ERA STENE (PTY) LTD

APPLICATION FOR AN ENVIRONMENTAL AUTHORISATION IN SUPPORT OF AN AMENDMENT TO A MINING RIGHT FOR THE EXTENSION OF AN EXISTING CLAY QUARRY NEAR DELMAS

FINAL ENVIRONMENTAL IMPACT REPORT AND ENVIRONMENTAL MANAGEMENT PROGRAMME

Report No.: JW115/16/F052

February 2017

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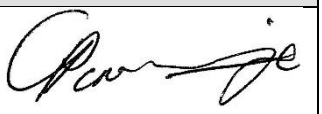
Prepared	Environmental Scientist	Gerhard Cronje	13/02/2017	
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2016/12/14	A	Draft Report for internal review	Jacqui Hex	Electronic	1
2016/12/15	0	Draft Report for comment	Naude Enslin	Electronic	1
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2017/02/16	2	Final Report for comment	Naude Enslin	Electronic	1
2017/02/21	3	Final Report for Competent Authority review	Stakeholders	Hard Copy (Library)	1
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ERA STENE SOUTH QUARRY EXPANSION

APPLICATION FOR AN ENVIRONMENTAL AUTHORISATION IN SUPPORT OF AN AMENDMENT TO A MINING RIGHT FOR THE EXTENSION OF AN EXISTING CLAY QUARRY NEAR DELMAS

REPORT NO: JW115/16/F052

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LIST OF ACRONYMS & ABBREVIATIONS

BID	Background Information Document
CEIR	Consultation Environmental Impact Report
CRR	Comments and Responses Report
CSR	Consultation Scoping Report
CV	Curriculum Vitae
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
EAP	Environmental Assessment Practitioner
EMPr	Environmental Management Programme
ENPAT	Environmental Potential Atlas
FEIR	Final Environmental Impact Report
FSR	Final Scoping Report
ha	Hectares
LOM	Life of Mine
MAR	Mean Annual Runoff
MDARDLEA	Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs
MPRDA	Mineral and Petroleum Resources Development Act
MTPA	Mpumalanga Tourism and Parks Agency
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Area
PES	Present Ecological Status
SAHRA	South African Heritage Resources Agency
WULA	Water Use Licence Application

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

FINAL ENVIRONMENTAL IMPACT ASSESSMENT REPORT

AND

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

SUBMITTED FOR ENVIRONMENTAL AUTHORIZATIONS IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998 AND THE NATIONAL ENVIRONMENTAL MANAGEMENT WASTE ACT, 2008 IN RESPECT OF LISTED ACTIVITIES THAT HAVE BEEN TRIGGERED BY APPLICATIONS IN TERMS OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT, 2002 (MPRDA) (AS AMENDED).

NAME OF APPLICANT:	Era Stene (Pty) Ltd
TEL NO:	012 460 2211
FAX NO:	012 346 1447
POSTAL ADDRESS:	PO Box 25001, Monumentpark, 0105
PHYSICAL ADDRESS:	Office 34, Monument Park Shopping Centre, 79 Skilpad Street, Monumentpark, 0181

FILE REFERENCE NUMBER: MP30/5/1/2/3/2/1 135 EM

IMPORTANT NOTICE

In terms of the Mineral and Petroleum Resources Development Act (Act 28 of 2002 as amended), the Minister must grant a prospecting or mining right if among others the mining "will not result in unacceptable pollution, ecological degradation or damage to the environment".

Unless an Environmental Authorisation can be granted following the evaluation of an Environmental Impact Assessment and an Environmental Management Programme report in terms of the National Environmental Management Act (Act 107 of 1998) (NEMA), it cannot be concluded that the said activities will not result in unacceptable pollution, ecological degradation or damage to the environment.

In terms of section 16(3)(b) of the EIA Regulations, 2014, any report submitted as part of an application must be prepared in a format that may be determined by the Competent Authority and in terms of section 17 (1) (c) the competent Authority must check whether the application has taken into account any minimum requirements applicable or instructions or guidance provided by the competent authority to the submission of applications.

It is therefore an instruction that the prescribed reports required in respect of applications for an environmental authorisation for listed activities triggered by an application for a right or a permit are submitted in the exact format of, and provide all the information required in terms of, this template. Furthermore, please be advised that failure to submit the information required in the format provided in this template will be regarded as a failure to meet the requirements of the Regulation and will lead to the Environmental Authorisation being refused.

It is furthermore an instruction that the Environmental Assessment Practitioner must process and interpret his/her research and analysis and use the findings thereof to compile the information required herein. (Unprocessed supporting information may be attached as appendices). The EAP must ensure that the information required is placed correctly in the relevant sections of the Report, in the order, and under the provided headings as set out below, and ensure that the report is not cluttered with un-interpreted information and that it unambiguously represents the interpretation of the applicant.

1. OBJECTIVE OF THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The objective of the environmental impact assessment process is to, through a consultative process—

(a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;

(b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;

(c) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

(d) determine the—-

(i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and

(ii) degree to which these impacts—

(aa) can be reversed;

(bb) may cause irreplaceable loss of resources, and

(cc) can be avoided, managed or mitigated;

(e) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;

(f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;

(g) identify suitable measures to manage, avoid or mitigate identified impacts; and

(h) identify residual risks that need to be managed and monitored.

PART A

SCOPE OF ASSESSMENT AND ENVIRONMENTAL IMPACT ASSESSMENT REPORT

2. CONTACT PERSON AND CORRESPONDENCE ADDRESS

a) Details of

(i) Details of the EAP

Name of The Practitioner:	Jacqui Hex / Gerhard Cronje
Tel No:	011 519 0200
Fax No:	011 519 0201
e-mail address:	jacqui@jaws.co.za / cronje@jaws.co.za

(ii) Expertise of the EAP.

1) The qualifications of the EAP

(with evidence).

Jacqui Hex

MSc Environmental Management (University of Johannesburg)

Registered Professional Natural Scientist (Pr.Sci.Nat.) Reg No: 400374/11

Certified Environmental Assessment Practitioner (EAP) from the Interim Certification Board (EAPASA)

Gerhard Cronjé

BSc Hons Geography and Environmental Management (University of Johannesburg)

Please refer to **Appendix A** for copies of the CV's and proof of qualifications.

2) Summary of the EAP's past experience.

(In carrying out the Environmental Impact Assessment Procedure)

Jacqui Hex holds an MSc in Environmental Management (cum laude) from the University of Johannesburg. She has over 10 years' experience in the management of waste and environmental assessments and authorisation projects. She joined Jones & Wagener in 2011, where she is currently a Technical Director and Environmental Scientist in their Environmental Sciences and Management Department, responsible for the project management of environmental assessment projects. Her broad range of expertise includes

inter alia Environmental Impact Assessments, Basic Assessments, Environmental Management Programs (National Environmental Management Act), Environmental Management Program Reports (Mineral and Petroleum Resources Development Act), Environmental Control Officer Services, Environmental Auditing, Water Use Licence Applications, Waste Licence Applications, Feasibility Studies, Public Participation, GIS, as well as Screening Assessments.

Gerhard Cronje has 9 years of experience in the field of environmental management, as an Environmental Scientist. He joined Jones & Wagener in 2011 where he is currently an Environmental Scientist in their Environmental Sciences and Management Department, responsible for undertaking a broad range of environmental assessment projects. His expertise includes managing and compiling Environmental Basic Assessment Reports, Environmental Scoping Reports, Environmental Impact Assessment Reports, Environmental Management Programme Reports (under the National Environmental Management Act and as well as the Mineral and Petroleum Resources Development Act), Environmental Auditing, Public Participation, Water Use Licence Applications, Waste Licence Applications, as well as undertaking water sampling.

Examples of past projects are listed in the respective CVs attached as Appendix A.

b) Description of the property.

Farm Name:	Rietvalei 195 IR
Application area (Ha)	57.68 ha
Magisterial district:	Victor Khanye Local Municipality within the Nkangala District Municipality
Distance and direction from nearest town	15km north west of Delmas
21digit Surveyor General Code for each farm portion	Rietvalei 195 IR Ptn 7 (RE): T01R00000000019500007

c) Locality map **(show nearest town, scale not smaller than 1:250000 attached as Appendix C).**

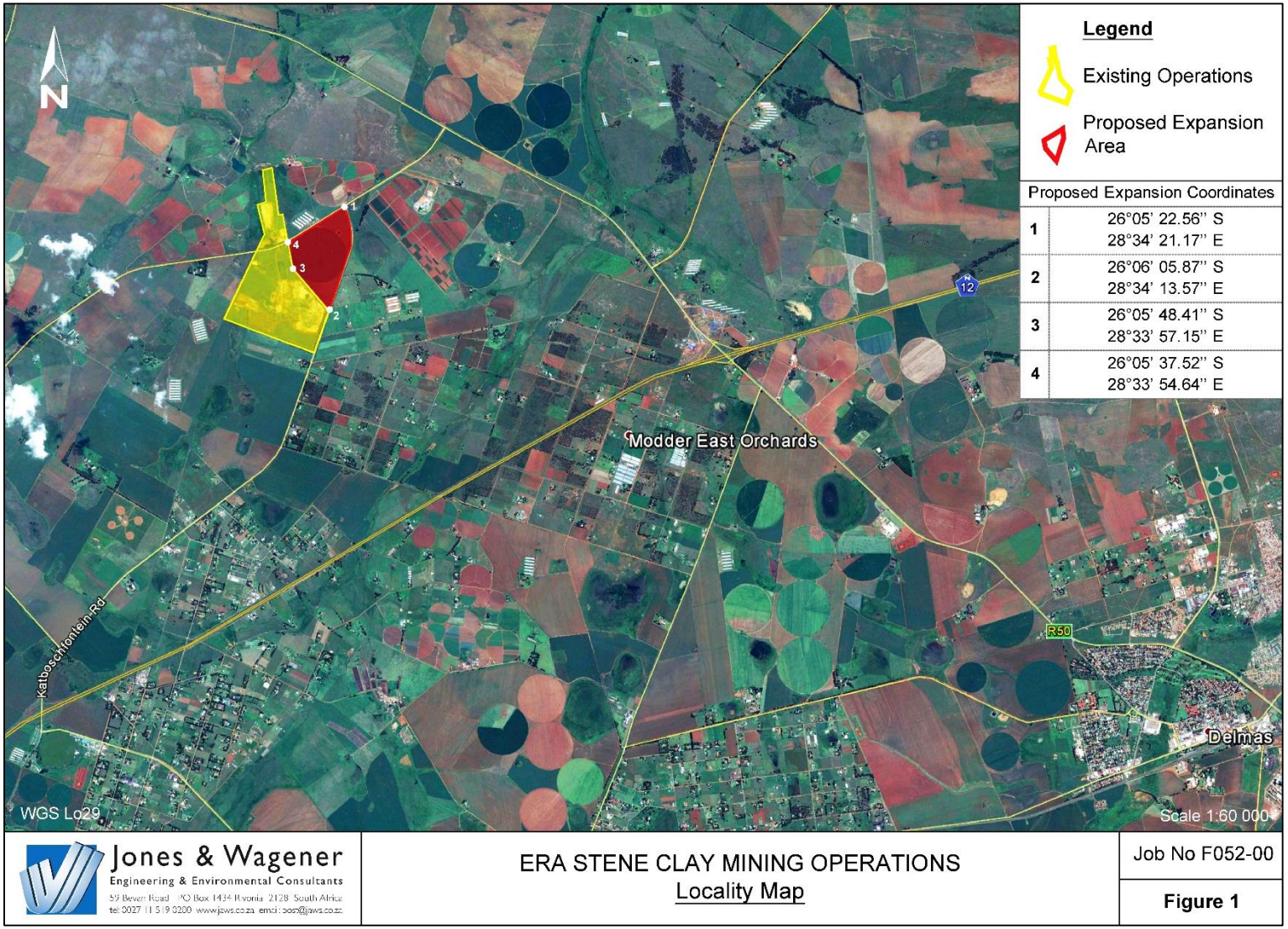


Figure 1: Locality Map

d) Description of the scope of the proposed overall activity.

Provide a plan drawn to a scale acceptable to the competent authority but not less than 1: 10 000 that shows the location, and area (hectares) of all the aforesaid main and listed activities, and infrastructure to be placed on site. Please refer to **Appendix D.**

(i) Listed and specified activities

NAME OF ACTIVITY (All activities including activities not listed) **(E.g. Excavations, blasting, stockpiles, discard dumps or dams, Loading, hauling and transport, Water supply dams and boreholes, accommodation, offices, ablution, stores, workshops, processing plant, storm water control, berms, roads, pipelines, power lines, conveyors, etc…etc…etc.)**	**Aerial extent of the Activity** **Ha or m²**	**LISTED ACTIVITY** **Mark with an X where applicable or affected.**	**APPLICABLE LISTING NOTICE** **(*GNR 544, GNR 545 or GNR 546)/NOT LISTED***
Expansion of existing clay quarry	57.68 ha	X	GNR 984 of 2014: Activity 17
Expansion of existing clay quarry within 32m from the edge of a watercourse.	57.68 ha	X	GNR 985 of 2014: Activity 14 (xii) c

(ii) Description of the activities to be undertaken

(Describe Methodology or technology to be employed, including the type of commodity to be mined and for a linear activity, a description of the route of the activity)

Era Stene (Pty) Ltd holds an existing mining right (MP30/5/1/2/3/2/1 135 MR) from the Department of Mineral Resources (DMR) since 2013 for their clay mining operations, which is located approximately 15km north west of Delmas, Mpumalanga Province. The old order mining right was originally granted in 1997.

Clay material is currently being extracted from the quarry by means of an excavator and then temporarily stockpiled on an existing stockpile on site, where after it is transported by means of truck to the existing brick manufacturing plant which is also owned and operated by Era Stene in Olifantsfontein, Ekurhuleni, where various types of bricks are being manufactured for the local market. The mining method employed at Era Stene does not involve any blasting.

The Life of Mine (LoM) of the existing operations at the southern quarry is estimated to comprise sufficient reserves to supply Era Stene with clay material for the next 3-5 years. Era Stene therefore wishes to expand the footprint of their existing clay mining operations in order to be able to sustain their brick manufacturing plant with clay material. This will prolong the life of the clay mining operations by approximately 31 years during phase 1 and ensure prolonged employment opportunities for those currently working on the mine (Refer to **Appendix J**).

As can be seen in **Figure 2** and **Table 1** below, the LoM for the proposed expansion of the southern quarry is proposed to be undertaken in a phased approach:

- Phase 1 is proposed to cover an area of approximately 15 ha, and will be mined until 2047 (31 years) in a north eastern direction. The clay layer to be mined will reach up to 8 meters in thickness, and the volume of clay to be extracted from Phase 1 equals approximately 1.2 million cubic meters (Mm3).
- Phase 2 is proposed to cover an area of approximately 15.5 ha, and will be mined until 2075 (28 years) in a north eastern direction as well. The clay layer to be mined will reach up to 7 meters in thickness, and the volume of clay to be extracted from Phase 2 totals approximately 1.09 Mm3.
- Phase 3 is proposed to cover an area of approximately 23.3 ha, and will be mined until 2086 (11.5 years). The clay layer to be mined will reach only up to 2 meters in thickness, and the volume of clay to be extracted from Phase 3 totals approximately 0.46 Mm3.

Table 1: Proposed phased expansion of the southern quarry.

	Phase 1	Phase 2	Phase 3
Area (ha)	15	15.5	23.3
Thickness (m)	8	7	2
Volume (10^6 m^3)	1.2	1.09	0.46
LOM (years)	31	28	11.5

The infrastructure at the existing clay mining operations (northern and southern quarry) will be used to service the proposed expansion of the southern quarry, and includes the following as depicted in the Site Plan in **Appendix D** and in **Figure 2** and below):

- Workshop and refuelling area;
- Old office buildings;
- Haul roads;
- Topsoil stockpiles;
- Clay stockpiles;
- Affected water dam (Farm dam);
- Affected water channel leading to the Farm dam;
- 11 kV powerline (of which a short section will be re-routed);
- Three hauling trucks, one water truck, one bull dozer, one front end loader (excavator) and one road grader; and
- Mobile pumps.

The intention is to make use of the property directly adjacent towards the east of the existing operations, as it belongs to Era Stene.

Jones & Wagener (Pty) Ltd Engineering and Environmental Consultants (J&W) has been appointed to undertake an Environmental Authorisation process, in terms of the National Environmental Management Act (NEMA, Act 107 of 1998) in support of an amendment to the existing Mining Right in terms of Section 102 of the Mineral and Petroleum Resources Development Act, (MPRDA, Act 28 of 2002) for the abovementioned expansion of clay mining activities proposed by Era Stene.

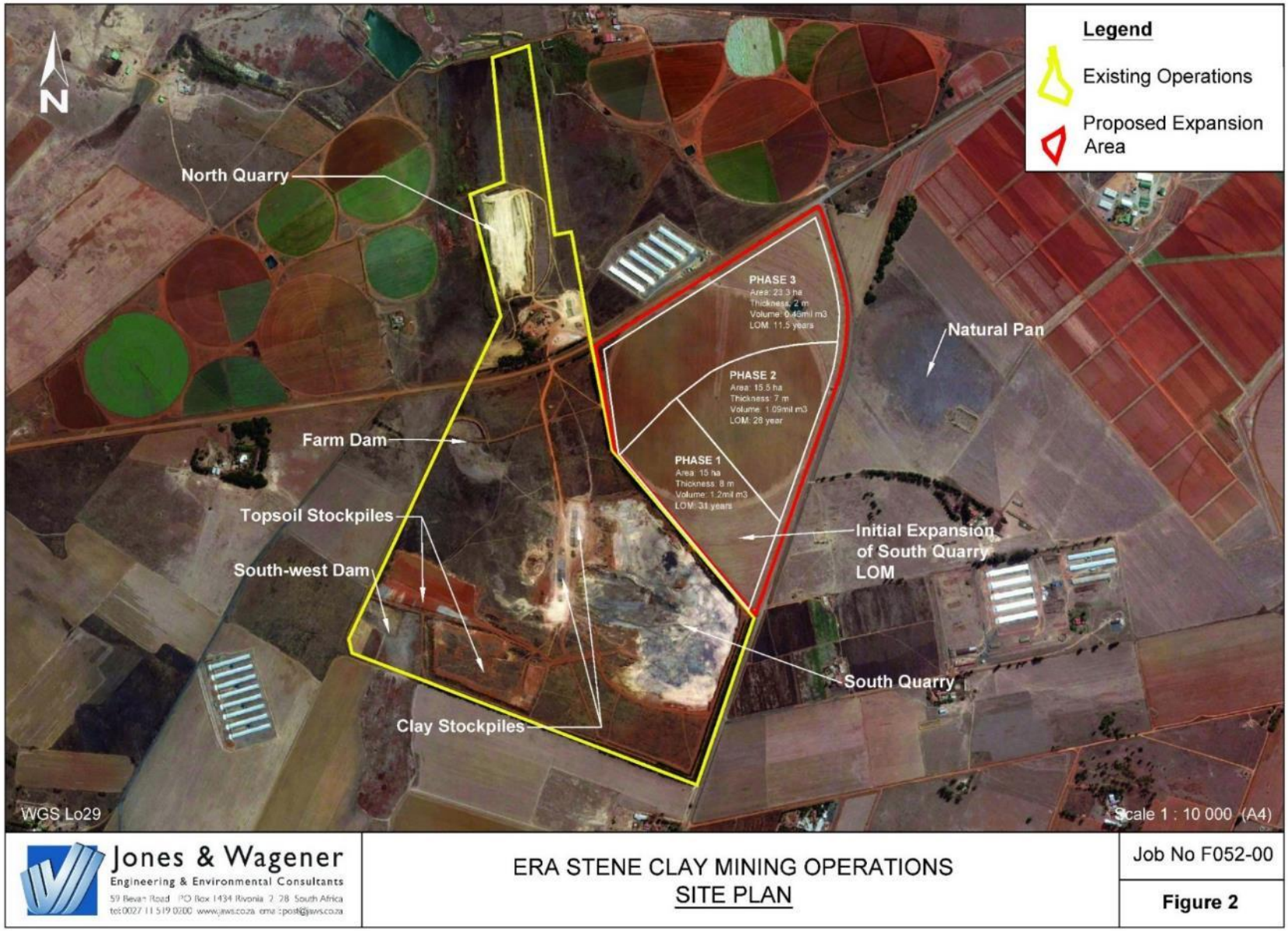


Figure 2: Site Plan

e) Policy and Legislative Context

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process);	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT **(E.g In terms of the National Water Act-Water Use Licence has/has not been applied for).**
National Environmental Management Act (No. 107 of 1998)	Impact Assessment (Appendix G)	This Environmental Impact Assessment is being undertaken in terms of the National Environmental Management Act (No. 107 of 1998). This is in order to determine any possible impacts on the environment and to propose sufficient mitigation in order to minimise harm to the environment.
Environmental Impact Assessment Regulations: 982 to 985 of 4 December 2014	Impact Assessment (Appendix G)	This Environmental Impact Assessment is being undertaken in terms of the Environmental Impact Assessment Regulations: GNR 982 to GNR 985 of 4 December 2014. This is in order to determine any possible impacts on the environment and to propose sufficient mitigation in order to minimise harm to the environment.
National Heritage Resources Act (No. 25 of 1999)	Impact Assessment (Appendix G)	The National Heritage Resources Act legislates the necessity for cultural and heritage impact assessments in areas earmarked for development, which exceed 0.5 hectares (ha) amongst others. The Act makes provision for the potential destruction to existing sites, pending the archaeologist's recommendations through permitting procedures. Permits are administered by the South African Heritage Resources Agency (SAHRA). Should the proposed activities impact on heritage resources, application to the SAHRA would be required to obtain the necessary permits. The proposed expansion of the southern quarry is not likely to have any impact on the features that were identified by the specialist within the footprint of the proposed expansion area, as none of the features were of any heritage significance. Should any significant

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process);	**REFERENCE WHERE APPLIED**	**HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT** **(E.g In terms of the National Water Act-Water Use Licence has/has not been applied for).**
		heritage resources such as graves, human remains or fossils be discovered during the expansion of the southern quarry, all work must be halted, SAHRA should be informed and a qualified heritage practitioner should evaluate the finds in order to recommend appropriate actions.
National Water Act, 1998 (Act 36 of 1998)	Water Use Licence Application (WULA) submitted to the Department of Water and Sanitation (DWS) by Shangoni Management Services	Water uses associated with the development have been included in a WULA that was submitted to the DWS by Shangoni Management Services.
National Forests Act (Act 84 of 1998)	Impact Assessment (Appendix G)	This Environmental Impact Assessment has considered the National Forests Act in order to not impact on any protected tree species which might occur in the footprint of the proposed expansion area.
National Environmental Management: Biodiversity Act (Act 10 of 2004)	Impact Assessment (Appendix G)	This Environmental Impact Assessment has considered the National Environmental Management: Biodiversity Act in order to determine any possible impacts on the environment and to propose sufficient mitigation in order to minimise harm to the environment.
Mpumalanga Nature Conservation Act (No.10 of 1998)	Impact Assessment (Appendix G)	This Environmental Impact Assessment has considered the Mpumalanga Nature Conservation Act in order to determine any possible impacts on the environment and to propose sufficient mitigation in order to minimise harm to the environment.
Victor Khanye Local Municipality Cemeteries & Crematoria By-Laws 2014	Impact Assessment (Appendix G)	The proposed expansion of the southern quarry will not impact on any cemeteries as none are located within the expansion footprint. Should any mortal remains be discovered

APPLICABLE LEGISLATION AND GUIDELINES USED TO COMPILE THE REPORT (A description of the policy and legislative context within which the development is proposed including an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process);	REFERENCE WHERE APPLIED	HOW DOES THIS DEVELOPMENT COMPLY WITH AND RESPOND TO THE POLICY AND LEGISLATIVE CONTEXT **(E.g In terms of the National Water Act-Water Use Licence has/has not been applied for).**
		during the expansion process, all work will be halted, SAHRA will be informed and a qualified heritage practitioner should evaluate the finds in order to recommend appropriate actions.
Victor Khanye Local Municipality Public Health By-Laws 2014	Impact Assessment (Appendix G)	The proposed expansion of the southern quarry is not foreseen to impact on the health of the public.
Victor Khanye Local Municipality Integrated Development Plan 2011 - 2017	Impact Assessment (Appendix G)	This Environmental Impact Assessment has considered the Victor Khanye Local Municipality Integrated Development Plan in order to determine any possible impacts (positive or negative) which the proposed project might have on the social environment and to propose sufficient mitigation.

f) Need and desirability of the proposed activities.

