PROPOSED 100ML BRONBERG RESERVOIR AND ASSOCIATED INFRASTRUCTURE

Basic Assessment Report

July 2017

Final

Prepared for: Rand Water

DEA Reference: 14/12/16/3/3/1/1598

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Title and Approval Page

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Amendments Page

Date:	Nature of Amendment	Amendment Number:
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Table of Contents

List of Figures

List of Tables

List of Appendices

Appendix J: Additional Information

Appendix J1: Coordinates

Appendix J2: Approved Record of Decision for the R5 Pipeline

Appendix J3: Approved Water Use License for the R5 Pipeline (inclusive of Bronberg Reservoir)

Appendix J4: Geotechnical Data Report and Geotechnical Recommendations Report

Appendix J5: Stormwater Management Plan

Appendix J6: Addendum to Traffic Management Plan

Appendix J7: Revolutionary Road Solutions Road Assessment

Appendix J8: Service Provision and Access

Appendix J9: CoT: Capacity Planning and Demand Management Letter

Appendix J10: Golden Mole Rehabilitation Plan including the Bronberg Conservancy Plant List

Appendix J11: Proposed townships and developments in Region 7 and Bronkhorspruit Cullinan area implementation plan

Appendix J12: CoT: Water and Sanitation Department's request for Rand Water to augment the system

Appendix J13: Broad Bronberg Ecological Study (As Supporting Documentation)

environmental affairs
Department:
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Basic assessment report in terms of the Environmental Impact Assessment Regulations, 2014, promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended.

Kindly note that:

1. This **basic assessment report** is a standard report that may be required by a competent authority in terms of the EIA Regulations, 2014 and is meant to streamline applications. Please make sure that it is the report used by the particular competent authority for the activity that is being applied for.
2. This report format is current as of **08 December 2014**. It is the responsibility of the applicant to ascertain whether subsequent versions of the form have been published or produced by the competent authority
3. The report must be typed within the spaces provided in the form. The size of the spaces provided is not necessarily indicative of the amount of information to be provided. The report is in the form of a table that can extend itself as each space is filled with typing.
4. Where applicable **tick** the boxes that are applicable in the report.
5. An incomplete report may be returned to the applicant for revision.
6. The use of "not applicable" in the report must be done with circumspection because if it is used in respect of material information that is required by the competent authority for assessing the application, it may result in the rejection of the application as provided for in the regulations.
7. This report must be handed in at offices of the relevant competent authority as determined by each authority.
8. No faxed or e-mailed reports will be accepted.
9. The signature of the EAP on the report must be an original signature.
10. The report must be compiled by an independent environmental assessment practitioner.
11. Unless protected by law, all information in the report will become public information on receipt by the competent authority. Any interested and affected party should be provided with the information contained in this report on request, during any stage of the application process.
12. A competent authority may require that for specified types of activities in defined situations only parts of this report need to be completed.
13. Should a specialist report or report on a specialised process be submitted at any stage for any part of this application, the terms of reference for such report must also be submitted.

14. Two (2) colour hard copies and one (1) electronic copy of the report must be submitted to the competent authority.
15. Shape files (.shp) for maps must be included in the electronic copy of the report submitted to the competent authority.

SECTION A: ACTIVITY INFORMATION

Has a specialist been consulted to assist with the completion of this section?	NO ✓

If YES, please complete the form entitled "Details of specialist and declaration of interest" for the specialist appointed and attach in Appendix I.

1. PROJECT DESCRIPTION

a) Describe the project associated with the listed activities applied for

Rand Water is the primary supplier of water to Gauteng, Mpumalanga and surrounding areas. The area of focus for this project includes the areas north of Bronberg to Mamelodi and extending to Bronkelspruit and Ekandustria, within the City of Tshwane. The background to the existing 100 Mega Litre (ML) Bronberg reservoir needs to be discussed first to understand the need for the proposed reservoir: The initial Vlakfontein – Mamelodi system did not include a storage reservoir. Only a break pressure installation with a 5 ML tank was constructed. A few years later, it was realised that an adequate storage facility closer to Mamelodi was required as the distance to the points of the use of water to the north of the Bronberg from the Vlakfontein reservoir in Benoni is too long. The risk for non-supply was too high taking into account that only a single pipeline supplies the whole area. Subsequently the existing 100ML Bronberg reservoir was constructed. The Vlakfontein Mamelodi system forms part of Rand Waters Mapleton system. The purpose of the system is bulk water supply. The system is located between Vlakfontein and Mamelodi and then extends further to feed municipal reservoirs in Ekandustria and an emergency connection to Cullinan.

The existing 100 ML reservoir in the Rand Water Bronberg property supplies a large area, refer to **Appendix C** for a map showing the supply area. From the Bronberg Reservoir to Mamelodi, the pipeline supplies the following networks/regions:

- The Bronberg East Bulk System: there are no reservoirs on this system and it serves a number of reticulation networks directly. These direct connections include Silver Lakes, a portion of Shere, Paradiso, Tijger Vallei, Zwartkoppies and Boschkop.
- Rand Water Bronberg to Mamelodi system: There are several direct connections including the suburbs of Shere, Paramount, Six Fountains, Silver Willows, Savannah, African Renaissance/Sammy Marks and Nellmapius. There are currently no areas supplied by the existing reservoir off this section of pipe, with the exception of the Shere connection.
- Mamelodi Reservoirs R3 and R4: At the southern edge of Mamelodi, a City of Tshwane pipeline branches off the Rand Water pipeline and extends north to supply Mamelodi Reservoirs R3 and R4.
- Mamelodi Direct feeds R5 and R6: a pipeline branches off the H26 supplying two Mamelodi direct feed connections R5 and R6.
- Supply to Ekandustria: beyond the Mamelodi connection, the pipeline provides 30Ml/day to augment supply to Ekandustria Reservoirs (used primarily to supply the neighbouring Thembisile Hani Municipality). The same pipeline also includes an emergency connection to Cullinan.

The proposed project is the construction of a 100ML reservoir adjacent to the existing 100ML reservoir in the Rand Water Bronberg property. The project is associated with the listed activities applied for is the construction, operation and maintenance of a 100 ML reservoir. The proposed additional 100 ML reservoir will supply water to Shere, Paramount, Six Fountains, Silver Willows, Savannah, African Renaissance/Sammy Marks and Nellmapius, thereby freeing up capacity in the current system to

increase capacity in the system to supply to Mamelodi, Ekundstria, Bronhorspurit and Cullinan. The proposed 100ML reservoir forms part of Rand Waters Mapelton system.

The proposed 100ML Bronberg reservoir site is located within the existing Rand Water reservoir property in Pretoria East, near areas such as Olympus Agricultural Holdings, Wapadrand and Shere within the City of Tshwane Metropolitan Municipality (**Figures 1** to **3**).

The proposed development will be located on Portion 18 as well as the remaining extent of Tweefontein Farm No. 372 JR, City of Tshwane Metropolitan Municipality, in Pretoria. Infrastructure associated with the proposed development is addressed as part of this application and includes but is not limited to inlet and outlet pipelines, value chambers, upgrade to the existing palisade fence, a discharge and overflow pipe, temporary upgrade of an existing dirt road to allow for a construction access road, construction camp (otherwise referred to as contractor's offices) and laydown area.

The study area for the proposed development overlaps with a portion of the approved Rand Water R5 (GAUT 002/13-14/E0045) pipeline project (**Figure 4**). If the proposed reservoir is authorised, construction of the R5 pipeline is proposed to overlap with the proposed reservoir construction.

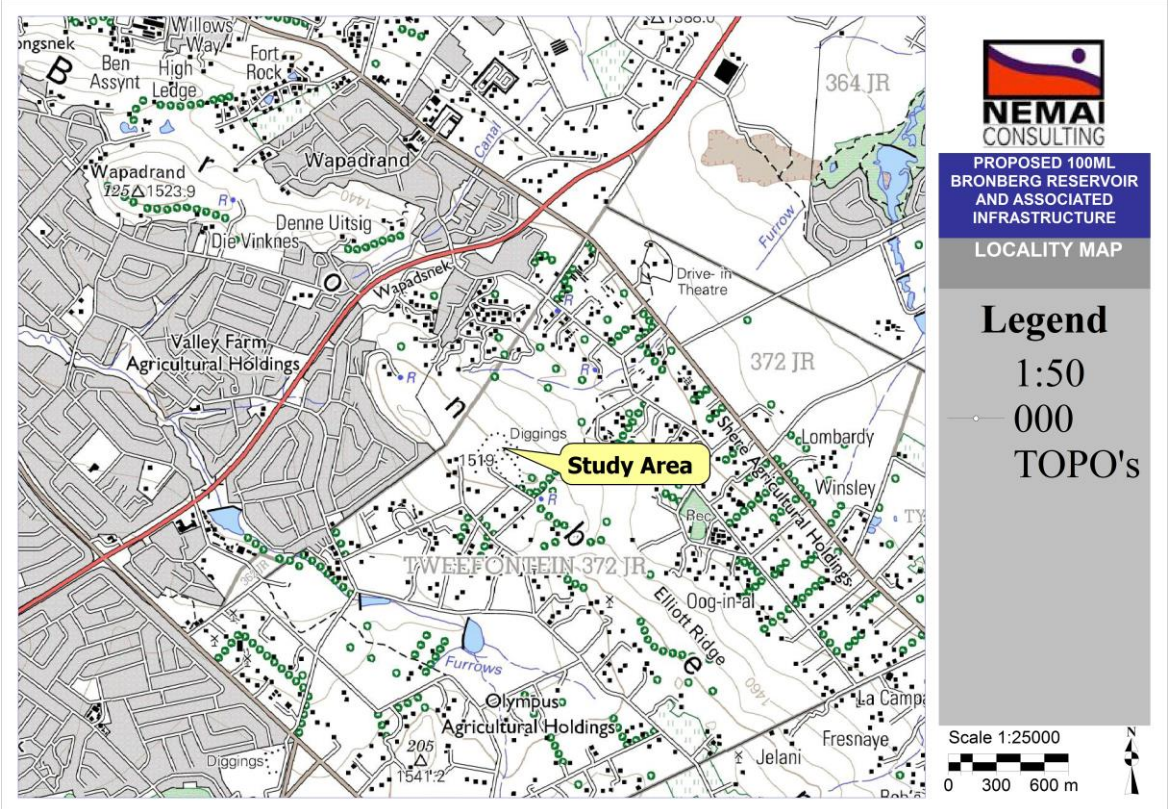

Figure 1: 1:50 000 Topographical locality map of study area

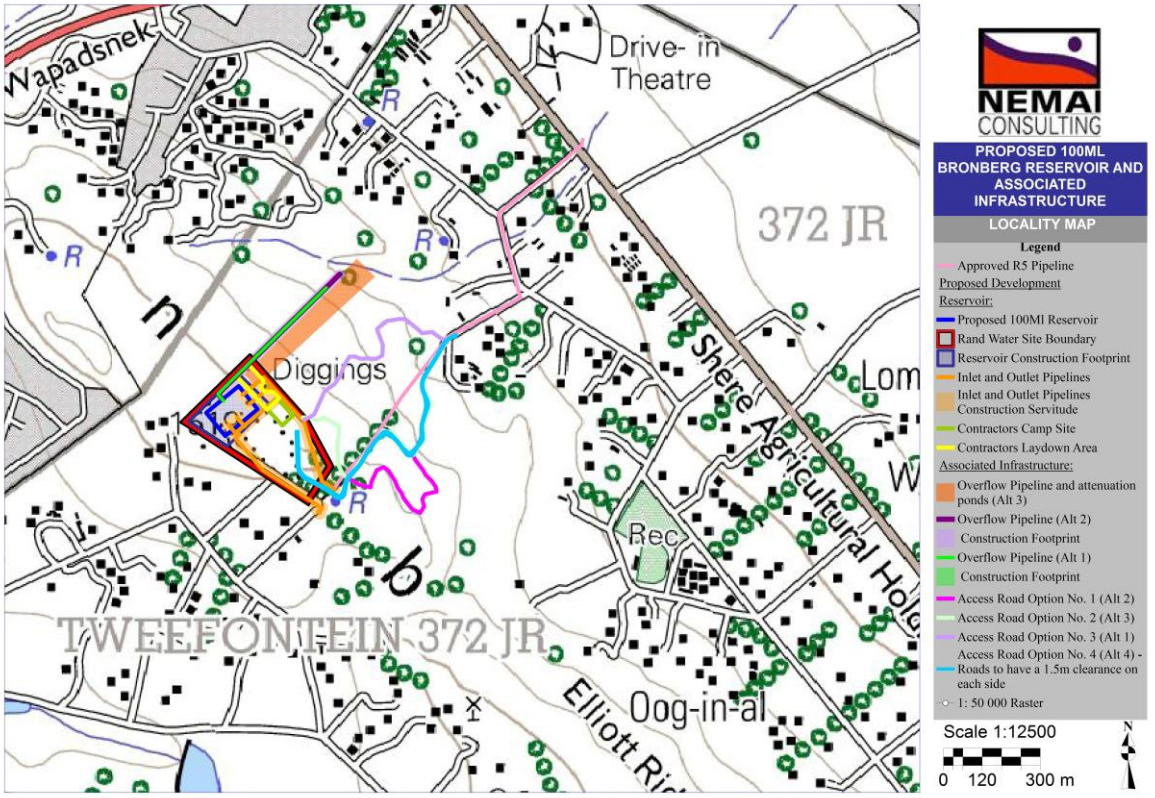

Figure 2: Proposed Rand Water development (including alternatives)

