation of clean and dirty water at the plant are not appropriately managed, water quality in the wetland may be compromised. Multiple stormwater channels at the plant were found to be blocked with sediment which can negatively affect inflowing water quality. Fine sediments which may be present in stormwater may also impact aquatic biodiversity. Seepage from the wetland, which then contains stormwater contaminants, may contaminate the groundwater resources. Contaminated groundwater would impose health risks to the surrounding communities which rely on this water source for domestic uses.
- Stormwater management around the coal stockpile was found to be insufficient during a site visit by JG Afrika. Runoff from this stockpile has the potential to negatively affect downstream environments.
- Spillage of additives in the storage area may negatively affect downstream environments. Magnetite,Vanchem Bauxite, Zimalco Aluminium Dross, Silica sand and Pozz Sand (Fly Ash) are stored in the additives area.
- Seepage of contaminated water into the Harts River may impact negatively on livestock and small wildlife which drink from the river. According to the Stormwater Management Report (JG Afrika, 2022), a number of channels within Area A of the plant were found to be blocked or undersized which could likely affect the water quality entering the Harts River. Recommendations were given to rectify this issue.
- Hydrocarbon spills were evident during the site inspection by JG Afrika. These pollutants can enter downstream environments affecting water quality.

- Agriculture is an important land use in the surrounding area. Contaminated groundwater and/or river water used for irrigation may affect crop growth or render the crop unsafe for consumption.
- At present, the uptake of water from the wetland for use in the factory does not have an effect on the wetland water levels. However future water demands of the factory may increase pressure on the wetland resulting in reduced water levels, affecting the ecological functioning of the system.

Groundwater is currently of good quality and it is anticipated that operations, run-off from the plant and seepage from the unlined coal and gypsum stockpiles will not negatively impact this resource. Impacts from these sources have not yet been felt by the well field after more than 50 years of operation, but require close monitoring.

g) Class and the resource quality objectives of the water resource

The Lafarge cement factory falls within the quaternary catchment C31A of the Harts River. This river, along with the Molopo, Kuruman and lower reaches of the Vaal River form part of the Lower Vaal Water Management Areas.

Resource quality objectives have not been set for the water resource catchment C31A, although the adjacent quaternary catchments (C31B and C31C) have been given a Present Ecological State (PES) of Moderately Modified (Class C). (DWS Government Gazette No. 470 of 22nd April 2016).

When looking at the site-specific PES, the Wetland Map 5 (which runs through the cement factory) has been identified as having a PES Category E. This is in light of the infilling of the wetland area. The wetland health tool could not be used to ascertain the PES of the NFEPA wetland as the requirements for this wetland could not be met. Instead the PES of this wetland was based on a comparison with other mined pits in the area. The NFEPA wetland was therefore rated as having a variable PES, ranging between a Category D and B.

h) Investments already made and to be made by the water user in respect of the water use in question

Lafarge currently operates 166 cement plants in 50 countries around the world with a production capacity in excess of 200 million tons. With the South African domestic market for cement growing, Lafarge is likely to continue to invest in its South African plants to expand production and ultimately profits. Increased expansion and profits may lead to further local employment opportunities and support to local municipalities, schools and community upliftment projects.

i) Strategic importance of the water use to be authorised

The continued operation of the Lafarge cement factory will be of strategic importance to Lafarge South Africa (Pty) Ltd, the local community and the South African economy in general. Increased production associated with the expansion of the production lines will improve socio-economic development as stated in the above. Rehabilitation plans for Wetland Map 5 will also improve the overall ecological state of the wetland, which will be beneficial to the community and the environment.

j) The quality of water in the water resource which may be required for the Reserve and for meeting international obligations

Water quality investigations on free water at the Lichtenburg plant were undertaken as part of the approved EMPr (1995) and EMPr amendment (2006). Water samples were submitted to scientific services on the 8th January 2016 (Test Report 2016-10338). Results were as follows:

- The organic content (TOC) was insignificant and much lower that the limit of 10 mg/L as prescribed by SANS 241: 2015. There was no noticeable activity of bacteria associated with such problems.
- No toxic or harmful concentrations of any elements were found.

- The water quality was deemed suitable for a number of uses (drinking, aquatic life, animal use, agricultural use and recreation).
- Additional water samples were taken from a number of locations. The samples were classified in terms of the DWAF Water Quality Guidelines. These results showed that generally, the surface water and groundwater quality of the samples taken from the localities listed above are of ideal and good water quality.

An updated water quality report was produced for August 2022 (Aquatico Scientific Water Quality Report, 2022). The results were as follows:

- Exceedances observed in terms of pH and EC at locality Process water, while pH, EC, Cl, SO4 and Mn exceeded at Zinc Dam when measured against the SAWQG for Industrial Use.
- EC and Mn exceeded the General Authorisation Limit at Zinc Dam.
- All of the analysed variables complied with the General Authorisation Limit for surface water quality at the Townlands Pit. The good water quality might be attributed to the influx of fresh rain water.
- Elevated NO^3 concentrations persist at Lovedale Quarry DW.

k) Probable duration of any undertaking for which a water use is to be authorised

It is recommended that the duration of the Water Use Licence for the Lichtenburg Cement Plant be issued as per the Approved Mining Right (DMR Ref NW30/5/1/2/2/454MR) that is valid for a period of thirty (30) years ending on the 07th March 2043.

[END OF WULA SUMMARY REPORT]