(Motivate the need and desirability of the proposed development including the need and desirability of the activity in the context of the preferred location).

The Era Stene clay mining operation near Delmas, Mpumalanga Province has been in existence since 1997. It provides clay material to its brick manufacturing plant (also owned and operated by Era Stene) located in Olifantsfontein, Ekurhuleni where various types of bricks are being manufactured for the local market.

The proposed expansion of the existing clay quarry forms part of Era Stene's long-term planning in order to ensure the prolonged life of the clay mining operations by approximately 31 years during phase 1 and to ensure continued employment for those currently working on the mine. The proposed expansion of the clay quarry will also ensure an ongoing supply of clay for the brick manufacturing plant in Olifantsfontein in order to manufacture bricks for the local market.

The area proposed for the expansion of the southern clay quarry is dictated by the location of the clay reserve within the study area. Current infrastructure that is utilised at the existing clay mining operations will be used to service the proposed expansion of the southern clay quarry.

g) Motivation for the preferred development footprint within the approved site including a full description of the process followed to reach the proposed development footprint within the approved site.

NB!! – This section is about the determination of the specific site layout and the location of infrastructure and activities on site, having taken into consideration the issues raised by interested and affected parties, and the consideration of alternatives to the initially proposed site layout.

(i) Details of the development footprint alternatives considered.

*With reference to the site plan provided as **Appendix D** and the location of the individual activities on site, provide details of the alternatives considered with respect to:*

(a) the property on which or location where it is proposed to undertake the activity;

The positioning of the area proposed for the expansion of the existing southern quarry is dictated by the location of the clay reserve in the study area. It is for this reason that the site adjacent to the existing southern clay quarry towards the north east has been identified as being ideal to expand the southern quarry. This property is also owned by Era Stene. Existing infrastructure, such as topsoil stockpiles and clay stockpiles will be used for the expansion as sufficient capacity is available and therefore no additional infrastructure is required.

(b) the type of activity to be undertaken;

No project alternatives were considered for this assessment. The existing mining right was obtained for the sole purpose of mining clay from the existing quarries as described in this report. The activities included in this application were determined by the location of the clay reserve in the study area, and the proposed mining method to be employed (this was assessed and authorised in the existing EMPR for the mine). There is no other means of extracting the clay for brick making purposes other than through an open quarry operation.

(c) the design or layout of the activity;

Similar to the property alternatives discussed above, the proposed design and layout alternatives of the proposed expansion of the southern quarry are limited due to the location of the clay reserve in the study area. Once again it is for this reason that the site adjacent to the existing southern clay quarry towards the north east has been identified as being ideal to expand the southern quarry. No additional infrastructure is planned as existing infrastructure will be used to service the expansion of the existing southern clay quarry.

(d) the technology to be used in the activity;

Standard opencast mining practices will be utilised for the proposed expansion of the southern quarry. No changes to the current mining practices or technology alternatives, as discussed in the authorised EMPR, will be undertaken. The opencast mining method was selected due to the ability to maximise the clay extraction, and to recover the clay reserves in the area. Truck and shovel operations will be used as is currently the case at the existing clay mining operations. One excavator and various hauling trucks (that are currently being used) will be used for transporting the clay material to the existing stockpile areas via the current haul roads at the existing clay mining operations of Era Stene.

(e) the operational aspects of the activity

The operational aspects of the proposed project are outlined in Section (d) above. Therefore, the operational aspects / alternatives are limited to the mining method / technology alternatives already in use as discussed above.

(f) the option of not implementing the activity.

This option, also known as the No-Go option, entails the continuation of the current land use (crop farming) on the study site proposed for the expansion of the southern quarry, without extracting the clay reserves below the surface. Expanding the southern quarry will contribute towards the achievement of providing continued jobs for the current staff, as well as the continued supply of clay material to the brick manufacturing plant in Olifantsfontein which supplies the local market with bricks, and therefore also contributing towards South Africa's economy.

Should the proposed project therefore not be authorised to proceed, it is anticipated that there will be a shortage in the supply of clay to the brick manufacturing plant, which will in turn lead to a shortage in the supply of bricks to the local market. The current employment opportunities will also be terminated once the reserves of the current southern clay quarry have been depleted in the next three to five years.

The No-Go alternative is therefore not a desirable option in this case, as it suggests that the clay reserves should not be exploited, and current employment opportunities should not be prolonged at both the quarry as well as the brick manufacturing plant.

(ii) Details of the Public Participation Process Followed

Describe the process undertaken to consult interested and affected parties including public meetings and one on one consultation. NB the affected parties must be specifically consulted regardless of whether or not they attended public meetings. (Information to be provided to affected parties must include sufficient detail of the intended operation to enable them to assess what impact the activities will have on them or on the use of their land).

The following steps have been undertaken thus far as part of the public participation process in order to notify interested and affected parties of the proposed project:

Announcement Phase

Identification of interested and affected parties

The identification of stakeholders is on-going and is refined throughout the process. As the on-the-ground understanding of affected stakeholders improves through interaction with various stakeholders in the area, the database is updated. According to the NEMA EIA Regulations (Regulation 42 of GNR 982) a register of I&APs must be kept by the public participation practitioner. Such a register has been compiled and is updated with the details of involved I&APs throughout the process.

Authority consultation

The following authorities are consulted throughout the project:

- Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA);
- Department of Environmental Affairs (DEA);
- Department of Water and Sanitation (DWS) – Regional office;
- Department of Agriculture, Forestry and Fisheries (DAFF);
- Department of Mineral Resources (DMR);
- Mpumalanga Tourism and Parks Agency (MTPA);
- South African Heritage Resources Agency (SAHRA);
- Nkangala District Municipality; and
- Victor Khanye Local Municipality.

Announcement of opportunity to become involved

The opportunity to participate in the environmental authorisation processes was announced as follows:

- Distribution of a Background Information Document (BID) containing details of the environmental authorisation process, the proposed project and a registration sheet. The BID was also published on the Jones & Wagener website (www.jaws.co.za). The BIDs were hand delivered to the surrounding landowners;
- A media advertisement was placed in the following newspapers:

Newspaper	Date of publication
Streeknuus	11 March 2016

- Site notice boards were positioned at prominent locations in and around the proposed study area.

Obtaining comment and contributions

The following opportunities were available during the Scoping phase for contribution from I&APs:

- Completing and returning the registration/comment sheets; and
- Providing comment telephonically or by email to the public participation office.

Comment s and Responses Report (CRR)

The first version of a Comments and Responses Report (CRR) was appended to the Final Scoping Report (FSR) and included the comments from stakeholders on the announcement of the project and their comments on the Consultation Scoping Report (CSR).

A second version of the CRR was appended to the Consultation Environmental Impact Report and Environmental Management Programme (CEIR / EMPr) and included comments received from stakeholders on the FSR. The third version of the CRR is appended to this Final EIR / EMPr which includes comments from stakeholders on the CEIR / EMPr.

Scoping Phase

Consultation Scoping Report (CSR)

The purpose of the public participation process during the Scoping phase was to enable I&APs to verify that their contributions have been captured, understood and correctly interpreted, and to raise further issues.

At the end of the Scoping phase, the issues identified by the I&APs and by the environmental technical specialists, were used to define the Terms of Reference for the Specialist Studies which were conducted during the Impact Assessment Phase of the EIA/EMPr.

The availability of the CSR was announced as follows:

- Through a media advertisement; and
- In the BID (hand delivered and emailed) sent out to all individuals and organisations on the stakeholder database.

The CSR was also distributed for comment as follows:

- At public venues within the vicinity of the project area. (These are listed in the table below);
- Mailed in electronic format to I&APs who requested the report.

The notification that the CSR was available for public review, as well as a hard copy and electronic copy of the report were distributed to the authorities listed above.

I&APs could comment on the report in various ways, such as completing the comment sheet accompanying the report and submitting individual comments in writing or by email during the public review period of the CSR. Details of the public places where the CSR was available for public review and comment are indicated in the table below.

Person	Location	Contact
Printed Copies		
Ms Lydia Mehlape	Delmas Public Library	013 665 1831
Electronic Copies		
Anelle Lötter / Sibongile Bambisa	www.jaws.co.za	012 667 4860
	Phone and request a CD copy	

Final Scoping Report (FSR)

The Final Scoping Report (FSR) was made available for a period of 30 days for public comment from 5 May to 3 June 2016. A notification letter that the report was available for comment was emailed to all stakeholders. The report was accessible on the J&W website and stakeholders had the opportunity to contact the public participation office for a copy of the report on CD. Stakeholder comments were to be sent to the DMR case officer copied to the public participation office. Comments received were included in Version 2 of the CRR.

The FSR was accepted by the DMR on 26 September 2016.

EIR / EMPr Phase

The public participation process for the EIR / EMPr involves the following proposed steps:

- Announcement of the availability and public review of the CEIR / EMPr and the Final EIR / EMPr (FEIR / EMPr); and
- Notification of the authorities' decision with regards to the Environmental Authorisation.

Information about each step is provided below.

Announcing the availability of the CEIR / EMPr

A letter was distributed to all registered I&APs, informing them of the progress made with the study and that the CEIR / EMPr was available for comment from 13 January 2017 to 12 February 2017. The report was available at public places as listed in the table above.

Public review of the CEIR / EMPr

The EIA Guidelines specify that stakeholders must have the opportunity to verify that their issues have been captured and assessed before the relevant reports are approved. The findings of the specialist assessments were integrated into the CEIR / EMPr. The CEIR / EMPr was written in a manner that is accessible to stakeholders in terms of language level and general coherence. The CEIR / EMPr included a comprehensive project description, motivation, and description of alternatives considered and also the findings of the assessment and recommended mitigation measures. It included the CRR, which lists every issue raised, with an indication of how the issue was addressed. The findings of the assessment and recommended mitigation measures were also incorporated into the CEIR / EMPr.

Announcing the availability of the Final Reports

After comments on the CEIR / EMPr from I&APs were incorporated, all stakeholders on the database received personalised letters to report on progress made and to inform them that the Final EIR / EMPr (FEIR / EMPr) has been submitted to the competent authority for consideration. I&APs have also been provided the opportunity to comment on the final reports.

Announce authorities' decision on the Environmental Authorisations

The decision of the authorities on whether the Environmental Authorisation has been granted or not will be communicated to stakeholders as specified in the conditions. It is anticipated that the decisions will be communicated through the following methods:

- Notification letters will be sent out to individuals and organisations on the stakeholder database; and
- A media advert will be placed in the local newspaper.

Please refer to **Appendix B** for a detailed description of the Public Participation Process followed for this application, as well as all comments received from I&AP's / stakeholders to date.

(iii) Summary of issues raised by I&APs

(Complete the table summarising comments and issues raised, and reaction to those responses)

Please refer to **Appendix B** for all comments received from I&AP's and stakeholders to date, as well as the Public Participation process being followed for this application. A comprehensive list of the stakeholders that were notified are also included in **Appendix B**.

(iv) The Environmental attributes associated with the development footprint alternatives. (The environmental attributes described must include socio-economic, social, heritage, cultural, geographical, physical and biological aspects)

3. BASELINE ENVIRONMENT

a) Type of environment affected by the proposed activity.

(its current geographical, physical, biological, socio- economic, and cultural character).

Introduction

The purpose of this section is to provide information on the environment in which the proposed expansion of the southern clay quarry will take place, with a view to identify sensitive areas, such as wetlands or other environmental aspects, which need to be considered in the impact assessment. Please refer to **Appendix E** for a copy of the specialist studies undertaken as part of this assessment.

Climate

The site is situated in Mpumalanga Province where the mean annual rainfall is 736 mm. Most of the rainfall occurs during the summer months. The region receives the lowest rainfall during July and the highest during January (Shangoni Management Services IWULA, 2013). The majority of rain events are between October and April. The rainfall pattern decreases significantly during the winter months resulting in rare rainfall events. Evaporation is measured at Station B2E001 for a S Class Pan (**Table 2** below).

Table 2: Average annual precipitation and evaporation (mm).

Date	Rainfall (mm)	Evaporation (mm)
January	143.8	185.8
February	84.8	143.5
March	96.6	133.6
April	42.4	103.7
May	15.0	83.3
June	7.3	65.1

Date	Rainfall (mm)	Evaporation (mm)
July	2.7	73.0
August	8.0	102.6
September	20.3	141.7
October	77.1	165.8
November	114.0	162.5
December	124.5	176.7
Annual	**731.1**	**1524.9**

The project site is located approximately halfway between Johannesburg and Bethal. Temperatures are high during the summer and low during the winter. The coldest months are experienced from June to August while the hottest months range from September to March. The average daily temperatures range from 17°C in June, to 26°C in January. The mean maximum average temperature during the summer months range from 27 to 29.2°C, while during the winter months the mean average minimum temperature ranges from between 5.6 and 7.4°C (Shangoni Management Services IWULA, 2013).

The area also experiences extreme events on a regular basis, including frost, hail, drought, and high speed winds. Annual prevailing winds are north-westerly with an average speed of 15km/h.

Geology

Information regarding the Geology of the study area was obtained from the Geohydrological baseline investigation that was undertaken by J&W during May 2016 (updated in December 2016) for the proposed southern clay quarry expansion.

The regional surface geology over the study area is shown in **Figure 3** below. As can be seen from the geological map, the Era Stene site is situated on the contact between sandstone and shale of the Vryheid Formation (Ecca Group) and the dolomitic rocks of the Malmani Subgroup (Chuniespoort Group). The southern quarry is underlain by the Vryheid Formation, whereas the northern quarry is situated near the contact between the Vryheid Formation and the Malmani Subgroup. The proposed expansion area appears to be located mainly on the Malmani dolomite, but the exact quarry position will be dictated by the extent of the clay reserves on the property and mining will only take place in the Vryheid Formation, not in the dolomite.

Malmani Subgroup – Transvaal Supergroup

According to the geological map (**Figure 3**), the northern quarry at Era Stene is predominantly underlain by dolomite and limestone of the Chuniespoort Group (Malmani Subgroup) which is part of the Transvaal Supergroup of the Vaalian Sequence. Era Stene is, however, only mining for clays in the Vryheid Formation. The full extent of the clay pocket is currently unknown and further exploration will be undertaken to determine the extent of the clay resource. No mining is planned within the dolomite.

Vryheid Formation – Karoo Supergroup

The southern quarry is underlain by the Vryheid Formation which is part of the Ecca group and the Karoo sequence of rocks. The Vryheid Formation comprises mudrock, rhythmite, siltstone and fine- to coarse-grained sandstone (pebbly in places). Regionally, the Formation

contains up to five mineable coal seams. The lower Vryheid Formation can be described as upwards-coarsening shale and sandstone cycles, which represent prograding deltaic environments. This in turn is overlain by upwards-fining sandstone and shale cycles, which are of a fluvial origin.

The shale of the Vryheid Formation is known to weather into soils with high clay content and considerable expansion properties which may result in stability issues. The soil media and texture can be described as a sandy-clay-loam derived from the weathering of parent rock. Sections of the Vryheid Formation and Chuniespoort dolomites in close proximity to the study area are overlain by alluvium, especially along river floodplains.

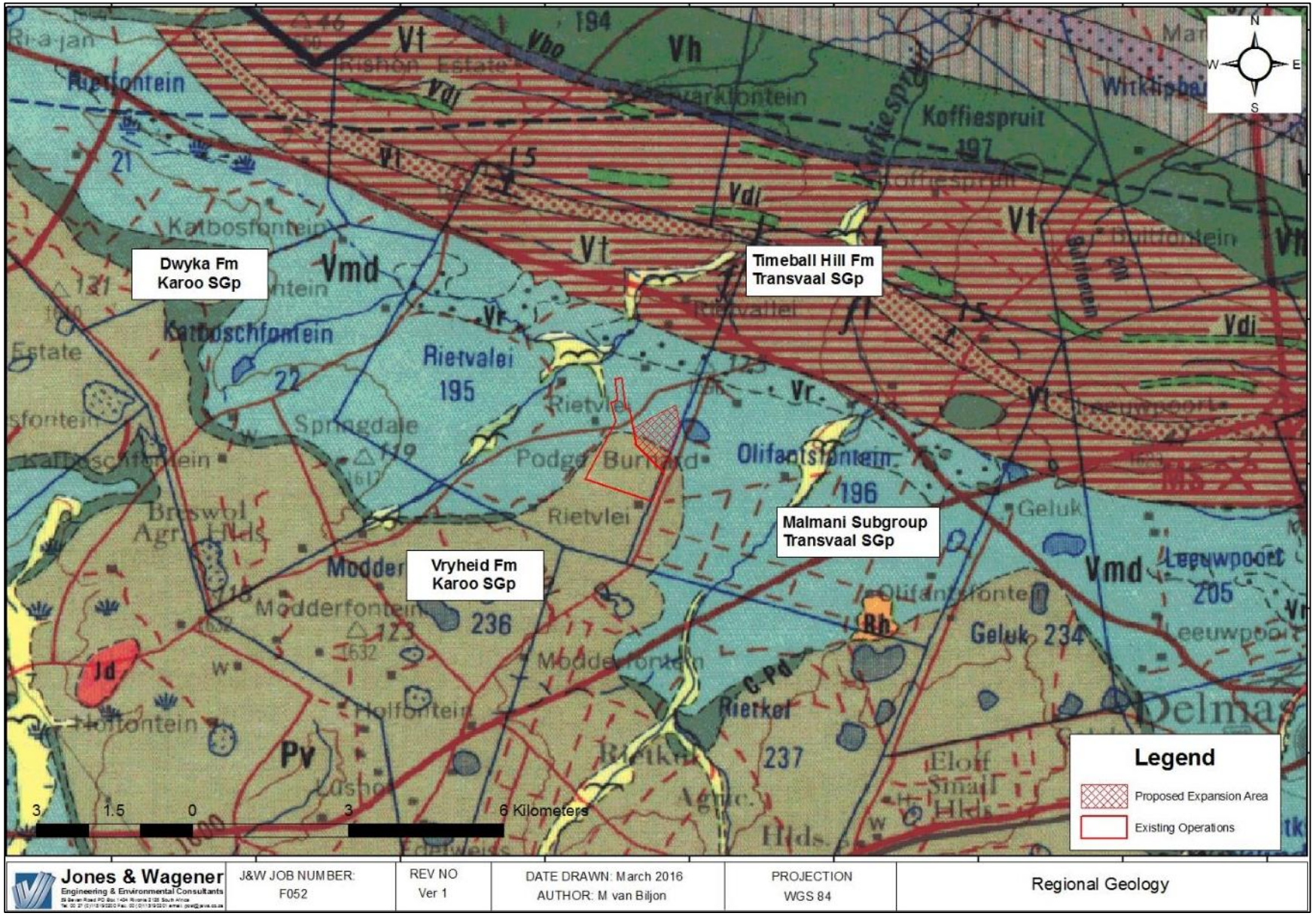


Figure 3: Regional surface geology.

Soils, Land Capability and Wetlands

Information regarding the soils and land use was obtained from the Soils, Land Capability and Wetland Assessment that was undertaken by J&W during April 2016 for the proposed expansion of the Era Stene southern clay quarry.

Soils

A distinct relationship between topography and dominant soil forms in the area was noted during the investigation that was undertaken. The soil forms in the study area are summarised below and shown in **Figure 4**. The soil auger holes are also indicated on **Figure 4** and the relevant information per auger hole is attached in Appendix C of the Soils, Land Capability and Wetland Assessment report.