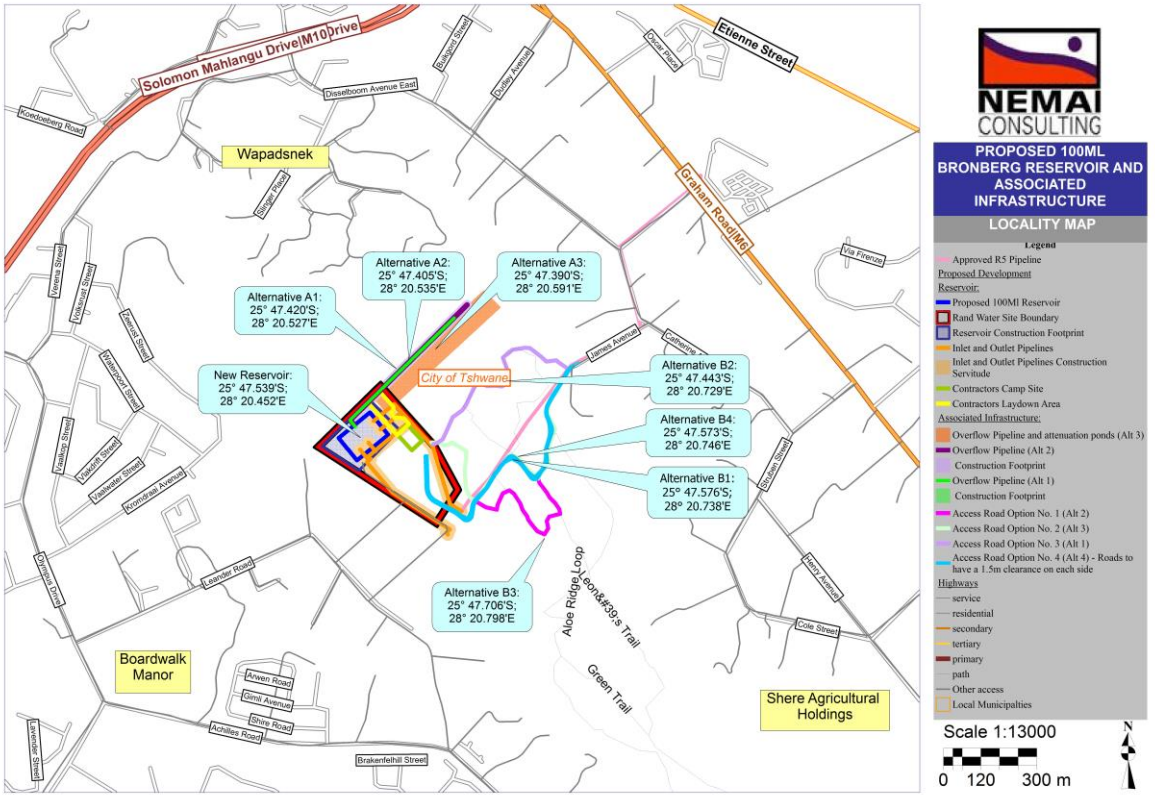

Figure 3: Locality map for proposed development

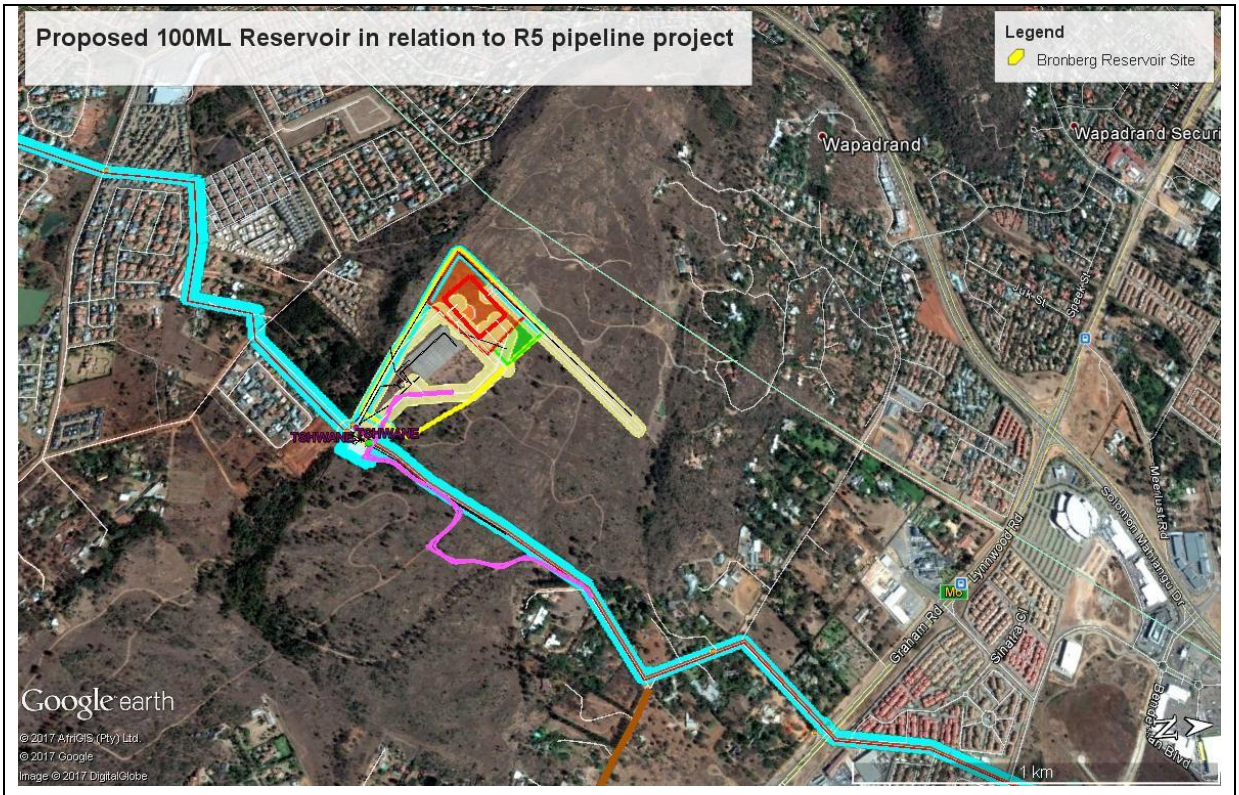

Figure 4: Locality map of the approved R5 pipeline project in relation to the study area and preferred construction footprint

The site for the proposed development occurs on the Bronberg Conservancy/Ridge (Class 2 ridge) (**Figure 5**) and falls within Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) and the CBA of the site is classified as Irreplaceable Areas. The proposed development site falls within the terrestrial threatened ecosystem identified as the Bronberg Mountain Bushveld. According to the Gauteng Conservation Plan 3.3, more than 80% of the entire proposed development site falls within Class 2 ridges. The Bronberg Conservancy is known for its rich biodiversity and specific importance of being the habitat for the Juliana's Golden Mole (*Neamblysomus julianae*) which is a critically endangered species.

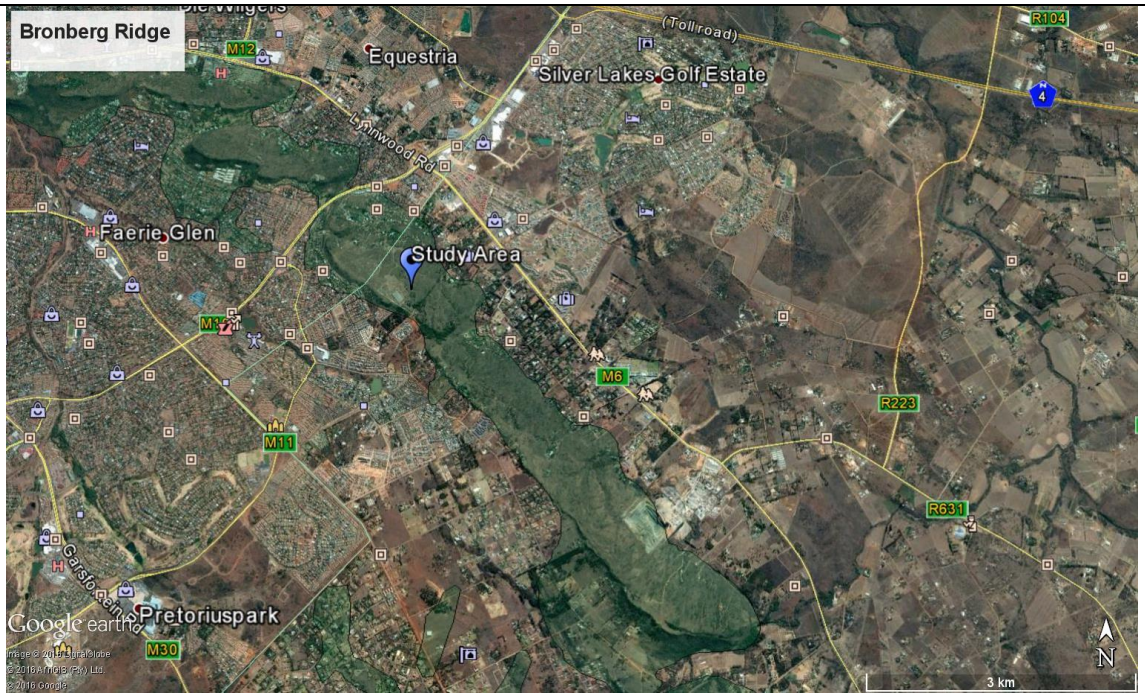

Figure 5: Map detailing the Bronberg Ridge

The population growth in the area of supply and the resulting water demand is expected to exceed the current supply from 2020 onwards. Rand Water strives to have a minimum of 24 hours strategic storage in terms of the annual average daily demand for any of its systems, thus the additional 100ML reservoir is required immediately to meet this objective and projected increase in demand. The proposed construction period for a reservoir is approximately 3 years. The proposed additional 100ML reservoir at Bronberg will suffice until 2035 up to a compound growth rate for the area of 2,5%. The downstream pipeline is currently operating at very high velocities and is therefore considered close to the limit of its capacity. There is considerable development pressure on the eastern side of this system (south of Mamelodi) which can only be supplied by this Rand Water system. Much of the area supplied by the downstream pipeline is via direct connections. Rand Water permits these direct connections since City of Tshwane contributed capital expenditure for 30 ML in the Rand Water existing 100 ML reservoir; this is an exceptions case as there are no appropriated sites for the installation of a municipal reservoir to supply the Kungwini Local Municipality area. This acquired storage capacity entitles the City of Tshwane to draw at hourly peaks at the supply points off the Rand Water H26 pipeline between the Bronberg reservoir and Mamelodi. Hence the R5 pipeline is to be constructed from the Bronberg Reservoir to Graham Road (extension to the east of Lynwood Road) and then the continuation of the pipeline to Mamelodi as well as the proposed 100ML reservoir. By constructing the new storage reservoir it is likely that peak flows may be significantly reduced thereby freeing up capacity in the system to supply new developments.

In terms of the existing systems capacity during peak demand the total flow rate leaving Bronberg reservoir would need to be 2,146l/s. A hydraulic model of this network was created to test the capacity of the system and the results indicate the flow rate leaving Bronberg reservoir is 2,013l/s, resulting in a flow velocity of 3.5m/s on portions of the pipeline. Rand Water design criteria will tolerate flow velocities up to 3.0m/s, therefore flow rates in the system are unacceptably high. The only solution is to provide additional reservoir storage in order to address increased demand and expected growth. This will allow for the existing direct feed connections (from the suburbs of Shere, Paramount, Six Fountains, Silver Willows, Savannah, African Renaissance/Sammy Marks and Nellmapius) to be switched to the additional reservoir supply and thereby reducing the peak demand requirement and releasing capacity in the pipeline for further development.

During peak demand, the high lying Mamelodi R4 reservoir, which is fed by a CoT branch off H26, is unlikely to receive its required supply rate. H26 and the associated bulk supply system is therefore considered to be operating beyond its capacity during peak hours and any new connections to this pipe should be accompanied by some form of mitigation. The most suitable way of "adding" capacity to back into H26 to offset the impact of new connections would be through the provision of reservoir storage such that existing direct connections could be rezoned to a reservoir feed thereby reducing peaks in demand. Much of the anticipated future development is expected to occur upstream of Bronberg, between Bronberg and Mamelodi and beyond. Any storage that is provided in the system must be located downstream of the proposed future development, thereby releasing capacity for a connection point upstream. Rand Water have advised that no other geographical site alternatives for this proposed development are feasible.

As a result of the site being highly environmentally sensitive, several environmental specialist studies were undertaken as part of this Basic Assessment (BA) Process to mitigate all potential impacts as much as possible.

b) Provide a detailed description of the listed activities associated with the project as applied for

Listed activity as described in GN 983, 984 and 985	Description of project activity
Example: ***GN 983 Item xx xx): The construction of a bridge where such construction occurs within a watercourse or within 32 metres of a watercourse, measured from the edge of a watercourse, excluding where such construction will occur behind the development setback line.***	***A bridge measuring 5 m in height and 10m in length, no wider than 8 meters will be built over the Orange river***
<u>GN No. 983 (04 December 2014 of NEMA) Item No. 9 (i and ii):</u> The development of infrastructure exceeding 1000 metres in length for the bulk transportation of water or storm water- (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more; excluding where- (a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve; or (b) where such development will occur within an urban area.	The development will involve the construction of inlet and outlet pipes (with a combined length of approximately 1200m) as well as a discharge and overflow pipeline (with an approximate length of 500m). The diameters of the pipelines vary between 1000 – 2000m and 1200 to 1500m respectively. In total, this exceeds 1000 metres in length for the bulk transportation of water within an area identified as rural according to the Gauteng Urban Edge.
<u>GN No. 983 (04 December 2014 of NEMA) Item No. 13:</u> The development of facilities or infrastructure for the off-stream storage of water, including dams and reservoirs, with a combined capacity of 50000 cubic metres or more, unless such storage falls within the ambit of activity 16 in Listing Notice 2 of 2014.	The development includes the construction of a 100ML reservoir.
<u>GN No. 983 (04 December 2014 of NEMA) Item No. 19 (i):</u> The infilling or depositing of any material of more than 5 cubic metres into, or the dredging, excavation, removal or	The temporary upgrade of an existing dirt road to allow for construction access. Road option 4 (Alternative 4) involves crossing the non-perennial drainage line

Listed activity as described in GN 983, 984 and 985	Description of project activity
moving of soil, sand, shells, shell grit, pebbles or rock of more than 5 cubic metres from- (i) a watercourse; but excluding where such infilling, depositing, dredging, excavation, removal or moving- (a) will occur behind a development setback; (b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or (c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.	and includes grading and infilling. The total cubic metre required for infilling is dependent on the final designs of the road. The estimation provided is based on preliminary designs which is approximately: 2163.42 m^3 – calculated as follows: The proposed upgrade of the temporary access road is 707 m in length, with a road prism of 3.8 with 1.5 m shoulder, with 3 layers of 150 mm. The volume of material in a road layer is obtained by multiplying the thickness of the layer (t) by the width of the layer (w) by the length of the layer (l).Therefore the estimated infill to be deposited is calculated at: 0.15 x 6.8 x 707 = 402.99 (x 3) = 2163.42 m^3
<u>GN No. 985 (04 December 2014 of NEMA) Item No. 2 (c)(v, vi and x):</u> The development of reservoirs for bulk water supply with a capacity of more than 250 cubic metres. (c) Gauteng: v. Sites identified within threatened ecosystems listed in terms of the National Environmental Management Act: Biodiversity Act (Act No. 10 of 2004); vi. Sensitive areas identified in an environmental management framework adopted by relevant environmental authority. x. Sites zoned for conservation or public open space or equivalent zoning.	The development involves the construction of a 100ML reservoir and associated infrastructure within a threatened ecosystem and a Class 2 Ridge. The site falls within the Bronberg Conservancy / Bronberg Ridge (Class 2 Ridge) conservation area - identified as CBAs and ESAs.
<u>GN No. 985 (04 December 2014 of NEMA) Item No. 4 (c)(iv, vi and xii):</u> The development of a road wider than 4 metres with a reserve less than 13,5 metres. (c) In Gauteng: iv. Sites identified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; vi. Sensitive areas identified in an environmental management framework adopted by relevant environmental authority. xii. Sites zoned for conservation or public open space or equivalent zoning.	The temporary upgrade of an existing dirt road for construction access road falls within a CBA and Class 2 Ridge within a threatened ecosystem. The road falls within the Bronberg Conservancy / Bronberg Ridge (Class 2 Ridge) conservation area - identified as CBAs and ESAs. Thick vegetation is proposed to be cleared for a nominal 12m temporary right of way servitude. A road prism of 3.8 m is proposed and a 1.5m wide area Within the 12m temporary right of way servitude, thick bush will be cleared to allow for overhang. The proposed area

Listed activity as described in GN 983, 984 and 985	Description of project activity
	(Bronberg Ridge) has steep slopes and sharp bends, therefore the vehicle geometry and curve widening as well as ensuring the grade change is proportional to the horizontal distance shall be considered. Within the 12m servitude the road prism will be widened around some of the tighter bends.
GN No. 985 (04 December 2014 of NEMA) Item No. 14 (xii)(a)(b)(iv, vi and x): The development of- (xii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs- (a) within a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. (b) In Gauteng: iv. Sites identified as Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) in the Gauteng Conservation Plan or in bioregional plans; vi. Sensitive areas identified in an environmental management framework adopted by relevant environmental authority; x. Sites zoned for conservation or public open space or equivalent zoning.	The temporary upgrade of an existing dirt road for construction access crosses a drainage line within the CBA and Class 2 Ridge within a threatened ecosystem. The road falls within the Bronberg Conservancy / Bronberg Ridge (Class 2 Ridge) conservation area - identified as CBAs and ESAs.

2. FEASIBLE AND REASONABLE ALTERNATIVES

"alternatives", in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to—

(a) the property on which or location where it is proposed to undertake the activity;
(b) the type of activity to be undertaken;
(c) the design or layout of the activity;
(d) the technology to be used in the activity;
(e) the operational aspects of the activity; and
(f) the option of not implementing the activity.

Describe alternatives that are considered in this application as required by Appendix 1 (3)(h), Regulation 2014. Alternatives should include a consideration of all possible means by which the purpose and need of the proposed activity (NOT PROJECT) could be accomplished in the specific instance taking account of the interest of the applicant in the activity. The no-go alternative must in all

cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed.