- Hutton (Hu) / Bainsvlei (Bv)

The Hutton Form is generally dominant over those areas defined by crestal topography i.e. high lying flat areas and upper side-slope areas. The soils in these areas are defined by the occurrence of an Orthic A – horizon underlain by a red apedal B-horizon typically in excess of 1,0m below ground level. A soft plinthic B-horizon underlying the red apedal B-horizon was occasionally encountered in these areas. The occurrence of a soft plinthic B-horizon would therefore tend towards a Bainsvlei Form classification. However, the soft plinthic layer typically occurs deeper than 0.7 m below ground level and as such does not lie within the effective rooting depth of 750 mm below ground level. This soil form is typical of a good agricultural potential with a land capability classification of arable land.

- Avalon (Av) / Clovelly (Cv)

This soil form is typically found on the mid to lower side slopes within the study area and is defined by the regular occurrence of a soft plinthic B-horizon. An Orthic A – horizon and yellow apedal B-horizon overlie this plinthic horizon. Where the soft plinthic horizon occurs at depths greater than 750 mm (effective rooting depth) the soil profile tends towards a Clovelly Form. This soil form is generally of moderate agricultural potential. These areas are suitable for use as arable land.

- Witbank (Wb)

The Witbank soil is found in areas where humans have altered to soil to a state that it no longer qualifies as any of the diagnostic soil forms. In the case of the site assessment the soils in the pits as well as the various mining areas have been classified as Witbank soils. Witbank areas have no agricultural potential and classify as wilderness land. The soil has low agricultural potential as a result of having a rooting depth of less than 250 mm. The pre-mining land capability for these areas would classify as wilderness land.

- Longlands (Lo) / Wasbank (Wa)

These soil forms are similar in that their topographic expression is characterised by low lying areas representing the pan feature. The soil forms are also similar in that they have hydromorphic characteristics and are either temporarily or seasonally saturated. The Longlands Form is comprised of an Orthic A-horizon underlain by a leached E-horizon and is distinguished by the occurrence a soft plinthic B-horizon at the base of the Longlands Form. Leaching within the E-horizon indicates a lack of soil nutrients.

The Wasbank Form comprising an Orthic A-horizon, also underlain by an E-horizon but here the soft plinthic horizon has hardened into a hard plinthic horizon. The areas in which these

soil forms are encountered are of low agricultural potential and classify as temporary or seasonal wetlands.

- Land Capability

A literature review was conducted in order to obtain any relevant information concerning the area, including information from the Environmental Potential Atlas (ENPAT), Weather Bureau and Department of Agriculture. Results from the soil study were taken into account when determining the agricultural potential also known as the land capability of the site. The land capability assessment methodology as outlined by the National Department of Agriculture, 2002 was used to assess the soil's capability to support agriculture on site.

According to the land capability methodology, the potential for a soil to be utilised for agriculture is based on a wide number of factors. These are listed in **Table 3** below along with a short description of each factor.

Table 3: Agricultural Potential criteria

Criteria	Description
Rock Complex	If a soil type has prevalent rocks in the upper sections of the soil it is a limiting factor to the soil's agricultural potential
Flooding Risk	The risk of flooding is determined by the closeness of the soil to water sources.
Erosion Risk	The erosion risk of a soil is determined by combining the wind and water erosion potentials.
Slope	The slope of the site could potentially limit the agricultural use thereof.
Texture	The texture of the soil can limit its use by being too sandy or too clayey.
Depth	The effective depth of a soil is critical for the rooting zone for agricultural crops.
Drainage	The capability of a soil to drain water is important as most grain crops do not tolerate submergence in water.
Mechanical Limitations	Mechanical limitations are any factors that could prevent the soil from being tilled or ploughed.
pH	The pH of the soil is important when considering soil nutrients and hence fertility.
Soil Capability	This section highlights the soil type's capability to sustain agriculture.
Climate Class	The climate class highlights the prevalent climatic conditions that could influence the agricultural use of a site.
Land Capability / Agricultural Potential	The land capability or agricultural potential rating for a site combines the soil capability and the climate class to arrive at the sites potential to support agriculture.

The soils identified above were classified according to the methodology proposed by the Agricultural Research Council – Institute for Soil, Climate and Water (2002). The criteria mentioned above were evaluated in the table below. The site is made up of two main land capability classes, namely Class II – cultivation and Class VII and VIII – grazing. The Class

II soils are suitable for cultivation and can be used for a range of agricultural applications. The Class VII and VIII soils have continuing limitations that cannot be corrected; in this case rock complexes, clay, flood hazard, stoniness, and a shallow rooting zone constitute these limitations. A summary of the dominant soil forms in the study area and land use capability is given in **Table 4** below.

Table 4: Summary of the land capability of the soil forms in the study area

Soil	**Hutton/ Bainsvlei**	**Clovelly/ Avalon**	**Witbank**	**Wasbank/ Longlands**
% on Site	17.6%	58.4%	15.3%	8.7%
Rock Complex	None	None	Yes	Ferricrete
Flooding Risk	No	No	No	High
Erosion Risk	Low	Low	High	Very Low
Slope %	3.9	3.7	4.0	0.5
Texture	Loam	Clay - Loam	Mixed	Clay
Effective Depth	> 120 cm	> 120 cm	< 30 cm	< 60 cm
Drainage	Good	Good	Imperfect	Poorly drained
Mech Limitations	None	None	Rocks	Ferricrete
pH	> 5.5	> 5.5	> 5.5	> 5.5
Soil Capability	Class II	Class II	VIII	VI
Climate Class	Mild	Mild	Mild	Mild
Land Capability	**Class II – Arable Land**	**Class II – Arable Land**	**Class VIII – Light Grazing/Wildlife**	**Class VII – Moderate Grazing Land**

No limitation	Low	Moderate	High	Very Limiting

In terms of the Land Capability hierarchy, the best use of soils is for the agricultural production of food. This is followed by grazing land and then the rest of the uses. With this in mind the *high potential* agricultural soils should be treated as a valuable resource (Refer to **Figure 4** below). Further to this, the wetland/pan soils should also be regarded as sensitive.

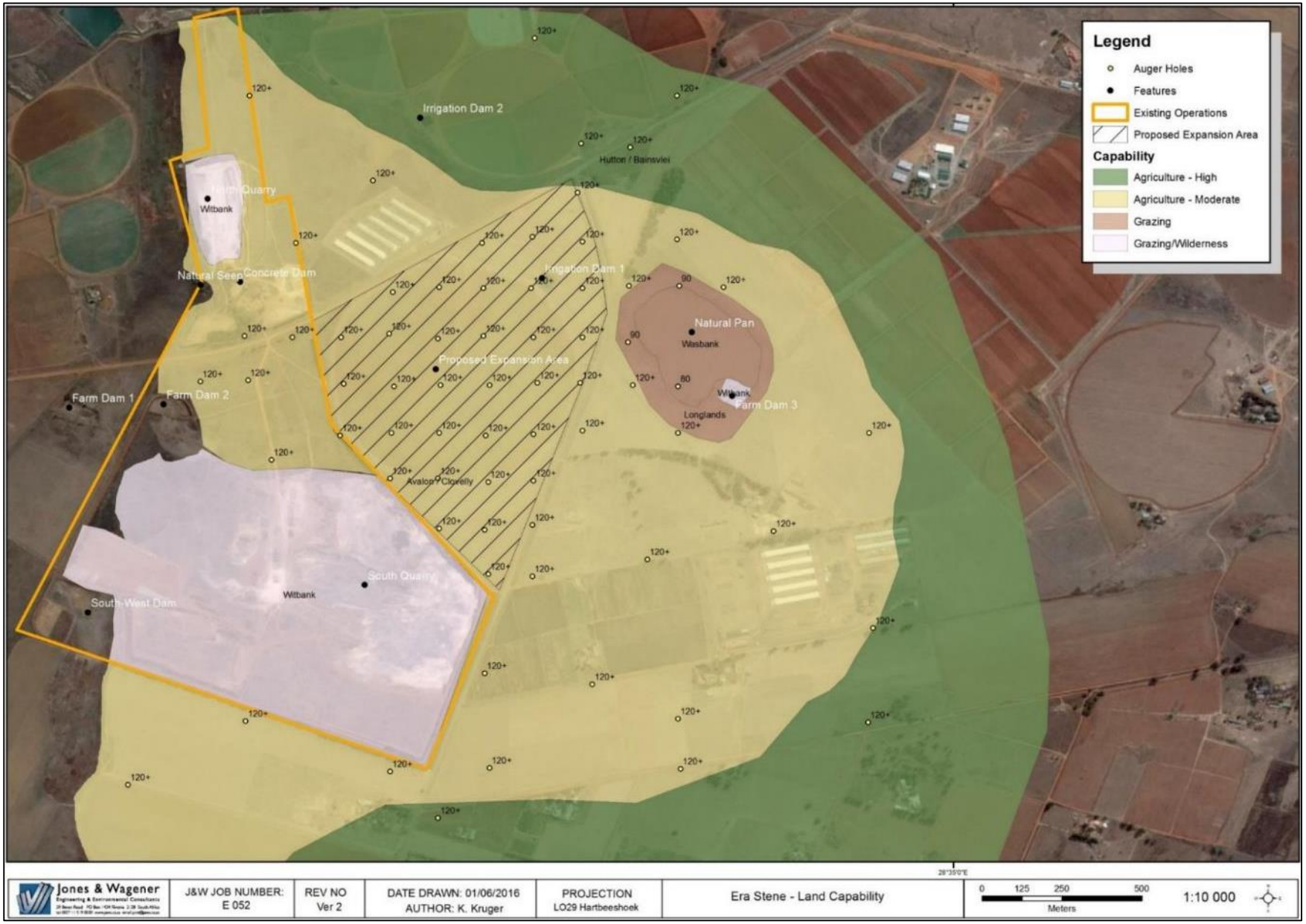


Figure 4: Land Capability of the Study Site

Wetlands

The Era Stene clay mining operation is located in drainage Region B, the Olifants River catchment. At a local scale the site is situated in quaternary catchment B20B. The general drainage on the property is from south to north. The site was investigated for the occurrence of wetlands and riparian areas, using the methodology of the Department of Water and Sanitation (DWS, previously known as the Department of Water Affairs and Forestry -DWAF) guideline, 2005: *A practical guideline procedure for the identification and delineation of wetlands and riparian zones*.

A few small streams drain through the area towards the Bronkhorstspruit Dam to the north. The main streams are the Koffiespruit, Blesbokspruit and the Bronkhorstspruit. The main terrain unit present in the study area is the side slope unit. In addition, the valley bottom, floodplain and crest units also occur. According to the DWS guidelines the valley bottom is the terrain unit where wetlands are most likely to occur, but the occurrence of wetlands is not excluded from any of the other terrain units. Using the methodology for the delineation of wetlands by the DWS as mentioned above, various wetlands were identified in the study area.

Delineation is often the first step in wetland studies; however, the South African Biodiversity Institute (SANBI) proposes that the delineated wetlands also be classified. The classification was based on the method as defined in the National Wetland Classification System for South Africa, developed by the Freshwater Consulting Group for SANBI and the Working for Water Group.

This classification system has 6 levels of classification that in the end of level 5 described the functional wetland unit. This identification of the functional unit was the aim of the wetland assessment. The classification of the wetlands within the study area proceeded as follows:

- Desktop Assessment of Level 1 – 3 classifications; and
- Field verification of Level 3 classification and delineation of Level 4 and 5 units.

Using the methodology above, the wetland types described in **Table 5** below were identified and delineated on site. Please refer to **Figure 5** below for a map of the wetlands identified within the study area as well as the position of the proposed expansion of the southern clay quarry.

Table 5: Wetland types identified in the study area

System	Ecoregion	Setting	Hydrogeomorphic Unit	Hydrological Regime
Inland	Highveld	Plain	Channelled valley bottom wetland	Seasonal
			Un-channelled valley bottom wetland	Temporary
			Seep	Seasonal
			Depression/Flat	Temporary

The National Freshwater Ecosystem Priority Area (NFEPA) database lists the pan as well as the two dams to the west of the site as natural wetlands, however the two dams are artificial systems. The desktop Present Ecological Status (PES) assessment undertaken by the DWS in 1999 rated this system as a Class C – Moderately Modified system. The same applies for the pan depression.

In terms of the National Water Act, all wetlands are regarded as sensitive features that should be avoided. **Figure 5** below also illustrates the 100m buffer zone around the identified wetlands as prescribed by the Mpumalanga Tourism and Parks Agency (MTPA). As all of the wetlands are only temporary and seasonal wetlands, they are not as sensitive as permanent wetlands, however they should still be avoided.

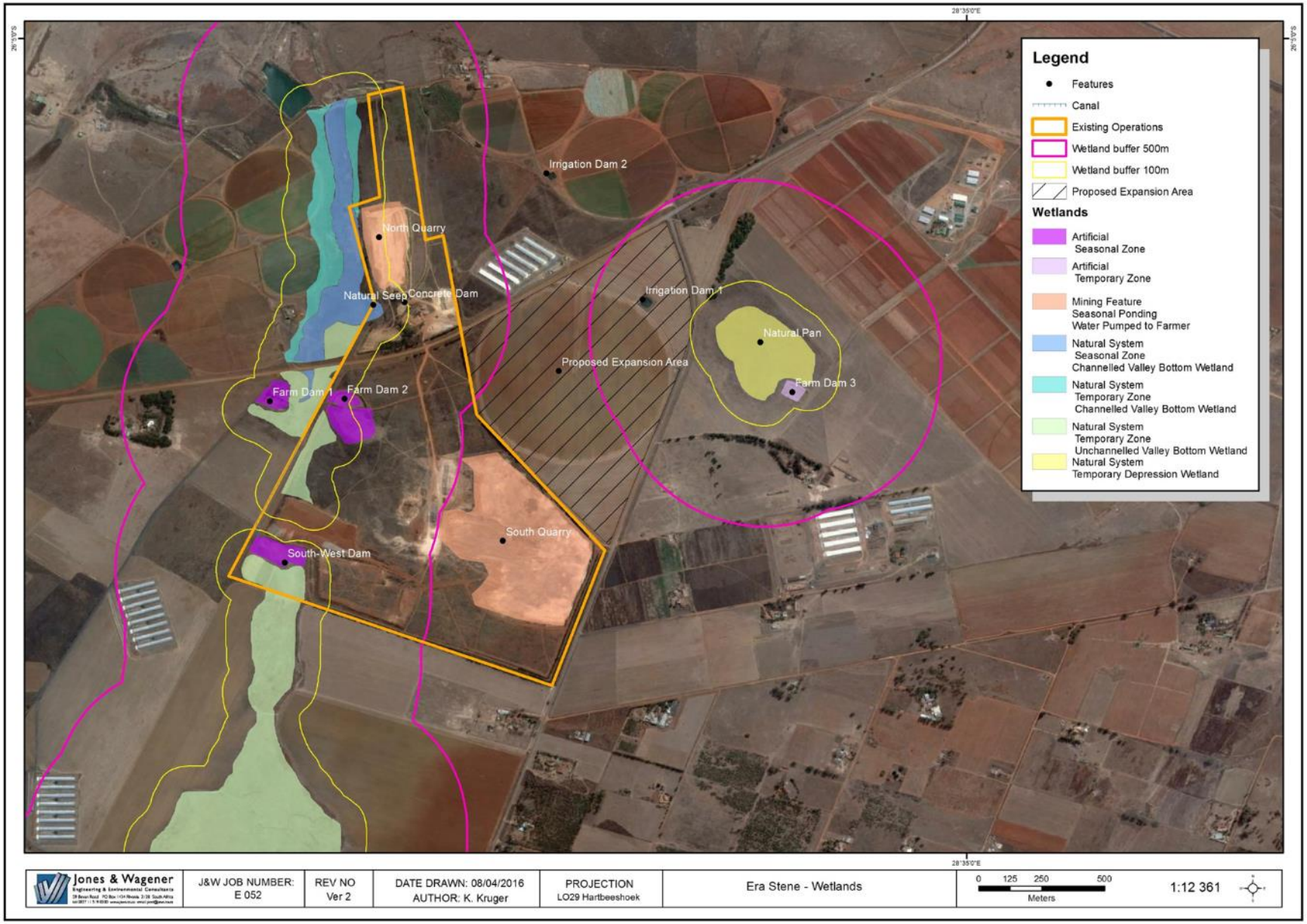


Figure 5: Identified wetlands including buffer zones

Ecology

The information below was obtained from the Ecological Assessment that was undertaken by Pachnoda Consulting during April 2016 for the proposed expansion of the Era Stene southern clay quarry.

The expansion area falls within the Grassland Biome and more particularly the Mesic Highveld Grassland Bioregion as defined by Mucina & Rutherford (2006). In addition, the natural vegetation on the study site is regionally classified as Eastern Highveld Grassland. Approximately 30 % of the study site, encompassing both pristine and transformed grassland, constitutes of Eastern Highveld Grassland. This grassland is restricted to undulating plains and includes a number of low hills and pan depressions. The vegetation is short and dominated by graminoid species of the genera *Themeda, Aristida, Agrostis* and *Eragrostis*. Nearly 44 % of this grassland type is already transformed by cultivation, coal mining and the creation of artificial impoundments.

The broad-scale habitat units that are encountered on the study site are depicted in **Figure 6** below. These include secondary grassland, and transformed habitat.

Secondary Grassland

This habitat unit is confined to the edge of the cultivated land and the road reserves, whereby it is a grassland characterised by a secondary or mid-successional floristic composition induced by existing and persistent disturbances. This habitat type does not contain suitable habitat for any plant species of conservation concern. It is also of small surface area, fragmented, thereby contributing little towards ecological connectivity, and is predicted to contain a low faunal richness of widespread and unspecialised (generalist) taxa. The dominant richness is composed of secondary taxa which renders the unit with a low ecological sensitivity.

Transformed Habitat

This habitat type is confined to the irrigation dam and cultivated land (**Figure 6**). The cultivated land is an artificial assemblage of tilled land utilised for the production of maize. It represents the largest surface area of all the habitat types on the study site. This unit is cleared of any native vegetation and accommodates a monoculture of *Zea mays*, although a variety of agrestal weed species contributed to its composition.

The irrigation dam is not suited for faunal colonisation and merely provides habitat for a few individuals of Red-knobbed Coot (*Fulica cristata*) and Yellow-billed Duck *(Ana undulata*). In addition, it is surrounded by steep sloping wall structures that will discourage faunal colonisation.

The transformed habitat does not contain suitable habitat for any plant species of conservation concern (*sensu* Raimondo *et al.,* 2009) and is of low ecological sensitivity.

Natural Depression/Pan

A natural depression/pan is located to the east of the expansion area, and is highly altered by persistent grazing and trampling by livestock (**Figure 7**). The pan could, however, during optimal conditions, (e.g. when inundated) provide ephemeral foraging habitat for a range of threatened and near- threatened bird species. The pan is surrounded by heavily grazed grassland dominated by *Eragrostis plana, Falckia oblonga* and *Senecio erubescens*. Other noteworthy plant species include *Sporobolus africanus, Cynodon dactylon, Eragrostis curvula, Seriphium plumosum Centella asiatica* and *Hypochaeris radicata*. Areas containing saturated soils, mainly on the central basin, is colonised by facultative wetland plants such as *Eleocharis dregeana, Panicum repens, Paspalum dilatatum* and *Kyllinga erecta*.

The pan, based on its important functional ecological properties (e.g. in providing potential ephemeral foraging habitat for many bird species of conservation concern) is of high ecological sensitivity.

Threatened, Near-Threatened and Declining Plant Species

No Red or Orange Listed plant species with known distribution patterns which fall across the study area were observed on the study area. One species of conservation concern could however be present on the pan located towards the east of the study site across the road.

Protected Plant Species

Schedule A of the National Forests Act (Act 84 of 1998) lists 47 tree species that are Protected in South Africa. In terms of the National Forests Act, a licence should be granted by the Department of Forestry and Fisheries (DAFF) prior to the removal, damage or destruction of any individual tree. No protected tree species occur on the study site.

The National Environmental Management: Biodiversity Act (Act 10 of 2004, as amended in 2013), is intended to protect plant and animal species that are directly threatened by utilisation or illegal trade. The Act assigns four categories namely Critically Endangered, Endangered, Vulnerable and Protected to species threatened by utilisation. The destruction, collection or trading of any species listed in the Act requires a permit which must be obtained from the relevant authority. No species as explained above could occur on the study site.

A number of plant species occurring in Mpumalanga Province are not considered to be threatened or near-threatened (*sensu* Raimondo *et al*., 2009), but are protected under Schedule 11 of the Mpumalanga Nature Conservation Act (No.10 of 1998). A permit is required to remove or disturb a protected plant. It is recommended that protected plants in danger of becoming destroyed during any of the planned activities be removed prior to the commencement of construction activities and be relocated to transformed or degraded habitat of potentially suitable nature within the study area, or used during landscaping. No species as explained above was observed on the study site.

Declared Weeds and Invader Plants

Invaders and weed species are plants that invade natural or semi-natural habitats, especially areas disturbed by humans, and are commonly known as environmental weeds. Weeds that invade severely disturbed areas are known as ruderal and agrestal weeds. Most of these weeds are annuals colonising waste sites and cultivated fields. These weeds only persist on recently disturbed areas and seldom invade established areas (Henderson, 2001).

The only noteworthy species observed on the study site was *Acacia dealbata*. This species is a Category 2 invasive species and since the area is not a registered plantation, it should be treated as a Category 1b species. This species must be controlled (preferably eradicated) on site.

Vertebrates of conservation concern

The study area mainly consists of transformed land, which provides habitat for synanthropic and unspecialised fauna taxa. Therefore, the probability for taxa of conservation concern to occur is deemed to be low.

However, the pan located east of the study site across the road, provides potential ephemeral habitat for certain bird and mammal taxa during optimal conditions. These include the Yellow-billed Stork (*Mycteria ibis*; regionally endangered), Black Stork (*Ciconia nigra*, regionally vulnerable), Lesser Flamingo (*Phoeniconaias minor*, globally near-threatened), Greater Flamingo (*Phoenicopterus roseus*, regionally near-threatened), Maccoa Duck (*Oxyura maccoa*, globally near-threatened) and the near-threatened Serval (*Leptailurus serval*).

However, these species are considered as uncommon or irregular foraging visitors to the study area.

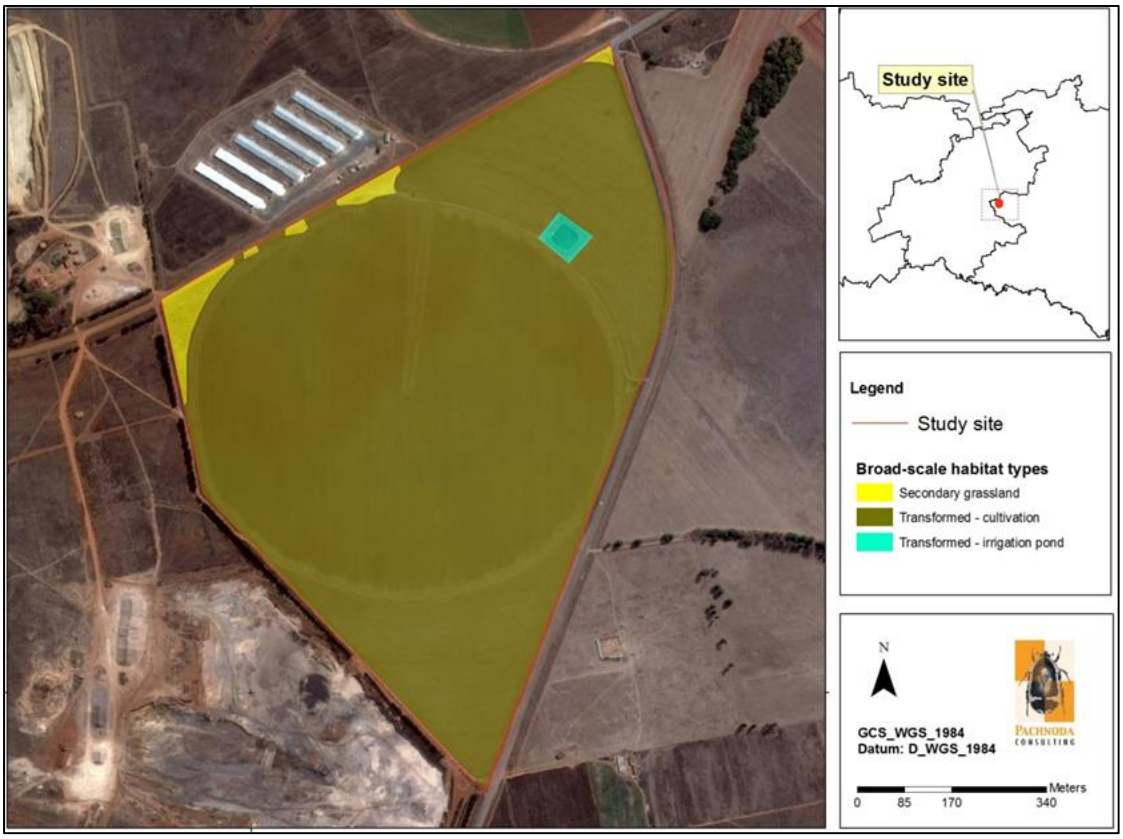


Figure 6: Broad-scale habitat types on the study site

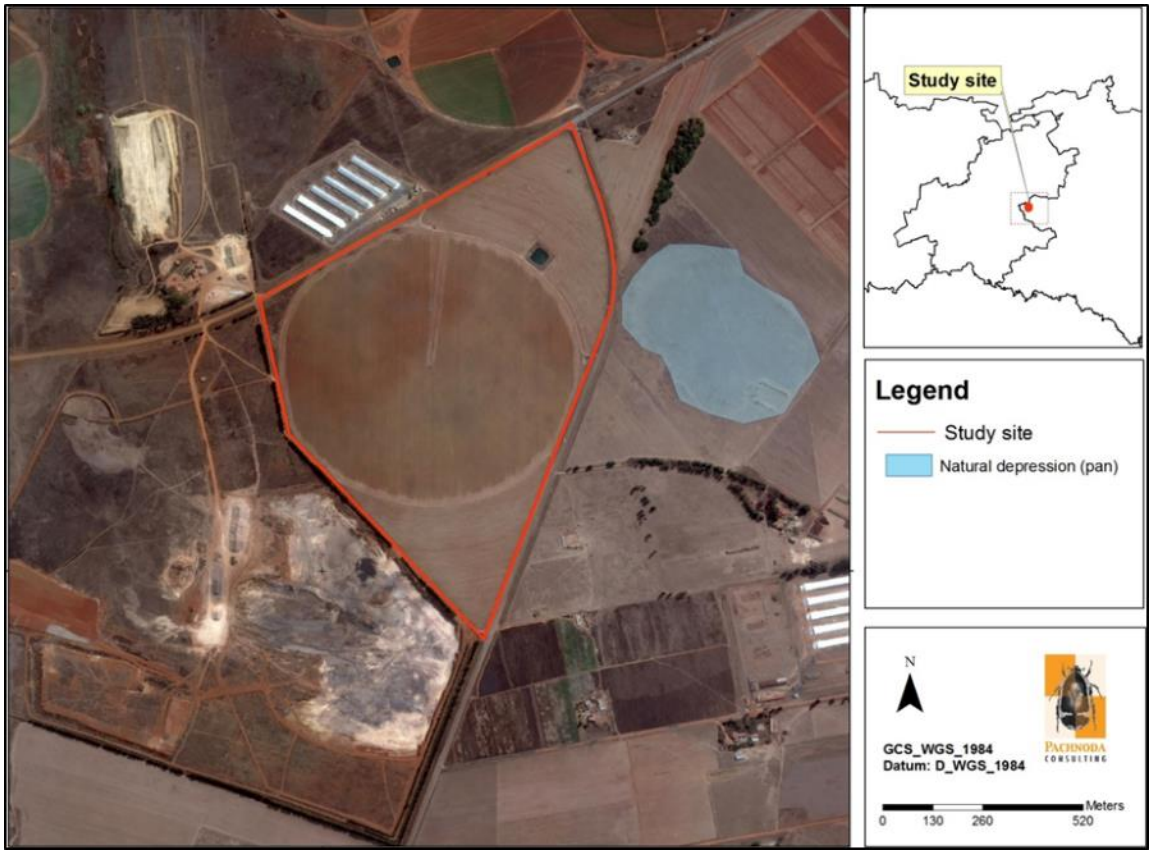


Figure 7: Locality of the nearby natural depression/pan

Groundwater / Geohydrology

Information regarding the groundwater was obtained from the Geohydrological Baseline Assessment that was undertaken by J&W during May 2016 (updated in December 2016) for the proposed expansion of the Era Stene southern clay quarry.

The geohydrology of the study area was assessed using available data and other than a 2km radius hydro census no additional fieldwork was undertaken. The geohydrology is described under the following headings:

- Boreholes used in evaluation;
- Aquifer type;
- Groundwater gradients and flow;
- Groundwater chemistry;
- Aquifer classification, and
- Aquifer vulnerability.

Boreholes Used in Evaluation

As part of the Geohydrological investigation, a hydro census was undertaken. The aim of the hydro census was to establish borehole details such as borehole co-ordinates, estimated yields, water levels, water quality, water use types and volumes. All boreholes within a 2km radius of the Era Stene site were identified and where possible, a water level was measured in the field.

During the hydro census, neighbouring farmers and relevant borehole owners (boreholes within a 2km radius of the Era Stene site) were contacted and discussions were held in order to obtain additional information about their boreholes. When possible, historical monitoring data was obtained during these discussions and were used in the interpretation of the investigation. The monitoring results obtained from the farmers are included in Appendix C of the Geohydrological study.

In addition to the water levels measured in the field from the available boreholes, a list of registered boreholes within the B20B quaternary catchment was obtained from the DWS in which historic water levels were included.

Figure 8 below illustrates the locations of the hydro census boreholes (within a 2km radius of the Era Stene site), as well as the regional boreholes located within a 6km radius of the site as provided by DWS.

Following the initial assessment of the geohydrology (J&W Report No: JW066/16/F052, May 2016) it was concluded that there is some uncertainty as to the relationship between the different aquifers that are potentially being impacted on by the quarry and the aquifer that is being utilised by the local users. To improve this understanding and to establish a suitable groundwater monitoring network, five new boreholes were drilled. The localities of these new boreholes are shown in **Figure 9.**

The aim of the drilling was to establish a monitoring network that can distinguish between the shallower Karoo aquifer and the deeper dolomite aquifer. Three boreholes were drilled to monitor the Karoo aquifer and two boreholes to monitor the dolomite aquifer.

The clay mining occurs within the shallower Karoo aquifer, which is not commonly considered a significant aquifer. The deeper, dolomite aquifer is, however, considered a major aquifer and although no details are available, it is suspected that the local groundwater users mainly

taps from this aquifer. In order to determine the impact from the clay mining on the groundwater it is important to evaluate the aquifers separately.

The rationale for the placement of the new boreholes is as follows:

- ES16-BH1D: This borehole was drilled into the dolomite aquifer on the up-gradient side of the site, firstly to determine the thickness of the Karoo strata and to monitor the water in the dolomite aquifer. The Karoo formations were sealed off to only monitor the dolomite aquifer. The drilling has, however, shown that the Karoo attains a thickness of 13m in this area.
- ES16-BH1S: This shallow borehole was stopped above the dolomite, at the top of the Dwyka tillite, so as to monitor the water in the Karoo aquifer. The Dwyka tillite is considered an aquiclude (impermeable formation) that prevents the downward migration of groundwater.
- ES16-BH2D: This borehole was drilled into the dolomite aquifer and it was found that the Karoo formations are absent in this area.
- ES16-BH3S: The aim of this borehole is to monitor the Karoo aquifer and was stopped in the Dwyka tillite at 23m. Based on the thickness of the tillite in borehole ES16-BH1D, it is estimated that the Karoo attains a thickness of 26m in this area.
- ES16-BH4S: The aim of this borehole is to monitor the Karoo aquifer and was stopped above the dolomite at 16m. There was limited sample return from 13-16m, probably due to the drill bit being blocked. Based on the driller's logs and penetration rates, it is assumed that a bedrock profile was encountered at 16m. It is estimated that the Karoo attains a thickness of 20m in this area.

Aquifer Type

This section outlines the general geohydrological characteristics of the various lithostratigraphic units encountered in the study area. In order to fully understand the geohydrological properties of the study area, an understanding of the various aquifers underlying the site is imperative. The DWS has characterised South African aquifers based on the rock formations in which they occur and its capacity to transmit water to boreholes drilled into specific formations.

As previously mentioned, the Era Stene site extends over two different geological formations (i.e. the Vryheid Formation and the Malmani Subgroup). There are two aquifers present in the immediate vicinity of Era Stene, the Karoo aquifer and the Dolomite aquifer. The Karoo aquifer is limited in extent, whereas the Dolomite aquifer is a major aquifer and the primary source of groundwater to private users. Era Stene mines clay from the Karoo sediments and therefore will have a larger potential to impact on the Karoo aquifer.

Groundwater Gradients and Flow

The first important aspect when evaluating the geohydrological regime and groundwater flow mechanisms is the groundwater gradients. Groundwater gradients, taking into consideration fluid pressure, are used to determine the hydraulic head which is the main driving force behind groundwater flow. Groundwater flow within the study area is mainly controlled by the geology of the region and it is known that in most geological terrains the groundwater typically mimics the topography. Because contaminants generally move in the direction of groundwater flow, contaminant movement may also be predicted.

Typically, a linear relationship should exist between the depth to groundwater and the topography, due to the fact that groundwater normally drains under gravity towards streams and rivers. The boreholes included in the hydro census were evaluated either to prove or disprove if this concept is valid for the study area. A good correlation of 89% is observed between the Karoo/Transvaal groundwater level and the topography. This indicates that the

groundwater level mimics the topography and that groundwater flow will be similar to that of surface water run-off. The correlation between the dolomite aquifer and the topography is not as well defined, but a 66% correlation indicates that there is some resemblance to the topography. Generally, the groundwater gradient in the dolomite aquifer is a relatively flat surface due to higher aquifer parameters.

A regional groundwater level map was produced using the Bayesian interpolation that takes cognisance of the measured groundwater levels as well as the relationship with the topography. The regional groundwater gradient map indicating the groundwater flow in the vicinity of Era Stene is presented in **Figure 10** below. As can be seen from this map, the groundwater flow is predominantly in a northerly direction towards the tributary of the Koffiespruit. A smaller component will be flowing in an eastern direction towards the Koffiespruit.

Groundwater Chemistry

The following section discusses the hydrochemistry around the Era Stene site, based on water samples collected during the hydro census and on available information obtained from the neighbouring farmers as well as the newly drilled boreholes. During the hydro census a total of five samples were collected, including four groundwater samples and one surface water sample. The samples collected were submitted to Waterlab (Pty) Ltd, a SANAS accredited laboratory in Pretoria, for major cation and anion analyses to determine the water quality in the area. Groundwater chemistry results for boreholes Peca and Riverside were supplied by the owners.

The groundwater chemistry results indicate that the groundwater quality is exceptionally good. Only nitrate (N) reading exceeds the guideline limit in borehole Peca and lead (Pb) in boreholes F Smit, G Pedra and Pioneer. The origin of the slightly elevated lead concentrations is unclear at the moment, but there is no evidence to suggest that it is derived from the quarry. The lead concentration in the quarry water sample is below the detection limit.

The turbidity count of the surface water sample collected from the southern quarry is very high. This indicates that there is a high concentration of suspended solids in the water and may give the water an unpleasant taste. The reason for this high value may be due to the fact that the water was disturbed when the sample was collected i.e. as the sample was collected, solids may have been trampled on resulting in them being suspended in the water as the sample was collected.

The groundwater samples that were taken are indicative of dolomitic water. This is as expected, as most of these boreholes are located in the Malmani Dolomites (karst). Boreholes Daybreak 1 and F. Smith 1 are possibly located in the Vryheid Formation, but still have a dolomitic signature. The reason for this may be that the boreholes have been drilled through the Vryheid Formation and into the underlying Malmani Dolomites. Due to lack of information relating the construction of the borehole, it is difficult to say whether or not mixing of the two aquifers has taken place within these boreholes making it difficult to distinguish between the two aquifers.

The surface water sample collected from the south quarry has a very different chemical signature to those of the dolomite groundwater samples and is more typical of the characteristics of the newly drilled shallow Karoo boreholes. The chemistry of the water in the South Quarry is in fact relatively similar to what we would expect in natural rainwater. The water in the North- and South Quarries at Era Stene reportedly accumulates mostly via direct rainfall and stormwater run-off. It is therefore likely that the main source of water within the Southern Quarry is rainwater.

Aquifer Classification

Considering the geology and the hydrogeology characteristics of the study area as well as the available information from previous studies and the hydro census, the two aquifer systems directly underlying the Era Stene site can be summarised as follows:

- Malmani Subgroup (Dolomite Aquifer)

This aquifer system consists predominantly of dolomitic rock, limestone and chert in places. The aquifer directly underlies the site in the northern portion of the study area and is overlain by the Vryheid Formation in the south. According to Shangoni (2012), large scale abstractions from the Bapsfontein/Delmas compartment mostly for irrigational and domestic use occur in the vicinity of the study area. This aquifer system is classified as a C5 karst aquifer. Based on the findings in the Geohydrological Assessment and according to Parson's aquifer classification, this aquifer can be regarded as a Major or Sole Aquifer in some instances.

- Vryheid Formation (Karoo Aquifer)

The Vryheid Formation comprises predominantly of thick beds of sandstone with alternating layers of shale. The aquifer directly underlies the site in the southern portion of the study area. The sandstones are considered to be poorly sorted and therefore have low permeabilities. The groundwater yield potential for this aquifer is low and is therefore classified as a D2 intergranular and fractured aquifer. Based on the findings and according to parson's aquifer classification, this aquifer can be regarded as a Minor Aquifer.

Due to the importance of the dolomite aquifer and the need to protect it, it is therefore important that the mine put certain measures in place to show that it is not impacting on the groundwater.

Aquifer Vulnerability

Groundwater plays an important role in supplying water to many regions of Southern Africa due to its low annual average precipitation of 460 mm, which is well below the world average of 860 mm. The area surrounding Era Stene is no exception and there is a high dependency on groundwater on neighbouring properties.

The quality of groundwater resources in South Africa has therefore received considerable focus and attention on the need for a proactive approach to protect these sources from contamination (Lynch *et al*., 1994). Groundwater protection therefore needs to be prioritised based upon the susceptibility of an aquifer towards pollution. One way in which this can be achieved is through an aquifer vulnerability assessment. Such an assessment considers the characteristics of the aquifer itself or parts of the aquifer in terms of its sensitivity to being adversely affected by a contaminant should it be released.

Although the dolomite aquifer is at risk according to the "DRASTIC" assessment as contained in the Geohydrological Assessment, no mining would take place in this formation, therefore reducing the risk of contamination. Mining operations only take place within the Vryheid Formation and the mining itself has limited pollution potential. It is, however, important to note that the attenuation properties of the remaining soil / rock formation have been greatly reduced by the mining. Post-closure options for the quarry should consider this and the placement of waste in the quarry is not recommended.