The determination of whether site or activity (including different processes, etc.) or both is appropriate needs to be informed by the specific circumstances of the activity and its environment. After receipt of this report the, competent authority may also request the applicant to assess additional alternatives that could possibly accomplish the purpose and need of the proposed activity if it is clear that realistic alternatives have not been considered to a reasonable extent.

The identification of alternatives should be in line with the Integrated Environmental Assessment Guideline Series 11, published by the DEA in 2004. Should the alternatives include different locations and lay-outs, the co-ordinates of the different alternatives must be provided. The co-ordinates should be in degrees, minutes and seconds. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection.

The purpose of the proposed development is bulk water supply. Alternatives discussed in the Basic Assessment Report (BAR) considered the principles of sustainable development and provided the framework for evaluating the need and purpose of the development. A range of alternatives exist, however not all of which were appropriate for the BAR, only those that were assessed as appropriate (feasible) for the potential project were fully assessed for the proposed development. Alternatives that would meet the stated purpose of the project were evaluated. The following aspects were considered during the evaluation of all realistic alternatives:

- Who is the proponent?
    - Rand Water is an organ of state (public sector), a mandated bulk water services provider in terms of the Water Services Act No 108 of 1997;
- Who are the intended beneficiaries?
    - Beneficiaries are residents of the City of Tshwane, more specifically, the suburbs of Silver Lakes, a portion of Shere, Paradiso, Tijger Vallei, Zwartkoppies and Boschkop, Paramount, Six Fountains, Silver Willows, Savannah, African Renaissance/Sammy Marks and Nellmapius and Mamelodi, Ekandustria, Cullinan;
- Where is the proposal to occur?
    - The proposed 100ML Bronberg reservoir site is located within the existing Rand Water reservoir property in Pretoria East, near areas such as Olympus Agricultural Holdings, Wapadrand and Shere within the City of Tshwane Metropolitan Municipality (**Figures 1** to **3**). The proposed development will be located on Portion 18 as well as the remaining extent of Tweefontein Farm No. 372 JR, City of Tshwane Metropolitan Municipality, in Pretoria. Infrastructure associated with the proposed development is addressed as part of this application and includes inlet and outlet pipelines, value chambers, upgrade to the existing palisade fence, a discharge and overflow pipe, temporary upgrade of an existing dirt road to allow for a construction access road, construction camp (otherwise referred to as contractor's offices) and a laydown area. The associated infrastructure as detailed above is proposed to be sited on the remaining portion 18 of Tweefontein Farm No. 372 JR, City of Tshwane Metropolitan Municipality. The site for the proposed development occurs on the Bronberg Conservancy/Ridge (**Figure 4**) and falls within the Critical Biodiversity Areas (CBAs) and Ecological Support Areas and the CBA of the site is classified as Irreplaceable areas. The proposed development site falls within the terrestrial threatened ecosystem identified as the Bronberg Mountain Bushveld. According to the Gauteng Conservation Plan 3.3, more than 80% of the entire proposed development site falls within Class 2 ridges. The site is known for its rich biodiversity and specific importance of being the habitat for the Juliana's Golden Mole

(*Neamblysomus julianae*) which is a critically endangered species.

Alternatives Considered:

Two different types of alternatives have been considered for the proposed development as part of the Basic Assessment (BA) Process:

- Overflow Pipeline (Refer to "b" below) – overflow pipeline is required to be constructed for safe operation of the reservoir; and
- Temporary Construction Road Alignments (Refer to "b" below) – the temporary upgrade of road for access during the construction period.

a) Site alternatives

Rand Water have advised that there are no feasible site alternatives for the proposed development. The location of additional storage in a system is determined by the design, operation and layout of the existing Mapelton system (Vlakfontein – Mamelodi) (refer to system schematic in Appendix C), which takes into consideration the existing infrastructure, supplies and flow rates and pressure. Furthermore, the location of additional storage must be located with the system where it will achieve the intended purpose of the project (augmentation of the system by releasing capacity for future development in the area identified for growth). Much of the anticipated future development is expected to occur downstream of Bronberg, between Bronberg and Mamelodi and beyond to Ekandustria. Any storage that is provided in the system must be located upstream of the proposed future development, thereby releasing capacity for a connection point downstream. Rand Water has advised that no other geographical site alternatives for this proposed development are feasible. There are no appropriate reservoir sites down-stream of Bronberg up to the hills where the Mamelodi reservoirs are, hence the reason for the City of Tshwane acquiring 30ML (as no appropriated sites for the installation of a municipal reservoir to supply the Kungwini Local Municipality area), as equivalent balancing storage to smooth out peak hourly draw-offs and further the reasoning for proposing an additional 100ML reservoir at the same location.

However, the proposed site is highly environmentally sensitive because the critically endangered Juliana's golden mole species. The Bronberg Conservancy covers an area of over 300 hectares, and includes a number of ecological zones, incorporating quartzite ridges as well as grassland areas. It is home to a remarkable diversity of plant and animal life.

The proposed reservoir forms part of the Rand Water Mapelton supply system which services central and eastern Tshwane and eastern Ekurhuleni (refer to **Figure 6**).

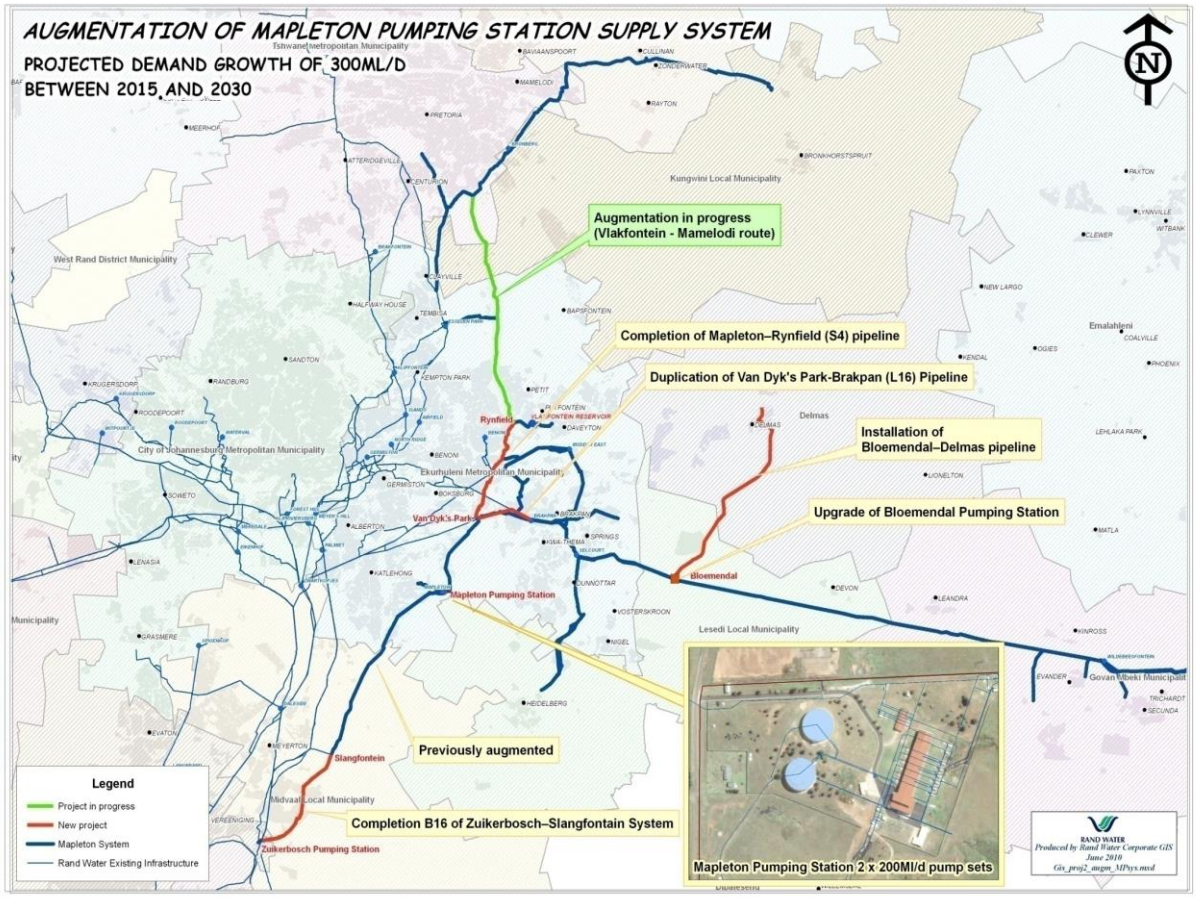

Figure 6: Rand Water supply system - Mapleton system

The Vlakfontein and Bronberg reservoirs are some 48 km apart. During the pre-feasibility assessment undertaken by Rand Water, two possible reservoir sites were investigated as alternatives to the Bronberg Reservoir site (refer to **Figure 7**). Both alternatives were found unsuitable and not feasible, these were not investigated further in the Basic Assessment Process as they were identified as non-feasible by Rand Water.

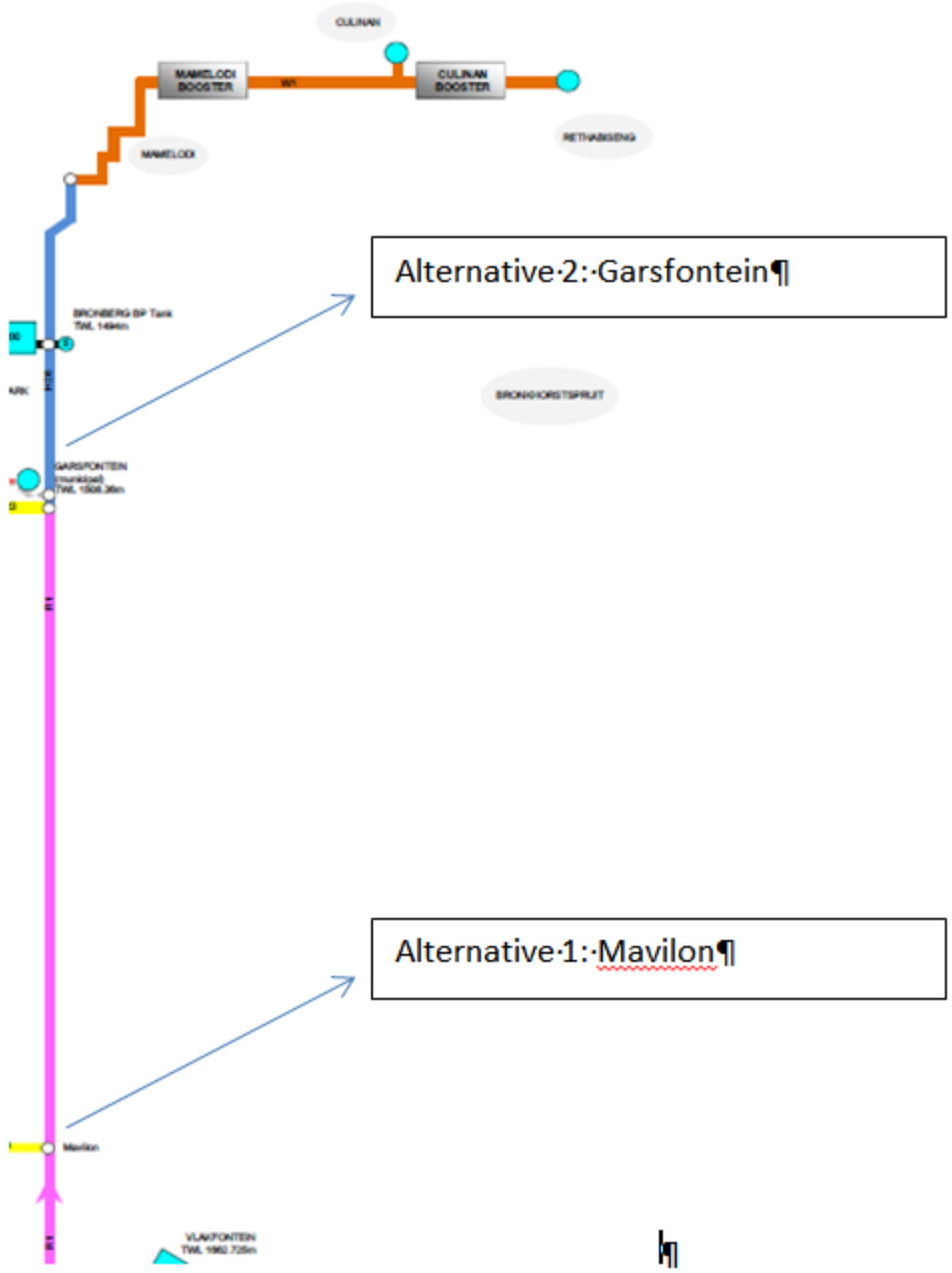

Figure 7: Palmiet / Mapleton system (schematic)

Alternative 1:
The first site is some 2 km beyond Mavillon and it is too close to the Vlakfontein reservoir to serve its required purpose (need of the proposed activity).

Alternative 2:
The second alternative site is some 2 km beyond the Garsfontein reservoir meter. Rand Water have stated the Garsfontein site will not result in the required release of capacity for connection points upstream as required by the project. The Garsfontein site does not allow for the existing direct feed connections (from the suburbs of Shere, Paramount, Six Fountains, Silver Willows, Savannah, African Renaissance/Sammy Marks and Nellmapius) to be switched to the additional reservoir supply and will not result in reducing the peak demand requirement and releasing capacity in the pipeline for further development. Therefore, Garsfontein site will not serve the required purpose (need of the proposed activity).

Considering the Garsfontein site poses the following problems:

- Rand Water will have to acquire adequate land (the extent estimated at not less than 40.000m²), suitable in terms of elevation, geotechnical, aesthetical, functional, social and environmental conditions, for a 100ML reservoir, complete with break pressure installations and in/outlet pipes;
- The City of Tshwane has made capital contributions to the R1 and H26 pipelines, as well as to the existing 100ML Bronberg reservoir. The City of Tshwane will have to be part of any discussions not to proceed with the proposed Bronberg reservoir as it has made substantial capital contributions to the Vlakfontein system;
- It is noted from the long section (technical design drawings) that following the commissioning of the R5 pipeline, probably for at least 10 years it will not be necessary for the City of Tshwane to pump water received from Rand Water to its Mooikloof reservoir. Meters that supply the City of Tshwane will be negatively affected by such a lowering of operating pressures and may require pumping;
- Due to the hydraulic gradient available from the existing system for the meters, Rand Water will be required to lay a separate +/-1900mm diameter pipeline (instead of the +/-1200mm diameter pipeline that is already being constructed in different phases – R5) for about +/-7400m. This +/-1900mm diameter pipeline may in no way be connected to the adjacent existing 900mm diameter H26 pipeline that supplies the Bronberg reservoir directly from the Vlakfontein reservoir, a separate pipeline will need to be constructed;
- A separate +/-1900mm diameter pipeline will probably be 60-70% more expensive than the proposed +/-1200mm diameter R5 pipeline for this 7400m;
- Supplies through both the 900mm diameter H26 and a separate 1900mm diameter pipeline will be required to both pass through the Bronberg reservoir and surrounding area (including the Bronberg Ridge/Conservancy).
- The 830mm diameter H26 pipeline downstream of the Bronberg reservoir to Mamelodi was designed for pressures emanating from the Bronberg reservoir only and is of an API5L Grade B steel;
- This methodology of operation will mean that the existing Bronberg reservoir will have an added operational requirement which will result in it being a less reliable/stable storage reservoir.
- An additional break pressure installation with additional inlet and outlet pipes may also be required at the existing Bronberg reservoir to suit the increased operational requirement;
- The option to bypass the existing Bronberg reservoir break pressure installation will result in the existing 830mm diameter H26 between a distance 4000m and 7500m (length of 3.500 metres) not of adequate strength to handle the increased pressures and the two different pipelines will have to be separated once again and the planned +/-1000mm pipeline between Graham Road and Mamelodi will require a thicker wall and higher quality steel than planned;
- An alternative reservoir site will still require additional works to be undertaken at the Bronberg reservoir site following the analysis for increased flows and functioning of the break pressure installation with inlet and outlet pipes;
- The Garsfontein site as an alternative site for an additional reservoir will result in a substantial investment of hundreds of millions of Rands more than approved and planned for and further a greater impact on the environment as additional pipelines will be installed down the ridge and through the sensitive Bronberg Conservancy and further a larger diameter pipe (R5) will need to be installed from Graham road to Mamelodi passing through the Rietvlei Nature Reserve; and
- Garsfontein site will not serve the required purpose (need of the proposed activity. In conclusion, Rand Water found the above alternative not to be feasible and thus not evaluated during the Basic Assessment Process.

Therefore location of the new reservoir is proposed adjacent to the existing 100ML reservoir (within the existing Rand Water property) and is located on the Bronberg ridge which is technically required for the development as efficient functioning of the reservoir depends on gravitational flow of the water and current operations of the supply system. Rand Water considered the requirements for the proposed project in terms of the required topology, elevation, geotechnical, functional, social, environmental conditions,

proximity to existing infrastructure as well as the proposed area of supply and came to the conclusion that an alternative location for the development was not feasible.

In conclusion, the above alternatives were not found to be feasible and thus not evaluated during the Basic Assessment Process – **No site alternatives are considered.**

For route alternatives that are longer than 500m, please provide an addendum with co-ordinates taken every 250 meters along the route for each alternative alignment.
In the case of an area being under application, please provide the co-ordinates of the corners of the site as indicated on the lay-out map provided in Appendix A of this form.

b) Lay-out alternatives

The first type of alternative considered is for the Overflow Pipeline:

An overflow pipeline is required to be constructed for safe operation of the reservoir. The overflow pipeline is required in case of failure or malfunction of the reservoir, such as failure of pumps to shut down. The risk of the reservoir failing is however extremely low, however needs to be catered for as a design risk component to the project. The final diameter of the pipeline is dependent on the approval of the final designs from the Department of Water and Sanitation, whereby the DWS provide permission to construct; this can only be obtained following receipt of all other requisite approvals.

The overflow from the existing reservoir is directed to the south to Boardwalk Meander Estate. Following comments received from the public at a Focus group meeting, concerns were raised with regards to the silt in the Boardwalk meander dam. Rand Water investigated and it was confirmed that the overflow pipeline has a number of illegal storm water connections. Further it was confirmed that Rand Water do not have a registered servitude for the pipeline and the pipeline has been encroached upon by a residential complexes, therefore access is not possible for an upgrade nor for maintenance of the pipeline. Rand Water additionally consulted with the City of Tshwane it was further confirmed that the Boardwalk Meander dam does not have capacity to cater for the overflow of the proposed additional reservoir. Therefore the overflow pipeline for the additional reservoir is proposed on the western boundary of the landowners property adjacent to an existing Council pipeline. The pipeline will service both reservoirs (refer to Appendix C - Facility layout drawing).

Three alternative options are proposed:

1. Alternative A1 (Refer to Alternative 1 in **Figure 8**) – Pipeline approximately 500m in length and 1200mm – 1500mm in diameter, with a 10m wide construction footprint. The pipeline length was reduced to avoid impeding on the drainage line and recommended buffer zone. The design includes the installation of erosion control structures and energy breakers to prevent downstream erosion and potential scouring.
2. Alternative A2 (Refer to Alternative 2 in **Figure 8**) – Pipeline approximately 560m in length and 1200mm-1500mm in diameter, with a 10m wide construction footprint. This pipe intrudes on the drainage line and recommended buffer zone.
3. Alternative A3 (Refer to Alternative 3 in **Figure 8**) – Overflow pipeline and attenuation ponds. Involves the installation of an overflow pipe connected to three attenuation ponds, the footprint would be approximately 40 000m^2.

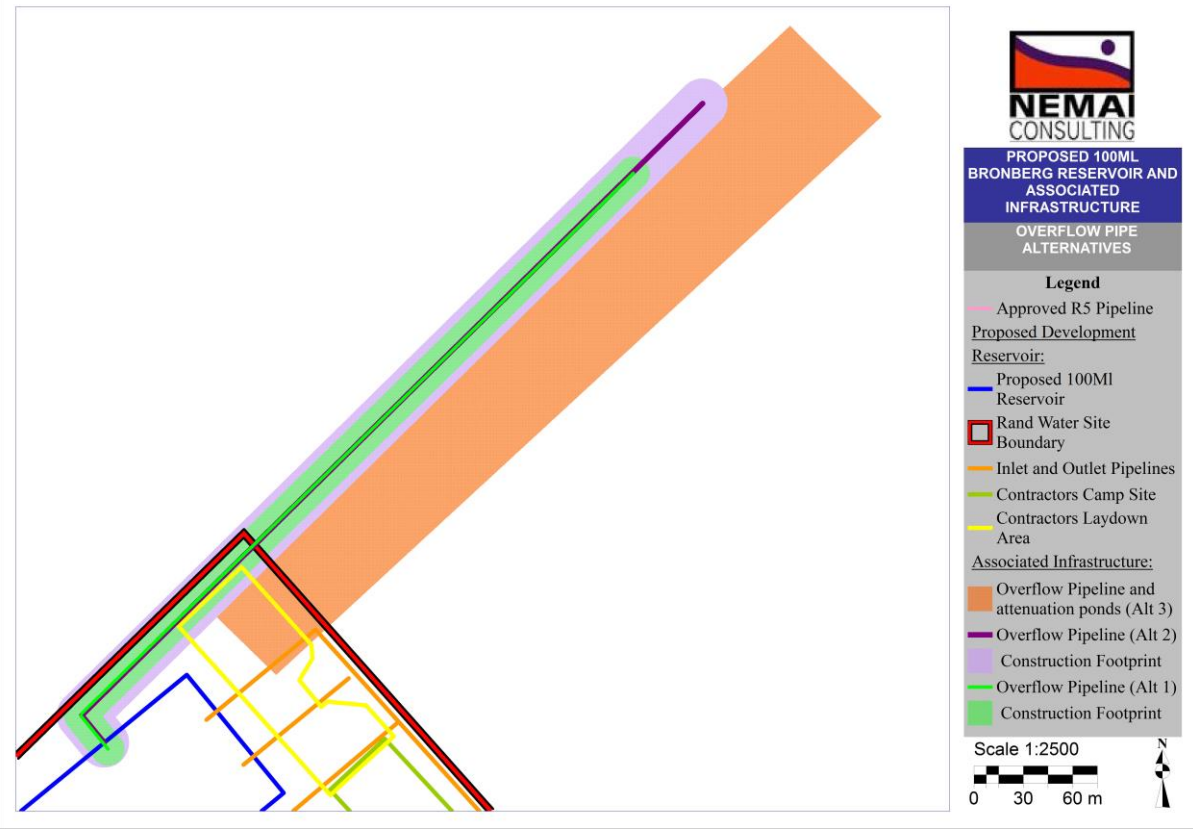

Figure 8: Alternatives for the overflow pipeline

Alternative:	**Latitude (S):**	**Longitude (E):**
Alternative A1 (preferred)		
• Starting point of the activity	25°47'31.20"S	28°20'26.23"E
• Middle/Additional point of the activity	25°47'25.22"S	28°20'31.61"E
• End point of the activity	25°47'19.96"S	28°20'37.56"E
Alternative A2 (if any)		
• Starting point of the activity	25°47'31.10"S	28°20'26.14"E
• Middle/Additional point of the activity	25°47'24.28"S	28°20'32.08"E
• End point of the activity	25°47'18.58"S	28°20'39.07"E
Alternative A3 (if any)		
• Starting point of the activity	25°47'28.88"S	28°20'28.86"E
• Middle/Additional point of the activity	25°47'23.38"S	28°20'35.48"E
• End point of the activity	25°47'17.98"S	28°20'41.94"E

Refer to **Appendix J1** for Coordinates.

The second type of alternative considered is for the Road Alignments for the temporary upgrade of existing dirt roads for use as a construction service/access road:

The existing operational access to the Rand Water reservoir site from Olympus Drive into Leander Road (southern access) is inaccessible for large construction vehicles due to the existing infrastructure at the entrance of the site (valve chambers, balancing tank, R1 pipeline, H26 pipeline and municipal pipeline (potentially asbestos pipeline) (**Figure 9**).

Figure 9: Existing infrastructure at the south entrance

Turning movement paths for heavy vehicles were modelled and clearly show inadequate space for heavy vehicle to turn as a result of the infrastructure around the entrance. In additional to insufficient space, this access route would involve pipeline crossings. Pipelines and surrounding infrastructure can be damaged by compaction and vibrations and excessive loads, which may result in damage to pipe joints, soil subsidence and possibly pipe failure. Should infrastructure be damaged it will affect the supply of water for the following networks/regions:

- The Bronberg East Bulk System: Silver Lakes, a portion of Shere, Paradiso, Tijger Vallei, Zwartkoppies and Boschkop.
- Rand Water Bronberg to Mamelodi system: Shere, Paramount, Six Fountains, Silver Willows, Savannah, African Renaissance/Sammy Marks and Nellmapius.
- Mamelodi Reservoirs R3 and R4: supply to Mamelodi Reservoirs R3 and R4.
- Mamelodi Direct feeds to Memelodi reservoirs R5 and R6: a pipeline branches off the H26 supplying two Mamelodi direct feed connections R5 and R6.
- Supply to Ekandustria: beyond the Mamelodi connection.
- Emergency connection to Cullinan.

The southern access route involves traversing narrow residential roads with many turning circles and additionally passes through a highly residential area with school nurseries and small businesses.

Therefore, access through the south entrance is not feasible. Consequently, a temporary access route (from the north) is required during the construction period to allow the heavy construction trucks and vehicles (cranes, abnormal loads, diggers, graders etc) to travel to and from the proposed reservoir site during construction. There are existing dirt tracks on the property adjacent (Bronberg Conservancy) to the proposed site and thus Rand Water propose to upgrade one of the existing tracks for temporary use during construction and then reinstate and rehabilitate the road following completion of construction. The proposed construction access route partially follows the alignment of the R5 pipeline servitude and coincides within the access route to be utilised during the construction of the R5 pipeline as per the approved R5 Environmental Authorisation (GAUT 002/13-14/E0045) and Environmental Management Programme (EMPr).

The following alternative access routes from James Road (the north) to the proposed reservoir site were considered in the BAR as feasible alternatives:

1. Alternative B1 (Refer to Road Option 3 in **Figure 10**) – 707m in length
2. Alternative B2 (Refer to Road Option 1 in **Figure 10**) – 1.3km in length
3. Alternative B3 (Refer to Road Option 2 in **Figure 10**) – 1km in length
4. Alternative B4 (Refer to Road Option 4 in **Figure 10**) – 1.04km in length

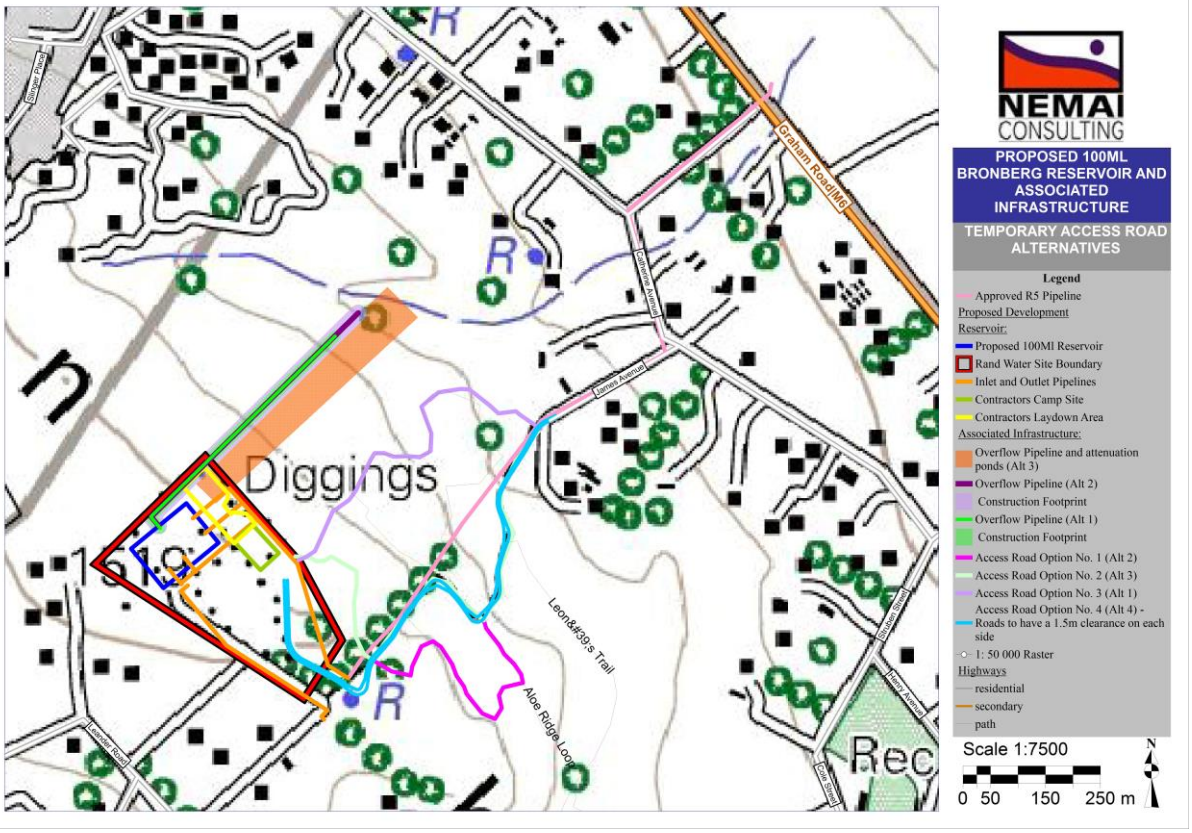

Figure 10: Alternatives for the temporary access road

The above routes were found to be feasible options for the proposed temporary road and offered routes that could be safely traversed by construction vehicles following the upgrade of the existing dirt tracks. All routes considered followed existing dirt tracks (refer to **Figure 11**). However, there will still be an environmental impact by the proposed road options, which were thus assessed by the Specialists as part of the BA Process to recommend the road option with the least impact on the environment.