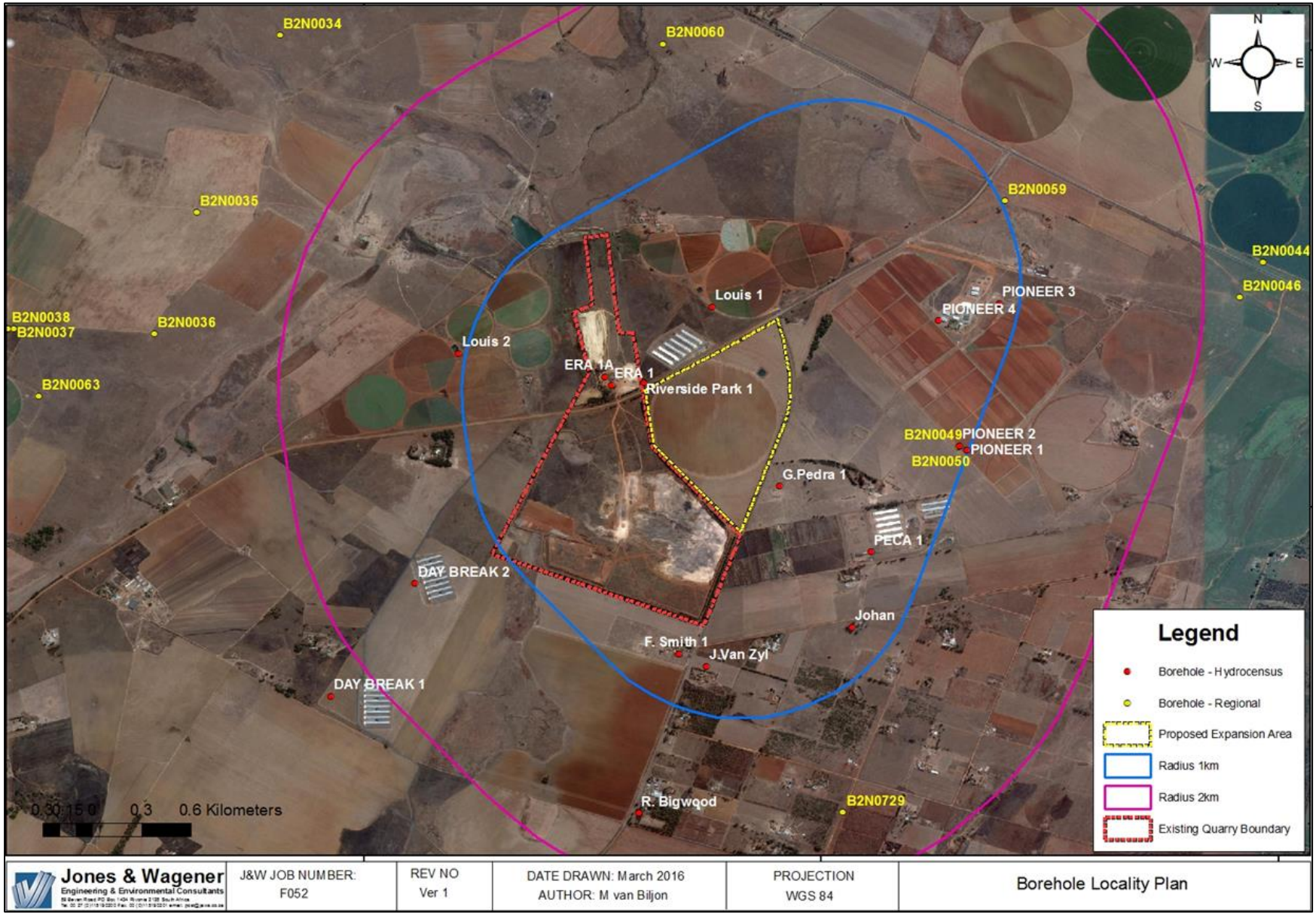


Figure 8: Borehole locality plan

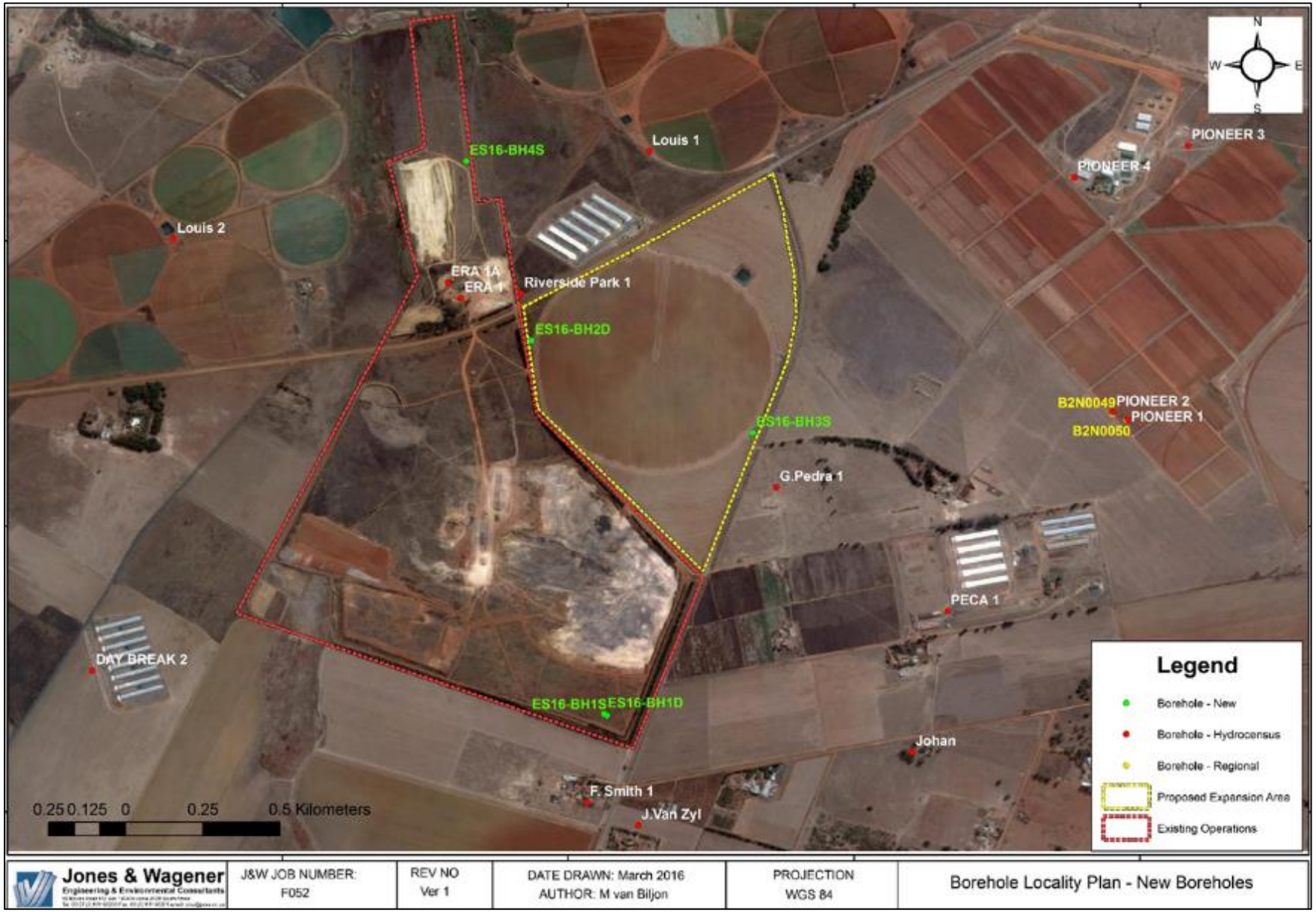


Figure 9: Borehole locality plan – additional boreholes

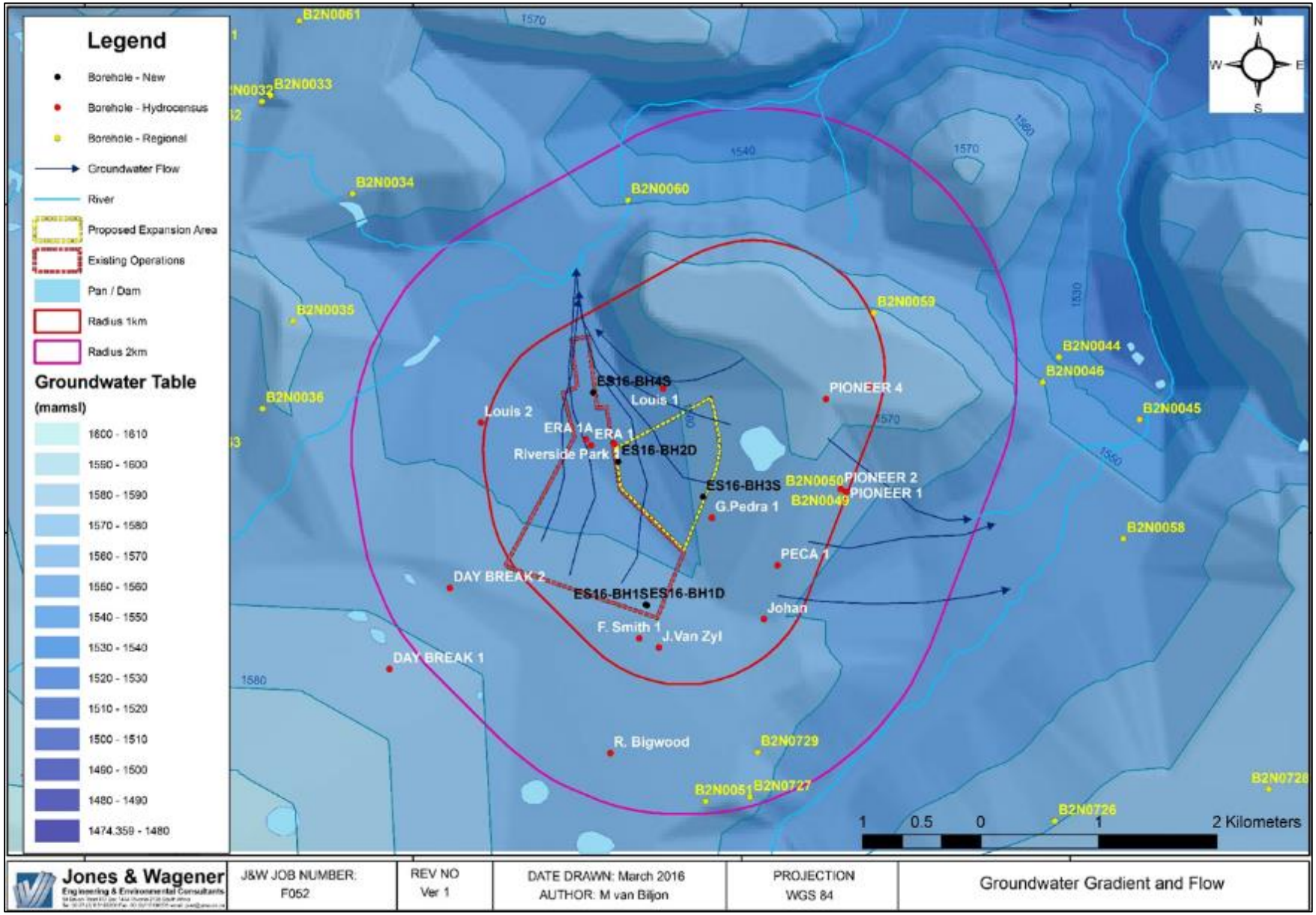


Figure 10: Regional groundwater gradients and flow

Surface Water

Information regarding the hydrology of the study site was obtained from the Surface Water Assessment that was undertaken by J&W during June 2016 for the proposed expansion of the Era Stene southern clay quarry.

Catchment Description

The site lies between the Koffiespruit to the east and one of its tributaries to the west. These rivers then join the Bronkhorstspruit River, which enters the Bronkhorstspruit Dam approximately 20 km north-east of the site. The Bronkhorstspruit River continues beyond the dam where it first meets the Wilge and then the Olifants River. The Olifants River flows through the Witbank Dam and later the Loskop Dam. From the Loskop Dam, the Olifants River flows through Mpumalanga and the central part of the Kruger National Park to Mozambique, where it joins the Limpopo River, which discharges into the Indian Ocean.

The property lies within the quaternary sub-catchment B20B of the Limpopo-Olifants Primary Drainage Region. The receiving water body for the assessment of the potential surface water quality impacts related to the proposed expansion of the southern clay quarry is considered to be the Bronkhorstspruit Dam, via the Koffiespruit.

Mean Annual Runoff (MAR)

The gross MAR for quaternary sub-catchment B20B is quoted in *"Surface Water Resources of South Africa 1990*" (WRC,1990), as 37 mm. The MAR for the site, as well as the watercourse running past the western boundary of the site is compared with the MAR for the quaternary catchment and the Bronkhorstspruit Dam in **Table 6** below.

Table 6: MAR for catchments relevant to the proposed Era Stene site

Catchment	Catchment area (km^2)	MAR* ($x 10^6 m^3$)	% MAR of Quaternary Catchment B202B	% MAR of Bronkhorst-spruit Dam
Total site (undeveloped)	1.88	0.070	0.59	0.15
Current site development*	0.26	0.010	0.08	0.02
Fully developed site (southern quarry expansion)*	0.89	0.032	0.27	0.07
Tributary to Koffiespruit, downstream of site	12.4	0.524	4.44	1.10
Quaternary catchment B20B	322	11.8	-	24.9
Bronkhorstspruit Dam catchment	1260	47.4	-	-

*MAR for these scenarios determined on basis of no runoff from the quarries being released to the environment.

Surface Water Quality

Era Stene currently does not have a surface water quality monitoring programme in place. However, in order to detect impacts attributable to an activity, water quality monitoring should be carried out upstream and downstream of the site.

The primary constituent of concern in terms of water quality, related to the Era Stene quarry site, is suspended solids. The proposed surface water monitoring locations at the Era Stene quarry site are listed in **Table 7** below and indicated in **Figure 11**.

Table 7: Recommended surface water quality monitoring locations

Monitoring location	Description	Co-ordinate	
		Latitude	Longitude
ESW1	South-west Dam (upstream point)	26°6'10.7"	28°33'34.3"
ESW2	In-stream downstream of Northern quarry (downstream point)	26°5'3.3"	28°33'37.1"
ESW3	Farm Dam at overflow	26°5'45.9"	28°33'41.7"
ESW4	Northern quarry settling facility	26°5'20.8"	28°33'45.2"
ESW5	Southern quarry settling facility	26°5'58.7"	28°34'4.84"

An elevated EC will provide an indication of elevated dissolved solids and therefore chemical contamination in the water. Should an elevated EC be detected, further inorganic analysis, for macro-inorganic variables, should be undertaken to determine the nature of the contamination and assist in identifying the source.

Dry Weather Flow (DWF)

An accepted definition for dry weather flow is that flow that is equalled or exceeded 70% of the time. The catchment for the tributary to the Koffiespruit which flows along the western boundary of the site amounts to some 12.4 km^2. The watercourse is ephemeral and during dry periods there is no flow in the watercourse.

Floodline Determination

The river floodlines were determined based on the calculated flood peaks at each node. A steady flow, backwater analysis was performed for the stream using the HEC-RAS river modelling system. HEC-RAS was developed by the United States Army Corps of Engineers, and is considered industry standard software for floodline determination in many countries, including the United States, the United Kingdom, Europe, Australia and South Africa. When determining floodlines, the stream is defined by inputting a number of cross sections along the length of the stream. The mapping data used consisted of 0.5 m contour interval Digital Terrain Model (DTM) generated from survey data received from Era Stene on 19 May 2016.

It should be noted that the accuracy of the floodlines produced in this study is equal to the accuracy of the DTM data provided. With a contour interval of 0.5 m, the accuracy of the floodlines can be considered to be within 1 m vertically. The 1:50 and 1:100 year floodlines have been computed for the area west of existing operations, proposed expansion of the southern clay quarry as well as for the natural pan. The river floodlines can be seen in **Figure 12** below. In order to assess the volumes of water in the pan, a water balance was computed in an excel spreadsheet developed in-house by J&W. The considered inflows into the pan

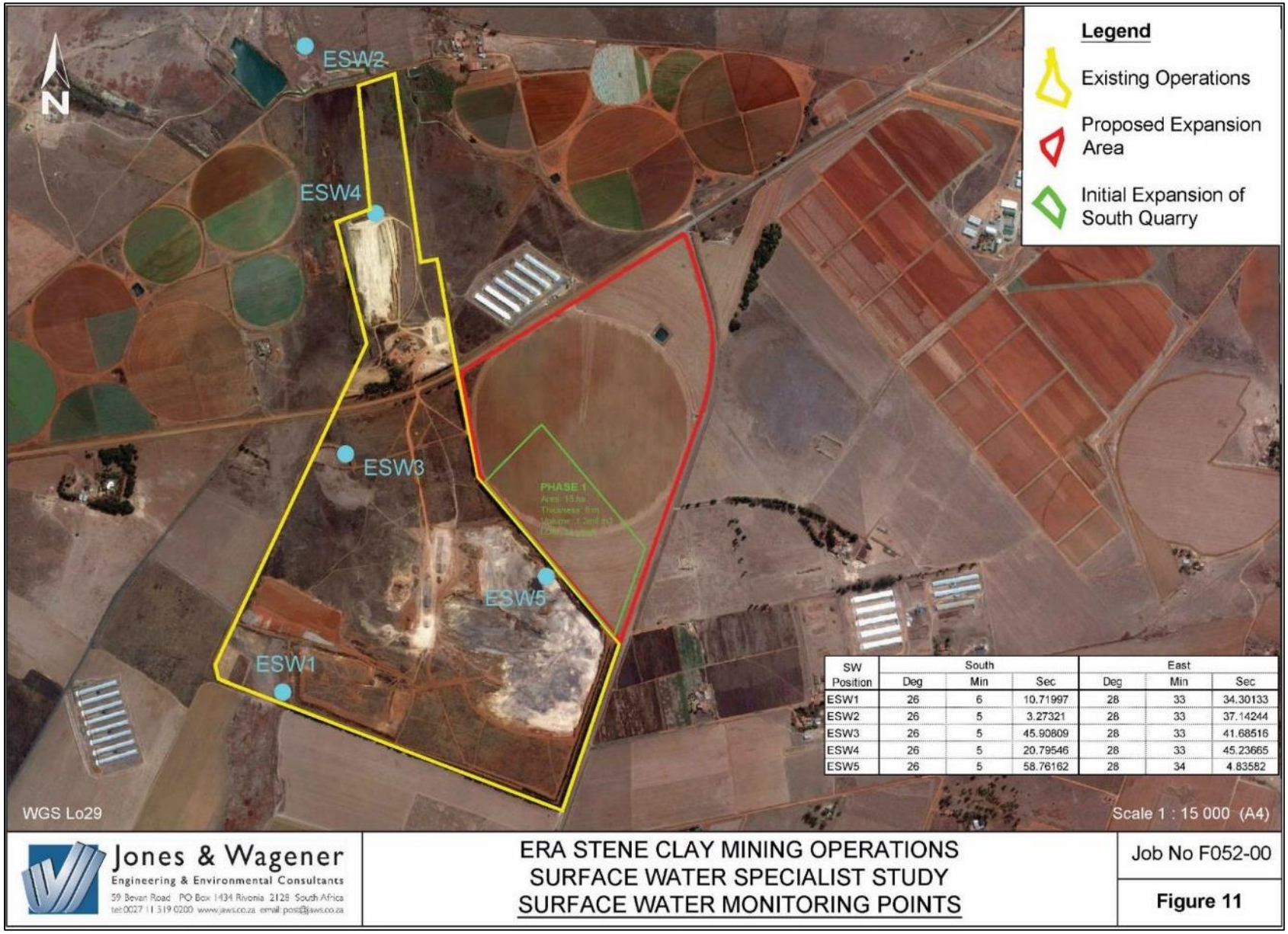
consisted of direct rainfall, as well as runoff from the surrounding catchment. The outflows from the pan include evaporation off the pan water surface area. The daily volume in the pan was then computed, taking into consideration the above inflows and outflows, by means of a daily time step water balance. The 1 day 1:50 year water level for the pan is computed as 1596.8 mamsl. This is the height of the computed floodline. The pan floodline can be viewed in **Figure 13** below.

Air Quality

The air quality of the pre-mining period is expected to have been of a better quality than the current situation, however the farming activities in the surrounding areas also contribute to the air quality degradation. The main concern in this regard would however be dust from the proposed expansion of the southern quarry settling on surrounding areas.

A dust fallout monitoring programme is currently in place at the existing clay mining operations, in order to measure the performance on a monthly basis, and to be used for compliance reporting. The three-month running average is a good indication of the trend of dust fallout present on-site. This average was calculated over a period of 12 months, from January 2015 to December 2015. The value (276 mg/m^2/day) is very low, therefore indicating a low overall dust fallout trend on-site.

The dust fallout monitoring programme should be expanded to include the expansion of the southern quarry in order to control any possible nuisance dust that might give rise to complaints from surrounding landowners.



SW Position	South			East		
	Deg	Min	Sec	Deg	Min	Sec
ESW1	26	6	10.71997	28	33	34.30133
ESW2	26	5	3.27321	28	33	37.14244
ESW3	26	5	45.90809	28	33	41.68516
ESW4	26	5	20.79546	28	33	45.23665
ESW5	26	5	58.76162	28	34	4.83582

Figure 11: Surface Water Monitoring Points

Figure 12: Floodlines for the River

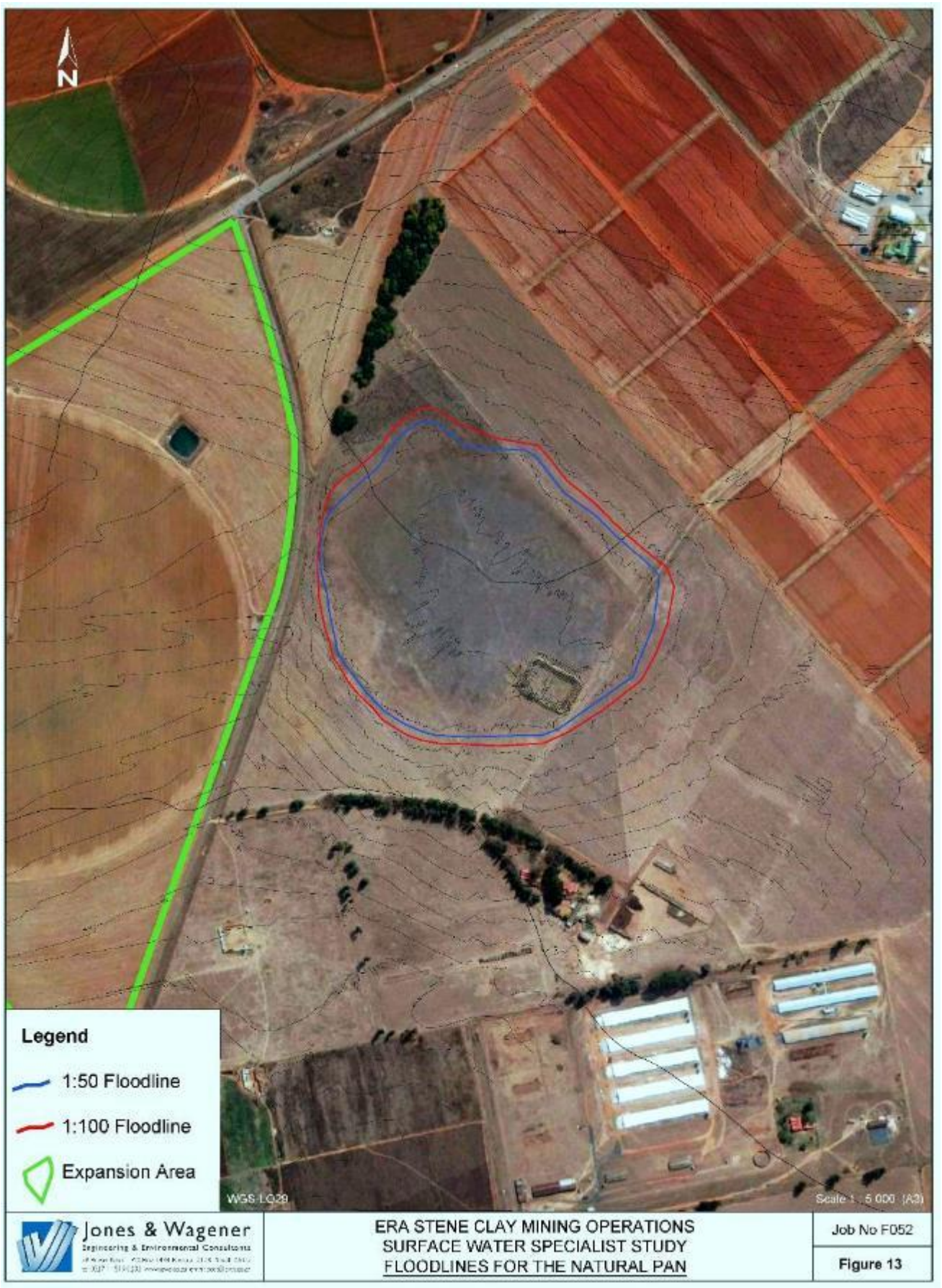


Figure 13: Floodlines for the Natural Plan

Heritage

The information below was obtained from the Phase 1 Heritage Impact Assessment that was undertaken by PGS Heritage during April 2016 for the proposed expansion of the Era Stene southern clay quarry.

PGS Heritage undertook a site visit to survey for possible heritage features. Permission was received from the client to interview the occupants to the north of the study site and possible labour that would be encountered. No interviews on the history of the property or possible heritage features noted by local inhabitants or labour were collected as no persons were available. Transects of the property were conducted focussing on areas of possible heritage features (PHF) that were noted when viewing past aerial images of the land and the topographical map from 1965 (**Figure 14**).

An analysis of historical maps identified one grave site north of the study area, while additional analysis of aerial photography identified some anomalies in the maize fields that were investigated during field work. All possible heritage features that were identified from the aerial photographs and topographical map were inspected, photographed and marked as of no heritage significance (**Table 8**).

However, should any significant heritage resources such as graves, human remains or fossils be discovered during the expansion of the southern quarry, all work must be halted, SAHRA should be informed and a qualified heritage practitioner should evaluate the finds in order to recommend appropriate actions.