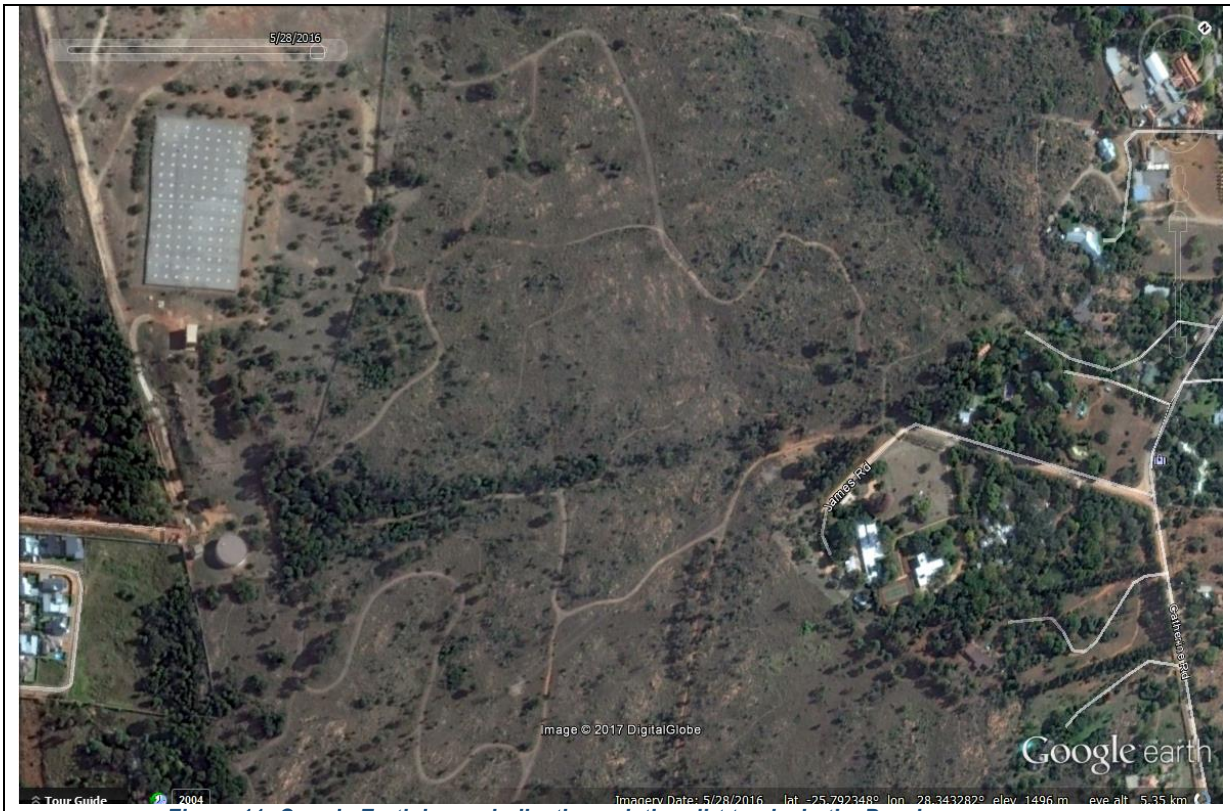

Figure 11: Google Earth image indicating existing dirt tracks in the Bronberg conservancy

Alternative:	Latitude (S):	Longitude (E):
Alternative B1		
• Starting point of the activity	25°47'24.95"S	28°20'51.20"E
• Middle/Additional point of the activity	25°47'26.58"S	28°20'43.74"E
• End point of the activity	25°47'33.15"S	28°20'35.24"E
Alternative B2		
• Starting point of the activity	25°47'24.95"S	28°20'51.20"E
• Middle/Additional point of the activity	25°47'42.37"S	28°20'47.91"E
• End point of the activity	25°47'32.98"S	28°20'35.09"E
Alternative B3		
• Starting point of the activity	25°47'24.95"S	28°20'51.20"E
• Middle/Additional point of the activity	25°47'34.36"S	28°20'44.79"E
• End point of the activity	25°47'32.98"S	28°20'35.09"E
Alternative B4 (preferred)		
• Starting point of the activity	25°47'24.68"S	28°20'51.78"E
• Middle/Additional point of the activity	25°47'34.60"S	28°20'44.24"E
• End point of the activity	25°47'34.27"S	28°20'34.34"E

Refer to **Appendix J1** for Coordinates.

c) Technology alternatives – None

d) Other alternatives (e.g. scheduling, demand, input, scale and design alternatives) – None

e) No-go alternative

The Department of Environmental Affairs (DEA) stresses that the No-Go Alternative must be considered in cases where the proposed activities will have a significant negative impact that cannot be avoided and/or effectively or satisfactorily mitigated.

Under the Constitution of the Republic of South Africa, 1996, Chapter 2 (27) (1), states that: Everyone has the right to access to (b) sufficient water; and (2): The state must take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of each of these rights. Hence Rand Water intends to provide this service (bulk water provision). The no-go alternative would result in the demand for bulk potable water exceeding the supply and the Constitutional right of people will not be adhered to, overall the basic needs of water provision to the City of Tshwane (Bronberg and Mamelodi community, and even beyond to Bronkhorstspruit, Cullinan and Ekandustria), will not be met. Further pressure on the existing reservoir would increase creating a huge negative impact to the community in that there will be insufficient water supply. Failure to increase supply shall result in water shortages and reduced economic growth.

The proposed reservoir falls within the Mapleton system. The Mapleton system supplies central and eastern Tshwane and eastern Ekurhuleni. The expected increase of 300 Ml/d from 2015 to 2030 (growth in demand). The key augmentation projects within the system are all required to be completed in order to successfully augment the system as required to address the expected growth (the projects are dependent on one another as they operate with the Mapleton system, (refer to **Figure 12**). The key augmentation projects identified are:

- R5 Vlakfonteing to Mamelodi pipeline (construction commenced) – GDARD approval
- Zuikerbosch – Slangfontein B16 pipeline – DEA approved
- Engine Room 3 at Mapleton station – DEA approved
- S4 Van Dyk Park to Vlakfontein pipeline – DEA approved
- Vlakfontein Reservoir 200ML – DEA approval
- **Bronberg Reservoir 100ML**

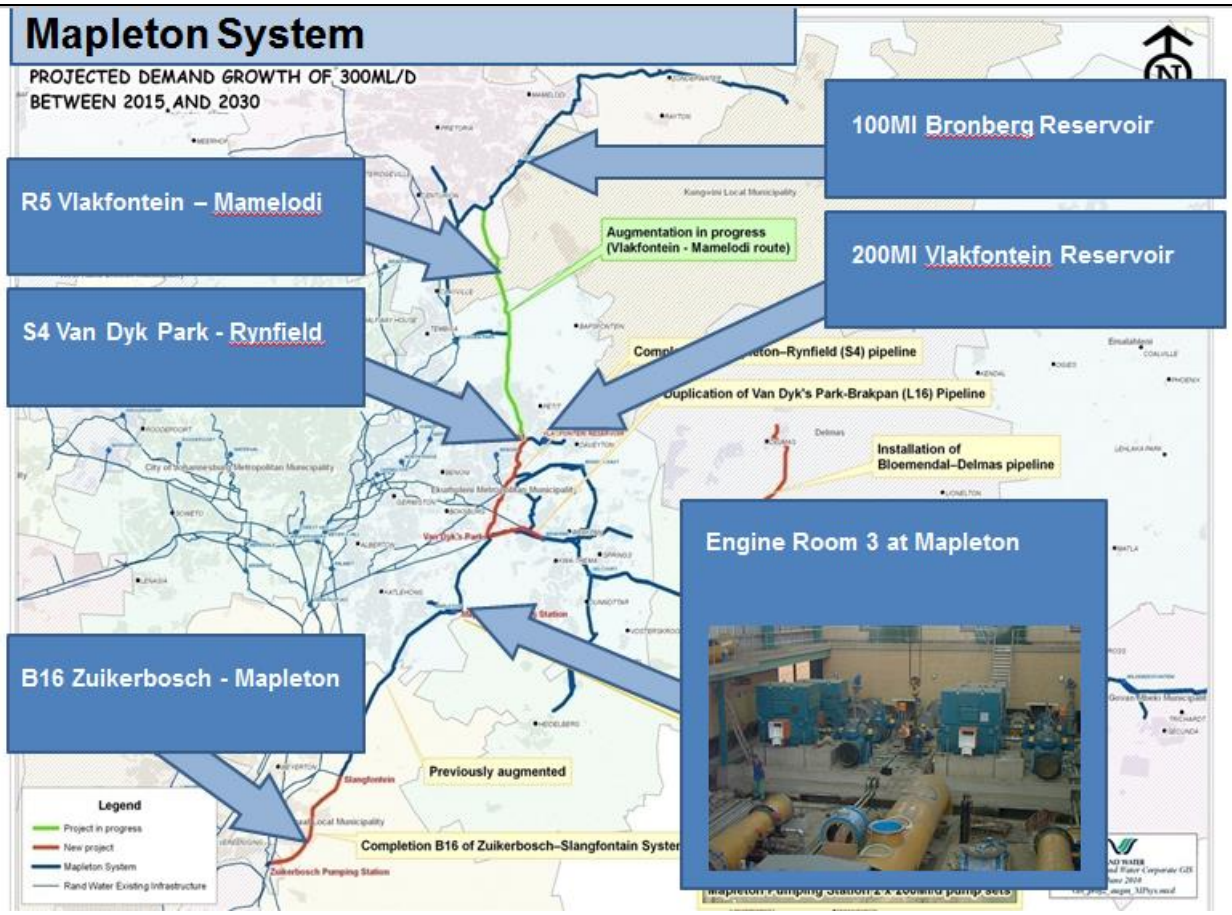

Figure 12: Augmentation projects within the Mapleton system

Rand Waters 20 year plan includes an addition of 1300ML reservoir storage, this is required to address the balancing of storage and emergency storage. The projects proposed to achieve this include Vlakfontein reservoir, Brakpan reservoir, Daleside reservoir, Bronberg reservoir and Meredale resevoirs.

The Table below indicates that it is clear that the proposed 100ML Bronberg reservoir is required as early as possible should Rand Water wish to maintain strategic storage equivalent to 24 hours water demand expressed as annual average daily demand. The table details the estimated future annual average daily water demands until 2035. The proposed additional 100ML reservoir at Bronberg will suffice until 2035 up to a compound growth rate for the area of 2,5%.

Table 1: Estimated future Annual Average Daily Water Demands (Megalitres per day) on the Bronberg and Vlakfontein reservoir systems

System		1,5% Growth			2,0% Growth			2,5% Growth		
Year	2011	2015	2020	2035	2015	2020	2035	2015	2020	2035
Bronberg reservoir system	128	131	135	149	132	138	158	133	140	168
Demand with Garsfontein support	77	80	84	98	81	87	107	82	89	117
Demand without Garsfontein support										
Normal Demand growth	50	53	57	71	54	60	80	55	62	90
* Tembisile (Ekandustria)	27	27	27	27	27	27	27	27	27	27
** Garsfontein support	51	51	51	51	51	51	51	51	51	51
***Bronberg reservoir Storage	70	70	170	170	70	170	170	70	170	170
Vlakfontein system up to Bronberg	204	217	233	292	221	244	328	225	255	369
Vlakfontein reservoir Storage	420	420	420	420	420	420	420	420	420	420
Vlakfontein + Bronberg demands	332	348	368	441	353	382	487	358	395	537
Vlakfontein + Bronberg Storage	490	490	590	590	590	590	590	590	590	590

* Assume that the supplies to Thembisile (Mamelodi – Ekandustria system) remain at 27Ml/d.
** Rand Water agreed to the City of Tshwane that the Nelmapius and Graham Road meters will support the Garsfontein reservoir system totalling 51Ml/d.
***Assume additional 100Ml Bronberg reservoir is commissioned by 2020.

The above system falls within the Mapleton system, the figure below details the peak demand by pumping station. The table further indicates projected peak day demands following the savings predicted to be achieved following the implementation of Water Demand Measure savings.

Table 2: Peak demand by pumping station

Station	Design capacity	Projected peak day demands (Ml/d) (including WDM savings - indicative)			
		2020 (2025)	2025 (2030)	2030 (2035)	2035 (2040)
Primary Systems					
Zuikerbosch	3610	4300	4800	5300	5800
Vereeniging	1200	1300	1300	1300	1300
Booster systems					
Palmiet	1875	2000	2190	2380	2570
Mapleton	960	990	1080	1180	1270
Eikenhof	1800	1470	1610	1750	1880
Zwartkopjes	800	760	780	840	880

The No-Go alternative necessitates that the construction of the proposed Bronberg Reservoir project should **not** be undertaken.

If the No-Go alternative occurs then it should be noted that:

- The population growth in the area of supply and the resulting water demand is expected to exceed the current supply from 2020 onwards;
- Rand Water strives to have a minimum of 24 hours strategic storage in terms of the annual average daily demand for any of its systems, without the additional 100ML reservoir Rand Water

will be unable to meet this objective and projected increase in demand;

- The downstream pipeline (H26) is currently operating at very high velocities and without the additional storage in the system it is proposed that pipeline will exceed its limits of capacity;
- Development on the eastern side of the system (south of Mamelodi) will not be supplied by Rand Water;
- Peak flows will not be reduced and no capacity in the system will be generated which would allow for supply to new developments or allow for economic development;
- During peak demand, the high lying Mamelodi R4 reservoir, which is fed by a CoT branch off H26, is unlikely to receive its required supply rate;
- H26 and the associated bulk supply system is operating beyond its capacity during peak hours and no new connections shall be permitted;
- Development, economic growth and job creation shall be restricted (south of Mamelodi and further afield to Cullinan, Bronkhorstpurit and Ekandustria);
- Economic prospects associated with the development and opportunities for generating employment opportunities during the construction will not materialise;
- The upgrade of storm water management along the proposed access route shall not materialise;
- The upgrade of roads in the Shere community (access route) shall be materialised;
- The above mentioned key augmentation projects will not achieved the intended purpose within the Mapelton system; and
- Water shortages shall be continued to be experienced in Ekangala and Thembisile Hani LM and the service delivery will only worsen.

According City of Tshwane's Spatial Development Framework, the population growth has increased in the past years and this affected the water supply to Bronkhorstpruit, Cullinan and some parts of Mamelodi areas. The current water demand for Bronhorspruit is 54.6 Ml/d while the total water available is 46.3. Water supply capacity is already running at minus (-8.3 Ml/d). According the Cities Water Resources Master Plan, the city requires additional supply and therefore the Rand Water Bronberg system is required to be augmented in order to allow for effective service delivery to the community.

The "Do-nothing" approach entails that the proposed reservoir is not constructed at Bronberg site. This will result in Rand Water not meeting its mandate in respect to bulk water provision as detailed in the Water Services Act and as required by the Bill of rights set out in the Constitution (Act No. 108 of 1996). The rights of the community members of the City of Tshwane shall be impacted upon resulting in inadequate service delivery, limited economic growth, and inadequate provision of water and sanitation services.

The land proposed to be impacted by this project (proposed Bronberg reservoir) will in part still be impacted by another project to be constructed in the same vicinity (R5 pipeline). Rand Water has been granted approval for the installation of the R5 pipeline whereby construction is due to commence in 2017. The pipeline passes through the Bronberg conservancy and Bronberg Reservoir site. The construction of the pipeline will make use of the access route as approved in the Environmental Authorisation and approved Traffic Management Plan and EMPr. The alignment of the pipeline from Bronberg reservoir follows an existing Rand Water servitude and follows north down through the conservancy to James Road, Catherine Road and Frank Road to Graham road. The construction shall entail a 20m wide working strip within the Bronberg Conservancy along the central drainage line. The impacts associated with the development shall be mitigated and managed as per the authorisations in hand and approved EMPr. **Figure 4** depicts the Bronberg reservoir site in proximity to the R5 pipeline to be constructed.

Paragraphs 3 – 13 below should be completed for each alternative.

There is no need for Paragraphs 3 – 13 to be repeated, as each alternative has no difference in the information provided below.

3. PHYSICAL SIZE OF THE ACTIVITY

a) Indicate the physical size of the preferred activity/technology as well as alternative activities/technologies (footprints):

Proposed 100ML Reservoir:	**Size of the activity:**
Alternative 1 (preferred activity alternative)	11656m^2
No Alternatives	

Inlet and Outlet Pipelines:	**Length of the activity:**
Alternative 1 (preferred activity alternative)	Vary between 100m and 550m
No Alternatives	

Overflow Pipeline:	**Length of the activity:**
Alternative A1 (preferred activity alternative)	500m
Alternative A2	560m
Alternative A3	Approximately 37 000m^2 (area of the attenuation ponds)

Road Alignment:	**Length of the activity:**
Alternative B1	707m
Alternative B2	1300m
Alternative B3	1000m
Alternative B4 (preferred activity alternative)	1040m

b) Indicate the size of the alternative sites or servitudes (within which the above footprints will occur):

Proposed 100ML Reservoir:	**Size of the site/servitude:**
Alternative 1 (preferred activity alternative)	27000m^2
No Alternatives	

Inlet and Outlet Pipelines:	**Size of the site/servitude:**
Alternative 1 (preferred activity alternative)	8 000m^2 (100m x 80m servitude and 44 000m^2 (550m x 80m) = Between 8000 and 44000m^2
No Alternatives	

Overflow Pipeline:	**Size of the site/servitude:**
Alternative A1 (preferred activity alternative)	500m x (1.2 -1.5m diameter +

	10m temporary servitude) = 5600-5750m^2
Alternative A2	500m x (1.2 -1.5m diameter + 10m temporary servitude) = 5600-5750m^2
Alternative A3	Approximately 37 000m^2

Road Alignment:	**Size of the site/servitude:**
Alternative B1	12m x 707m = 8 484m^2
Alternative B2	12m x 1 300m = 15 600m^2
Alternative B3	12m x 1 000m = 12 000m^2
Alternative B4 (preferred activity alternative)	12m x 1 040m = 12 480 m^2

4. SITE ACCESS

Does ready access to the site exist?	NO ✓
If NO, what is the distance over which a new access road will be built	1040m

Describe the type of access road planned:

Refer to Section A2 of the report – the temporary access road is discussed. There are four alternative alignment options for this road.