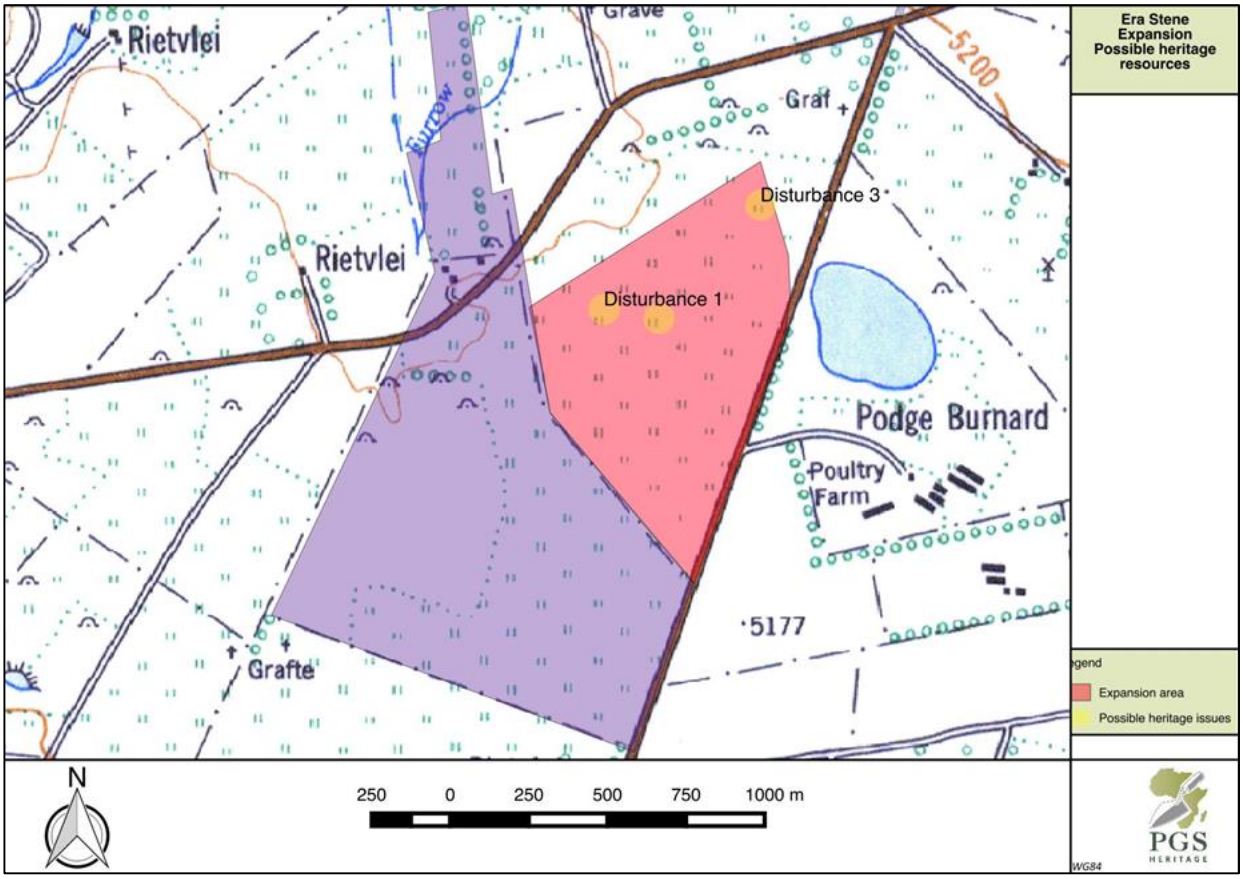


Figure 14: Possible heritage features that were identified.

Table 8: Possible heritage features identified

PHF No.	Latitude, Longitude	Description	Photograph
1	26.093808°, 28.567570°	No observed disturbance in this location	
2	26.094067°, 28.569317°	Electrical power supply	
3	26.090839°, 28.572550°	Power cable poles in the maize field.	

Social

The information below was extracted from the Delmas Clay Mine Environmental Management Programme, October 2006, and from the updated Social and Labour Plan for Era Stene clay mine (**Appendix K**).

The Era Stene clay mining operation employs 12 people (8 mining staff and 4 security guards) of which a few are resident around the operation. The dominant population group in the area is Black African, followed by White (see table below obtained from Statistics South Africa,

2006). The existing clay mining operation is located in an area where the population density is very low.

Table 9: Population Groups

Population Group	Persons
Black African	49644
Coloured	257
Indian or Asian	101
White	6206
Total Population	**56208**

About 63.7 % of the population in this area falls within the economically active range (Refer to **Table 10** and **Table 11** below). The total labour market is population aged 15-65 and is divided into three categories: employed, unemployed and not economically active. The latter include students, homemakers, the disabled, those too ill to work and anyone not seeking work.

Economically active includes employed and unemployed persons. From a total labour force (economically active) of 23 017 in this Municipal area only 13 232 are employed.

Table 10: Total labour market

Labour Market Status	Persons
Employed	13 232
Unemployed	9 785
Not Economically Active	13 094
Total Labour Force	**36 111**

Unemployment in the area, as for the rest of the country, is very high. A total of 42.5 % of the population in this area is unemployed (Obtained from Statistics South Africa).

Table 11: Age Groups

Age Group	Persons
0 to 4 years	6 236
5 to 14	11 732
15 to 34	20 778
34 to 64	15 105
Over 65	2 357

Various social amenities are available close to the operation. These include schools, hospitals, churches, recreation facilities as well as a Police Station at Delmas, which is located 15 km from the existing clay mining operation.

b) Description of the current land uses.

The land use within and surrounding the study site varies, comprising grazing, cultivated and/or agricultural land, as well as mining operations (refer to **Figure 15**). The majority of the study area has therefore been disturbed by economic agriculture and mining, and have altered the landscape, soils and the capability of the land, rendering the area a brownfields environment for the most part. The natural grasslands and biodiversity have mostly been altered by these activities.

c) Description of specific environmental features and infrastructure on the site.

Please refer to Section 2(d)(ii) and **Figure 2** for a description of the activities and infrastructure which are foreseen to form part of the proposed expansion of the southern quarry.

d) Environmental and current land use map (Show all environmental, and current land use features) Refer to **Appendix F.**

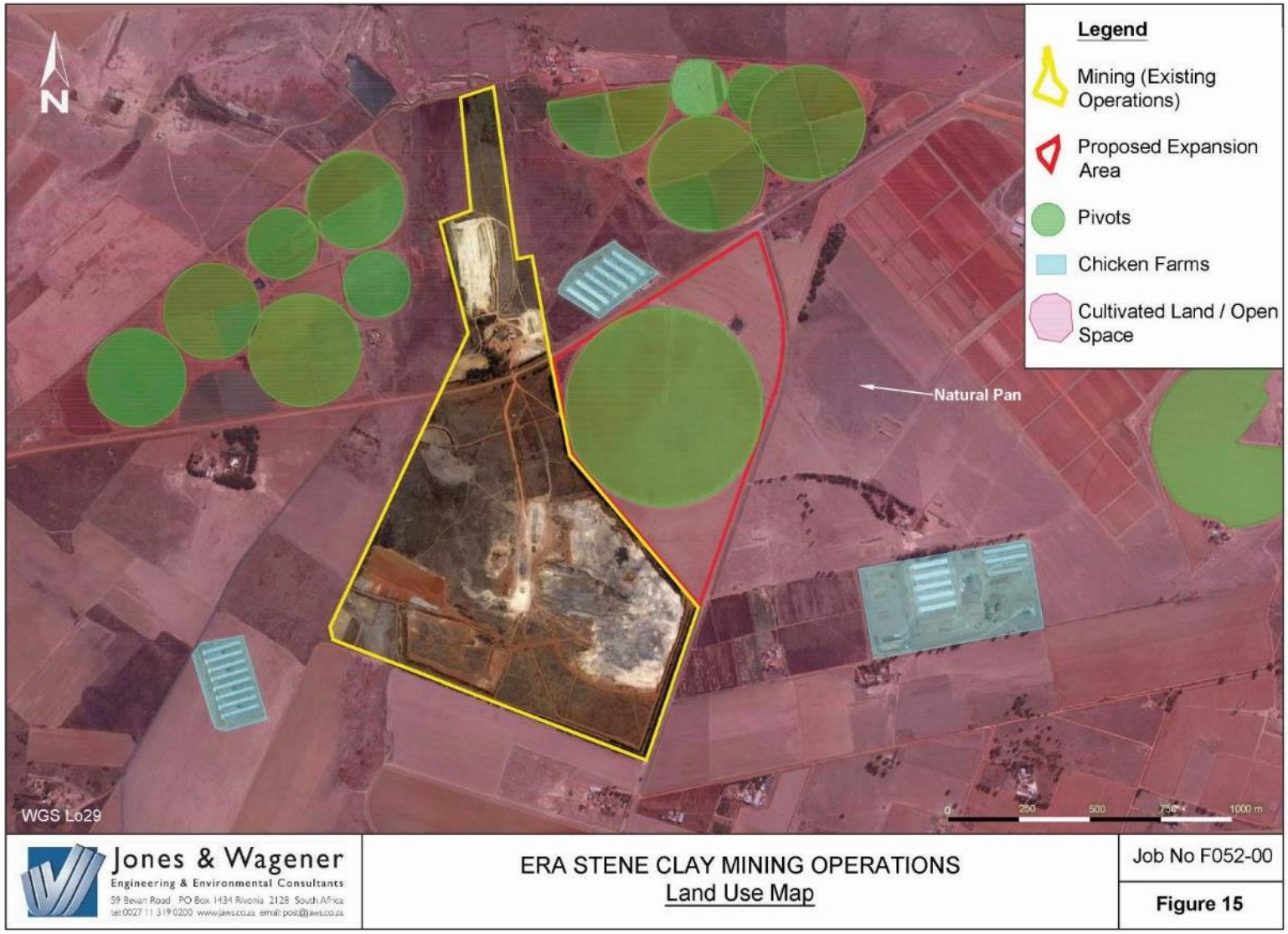


Figure 15: Land Use Map.

(i) Impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts

(Provide a list of the potential impacts identified of the activities described in the initial site layout that will be undertaken, as informed by both the typical known impacts of such activities, and as informed by the consultations with affected parties together with the significance, probability, and duration of the impacts. Please indicate the extent to which they can be reversed, the extent to which they may cause irreplaceable loss of resources, and can be avoided, managed or mitigated).

Please refer to **Appendix G** for the full Impact Assessment undertaken for the proposed expansion of the southern quarry at the Era Stene mining operations.

(ii) Methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;

(Describe how the significance, probability, and duration of the aforesaid identified impacts that were identified through the consultation process was determined in order to decide the extent to which the initial site layout needs revision).

Please refer to the full description of the Impact Assessment Methodology under Section e) below.

(iii) The positive and negative impacts that the proposed activity (in terms of the initial site layout) and alternatives will have on the environment and the community that may be affected.

(Provide a discussion in terms of advantages and disadvantages of the initial site layout compared to alternative layout options to accommodate concerns raised by affected parties)

In terms of the EIA regulations, consideration must be given to alternatives. Alternatives are different approaches and ways of meeting the need, purpose and objectives of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, processes or technology alternatives, temporal alternatives, etc. The no-go alternative or option is also considered, as it provides the baseline against which the impacts of other alternatives may be compared.

However, for this specific project, no alternatives have been investigated, with the exception of the no-go alternative. The reason for this being that the existing mining right was obtained for the sole purpose of mining clay from the existing quarries as described earlier in this report. The activities included in this application are determined by the location of the clay reserve in the study area, and the proposed mining method to be employed as was assessed and authorised in the existing EMPR for the mine.

The No-Go option, entails the continuation of the current land use (crop farming) on the study site proposed for the expansion of the southern quarry, without exploiting the clay reserves below the surface. Extending the southern quarry will contribute towards providing continued jobs for the current staff, as well as the continued supply of clay material to the brick manufacturing plant in Olifantsfontein which supplies the local market with bricks, and therefore also contributing towards the South African economy.

Should the proposed project therefore not be authorised to proceed, it is anticipated that there will be a shortage in the supply of clay to the brick manufacturing plant, which will in turn lead to a shortage in the supply of bricks to the local market. The current employment opportunities

will also be terminated once the reserves of the current southern clay quarry have been depleted in the next three to five years.

The No-Go alternative is therefore not a desirable option in this case, as it suggests that the clay reserves should not be exploited, and current employment opportunities should not be prolonged.

Please refer to the full Impact Assessment attached as **Appendix G**.

(iv) The possible mitigation measures that could be applied and the level of risk.

(With regard to the issues and concerns raised by affected parties provide a list of the issues raised and an assessment/ discussion of the mitigations or site layout alternatives available to accommodate or address their concerns, together with an assessment of the impacts or risks associated with the mitigation or alternatives considered).

Refer to the Comments and Response Report (CRR) contained in **Appendix B** for the issues that have been raised by I&AP's and stakeholders during the process, as well as a response to those issues by the Environmental Assessment Practitioner.

Also please refer to the full Impact Assessment attached as **Appendix G**.

(v) Motivation where no alternative sites were considered.

The selection of the identified site for the expansion of the southern quarry, is predominantly determined by the location of the clay reserve and land owned by Era Stene within the study area, as well as the feasibility of mining it from an environmental, social and economic perspective. This is the reason why the property adjacent to the existing southern quarry was identified as being suitable to extend the footprint of the southern quarry.

Please note that no additional infrastructure will be established for the expansion of the southern quarry and that the existing infrastructure currently servicing the existing clay mining operations will be used, and therefore no alternatives for the location of infrastructure were identified.

(vi) Statement motivating the alternative development location within the overall site.

(Provide a statement motivating the final site layout that is proposed)

As mentioned above, the location of the clay reserve and land owned by Era Stene within the study area were the main motives for selecting the site onto which the existing southern quarry is to be extended upon. The feasibility of mining the clay material from an environmental, social and economic perspective also plays a role. These are the reasons why the property adjacent to the existing southern quarry was identified as being suitable to extend the footprint of the southern quarry.

e) Full description of the process undertaken to identify, assess and rank the impacts and risks the activity will impose on the preferred site (In respect of the final site layout plan) through the life of the activity. (Including (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.)

IMPACT ASSESSMENT METHODOLOGY

In order to ensure uniformity, a standard impact assessment methodology will be utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology will be used to describe the impacts for each of the aforementioned assessment criteria. A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in **Table 12** below.

Table 12: Quantitative rating and equivalent descriptors for the impact assessment criteria.

RATING	SIGNIFICANCE	EXTENT SCALE	TEMPORAL SCALE
1	VERY LOW	*Isolated site*	Incidental
2	LOW	*Study area*	Short-term
3	MODERATE	*Local*	Medium-term
4	HIGH	*Regional / Provincial*	Long-term
5	VERY HIGH	*Global / National*	Permanent

A more detailed description of each of the assessment criteria is given in the following sections.

Significance Assessment

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1000km2) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in **Table 13** below.

Table 13: Description of the significance rating scale.

RATING		DESCRIPTION
5	VERY HIGH	Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.
4	HIGH	Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible but they are more difficult, expensive, time-consuming or some combination of these.
3	MODERATE	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	LOW	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	VERY LOW	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activities are needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	NO IMPACT	There is no impact at all - not even a very low impact on a party or system.

Spatial Scale

The spatial scale refers to the extent of the impact, i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in **Table 14**.

Table 14: Description of the spatial rating scale.

RATING		DESCRIPTION
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of impacts possible, and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50km from the proposed site.
3	Local	The impact will affect an area up to 5km from the proposed site.
2	Study Area	The impact will affect an area not exceeding the boundary of the site.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the site.

Duration Scale

In order to accurately describe the impact, it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in **Table 15**.

Table 15: Description of the temporal rating scale.

RATING		DESCRIPTION
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greatest.
3	Medium term	The environmental impact identified will operate for the duration of life of the project.
4	Long term	The environmental impact identified will operate beyond the life of operation.
5	Permanent	The environmental impact will be permanent.

Degree of Probability

Table 16 below will be describing the probability or likelihood of an impact occurring.

Table 16: Description of the degree of probability of an impact occurring.

RATING	DESCRIPTION
1	Practically impossible
2	Unlikely
3	Could happen
4	Very Likely
5	It's going to happen / has occurred

Degree of Certainty

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used as discussed in **Table 17**. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 17: Description of the degree of certainty rating scale.

RATING	DESCRIPTION
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.

Quantitative Description of Impacts

To allow for impacts to be described in a quantitative manner in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus the total value of the impact is described as the function of significance, spatial and temporal scale as described below.

$$\textit{Impact Risk} = \frac{(\text{SIGNIFICANCE} + \textit{Spatial} + \text{Temporal})}{3} \times \frac{\text{Probability}}{5}$$

An example of how this rating scale is applied is shown in **Table 18** below.

Table 18: Example of Rating Scale.

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	LOW	*Local*	Medium Term	*Could Happen*	
Impact to air	**2**	***3***	**3**	**3**	**1.6**

Note: The significance, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a criteria rating of 2, 67. The probability (3) is divided by 5 to give a probability rating of 0, 6. The criteria rating of 2, 67 is then multiplied by the probability rating (0, 6) to give the final rating of 1, 6.

The impact risk is classified according to 5 classes as described in **Table 19** below.

Table 19: Impact Risk Classes.

RATING	IMPACT CLASS	DESCRIPTION
0.1 – 1.0	1	Very Low
1.1 – 2.0	2	Low
2.1 – 3.0	3	Moderate
3.1 – 4.0	4	High
4.1 – 5.0	5	Very High

Therefore, with reference to the example used for air quality above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a low impact.

f) Assessment of each identified potentially significant impact and risk

(This section of the report must consider all the known typical impacts of each of the activities (including those that could or should have been identified by knowledgeable persons) and not only those that were raised by registered interested and affected parties).

NAME OF ACTIVITY	**POTENTIAL IMPACT**	**ASPECTS AFFECTED**	**PHASE** In which impact is anticipated	**SIGNIFICANCE** if not mitigated	**MITIGATION TYPE** (modify, remedy, control, or stop) through	**SIGNIFICANCE** if mitigated
Expansion of the existing southern clay quarry	• Dust pollution	• Air quality	Construction / Operation	• Moderate	• Control through dust suppression • Control through limiting the speed of vehicle movement on haul roads	• Low
	• Loss of soil, soil erosion, compaction and contamination	• Soil		• High	• Avoid unnecessary vehicle movement on the surface, especially on areas without existing roads • Stockpiles to be protected against erosion • No stockpiles to be placed inside of a drainage line • Ensure that vehicles are maintained and serviced regularly to prevent hydrocarbon spillages • Control through implementation of storm water management measures • Remedy through treatment of contaminated soils	• Moderate
	• Loss and clearing of vegetation (maize) • Displacement of faunal species, mainly bird species associated with adjacent pan • Invasion by alien invasive species	• Ecology		• Moderate	• Construction activities should avoid areas of high sensitivity or any buffer zones • Rehabilitation/restoration should make use of indigenous species, and preferably of species native to the study site • Checks must be carried out at regular intervals to identify areas where erosion is occurring • Buffer the nearby pan with 100m and restrict access to buffer area • Control though alien invasive eradication programme	• Low
	• Storm water runoff from the exposed clay materials in	• Wetlands/Watercourses/Surface Water		• Moderate	• Retain the water found in quarry and allow time for the solids to settle out by	• Low

NAME OF ACTIVITY	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	SIGNIFICANCE if not mitigated	MITIGATION TYPE (modify, remedy, control, or stop) through	SIGNIFICANCE if mitigated
	the quarry, as well as the clay and overburden / topsoil stockpiles can be expected to contain an elevated concentration of suspended solids, which if released to the environment could contribute to ecological degradation • Potential pollution of nearby surface water resources				gravity before releasing into the environment • Hydro-carbons should be stored in a bunded storage area • All hazardous materials *inter alia* oils, fuels, paints, turpentine and thinners must be stored appropriately to prevent these contaminants from entering the environment • Spill-sorb or similar type product must be used to absorb hydrocarbon spills in the event that such spills should occur • Erosion and vegetation establishment monitoring to be undertaken monthly for 6 months after the end of rehabilitation • Adhere to all the requirements of the stormwater management plan	
	• Change in groundwater levels • Groundwater quality	• Groundwater		• Moderate	• Groundwater monitoring is recommended • Dust suppression and monitoring should be implemented	• Low
	• Social impact	• Health, safety and security		• Moderate	• Prevent through HSEC management measures	• Low
	• Social impact	• Economy • Job Security		• Moderate	• Positive impact	• Moderate
	• Heritage	• Archaeological or heritage features		No impact	• Prevent through reporting and evaluation of any archaeological or heritage features found	No impact

The supporting impact assessment conducted by the EAP must be attached as an appendix, marked as **Appendix G**

g) Summary of specialist reports.