The existing operational access to the Rand Water reservoir site from Olympus into Leander (Southern access) is inaccessible for large construction vehicles due to the existing infrastructure at the entrance of the site (valve chambers, balancing tank, R1 pipeline, H26 pipeline and municipal pipeline (potentially asbestos pipeline)(Figure 5). Turning movement paths for heavy vehicles were modelled and clearly show inadequate space for heavy vehicle to turn as a result of the infrastructure around the entrance. Access via this route would involve pipeline crossings. Pipelines and surrounding infrastructure can be damaged by compaction and vibrations and excessive loads, which may result in damage to pipe joints, soil subsidence and possibly pipe failure. If infrastructure is damaged it will affect the supply of water for the following networks/regions

- The Bronberg East Bulk System: Silver Lakes, a portion of Shere, Paradiso, Tijger Vallei, Zwartkoppies and Boschkop.
- Rand Water Bronberg to Mamelodi system: Shere, Paramount, Six Fountains, Silver Willows, Savannah, African Renaissance/Sammy Marks and Nellmapius.
- Mamelodi Reservoirs R3 and R4: supply to Mamelodi Reservoirs R3 and R4.
- Mamelodi Direct feeds to Memelodi reservoirs R5 and R6: a pipeline branches off the H26 supplying two Mamelodi direct feed connections R5 and R6.
- Supply to Ekandustria: beyond the Mamelodi connection.
- Emergency connection to Cullinan.

Southern access route involves traversing narrow residential roads with many turning circles and additionally passes through a highly residential area with school nurseries and small businesses.

Refer to **Figure 7** for a figure depicting the existing operation access at the Bronberg site.

Therefore, access through the south entrance is not feasible. Consequently, a temporary access route (from the north) is required during the construction period to allow the heavy construction trucks and

vehicles (cranes, abnormal loads, diggers, graders etc) to travel to and from the proposed reservoir site during construction. There are existing dirt tracks on the property adjacent (Bronberg Conservancy) to the proposed site and thus Rand Water propose to upgrade one of the existing tracks for temporary use during construction and then reinstate and rehabilitate the road following completion of construction.

The following alternative access routes from James Road to the proposed reservoir site were considered in the BAR as feasible alternatives:

- Alternative B1 (Refer to Road Option 3 in **Figure 7**) – 707m in length
- Alternative B2 (Refer to Road Option 1 in **Figure 7**) – 1.3km in length
- Alternative B3 (Refer to Road Option 2 in **Figure 7**) – 1km in length
- Alternative B4 (Refer to Road Option 4 in **Figure 7**) – 1.04km in length

The above routes were found to be feasible options for the proposed temporary road and offered routes that could be safely traversed by construction vehicles following the upgrade of the existing dirt tracks. All routes considered followed existing dirt tracks.

Alternative B4 (Road Option 4) is the proposed road. There is an existing dirt track along this route, which varies in width and the majority of the dirt track is 2.5m in width. A nominal 12m temporary right of way servitude has been requested from the landowner Mr Gabriel Falkson (Hedianga Farm). A road prism of 3.8 m is proposed and a 1.5m wide area is required immediately adjacent for safety and driver error. Within the 12m temporary right of way servitude, thick bush will be cleared to allow for overhang, where necessary (majority of vegetation proposed for clearance is alien invasive black wattles and blue gums). The proposed area has steep slopes and sharp bends, therefore adjustments in vertical alignment will minimise impacts and produce a stable road by reducing cut and fills and prevent erosion damage. Off tracking wheels shall be negated through the proper consideration of the vehicle geometry and curve widening as well as ensuring the grade change is proportional to the horizontal distance. Thus the road prism will be increased in these areas to ensure stable terrain and safe passage for the construction vehicles and driver (however still remain within the servitude width). The system will be strictly one way, with a stop and go system implemented.

Therefore access to the site will depend on which road alignment is authorised by DEA (if approved).

Include the position of the access road on the site plan and required map, as well as an indication of the road in relation to the site.

Refer to **Figure 3** and **Appendix A1**.

5. LOCALITY MAP

An A3 locality map must be attached to the back of this document, as Appendix A. The scale of the locality map must be relevant to the size of the development (at least 1:50 000. For linear activities of more than 25 kilometres, a smaller scale e.g. 1:250 000 can be used. The scale must be indicated on the map.). The map must indicate the following:

- an accurate indication of the project site position as well as the positions of the alternative sites, if any;
- indication of all the alternatives identified;
- closest town(s;)
- road access from all major roads in the area;

- road names or numbers of all major roads as well as the roads that provide access to the site(s);
- all roads within a 1km radius of the site or alternative sites; and
- a north arrow;
- a legend; and
- locality GPS co-ordinates (Indicate the position of the activity using the latitude and longitude of the centre point of the site for each alternative site. The co-ordinates should be in degrees and decimal minutes. The minutes should have at least three decimals to ensure adequate accuracy. The projection that must be used in all cases is the WGS84 spheroid in a national or local projection).

Refer to **Appendix A1** for the A3 Locality Map.

6. LAYOUT/ROUTE PLAN

A detailed site or route plan(s) must be prepared for each alternative site or alternative activity. It must be attached as Appendix A to this document.

The site or route plans must indicate the following:

- the property boundaries and numbers of all the properties within 50 metres of the site;
- the current land use as well as the land use zoning of the site;
- the current land use as well as the land use zoning each of the properties adjoining the site or sites;
- the exact position of each listed activity applied for (including alternatives);
- servitude(s) indicating the purpose of the servitude;
- a legend; and
- a north arrow.

Refer to **Appendix A2** for the A3 Layout Maps.

7. SENSITIVITY MAP

The layout/route plan as indicated above must be overlain with a sensitivity map that indicates all the sensitive areas associated with the site, including, but not limited to:

- watercourses;
- the 1:100 year flood line (where available or where it is required by DWS);
- ridges;
- cultural and historical features;
- areas with indigenous vegetation (even if it is degraded or infested with alien species); and
- critical biodiversity areas.

The sensitivity map must also cover areas within 100m of the site and must be attached in Appendix A.

Refer to **Appendix A3** for the A3 Sensitivity Maps. The overall sensitivity map is quite detailed and thus the sensitivity maps were sub-divided to show the different sensitivities more clearly.

8. SITE PHOTOGRAPHS

Colour photographs from the centre of the site must be taken in at least the eight major compass directions with a description of each photograph. Photographs must be attached under Appendix B to this report**.** It must be supplemented with additional photographs of relevant features on the site, if applicable.

Refer to **Appendix B** for Photograph Map and Site Photographs.

9. FACILITY ILLUSTRATION

A detailed illustration of the activity must be provided at a scale of at least 1:200 as Appendix C for activities that include structures. The illustrations must be to scale and must represent a realistic image of the planned activity. The illustration must give a representative view of the activity.

Facility illustrations and designs of the development can be referred to in **Appendix C.**

10. ACTIVITY MOTIVATION

Motivate and explain the need and desirability of the activity (including demand for the activity):

1. Is the activity permitted in terms of the property's existing land use rights?	YES ✓		Please Explain
The new reservoir is proposed adjacent to the existing reservoir within the existing Rand Water Property. The property currently houses an existing reservoir and aligns to the existing land use rights. The proposed overflow pipeline is proposed to be site on western boundary of privately owned land, namely the Hedianga Farm (a portion of the Bronberg conservancy). The area is described as agricultural small holdings. The area is vacant and currently utilised for tourist activities hiking trails. A servitude will be acquired adjacent to the existing Council servitude. The pipeline will be submerged and the affected landowner will be permitted to use the area for purposes as detailed in the servitude agreement. Rand Water will acquire servitude on the affect property. Temporary right of way servitude will be acquired adjacent to the existing Rand Water R1/R5 pipeline servitude to allow for temporary construction access. Rand Water have also liaised directly with the private landowner for the private property in which the associated infrastructure for the reservoir is to be developed on. The required temporary and permanent servitudes required for the proposed development are in line with the existing land use, notably the existing Rand Water pipeline servitude and the Council pipeline servitude. As per the Bioregional Plan for the City of Tshwane -2016, the land falls with ESA and CBA meaning these areas are required to be maintained in ecologically functional state to support critical biodiversity area. Compatible land uses must ensure that land use is not intensified and that activities are managed to minimise impact on threatened species.			

2. Will the activity be in line with the following?			
(a) Provincial Spatial Development Framework (PSDF)	YES ✓		Please Explain

The development falls within Gauteng Province. The Provincial Spatial Development Framework (PSDF) of Gauteng (2011) mandate includes basic service provision, thus this development is in line with the PSDF objectives. The PSDF and IDP mandates the provision of basic services to the citizens of South Africa, this includes quality water provision and sanitation services. Instead of compromising the integrity of the IDP and SDF, the project contributes to the mandate and objectives of these plans. Approximately 96 000 households do not currently receive a basic service from the municipality and development objective involves the eradication of this service need. It is however acknowledged that constraints such as funding, cost recovery and institutional arrangements are hampering the process. Specific plans and programmes are discussed in the Strategic Sanitation Master Plan of the city.

The City of Tshwane approved its new Spatial Development Framework on the 27 March 2014 to, inter alia, and integrates the planned developments of the newly incorporated Regions into the City. The Water and Sanitation Master Plans were also revised in terms of the SDF. The Spatial Development Framework 2017 for Region 6 states that bulk infrastructure is the key instrument to achieve strategic objectives of the municipality in this instance and to direct densification proposals. Higher densities should only be permitted once services have been sufficiently upgraded to effectively support the proposed densities. Access to bulk infrastructure is necessary to support industrial and tourism development. Access to municipal services is relatively high in the urban areas but should be extended to the rural areas to unlock potential where sensible development in line with the requirements of residents can be undertaken. In order to achieve PSDF there is a need to upgrade the current infrastructure and create new infrastructure in the different municipal wards. The proposed development shall provide quality basic services and is aligned with growth management priorities. The proposed additional reservoir shall increase storage in the system and allow for new development to be undertaken.

(b) Urban edge / Edge of Built environment for the area		NO ✓	Please Explain

The proposed development occurs outside of the Gauteng Urban Edge sourced from the current Gauteng C-Plan Version 3.3 from GDARD (**Figure 9**).

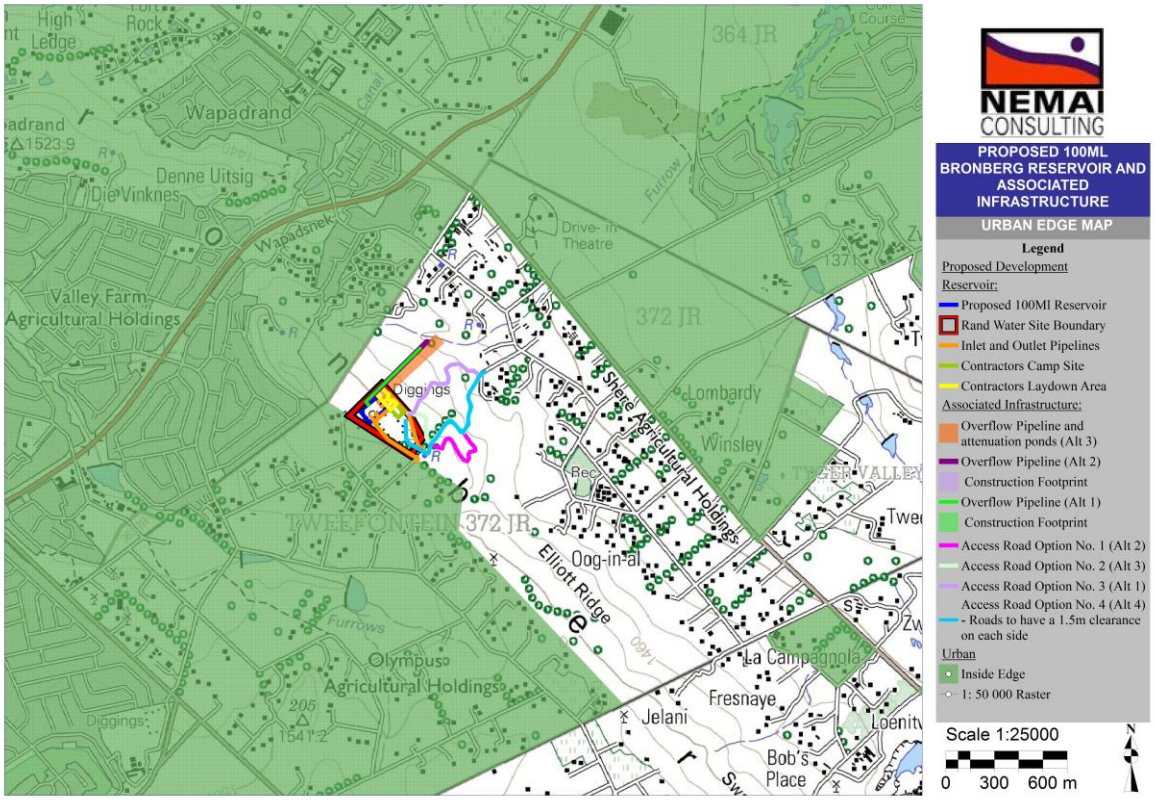

Figure 13: Urban edge map for Gauteng

(c) Integrated Development Plan (IDP) and Spatial Development Framework (SDF) of the Local Municipality (e.g. would the approval of this application compromise the integrity of the existing approved and credible municipal IDP and SDF?).	YES ✓		Please explain

The PSDF and IDP mandates the provision of basic services to the citizens of South Africa, this includes quality water provision. Instead of compromising the integrity of the IDP and SDF, the project contributes to the mandate and objectives of these plans. The development once complete will provide and encourage local municipalities to focus on and achieve the mandates stipulated in the IDP and SPDF in terms of increased service delivery related to sanitation and water provision. Furthermore it will ensure the needs of the community and the civilians of South Africa are met and livelihoods are improved. The IDP mandates the provision of basic services to the citizens of South Africa, this includes quality water provision. Instead of compromising the integrity of the IDP and SDF, the project contributes to the mandate and objectives of these plans. Approximately 96 000 households do not currently receive a basic service from the municipality and development objective involves the eradication of this service need. It is however acknowledged that constraints such as funding, cost recovery and institutional arrangements are hampering the process. Specific plans and programmes are discussed in the Strategic Sanitation Master Plan of the city. The City of Tshwane approved its new Spatial Development Framework on the 27 March 2014 to, inter alia, and integrates the planned developments of the newly incorporated Regions into the City.

Based on the city of Tshwane's Spatial Development Framework, the population growth has increased in the past years and this has affected the supply to Bronkhorstpruit, Cullinan and some parts of Mamelodi areas. The current water demand for Bronkhorstruit is 54.6 ML/d whil the total water available is 46.3 Ml/d. Due to this, there is a shortage in water supply to Region 7 (Bronkhorstspruit areas) as water supply capacity is already running at minus (-8.3 Ml/d). According the Water Resources Master Plan, an additional pipeline from the Rand Water Bronberg system is required to augment supply into the region for effective service delivery to the community. The proposed project has been recorded as urgent by the City of Tshwane.