(This summary must be completed if any specialist reports informed the impact assessment and final site layout process and must be in the following tabular form):-

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
Ecological Assessment	• A 100 m buffer should be allocated to the edge of the pan to control any possible edge effects caused by the proposed activities; • An alien invader plant species management plan should be compiled and implemented by a certified botanist; • An overspill of construction and operational impacts into adjacent areas (especially the pan) should be prohibited. The extent of the proposed activities should be demarcated on site layout plans, and no construction personnel or vehicles may leave the demarcated area. The areas surrounding the study site that are not part of the demarcated development area should be considered as “no-go” areas for employees, machinery or even visitors.	X	Impact Assessment and EMPr
Soils, Land Use and Wetland Assessment	• The seasonal dam/wetlands on site should be monitored for turbidity and Total Dissolved Solids (TDS) on a monthly basis for the duration of construction and operation on site; • Careful planning and proper rehabilitation post mining can however return the bulk of the soil material to the system, and potentially the Class II land capability as well. Post mining land uses can be set as either cultivation or grazing, depending on the feasibility of the land use, but the land capability should for at least 80% of the area, meet Class II land capability requirements. Careful planning and proper rehabilitation post mining can return the bulk of the soil material to the system, and potentially the land capability and land use as well; • The soil chemical status should be assessed prior to use in rehabilitation to ensure the required fertilizer is applied before use.	X	Impact Assessment and EMPr
Groundwater Assessment	• The newly drilled groundwater monitoring boreholes should be monitored for the following:	X	Impact Assessment and EMPr

LIST OF STUDIES UNDERTAKEN	RECOMMENDATIONS OF SPECIALIST REPORTS	SPECIALIST RECOMMENDATIONS THAT HAVE BEEN INCLUDED IN THE EIA REPORT (Mark with an X where applicable)	REFERENCE TO APPLICABLE SECTION OF REPORT WHERE SPECIALIST RECOMMENDATIONS HAVE BEEN INCLUDED.
	○ Monthly groundwater level measurements; ○ Bi-annual monitoring of the borehole water qualities as well as seepage / rainwater in the pits; and ○ Sampling of private boreholes every 2 years. • Water levels in the pits should be measured and sampled as part of the monitoring programme; • Water volumes pumped from the quarries should be measured with flow meters and recorded; • Rainfall should be measured on a daily basis as the aquifers are recharged by rainfall. Especially the Karoo aquifer which is affected by prolonged droughts due to the slow recharge (3-5% of the annual rainfall as opposed to 10-20% in the dolomite).		
Surface Water Assessment	• Surface water sampling should be undertaken regularly, and if water quality is found to contain constituents other than the clay particles or concentrations exceed those allowable, then water shall be withheld and shall require treatment; • In order to minimise the volumes of affected water that will require management, the following infrastructure will be constructed: ○ Perimeter diversion drains ○ Protection berms around quarries ○ In-pit sumps ○ Settling paddocks around overburden / topsoil stockpiles.	**X**	Impact Assessment and EMPr
Phase 1 Heritage Impact Assessment	• Stop construction if any heritage resources – such as graves, human remains or fossils are identified; • Inform SAHRA and have a qualified heritage practitioner evaluated the finds and recommend appropriate actions.	**X**	Impact Assessment and EMPr

Please refer to the abovementioned Specialist Reports in Appendix E for a comprehensive description of the recommendations which were made

h) Environmental impact statement

(vii) Summary of the key findings of the environmental impact assessment;

This assessment illustrates that there are various potential negative and positive impacts that may arise as a result of the proposed expansion of the southern quarry at the Era Stene clay mining operations which might have an effect on the following environmental components:

Terrestrial ecology

The proposed mining of clay is not anticipated to have any significant impacts on the terrestrial floristic and faunal composition considering that more than 95 % of the site is covered by transformed land with a low ecological sensitivity. However, a pan is present to towards the east of the site, which could provide potential ephemeral foraging habitat for a number of bird species of conservation concern. Nevertheless, these taxa are considered highly irregular and will only be present during optimal conditions (e.g. frequent inundation of the pan). A 100 m buffer should be allocated from the edge of the pan to control any possible edge effects caused by the proposed activities.

Soils and Land capability

The proposed extension of the existing southern clay quarry at the Era Stene mine will have an impact on the soils, land capability and land use in the study area. As this is an opencast operation the impacts to the soils will remain high throughout the operation of the quarry.

Careful planning and proper rehabilitation post mining can however return the bulk of the soil material to the system, and potentially the Class II land capability as well. Post mining land uses can be set as either cultivation or grazing, depending on the feasibility of the land use, but the land capability should for at least 80% of the area, meet Class II land capability requirements.

Wetlands

As proven by the geohydrological investigation, the impact on the pan due to the proposed expansion of the southern quarry is non-existent. The updating and adherence to the stormwater management plan for the site should ensure that this impact remains non-existent.

Air quality

The three-month running average is a good indication of the trend of dust fallout present on-site. This average was calculated over a period of 12 months, from January 2015 to December 2015. The value (276 mg/m^2/day) is very low, therefore indicating a low overall dust fallout trend and impact on-site.

Due to the nature of the proposed expansion of the southern quarry, it is not foreseen that additional dust emissions will be created other than to what is currently experienced. This can be ascribed to the fact that no additional machinery or different mining methods will be utilised as is currently the case with the existing operations. Furthermore, the rate of extracting the clay material from the proposed expansion area will not be higher than what is currently being mined.

Surface Water

It was found that the floodlines of the watercourse to the west and the natural pan to the east do not encroach on the proposed expansion area. However, the existing northern quarry is

expected to experience flooding, as it is located within the floodline. Through the implementation of best practice water management principles, with the implementation of the SWMP, as well as the surface water quality monitoring proposed herein, surface water impacts form the site can be effectively mitigated.

Groundwater

Based on the current data and interpretation thereof it is concluded that the clay mining has not caused dewatering of the aquifer/s and has not lowered the groundwater levels in boreholes that supply water to private users. It is also unlikely that the extended mining will have a different impact, provided that mining stays within the Karoo formations. The mining method employed at Era Stene does not involve any blasting and contamination as a result of mining is considered negligible. This is confirmed by the good quality water in the quarry, although this may have been diluted by rainfall.

The measured groundwater qualities in the private boreholes do not show any signs of contamination even though the mine has been active for almost two decades. With reference to the water characteristics, all the groundwater samples are similar, whereas the quarry water is very different. This suggests that there is no interaction between the quarry and the groundwater from which private users are tapping.

Heritage

No heritage features of significance was identified within the footprint of the proposed expansion area. On the condition that the mitigation measures outlined in this report are undertaken, any development impacts on possible heritage finds during the expansion will be adequately mitigated to allow the development to take place.

Social environment

The social environment will be impacted in a positive way due to the current job opportunities that will be prolonged both at the brick plant and at the quarry operations, should the expansion of the southern quarry be approved. Also, the South African economy will be impacted in a positive way due to the prolonged supply of clay to the brick manufacturing plant which supplies bricks to the local market.

(viii) Final Site Map

Provide a map at an appropriate scale which superimposes the proposed overall activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers. Attached as **Appendix H**

No environmental constraints which would prevent the proposed expansion of the southern quarry at Era Stene clay mining operations from being authorised have been identified by the specialists from an environmental sensitivity point of view. The Soil, Land Capability and Wetland Assessment did however delineate wetland areas that are deemed as being sensitive. These are indicated in **Figure 16** below.

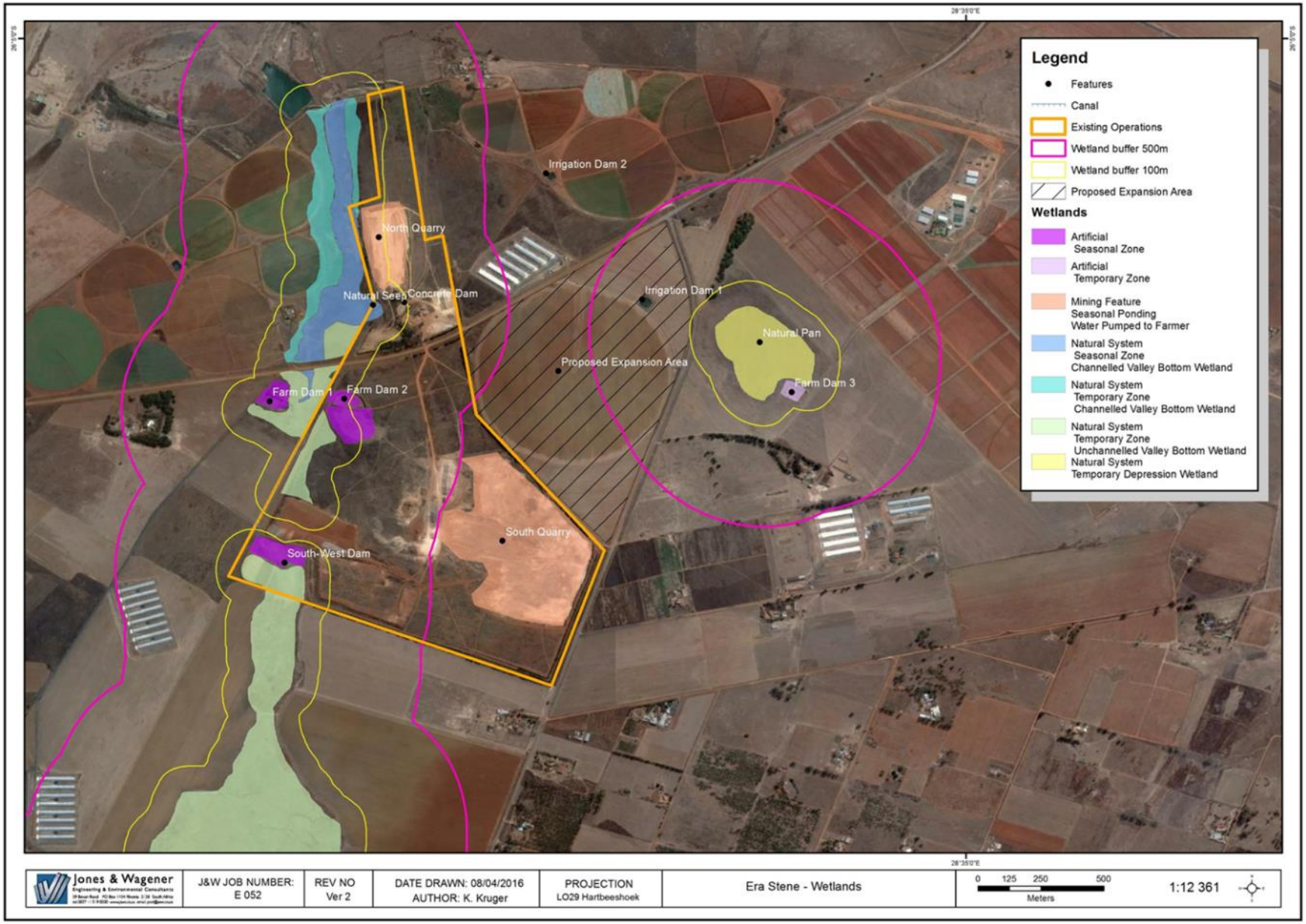


Figure 16: Sensitive areas identified as part of the proposed expansion of the southern quarry

(ix) Summary of the positive and negative implications and risks of the proposed activity and identified alternatives;

Please refer to the complete Impact Assessment that was undertaken in **Appendix G**.

i) Proposed impact management objectives and the impact management outcomes for inclusion in the EMPr;

Based on the assessment and where applicable the recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation.

The following management objectives are prescribed for the proposed expansion of the southern quarry at the Era Stene clay mining operations:

- Ensure that all necessary legal obligations and contractual conditions have been met prior to the commencement with construction, where applicable;
- Ensure that fauna species (mainly bird species associated with adjacent pan) are not displaced during the expansion;
- Ensure that declared invader and alien vegetation does not spread on site;
- Ensure that vehicles are maintained and serviced regularly to prevent hydrocarbon spillages;
- Ensure that the appropriate remedial actions are in place should hydrocarbon contamination of soil occur;
- Effectively control storm water runoff to ensure that impacts to surface water resources are controlled, and erosion is prevented as far as possible;
- Ensure that the pan towards the east of the expansion area is not affected by the proposed expansion activities by means of imposing a buffer of 100m around the pan and restrict access to the buffer area;
- Ensure that the expansion of the southern quarry does not impact on the groundwater quality;
- Ensure that the expansion of the southern quarry does not impact on the groundwater quantity of the surrounding areas;
- Ensure preservation and appropriate management of new archaeological finds should they be discovered during expansion; and
- Ensure the relocation of graves if discovered during the expansion process.

j) Aspects for inclusion as conditions of Authorisation.

Any aspects which have not formed part of the EMPr that must be made conditions of the Environmental Authorisation

The following aspects are proposed to be included as conditions in the Environmental Authorisation:

- Vegetation clearing should be restricted to the footprint of the expansion area only;
- Movement of construction vehicles and workers is to be restricted from areas outside of the boundaries of the demarcated expansion area;

- The construction staff should be educated about the value of wildlife and environmental sensitivity;
- Stockpiling of topsoil and overburden should be according to the specialist recommendations;
- Should a grave or any other historically significant feature be identified in the construction footprint, the feature may not be removed and a heritage specialist must be contacted immediately;
- Appropriate dust abatement measures must be implemented in areas where required;
- Dustfall monitoring should continue to take place as is currently the case at the Era Stene clay mining operations;
- Nuisance dust originating from the expansion of the southern quarry should be prevented by means of implementing appropriate dust suppression techniques;
- Invasive or exotic plant species should not be allowed to establish during and after the expansion of the southern quarry;
- The newly drilled groundwater monitoring boreholes should be monitored for the following:
  - Monthly groundwater level measurements;
  - Bi-annual monitoring of the borehole water qualities as well as seepage / rainwater in the pits; and
  - Sampling of private boreholes every 2 years.
- Water levels in the quarries should be measured and sampled as part of the groundwater monitoring programme;
- Surface water quality monitoring should be carried out upstream and downstream of the Era Stene site. Monitoring points ESW1 and ESW2 should be monitored monthly (when there is water in the system). Monitoring points ESW3, ESW4 and ESW5 should also be monitored on a monthly basis and when discharge takes place from these locations;
- The seasonal dam/wetlands on site should be monitored for turbidity and Total Dissolved Solids (TDS) on a monthly basis for the duration of construction and operation on site;
- The soil chemical status should be assessed prior to use in rehabilitation to ensure the required fertilizer is applied before use; and
- In-stream surface water sampling should be undertaken on a monthly basis, when there is water in the stream and on-site sampling should be undertaken on a monthly basis, at the recommended sampling points as per the surface water specialist study.

k) Description of any assumptions, uncertainties and gaps in knowledge.

(Which relate to the assessment and mitigation measures proposed)

The following assumptions, uncertainties and gaps in knowledge were identified in terms of the proposed expansion of the southern quarry at the Era Stene clay mining operations:

- The seasonality of the Soils, Land Use and Wetland assessment was adequate to assess the wetlands in the study area;
- The soil assessment was based on a hand auger excavation and field methods – no sampling or laboratory analysis were undertaken;
- Excessive rain limited access around the site, satellite photo interpretations were utilised in areas that could not be accessed.
- Large-scale abstraction volumes from the Dolomite aquifer is unknown;

- The surface water study did not include the delineation of sensitive areas such as pans and wetlands. This information has been included in the relevant Soils, Land Use and Wetland assessment specialist study;
- No historical surface or groundwater sampling data is available for the Era Stene clay mining operation;
- The heritage resources identified as part of the Heritage Impact Assessment do not necessarily represent all the possible heritage resources present within the area. As such, should any heritage features and/or objects be observed during the expansion of the southern quarry, a heritage specialist must immediately be contacted.

l) Reasoned opinion as to whether the proposed activity should or should not be authorised

(x) Reasons why the activity should be authorized or not.

The proposed expansion of the existing clay quarry forms part of Era Stene's long-term planning in order to ensure the prolonged life of the clay mining operations by approximately 31 years during phase 1. Expanding the southern quarry will contribute towards the achievement of providing continued jobs for the current staff, as well as the continued supply of clay material to the brick manufacturing plant in Olifantsfontein which supplies the local market with bricks, and therefore also boosting South Africa's economy.

Should the proposed project therefore not be authorised to proceed, it is anticipated that there will be a shortage in the supply of clay to the brick manufacturing plant, which will in turn lead to a shortage in the supply of bricks to the local market. The current employment opportunities will also be terminated once the reserves of the current southern clay quarry have been depleted in the next three to five years.

No impacts which are likely to cause detrimental harm to the environment were identified as part of this Environmental Impact Assessment, and therefore it is recommended that the proposed expansion of the southern quarry at Era Stene clay mining operations, be approved by the competent authority with the condition that all prescribed mitigation measures included in this report be implemented and adhered to at all times.

Furthermore, it is also suggested that, where relevant, the competent authority stipulates any additional mitigation measures that they consider necessary as conditions in the Environmental Authorisation.

m) Period for which the Environmental Authorisation is required.

The proposed expansion of the southern quarry at Era Stene clay mining operations will provide a LoM of approximately 31 years for phase 1 which will be mined until 2047. Phase 2 is proposed to be mined until 2075, and lastly phase 3 will be mined until 2086.

The authorisation being applied for as part of this assessment will therefore be required for a period of 70 years.

n) Undertaking

Confirm that the undertaking required to meet the requirements of this section is provided at the end of the EMPr and is applicable to both the Environmental Impact Assessment report and the Environmental Management Programme report.

The undertaking is provided at the end of the EMPr section of this report.

o) Financial Provision

State the amount that is required to both manage and rehabilitate the environment in respect of rehabilitation.

A total of R6 374 898.40 is expected to be required to ensure environmental compliance as well as for the rehabilitation of the 15 ha area at the end of mining Phase 1. This total amount as per **Table 20** below taken from the Mine Closure Report (**Appendix J**), comprises firstly out of a concurrent environmental cost of approximately R5 400 000.00 over Phase 1 (30 years), and secondly of a post closure remediation cost of R974 898.40 (sum of opencast rehabilitation + roads rehabilitation + topsoil rehabilitation).

Table 20: Scheduled closure cost (Phase 1)

Total area for rehabilitation (based on survey data) for Delmas _ Rosema Stene				
Final cut size		15	Ha	150000
Average depth		8	m	
Volume mined out		1800000	m^3	
Less product		1200000	m^3	
Overburden nett		600000	m^3	
Rate applied		1.29	Rands	
Total rehabilitation cost		R 774 900.00		
Concurrent cost		R 5 400 000.00		
Total closure cost	a.	R 6 174 900.00		* for opencast areas
Length of roads		2500	m	
		R 32.19	per meter	
	b.	R 80 475.00		
Topsoil overburden		1.2	ha	
		R 99 602.83		
		R 119 523.40		
TOTAL REQUIRED PROVISION		**R**		**6 374 898.40**

p) Explain how the aforesaid amount was derived.

The above amount was calculated as part of the Mine Closure Plan in accordance with the methodology in the Guideline Documents for the Evaluation of the Quantum of Closure Related Financial Provision provided by a Mine as published by the DMR.

Due to the promulgation of legislation (GNR 1147) by DEA with regards to Financial Provision for Prospecting, Exploration, Mining and Production Operations, which will now be a

requirement by 20 February 2019, Era Stene will ensure to have updated their current financial provision according to the new promulgated legislation.

q) Confirm that this amount can be provided for from operating expenditure. (Confirm that the amount, is anticipated to be an operating cost and is provided for as such in the Mining work programme, Financial and Technical Competence Report or Prospecting Work Programme as the case may be).

The concurrent environmental cost, of approximately R5 400 000.00 (R180 000.00 per year x 30 years) is anticipated to be an operating cost and is provided for as such in the Mine Works Programme (**Appendix L**).

The post closure remediation costs of R974 898.40 as reported in the Mine Closure Report should be provided for through a ceded trust account.

r) Deviations from the approved scoping report and plan of study.

(i) Deviations from the methodology used in determining the significance of potential environmental impacts and risks.

(Provide a list of activities in respect of which the approved scoping report was deviated from, the reference in this report identifying where the deviation was made, and a brief description of the extent of the deviation).

No deviations from the approved Scoping Report and Plan of Study were undertaken.

(ii) Motivation for the deviation.

Not Applicable.

s) Other Information required by the competent Authority

(i) Compliance with the provisions of sections 24(4)(a) and (b) read with section 24 (3) (a) and (7) of the National Environmental Management Act (Act 107 of 1998). the EIA report must include the:-

3) ***Impact on the socio-economic conditions of any directly affected person.*** (Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any directly affected person including the landowner, lawful occupier, or, where applicable, potential beneficiaries of any land restitution claim, attach the investigation report as an Appendix).

The expansion of the southern quarry at the Era Stene clay mining operations is solely proposed on Era Stene owned property. No land claims exist on this property.

4) ***Impact on any national estate referred to in section 3(2) of the National Heritage Resources Act.*** (Provide the results of Investigation, assessment, and evaluation of the impact of the mining, bulk sampling or alluvial diamond prospecting on any national estate referred to in section 3(2) of the National Heritage Resources Act, 1999 (Act No. 25 of 1999) with the exception of the national estate contemplated in section 3(2)(i)(vi) and (vii) of that Act, attach the investigation report as Appendix 2.19.2 and confirm that the applicable mitigation is reflected in 2.5.3; 2.11.6.and 2.12.herein).

No sites of significance were identified by the heritage specialist within the proposed expansion footprint of the southern quarry.

t) Other matters required in terms of sections 24(4)(a) and (b) of the Act.

(the EAP managing the application must provide the competent authority with detailed, written proof of an investigation as required by section 24(4)(b)(i) of the Act and motivation if no reasonable or feasible alternatives, as contemplated in sub-regulation 22(2)(h), exist. - ***Please refer to motivation below:***

No project alternatives were considered for this assessment. The reason for this being that the existing mining right was obtained for the sole purpose of mining clay from the existing quarries as described in this report. The activities included in this application is determined by the location of the clay reserve in the study area, and the proposed mining method to be employed (this was assessed and authorised in the existing EMPR for the mine).

The No-Go option, entails the continuation of the current land use (crop farming) on the study site proposed for the expansion of the southern quarry, without exploiting the clay reserves below the surface. Expanding the southern quarry will contribute towards the achievement of providing continued jobs for the current staff, as well as the continued supply of clay material to the brick manufacturing plant in Olifantsfontein which supplies the local market with bricks, and therefore also boosting South Africa's economy.

Should the proposed project therefore not be authorised to proceed, it is anticipated that there will be a shortage in the supply of clay to the brick manufacturing plant, which will in turn lead to a shortage in the supply of bricks to the local market. The current employment opportunities will also be terminated once the reserves of the current southern clay quarry have been depleted in the next three to five years.

The No-Go alternative is therefore not a desirable option in this case, as it suggests that the clay reserves should not be exploited, and current employment opportunities should not be prolonged.

PART B

ENVIRONMENTAL MANAGEMENT PROGRAMME REPORT

1. ENVIRONMENTAL MANAGEMENT PROGRAMME.

a) Details of the EAP, (Confirm that the requirement for the provision of the details and expertise of the EAP are already included in PART A, section 1(a) herein as required).