The City of Tshwane have stated that a Rand Water augmentation scheme is therefore required to supply an additional future 32 Mℓ/d at Cullinan, and 163 Mℓ/d into the Bronkhorstspruit system (via the Ekandustria reservoirs). Due to the dire situation in the Olifants River catchment, it will be prudent to round these values up to 40 Mℓ/d and 170 Mℓ/d respectively. This additional capacity can be utilised in the Cullinan and Bronkhorstspruit systems to essentially free up some of the resource in the Olifants River basin, which can be applied towards the minor expansions required at the Bronkhorstbaai WTP

(d) Approved Structure Plan of the Municipality	YES ✓		Please explain
The City of Tshwane Metropolitan Municipality WC/WDM Support Programme: Capacity Planning and Demand Management section are aware of the project and have engaged with Rand Water regarding the planned milestones and ultimately commissioning of the proposed infrastructure. The development is urgently required to meet current demand and future growth. Specific plans and programmes are discussed in the Strategic Sanitation Master Plan of the city. The City of Tshwane approved its new Spatial Development Framework on the 27 March 2014 to, inter alia, and integrates the planned developments of the newly incorporated Regions into the City. The Water and Sanitation Master Plans were also revised in terms of the SDF. The proposed development falls within these developments. It is proposed that the proposed reservoir be located within the Rand Water property which is currently developed as a site housing related activities of bulk water supply, therefore this will not impact on the structure plan of Municipality of the City of Tshwane. The project falls within the IDP and SDF and is also part of the Department of Water and Sanitations master plans.			
(e) An Environmental Management Framework (EMF) adopted by the Department (e.g. Would the approval of this application compromise the integrity of the existing environmental management priorities for the area and if so, can it be justified in terms of sustainability considerations?)	YES ✓		Please explain
According to the Gauteng EMF (2014), the proposed development mostly falls in EMF Zone 3 and 4, with an insignificant small portion falling within EMF Zone 1 and 2 (**Figure 10**). Zone 3 is a high control zone (outside the urban development zone). These areas are sensitive to development activities and in several cases also have specific values that need to be protected. Zone 4 is a Normal control zone. This zone is dominated by agricultural uses outside the urban development zone as defined in the Gauteng Spatial Development Framework. No listed activities may be excluded from environmental assessment requirements in this zone. The proposed development is compatible with this zone. The proposed development falls under the following category of the Gauteng EMF: Infrastructure and Transport – Water Network. This type of development is compatible in Zone 4 and conditionally compatible in Zone 3; however, it is not undesirable.			

Figure 14: Gauteng EMF zones map

As per the Bioregional Plan for the City of Tshwane 2016, the land falls within ESA and CBA meaning these areas are required to be maintained in ecologically functional state to support critical biodiversity area. Compatible land uses must ensure that land use is not intensified and that activities are managed to minimise impact on threatened species.

(f) Any other Plans (e.g. Guide Plan)	NO ✓

3. Is the land use (associated with the activity being applied for) considered within the timeframe intended by the existing approved SDF agreed to by the relevant environmental authority (i.e. is the proposed development in line with the projects and programmes identified as priorities within the credible IDP)?	YES ✓		Please explain
The new reservoir is proposed adjacent to the existing reservoir within the existing Rand Water Property. In terms of the City's Spatial Development Framework, per the "Tshwane 2055" long term vision, the required additional augmentation is required to ensure optimum utilisation of infrastructure and ensure sufficient water for developments in the medium (+/- 10 years) term. The City of Tshwane approved its new Spatial Development Framework on the 27 March 2014 to, inter alia, and integrates the planned developments of the newly incorporated Regions into the City. The Water and Sanitation Master Plans were also revised in terms of the SDF. The proposed development falls within these developments. It is proposed that the proposed reservoir be located within the Rand Water property which is currently developed as a site housing related activities of bulk water supply, therefore this will not impact on the structure plan of Municipality of the City of Tshwane. The project falls within the IDP and SDF and is also part of the Department of Water and Sanitations master plans. Approximately 96 000 households do not currently receive a basic service from the municipality and development objective involve the eradication of this service need. Specific plans and programmes are discussed in the Strategic Sanitation Master Plan of the city. Further according to the IDP, the unemployment rate is stated at 21.1% and 478,533 people are living below the poverty line. More over with regards to people with access to basic services only 78.37% have access to sanitation services and 80.73% have access to water. As per the CoT IDP, Tshwane's economy will have to grow massively if it is to fulfil the NDP targets of eliminating poverty. This project has direct influence over this goal (City of Tshwane, 2011).			

4. Does the community/area need the activity and the associated land use concerned (is it a societal priority)? (This refers to the strategic as well as local level (e.g. development is a national priority, but within a specific local context it could be inappropriate.)	YES ✓		Please explain

The new reservoir development is required urgently as the areas north of Bronberg to Mamelodi will not have sufficient future water supply if this development is not constructed timeously (water shortages may be experienced). Further areas extending to Bronkelspruit, Cullinan and Ekandustria shall also be supplied by the system and therefore allowing for future growth and development within the City of Tshwane.

The Cullinan water treatment plant receives raw water from the Wilge River Dam, also known as the Premier Mine Dam, situated downstream of the Bronkhorstspruit Dam within the Olifants river basin. The plant is owned and maintained by Magalies Water. The plant supplies the town of Cullinan as well as the areas of Rayton and Refilwe. Water is also provided to the Zonderwater prison. An emergency connection to augment the water treatment plant is available from Rand Water. Currently there is no further capacity available at both the Bronkhorstspruit as well as Cullinan water treatment plants to support further developments within their supply zones. There is also no additional raw water resource available to increase the capacity of both the water treatment plants. It has been shown through water resource analyses that neither the Bronkhorstspruit WTP nor the Cullinan WTP can be extended, due to limitations on water resource availability. Further Rand Water augmentation is the only solution. Currently water shortages are experienced in Ekangala and Thembisile Hani LM and the extension of the existing Rand Water Regional water scheme is the only solution in providing water to the community. As this scheme will serve both the CoT and Thembisile Hani LM, it should be viewed as a regional water supply scheme.

Some major developments that are planned by the City Planning and Development Department:

Township Details	Planned Housing Units	Estimated water demand (Mℓ/d)	Application Status
Zithobeni (Riverwalk)	2 002	1.4	Approved but not yet proclaimed
Zithobeni X8	1 898	1.3	Approved but not yet proclaimed
Zithobeni X9	1 918	1.3	Approved but not yet proclaimed
Tweespruit	1 124	0.8	Approved but not yet proclaimed
Zithobeni Heights	996	0.7	Approved but not yet proclaimed

The local community needs the development as the proposed development will supply water to Shere, Paramount, Six Fountains, Silver Willows, Savannah, African Renaissance/Sammy Marks and Nellmapius.

Additional storage in the system will provide capacity for future development. The proposed development is of provincial importance in terms of water provision and expected population growth and economic development.

Under the Constitution of the Republic of South Africa, 1996, Chapter 2 (27) (1), states that: *Everyone has the right to access to (b) sufficient water;* and (2): *The state must take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of each of these rights*. Hence Rand Water intends to provide this service (bulk water provision). Proposed reservoir is required by the CoT, if not implemented this would result in the demand for bulk potable water exceeding the supply and the Constitutional right of people will not be adhered to, overall the basic needs of water provision to the City of Tshwane (Bronberg and Mamelodi community, and even beyond to Cullinan and Ekandustria), will not be met. Further pressure on the existing reservoir would occur creating a huge negative impact to the community in that there will be insufficient water supply. Failure to increase supply shall result in water shortages and reduced economic growth.

The population growth in the area of supply and the resulting water demand is expected to exceed the current supply from 2020 onwards. Rand Water strives to have a minimum of 24 hours strategic storage in terms of the annual average daily demand for any of its systems, thus the additional 100ML reservoir is required immediately to meet this objective and projected increase in demand. During peak demand, the high lying Mamelodi R4 reservoir, which is fed by a CoT branch off H26, is unlikely to receive its required supply rate. H26 and the associated bulk supply system is therefore considered to be operating beyond its capacity during peak hours and any new connections to this pipe should be accompanied by some form of mitigation. The downstream pipeline is currently operating at very high velocities and is therefore considered close to the limit of its capacity. There is considerable development pressure on the eastern side of this system (south of Mamelodi) which can only be supplied by this Rand Water system.

In 2013/14, the City of Tshwane initiated a Water Resources Master Plan study to identify the possible upgrading or extension of CoT's own water resources, with a view to reduce the dependence on imports from the Vaal River Basin (via Rand Water). The study concluded that for the Olifant River catchment basin, there is no additional water resource available from natural flow and/or sewer return flows to increase the capacity of the Cullinan Water Treatment Plant (WTP) or the Bronkhorstspruit WTP from their existing 16 Mℓ/d and 54 Mℓ/d capacities respectively. There are basically only two options available for augmenting the supply to Cullinan, Bronkhorstspruit and Thembisile Hani LM, namely:

- Extension of the existing Rand Water (RW) augmentation scheme
- Pumping from Roodeplaat WTP in the Crocodile River Catchment

Considering the peak day water demand versus capacity graph for the extended Roodeplaat WTP, it is clear that there will be shortages in the longer term, which need to be augmented from another source, i.e. Rand Water. With all the proposed extended Roodeplaat WTP capacity therefore "used up" in its own supply area, there is no water available for augmentation to Cullinan and Bronkhorstspruit. This leaves extension of the existing Rand Water augmentation scheme as the only option.

This was further confirmed by the National Department of Water and Sanitation Olifants River Reconciliation study. The only option to ensure adequate supply is to augment the water supply form the Rand Water system parallel to the existing 30 ML/d augmentation scheme from the Bronberg Reservoir. Development, economic growth and job creation shall be realised south of Mamelodi and further afield to Ekandustria). Economic prospects associated with the development and opportunities for generating employment opportunities during the construction will materialise. Storm water management along the proposed access route shall be upgraded as well as the upgrade of roads in the Shere community (access route).

The community in Region 7 shall benefit from the proposed reservoir and augmentation of the scheme. A number of proposed townships and developments are reliant on this augmentation, refer to **Appendix J11**.

The development (reservoir and associated infrastructure) is proposed on the Bronberg Ridge (class 2 ridge) within the existing Rand Water property that houses a 100ML Reservoir and associated infrastructure, namely the overflow pipeline and temporary access route is proposed to be sited within the Bronberg Conservancy. The area is classified as ESA and CBA and is home to the endangered red data species, the Juliana Golden Mole. The proposed development will impact on the Juliana Golden Mole habitat and population. The proposed development and associated infrastructure is sited on land that has been previously disturbed.

5. Are the necessary services with adequate capacity currently available (at the time of application), or must additional capacity be created to cater for the development? (Confirmation by the relevant Municipality in this regard must be attached to the final Basic Assessment Report as Appendix I.)	YES ✓		Please explain
City of Tshwane has requested Rand Water to supply water to the Mamelodi area and beyond (Bronkhorstspruit, Ekandustria and Cullinan), thus Rand Water as a water board is legislated to provide the bulk water services. The necessary services are available on site and are deemed adequate for future operation. Operational access to the site will remain unchanged. No sanitary services exist on site and none will be required during future operation. An existing power connection exists as supplied by the City of Tshwane on site. The existing water supply points are adequate. No additional services are envisaged as there currently exists adequate capacity.			

6. Is this development provided for in the infrastructure planning of the municipality, and if not what will the implication be on the infrastructure planning of the municipality (priority and placement of services and opportunity costs)? (Comment by the relevant Municipality in this regard must be attached to the final Basic Assessment Report as Appendix I.)	YES ✓		Please explain

City of Tshwane has requested Rand Water to supply water to the Mamelodi and extended areas of City of Tshwane, thus this development is provided for within their infrastructure planning. The Water and Sanitation Department is responsible for the bulk water supply, sanitation services and the infrastructure planning and development in the city. The department consists mainly of two divisions, as well as the Management and Administration Support Section reporting to the Strategic Executive Director (SED). The two main divisions are:

- Bulk Water and Waste Water Services Division
- Planning and Development Division

The City of Tshwane approved its new Spatial Development Framework on the 27 March 2014 to, inter alia, and integrates the planned developments of the newly incorporated Regions into the City. The Water and Sanitation Master Plans were also revised in terms of the SDF. The Water Resource Master Plan indicated that not sufficient surface water resources are available within the Olifants River Catchment to supply the current and future development needs. City of Tshwane have confirmed there is no additional water resource available from natural flow to increase the capacity of the Cullinan Water Treatment Plant or the Bronkhorstspuit Water Treatment Plant from their existing capacity. This was further confirmed by the National Department of Water and Sanitation Olifants River Reconciliation study. The only option to ensure adequate supply is to augment the water supply form the Rand Water system parallel to the existing 30 ML/d augmentation scheme from the Bronberg Reservoir.

The Acting Strategic Executive Director: Water and Sanitation Deparment confirmed in a communication to Rand Water a request which aligns to the above, to augment the potable water supply to Bronkhorstpruit and Culllinan thus Rand Water is required to augment its Bronberg system in order to provide capacity in the system for future developments.

The overarching principles for spatial development in terms of the National Development Plan (pg. 246) is that all spatial development should conform to the following principles:

- Spatial justice – Unfair allocation of public resources between areas must be reversed. The additional storage reservoir shall allow for capacity in the system to supply areas which currently lack sufficient water supplies for basic services and development.

A letter was received by Rand Water in April 2017 from the CoT: Capacity Planning and Demand Management stating that the proposed project is supported by CoT: Water and Sanitation Division. Refer to Appendix J9.

7. Is this project part of a national programme to address an issue of national concern or importance?	YES ✓		Please explain

The National Development Plan (NDP) of 2010 proposes to "invigorate and expand economic opportunity through infrastructure, more innovation, private investment and entrepreneurialism.

The Plan aims to ensure that all South Africans attain a decent standard of living through the elimination of poverty and reduction of inequality. The core elements of a decent standard of living identified in the Plan is housing, water, electricity and sanitation. The project is additionally aligned with the Millennium Development goals whereby the goal is reduce population numbers without sustainable access to safe drinking water and basic sanitation. Further this project aligns to the rights

As detailed in the Bill of Rights: Everyone has the right to have access to health care services, including reproductive health care, sufficient food and water.

This development project addresses a national concern as many communities lack quality water provision, hence this development will assist in meeting the community needs and contribute to the health and sanitation of the people within the area. There currently exist large water services backlogs. This ranges from a need to upgrade the current infrastructure and creating new infrastructure in the different municipal wards.

The following areas within the municipal area still require bulk water supply:

- Remainder of Plot 45 Pienaarspoort 339 JR to accommodate 200 households
- Plot 123 Leeuwfontein 299JR to accommodate 340 households
- Plot 174 & 175 Kameeldrift 298 JR to accommodate 1200 households
- Plot 137 Elandshoek 337 JR (Proposed Phumzile re-settlement) to accommodate 340 households
- Refilwe Informal settlements (Plot 80 Boekenhoutskloof 288 JR) to accommodate 3000 households
- Plot 79 Dewagensdrift (reticulation to households) as current supply is communal

Access to bulk infrastructure is necessary to support industrial and tourism development.

The overarching principles for spatial development in terms of the National Development Plan (pg. 246) is that all spatial development should conform to the following principles:

- Spatial justice – Unfair allocation of public resources between areas must be reversed. The additional storage reservoir shall allow for capacity in the system to supply areas which currently lack sufficient water supplies for basic services and development.

8. Do location factors favour this land use (associated with the activity applied for) at this place? (This relates to the contextualisation of the proposed land use on this site within its broader context.)	YES ✓		Please explain

The new reservoir is proposed adjacent to the existing reservoir within the existing Rand Water Property. The proposed site is also located on the Bronberg ridge in which height is required for the functioning of the reservoir (gravity feed). The proposed site meets the required topology, elevation, geotechnical, functional, and proximity to existing infrastructure and the proposed area of supply.