Details of the EAP are included in Part A of this report. CV's are attached in **Appendix A**.

b) Description of the Aspects of the Activity (Confirm that the requirement to describe the aspects of the activity that are covered by the draft environmental management programme is already included in PART A, section (1)(h) herein as required).

The aspects of the activity are covered in Part A of this report.

c) Composite Map

(Provide a map **(Attached as an Appendix**) at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that any areas that should be avoided, including buffers)

Please refer to **Figure 16** - Sensitivity map earlier in this report.

d) Description of Impact management objectives including management statements

(i) Determination of closure objectives. (ensure that the closure objectives are informed by the type of environment described in 2.4 herein)

The following closure objectives have been identified as part of the Mine Closure Plan (refer to **Appendix J**):

- Implement operational control measures as indicated and required by the EMPr;
- Ensure post mining financial provision is documented and available;
- Careful planning and proper rehabilitation post mining can return the bulk of the soil material to the system, and potentially the Class II land capability as well. Post mining land uses can be set as either cultivation or grazing, depending on the feasibility of the land use, but the land capability should for at least 80% of the area, meet Class II land capability requirements;
- Establish a close working relationship with adjacent property owners and facilitate a common long-term closure objective;
- Address post mining objectives as stipulated in the Mine Closure Plan;
- Establish and conform to a frequent monitoring and reporting programme, such that liability assessments as well as legal compliance is tested and screened for improvements.

(ii) The process for managing any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of undertaking a listed activity.

A comprehensive Impact Assessment has been undertaken as part of this Environmental Impact Assessment report in order to identify and mitigate any potential environmental impacts as a result of the proposed expansion of the southern quarry at the Era Stene clay mining operations. A full list of mitigation measures are included in the impact assessment. Please refer to **Appendix G**.

i) **Potential risk of Acid Mine Drainage**. (Indicate whether or not the mining can result in acid mine drainage).

Acid mine drainage was not identified as a potential risk due to the nature of the mineral (clay) being mined at the Era Stene clay mining operations.

ii) **Steps taken to investigate, assess, and evaluate the impact of acid mine drainage.**

Not applicable.

iii) **Engineering or mine design solutions to be implemented to avoid or remedy acid mine drainage.**

Not applicable.

iv) **Measures that will be put in place to remedy any residual or cumulative impact that may result from acid mine drainage.**

Not applicable.

v) **Volumes and rate of water use required for the mining, trenching or bulk sampling operation.**

Not applicable.

vi) **Has a water use licence has been applied for?**

No new water uses are associated with phase 1 of the proposed expansion of the southern quarry. The water uses associated with the existing operations have been included in a Water Use Licence Application that was submitted to the DWS by Shangoni Management Services.

e) Impacts to be mitigated in their respective phases

Measures to rehabilitate the environment affected by the undertaking of any listed activity

ACTIVITIES (E.g. For prospecting - drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route **etc…etc…etc.**	**PHASE** (Of operation in which activity will take place.)	**SIZE AND SCALE of disturbance** (volumes, tonnages and hectares or m²)	**MITIGATION MEASURES** (Describe how each of the recommendations herein will remedy the cause of pollution or degradation and migration of pollutants)	**COMPLIANCE WITH STANDARDS**	**TIME PERIOD FOR IMPLEMENTATION**
Expansion of the southern quarry at the Era Stene clay mining operations	Construction / Expansion	57.68 ha	• A dustfall monitoring programme is currently in place at the existing clay mining operations, and will also be implemented for the proposed expansion of the southern quarry in order to control any possible nuisance dust that might give rise to complaints from surrounding landowners. • Continue with the spraying programme on the unpaved roads. Such a spraying programme is best managed by taking cognisance of rainfall and evaporation rates prevalent at the time. • Implement measures aimed at binding the surface material or enhancing moisture retention, such as wet suppression and chemical stabilization.	• Conduct dust suppression techniques to ensure that applicable standards for PM_{10} and $PM_{2.5}$ are not exceeded.	• During the life of the expansion of the southern quarry
			• Avoid unnecessary vehicle movement on the surface, especially on areas without existing roads. • Ensure that vehicles are maintained and serviced regularly to prevent hydrocarbon spillages. • Ensure that staff are adequately trained in handling the situation if a spillage of hydrocarbons does occur. • Vegetation clearing should be restricted to the footprint of the site earmarked for the expansion of the Southern quarry. • All contaminated soil shall be treated with spill kits and removed from site. • Expansion area should be inspected for any occurrence of erosion. Appropriate rehabilitation must be undertaken should any eroded areas be identified. • Soil stockpiles should be protected from erosion and contamination.	• Meet rehabilitation standards/objectives	• During the life of the expansion of the southern quarry

ACTIVITIES **(E.g. For prospecting -** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route **etc…etc…etc.**	**PHASE** (Of operation in which activity will take place.)	**SIZE AND SCALE of disturbance** (volumes, tonnages and hectares or m²)	**MITIGATION MEASURES** (Describe how each of the recommendations herein will remedy the cause of pollution or degradation and migration of pollutants)	**COMPLIANCE WITH STANDARDS**	**TIME PERIOD FOR IMPLEMENTATION**
			• No stockpiles to be placed inside of a drainage line. • Topsoil (1m – 1,5m) and subsoil (overburden) should be stripped and stockpiled separately in a designated area. • Ensure that stormwater control measures are in place to prevent soil erosion. • Rehabilitation of the expanded southern quarry should include the re-establishment of at least 1m of topsoil over the entire area of the quarry. • Quarry expansion area to be rehabilitated to a free-draining state as far as possible. • Replaced soil to be ripped after all vehicle traffic has been concluded to prevent compaction of the soils. • Erosion and vegetation establishment monitoring to be undertaken monthly for 6 months after the end of rehabilitation.		
			• Buffer the pan towards the east of the proposed expansion area with 100m and restrict access to buffer area. • The sensitivity map must be used as a decision tool to guide the expansion of the southern quarry. Areas of sensitivity and buffer zones should be avoided. • Checks must be carried out at regular intervals to identify areas where erosion is occurring. Appropriate remedial action, including the rehabilitation of the eroded areas, are to be undertaken. • Implement silt traps where necessary. • Intentional killing of any faunal species (in particular invertebrates and snakes) should be avoided by means of awareness programmes presented to the labour force. • Rehabilitation should make use of indigenous species, and preferably of species native to the study site and immediate surroundings. The species selected should strive to represent habitat types typical of the ecological landscape prior to construction.	• Meet rehabilitation standards/objectives	• During the life of the expansion of the southern quarry

ACTIVITIES **(E.g. For prospecting -** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route **etc…etc…etc.**	**PHASE** (Of operation in which activity will take place.)	**SIZE AND SCALE of disturbance** (volumes, tonnages and hectares or m²)	**MITIGATION MEASURES** (Describe how each of the recommendations herein will remedy the cause of pollution or degradation and migration of pollutants)	**COMPLIANCE WITH STANDARDS**	**TIME PERIOD FOR IMPLEMENTATION**
			• An alien and invasive plant eradication and control programme must be implemented along with a follow-up programme. The programme must be compiled by a qualified botanist/ecologist and the implementation thereof should be supervised by a qualified botanist/ecologist. The only noteworthy species observed on the study site was *Acacia dealbata*. This species is a Category 2 invasive species and since the area is not a registered plantation, it should be treated as a Category 1b species. This species must be controlled (preferably eradicated) on site. • Priority should be given to eradicate aggressive species. • Quarry expansion area to be rehabilitated to a free-draining state as far as possible. • Ensure that the water flow into and around the proposed expansion of the southern quarry is managed by the stormwater management plan for the site; and • Adhere to all the requirements of the stormwater management plan.		
			• Stop construction if any heritage resources – such as graves, human remains or fossils are identified. • Inform SAHRA and have a qualified heritage practitioner evaluated the finds and recommend appropriate actions.	• Objectives of National Heritage Resources Act (No. 25 of 1999)	• During the life of the expansion of the southern quarry
			• Expansion activities should adhere to all the relevant HSEC management measures and guidelines • The proposed expansion of the southern quarry can be screened from surrounding landowners and road users by means of planting trees on the borders of the expansion area as is currently the case at the existing southern clay quarry. Suitable species include *Searsia (Rhus) lancea*, and *Acacia karroo*.	• Objectives of Social & Labour Plan	• During the life of the expansion of the southern quarry
			• The newly drilled groundwater monitoring boreholes should be monitored for the following: ○ Monthly groundwater level measurements;	• Ensure that groundwater quality meets the SANS 241	• During the life of the expansion of the southern quarry

ACTIVITIES **(E.g. For prospecting -** drill site, site camp, ablution facility, accommodation, equipment storage, sample storage, site office, access route **etc…etc…etc.**	**PHASE** (Of operation in which activity will take place.)	**SIZE AND SCALE of disturbance** (volumes, tonnages and hectares or m²)	**MITIGATION MEASURES** (Describe how each of the recommendations herein will remedy the cause of pollution or degradation and migration of pollutants)	**COMPLIANCE WITH STANDARDS**	**TIME PERIOD FOR IMPLEMENTATION**
			○ Bi-annual monitoring of the borehole water qualities as well as seepage / rainwater in the pits; and ○ Sampling of private boreholes every 2 years. • Water levels in the pits should be measured and sampled as part of the monitoring programme; • Water volumes pumped from the quarries should be measured with flow meters and recorded; • Rainfall should be measured on a daily basis as the aquifers are recharged by rainfall. Especially the Karoo aquifer which is affected by prolonged droughts due to the slow recharge (3-5% of the annual rainfall as opposed to 10-20% in the dolomite).	Drinking Water Specification (2015)	
			• Surface water sampling/monitoring should be undertaken regularly, and if water quality is found to contain constituents other than the clay particles or concentrations exceed those allowable, then water shall be withheld and shall require treatment. • In order to minimise the volumes of affected water that will require management, the following infrastructure will be constructed: ○ Perimeter diversion drains ○ Protection berms around quarries ○ In-pit sumps ○ Settling paddocks around overburden / topsoil stockpiles.	• Ensure that surface water quality meets the "General Effluent Standards" published as Regulation No. 991 of May 1984 • Ensure that surface water quality meets the South African Water Quality Guidelines published by the DWAF in 1996	• During the life of the expansion of the southern quarry

f) Impact Management Outcomes

(A description of impact management outcomes, identifying the standard of impact management required for the aspects contemplated in paragraph ();

ACTIVITY (Whether listed or not listed).	POTENTIAL IMPACT	ASPECTS AFFECTED	PHASE In which impact is anticipated	MITIGATION TYPE	STANDARD TO BE ACHIEVED
Expansion of the southern quarry at the Era Stene clay mining operations	• Dust pollution	• Air quality	Expansion / Construction	• Control through dust suppression • Control through minimisation of vehicle movement • Control through monitoring of dustfall to determine if measures are effective	Conduct dust suppression techniques to ensure that applicable standards for PM_{10} and $PM_{2.5}$ are not exceeded
	• Soil loss and erosion, compaction and contamination • Overspill of expansion related activities into the adjacent pan towards the east of the proposed expansion area	• Soil • Wetlands		• Prevent through restricting the disturbed area • Prevent through restricting spillage from haulage vehicles • Control through removal of all utilisable soil and storage of the same • Control through implementation of storm water management measures • Remedy through treatment of contaminated soils • Prevent through implementing a 100m buffer around the pan towards the east of the proposed expansion area and restrict access to buffer area. • Prevent through using the sensitivity map as a decision tool to guide the expansion of the southern quarry. Areas of sensitivity and buffer zones should be avoided.	Rehabilitation standards/objectives
	• Loss of vegetation • Invasion by alien invasive species	• Vegetation		• Modify by vegetating soil stockpiles • Control though alien invasive eradication programme	Rehabilitation standards/objectives
	• Heritage	• Archaeological or heritage features		• Prevent through reporting and evaluation of any archaeological or heritage features found	Impact avoided
	• Social impact	• Noise and visual		• Control through appropriate management measures;	Objectives of Social & Labour Plan

ACTIVITY (Whether listed or not listed).	**POTENTIAL IMPACT**	**ASPECTS AFFECTED**	**PHASE** In which impact is anticipated	**MITIGATION TYPE**	**STANDARD TO BE ACHIEVED**
		• Health, safety and security		• Prevent through HSEC management measures	
	• Change in groundwater levels due to dewatering • Impact of groundwater quality due to mining	• Groundwater		• Prevent through monitoring of boreholes. • Prevent through monitoring water levels in the quarries.	Ensure that groundwater quality meets the SANS 241 Drinking Water Specification (2015)
	• Storm water runoff from the exposed clay materials in the quarry, as well as the clay and overburden / topsoil stockpiles can be expected to contain an elevated concentration of suspended solids, which if released to the environment could contribute to ecological degradation • Suspended solids could be expected to settle in the slow downstream river reaches, potentially altering the riparian habitat, with a negative impact on the aquatic ecology	• Surface water		• Prevent through surface water sampling/monitoring. • Prevent through implementing the stormwater management plan	Ensure that surface water quality meets the "General Effluent Standards" published as Regulation No. 991 of May 1984 Ensure that surface water quality meets the South African Water Quality Guidelines published by the DWAF in 1996

g) Impact Management Actions

(A description of impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (c) and (d) will be achieved).

ACTIVITY Whether listed or not listed.	**POTENTIAL IMPACT**	**MITIGATION TYPE**	**TIME PERIOD FOR IMPLEMENTATION**	**COMPLIANCE WITH STANDARDS**
Expansion of the southern quarry at the Era Stene clay mining operations	• Dust pollution	• Control through dust suppression • Control through minimisation of vehicle movement • Control through monitoring of dustfall to determine if measures are effective	Throughout the expansion / construction phase	Conduct dust suppression techniques to ensure that applicable standards for PM_{10} and $PM_{2.5}$ are not exceeded
	• Soil loss and erosion, compaction and contamination • Overspill of expansion related activities into the adjacent pan towards the east of the proposed expansion area	• Prevent through restricting the disturbed area • Prevent through restricting spillage from haulage vehicles • Control through removal of all utilisable soil and storage of the same • Control through implementation of storm water management measures • Remedy through treatment of contaminated soils • Prevent through implementing a 100m buffer around the pan towards the east of the proposed expansion area and restrict access to buffer area. • Prevent through using the sensitivity map as a decision tool to guide the expansion of the southern quarry. Areas of sensitivity and buffer zones should be avoided.		Rehabilitation standards/objectives
	• Loss of vegetation • Invasion by alien invasive species	• Modify by vegetating soil stockpiles • Control though alien invasive eradication programme		Rehabilitation standards/objectives
	• Heritage	• Prevent through reporting and evaluation of any archaeological or heritage features found		Impact avoided

ACTIVITY Whether listed or not listed.	**POTENTIAL IMPACT**	**MITIGATION TYPE**	**TIME PERIOD FOR IMPLEMENTATION**	**COMPLIANCE WITH STANDARDS**
	• Social impact	• Control through appropriate management measures; • Prevent through HSEC management measures		Objectives of Social & Labour Plan
	• Change in groundwater levels due to dewatering • Impact of groundwater quality due to mining	• Prevent through monitoring of boreholes. • Prevent through monitoring water levels in the quarries.		Ensure that groundwater quality meets the SANS 241 Drinking Water Specification (2015)
	• Storm water runoff from the exposed clay materials in the quarry, as well as the clay and overburden / topsoil stockpiles can be expected to contain an elevated concentration of suspended solids, which if released to the environment could contribute to ecological degradation • Suspended solids could be expected to settle in the slow downstream river reaches, potentially altering the riparian habitat, with a negative impact on the aquatic ecology	• Prevent through surface water sampling/monitoring. • Prevent through implementing the stormwater management plan		Ensure that surface water quality meets the "General Effluent Standards" published as Regulation No. 991 of May 1984 Ensure that surface water quality meets the South African Water Quality Guidelines published by the DWAF in 1996

(iii) Financial Provision

5) Determination of the amount of Financial Provision.

a) Describe the closure objectives and the extent to which they have been aligned to the baseline environment described under Regulation 22 (2) (d) as described in 2.4 herein.

The following closure objectives have been identified:

- Implement operational control measures as indicated and required by the EMPr;
- Ensure post mining financial provision is documented and available;
- Careful planning and proper rehabilitation post mining can return the bulk of the soil material to the system, and potentially the Class II land capability as well. Post mining land uses can be set as either cultivation or grazing, depending on the feasibility of the land use, but the land capability should for at least 80% of the area, meet Class II land capability requirements;
- Establish a close working relationship with adjacent property owners and facilitate a common long-term closure objective;
- Address post mining objectives as stipulated in the Mine Closure Plan;
- Establish and conform to a frequent monitoring and reporting programme, such that liability assessments as well as legal compliance is tested and screened for improvements.

b) Confirm specifically that the environmental objectives in relation to closure have been consulted with landowner and interested and affected parties.

This was undertaken as part of the public consultation of the Consultation Environmental Impact Report.

c) Provide a rehabilitation plan that describes and shows the scale and aerial extent of the main mining activities, including the anticipated mining area at the time of closure.

A rehabilitation plan will be provided as part of the promulgated legislation pertaining to Financial Provision for Prospecting, Exploration, Mining and Production Operations - GNR 1147, by 20 February 2019.

d) Explain why it can be confirmed that the rehabilitation plan is compatible with the closure objectives.

A rehabilitation plan will be provided as part of the promulgated legislation pertaining to Financial Provision for Prospecting, Exploration, Mining and Production Operations - GNR 1147, by 20 February 2019.

e) Calculate and state the quantum of the financial provision required to manage and rehabilitate the environment in accordance with the applicable guideline.

A total of R6 374 898.40 is expected to be required to ensure environmental compliance as well as for the rehabilitation of the 15 ha area at the end of mining Phase 1. This total amount as per Table 31 in the Mine Closure Report (**Appendix J**) comprises firstly out of a concurrent environmental cost of

approximately R5 400 000.00 over Phase 1 (30 years), and secondly of a post closure remediation cost of R974 898.40 (sum of opencast rehabilitation + roads rehabilitation + topsoil rehabilitation).

f) Confirm that the financial provision will be provided as determined.

The financial provision will be provided as determined.

Mechanisms for monitoring compliance with and performance assessment against the environmental management programme and reporting thereon, including

b) Monitoring of Impact Management Actions

c) Monitoring and reporting frequency

d) Responsible persons

e) Time period for implementing impact management actions

f) Mechanism for monitoring compliance

SOURCE ACTIVITY	IMPACTS REQUIRING MONITORING PROGRAMMES	FUNCTIONAL REQUIREMENTS FOR MONITORING	ROLES AND RESPONSIBILITIES (FOR THE EXECUTION OF THE MONITORING PROGRAMMES)	MONITORING AND REPORTING FREQUENCY and TIME PERIODS FOR IMPLEMENTING IMPACT MANAGEMENT ACTIONS
Expansion of southern quarry	Dust generation	PM_{10} monitoring for the expansion area.	Environmental Specialist	Monthly reports. Throughout expansion.
		Dustfall using ASTM D1739:1970 (or equivalent)	Environmental Specialist	Monthly monitoring. Annual reports. Throughout expansion.
	Alien invasive species	Develop alien invasive species monitoring programme, as well as eradication programme	Environmental Specialist	Within existing programmes. Throughout expansion.
	Groundwater related impacts	Develop a groundwater monitoring programme including water levels in the quarries	Environmental Specialist	Monthly groundwater level measurements; Bi-annual monitoring of the borehole water qualities as well as seepage / rainwater in the pits; Sampling of private boreholes every 2 years;

				Water levels in the pits should be measured and sampled as part of the monitoring programme; Water volumes pumped from the quarries should be measured with flow meters and recorded; Rainfall should be measured on a daily basis as the aquifers are recharged by rainfall.
	Surface water related impacts	Develop a surface water sampling monitoring programme	Environmental Specialist	Surface water sampling to be undertaken monthly. Throughout expansion

h) Indicate the frequency of the submission of the performance assessment report.

The environmental performance assessment report will be submitted to the DMR as per the frequency specified in the Environmental Authorisation.

i) Environmental Awareness Plan

(1) Manner in which the applicant intends to inform his or her employees of any environmental risk which may result from their work.

Potential environmental risks will be communicated to the mine employees by means of on-site inductions as well communication sessions.

(2) Manner in which risks will be dealt with in order to avoid pollution or the degradation of the environment.

Please refer to the impact assessment in **Appendix G**.

j) Specific information required by the Competent Authority

(Among others, confirm that the financial provision will be reviewed annually).

No specific information requirements have been stated by the competent authority to date.

2. UNDERTAKING

The EAP herewith confirms

a) the correctness of the information provided in the reports ☒

b) the inclusion of comments and inputs from stakeholders and I&APs ; ☒

c) the inclusion of inputs and recommendations from the specialist reports where relevant; ☒and

d) the acceptability of the project in relation to the finding of the assessment and level of mitigation proposed; ☒

Signature of the environmental assessment practitioner:

Jones & Wagener

Name of company:

2017/02/14

Date:

-END-

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14 February 2017

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APPENDIX A

EAP QUALIFICATIONS AND CV

APPENDIX B

PUBLIC PARTICIPATION PROCESS AND DOCUMENTS

B.1: Stakeholder Database

B.2 Advertisements

B.3 Site Notices

B.4 BID

B.5 Comments and Response Report

B.6 Correspondence

APPENDIX C

LOCALITY MAP

APPENDIX D

SITE LAYOUT PLAN

APPENDIX E

SPECIALIST INVESTIGATIONS AND DECLARATIONS OF INDEPENDENCE

E.1 Geohydrological Investigation

E.2 Soils, Land Capability and Wetlands

E.3 Heritage

E.4 Ecological

E.5 Surface Water

APPENDIX F

ENVIRONMENTAL & LAND USE MAP

APPENDIX G

IMPACT ASSESSMENT

APPENDIX H

FINAL SITE MAP

APPENDIX I

AUTHORITY CONSULTATION

APPENDIX J

MINE CLOSURE PLAN

APPENDIX K

SOCIAL AND LABOUR PLAN

APPENDIX L

MINE WORKS PROGRAMME