The necessary services are already available on site. The proposed additional 100 ML reservoir will supply water to Shere, Paramount, Six Fountains, Silver Willows, Savannah, African Renaissance/Sammy Marks and Nellmapius. These areas are in proximity to the reservoir site. The property currently houses an existing reservoir and aligns to the existing land use rights. The proposed overflow pipeline is proposed to be site on western boundary of privately owned land, namely the Hedianga Farm (a portion of the Bronberg conservancy). The area is described as agricultural small holdings/rural. The area is vacant and currently utilised for tourist activities hiking trails. A servitude will be acquired adjacent to the existing Council servitude. The pipeline will be submerged and the affected landowner will be permitted to use the area for purposes as detailed in the servitude agreement. Temporary right of way servitude will be acquired adjacent to the existing Rand Water R1/R5 pipeline servitude to allow for temporary construction access. The required temporary and permanent servitudes required for the proposed development are in line with the existing land use, notably the existing Rand Water pipeline servitude and the Council pipeline servitude.

The development (reservoir and associated infrastructure) is proposed on the Bronberg Ridge (class 2 ridge) within the existing Rand Water property that houses a 100ML Reservoir and associated infrastructure, namely the overflow pipeline and temporary access route is proposed to be sited within the Bronberg Conservancy. The area is classified as ESA and CBA and is home to the endangered red data species, the Juliana Golden Mole. The proposed development will impact on the Juliana Golden Mole habitat and population. The proposed development and associated infrastructure is sited on land that has been previously disturbed. .

The Rand Water reservoir site shall be rehabilitated, landscaped, and maintained as per Rand Waters operational and National Key Point requirements as well as the conditions detailed in the EMPr. The proposed area for the upgrade of the temporary construction access road shall be reinstated to its current state. The road is currently utilised by the land owner for operation and maintenance purposes. The area for the overflow pipeline shall be rehabilitated as required by the EMPr and shall be managed as per the servitude agreement. The land use shall not be not be altered.

9. Is the development the best practicable environmental option for this land/site?	YES ✓		Please explain

The Integrated Environmental Assessment Guideline Series 11, published by the DEA in 2004 define the Best Practical Environmental Option (BEPO) this as the option that provides the most benefit or causes the least damage to the environment as a whole, at cost acceptable to society in the long term as well as in the short term.

The proposed site is located on the Bronberg ridge in which height is required for the functioning of the reservoir (gravity feed) to reduce reliance on electricity). The development is strategically placed whereby water provision will be easily distributed to the communities within the City of Tshwane, specially the surrounding community who will have direct connections to the additional reservoir..

The geographical site location is the best practicable environmental option as the site already houses an existing 100 ML reservoir and the siting for the proposed reservoir (adjacent to existing). The site is already transformed and is low in biodiversity and considered least sensitive. The site additionally suits the current functioning of the Vlakfontien – Mamelodi system. A temporary construction access route overflow pipeline is proposed to be installed on the adjacent privately owned property (Bronberg Conservancy).

There are however sensitive environmental features on the site such as the Bronberg Ridge and the Juliana's Golden Mole (*Neamblysomus julianae*). The ridge area to be impacted is already transformed and the impact to the ridge is considered low as per the results of the assessment. The impact to the Golden Mole community is expected to be detrimental however the development has taken congnizance of the Golden Mole and have designed the layout and construction activities accordingly. The site for the reservoir is unsuitable habitat for the Golden Mole and the areas for the associated infrastructure are being located in already disturbed areas, ie the upgrade of existing dirt track and installation of pipework in the same proximity of municipal pipework.

The project is not expected to result in the irreplaceable loss of biodiversity and or irreversible deterioration in valued ecosystem services. This is evidenced through the surveys undertaken by the Golden Mole Specialist whereby evidence of mole activity is present along the existing Rand Water pipeline, where previous construction activities occurred. Further, the presence of moles has been confirmed by landowners in their residential gardens and along roads to the site.

The Golden Mole Specialist assessment report states "*no mitigation measures that would offset the potential impact of the construction operations for the Proposed Bronberg Reservoir Development on the viability, conservation status and long-term survival potential of the Juliana's golden mole occurring in the existing Rand Water property and the Bronberg Conservancy other than implementing measures to avoid or minimize the overlap of the Construction Footprints for the Proposed New Reservoir and the Associated Infrastructure with Sensitive Areas identified during the Golden Mole Specialist Assessment, which are Habitat Zones B, C and D (see Fig. 7, 8, 9a-d)"*.

Impacts are inevitable; however mitigation measures are implemented to reduce the impact. The Golden Mole Specialist Assessment further includes the following: "*Proper rehabilitation of areas that would have been affected by the construction of the Proposed New 100 ML Reservoir in existing Rand Water property and the area proposed for the Associated Infrastructure in the Bronberg Conservancy will be key to ensure that connectivity is restored between fragments of suitable habitat for golden moles and their return to the area after the proposed development have been completed. Numerous signs of golden mole activity have been recorded along the R1 pipeline of Rand Water, which indicates that rehabilitation of the soil was such that golden moles returned to the area, even though it is transformed. Careful management of topsoil, taking cognisance of the structure and use of burrow would enhance the success of post-construction rehabilitation (foraging – shallow tunnels; deeper more permanent tunnels and nests up to ~ 60cm)".*

The alignment of the temporary construction access road has been amended due to the environmental sensitivities on site as identified by the specialist studies. The alignment of the temporary access road bisects areas of transformed habitat and natural habitat where a low frequency of moles have been recorded as well as area where no moles are recorded. The Golden Mole Specialist stated in her report that was circulated with the Draft BAR that "*If an alternative access road can be found, the Significance Rating of the Proposed New 100 ML Reservoir development would be significantly reduced." The route follows an existing dirt track that is currently utilised by the land owner for maintenance and operation purposes and further by Rand Water during pipeline inspection and patrol.*

The alignment of the overflow pipeline has been sited on the western boundary of the land owner's property to avoid undue segmentation of the land owners property. This alignment of the overflow pipeline further coincides with a previously disturbed area, where an existing Eastern Gauteng Services Council (EGSC) pipeline exists.

The preferred alternative for the overflow pipeline has been decreased in length to avoid impeding on the northern drainage line as was identified by the specialists.

Due to the sensitivity of the site, all aspects of the proposed development and associated infrastructure have been sited on areas where previous disturbance has been recorded.

No alternative geographical site is available, the layout and design the proposed project has taken into consideration the site sensitivities and is proposing the layout and design that will result in the least damage to the environment.

10. Will the benefits of the proposed land use/development outweigh the negative impacts of it?	YES ✓		Please explain

The proposed land use will not change from the current land use.

The proposed use of the land for the proposed reservoir and adjacent property for associated infrastructure (overflow pipeline) and proposed temporary construction access route will result in bulk water provision. The proposed project will result in the water provision to the City of Tshwane (Bronberg and Mamelodi community, and even beyond to Bronkhorspruit, Cullinan and Ekandustria). The project will reduce pressure on the existing reservoir and the Vlakfontein – Mamelodi system and thereby avoid water shortages and reduced economic growth.

The implementation of the proposed development will result in the following benefits:

- Realisation of the right to access to water and basic sanitation services for the community members in the City of Tshwane;
- Availability of water for the economic development and growth;
- Supply shall not exceed demand by 2020;
- The project shall assist in the realisation of the Sustainable Development Goal 6;
- Rand Water shall maintain a minimum of 24 hours strategic storage in terms of the annual average daily demand for any of its systems;
- The H26 pipeline shall not exceed its limits of capacity;
- Development on the eastern side of the system (south of Mamelodi) and beyond shall be supplied by the Rand Water scheme;
- Peak flows will not be reduced and no capacity in the system will be generated which would allow for supply to new developments;
- During peak demand, the high lying Mamelodi R4 reservoir, which is fed by a CoT branch off H26, shall receive its required supply rate;
- New connections on the H26 shall be permitted as it wont be operating beyond its capacity during peak hours;
- Development, economic growth and job creation shall not be restricted, south of Mamelodi and further afield to Ekandustria, Bronkhorstspurit and Cullinan shall benefit;
- Economic prospects associated with the development and opportunities for generating employment opportunities during the construction shall materialise;
- The upgrade of storm water management along the proposed access route shall materialise;
- The upgrade of roads in the Shere community (access route) shall be materialised;
- Reduced water shortages/interruption of service delivery in Ekandustria (Region 7); and
- The key Rand Water augmentation projects shall realise their intended purpose.

The development (reservoir and associated infrastructure) is proposed on the Bronberg Ridge (class 2 ridge) within the existing Rand Water property that houses a 100ML Reservoir and associated infrastructure, namely the overflow pipeline and temporary access route is proposed to be sited within the Bronberg Conservancy. The area is classified as ESA and CBA and is home to the endangered red data species, the Juliana Golden Mole. The proposed development will impact on the Juliana Golden Mole habitat and population. The proposed development and associated infrastructure is sited on land that has been previously disturbed.

Moreover, mitigation measures are provided within the Environmental Management Programme (EMPr) as provided by identified by the specialists to assist in the achievement of the minimal impact that the development would cause. The overall socio-economic impact of water supply exceeds the negative impacts of the development.

11. Will the proposed land use/development set a precedent for similar activities in the area (local municipality)?	YES ✓		Please explain
The development once completed will provide/ encourage other municipalities to focus and achieve the mandates stipulated in the IDP and SPDF in terms of service delivery related to sanitation, water provision and economic growth and development, furthermore it will ensure the needs of the community and the civilians of South Africa are met, it will not only act as a motivator but will enhance community trust in the municipalities. The proposed development is a bulk water service delivery project in the form of the construction of bulk water reservoir. Thus it could be considered that similar activities related to this proposed development would be the construction of bulk water pipelines and reservoirs. The development of bulk water supply is designated function of Water Boards and the Department of Water and Sanitation, thus the proposed development shall not set a precedent for similar activities within the local municipality except in the form of increased and improved infrastructure development at a municipal level. The proposed development has not site alternatives as discussed above, where a new reservoir could be sited, therefore no similar activities are expected to occur in the area.			

12. Will any person's rights be negatively affected by the proposed activity/ies?		NO ✓	Please explain

The proposed development shall negatively affect the rights of the landowner of the adjacent property whose property shall be subject to construction activities for a period of approximately 3 years. A servitude on the western boundary of the adjacent land owners property shall be registered, where the land owners activities shall be restricted in accordance with the servitude agreement. The land owner shall not have full use of his property for the period of construction which may impact his tourism/recreation activities (hiking). The community of Shere shall be negatively impacted during the construction by increased traffic, influx of works, increased noise levels as well as potential increased in dust and safety and security impacts. Mitigation measures such as upgrades to infrastructure (roads, storm water, and security) have been proposed in order to mitigate the potential negative effects.

Housing and commercial developments are increasing in the area as the need for residential space in Gauteng increases. Development in CoT will mean an increase in economic activity and a rise in an economically active population as employment opportunities are created. This will raise household income in the municipality, which will impact positively on education and health activities. Overall the standard of living in the region will increase due to the provision of water services. Reservoirs are critical enabling infrastructure to allow CoT to realise its full development potential. Thus, is there is a critical need for the project.

For the community that is directly affected by the project through its construction, the project does come at a cost. The construction phase will negatively impact the community as it will impact on the sense of place and access. Access to the site and selected haul routes must be managed carefully and in consultation with the affected neighbours to the site. Stringent conditions shall be detailed in the EMPr and complied with and a rehabilitation plan and maintenance plan must be implemented and monitored.

The development will provide water to the area of City of Tshwane and thus be achieving basic human rights, thus contributing positively to people's well-being. Furthermore, the development will undergo the Environmental Authorisation Process according to the NEMA Regulations, which includes public participation. Public participation process is described in Section C of this report, the public participation process will allow all Interested and Affected Parties (IAPs) to contribute their opinions and concerns on the project and if their rights will be negatively affected by the project. The project provides the most benefits and strives for the least damage to the environment, as a whole, at acceptable cost, in the long term as well as in the short term.

13. Will the proposed activity/ies compromise the "urban edge" as defined by the local municipality?		NO ✓	Please explain

The development falls within the existing Rand Water property and adjacent property. The development falls outside the Gauteng urban edge.

14. Will the proposed activity/ies contribute to any of the 17 Strategic Integrated Projects (SIPS)?		NO ✓	Please explain

The proposed development does not form part of any of the 17 SIPS however it will support the achievement of Water and Sanitation SIPs. The SIPs are directly related to the achievement of SDG 6.

15. What will the benefits be to society in general and to the local communities?	Please explain

The proposed use of the land for the proposed reservoir and adjacent property for associated infrastructure (overflow pipeline) and proposed temporary construction access route will result in bulk water provision. The proposed project will result in the water provision to the City of Tshwane (Bronberg and Mamelodi community, and even beyond to Bronkhorstpruit, Cullinan and Ekandustria). The project will reduce pressure on the existing reservoir and the Vlakfontein – Mamelodi system and thereby avoid water shortages and reduced economic growth.

The implementation of the proposed development will result in the following benefits:

- Realisation of the right to access to water and basic sanitation services for the community members in the City of Tshwane;
- Availability of water for the economic development and growth
- Supply shall not exceed demand by 2020;
- The project shall assist in the realisation of the Sustainable Development Goal 6
- Rand Water shall maintain a minimum of 24 hours strategic storage in terms of the annual average daily demand for any of its systems,;;
- The H26 pipeline shall not exceed its limits of capacity;
- Development on the eastern side of the system (south of Mamelodi) and beyond shall be supplied by the Rand Water scheme
- Peak flows will not be reduced and no capacity in the system will be generated which would allow for supply to new developments;
- During peak demand, the high lying Mamelodi R4 reservoir, which is fed by a CoT branch off H26, shall receive its required supply rate;
- New connections on the H26 shall be permitted as it wont be operating beyond its capacity during peak hours
- Development, economic growth and job creation shall not be restricted, south of Mamelodi and further afield to Ekandustria, Bronkhorstspurit and Cullinan shall benefit;
- Economic prospects associated with the development and opportunities for generating employment opportunities during the construction shall materialise;
- The upgrade of storm water management along the proposed access route shall materialise;
- The upgrade of roads in the Shere community (access route) shall be materialised;
- Reduced water shortages/interruption of service delivery in Ekandustria (Region 7); and
- The key Rand Water augmentation projects shall realise their intended purpose.

In summary, the proposed activity plans to contribute to the provision of basic services (quality water) to the local community. The project shall contribute to social and economic infrastructure. Further the supply of water will ensure basic human rights are achieved. Moreover the project will result in job creation and poverty alleviation as a primary outcome and furthermore the increase supply will allow for future economic growth in the region and increased water and sanitation services.

16. Any other need and desirability considerations related to the proposed activity?	Please explain

The Acting Strategic Executive Director: Water and Sanitation Department confirmed in a high level communication to the Rand Water Chief Executive a request for the augmentation of its system in parallel to the already existing 30ML/d augmentation scheme from the Bronberg Reservoir. The City identified that there is no additional water resource available from natural flow to increase the capacity of the Cullinan Water Treatment Plant or the Bronhorspruit Water Treatment Plan from their existing 16ML/d and 54ML/d capacity. This is confirmed by the National Department of Water and Sanitations Olifants River Reconciliation study as well as an independent Water Resource Study conducted by the City.

There is great inequality in terms of the successes and access to services within the City of Tshwane. There still exists a problem with regards to access to services and resources and these results in poverty, this is mostly evident in rural areas (particularly areas in Region 6 and 7 which will benefit from the proposed project). In areas where access to water is not adequate or secure, food security is continually at risk, and there is a continual rise in extreme poverty and high child and maternal mortality rates are experienced. In terms of ensuring economic growth, a requirement for poverty eradication, the City of Tshwane needs a sustainable energy and water supply. This will ensure growth and assist in securing investment and increase employment opportunities and result in skill transfer. Poverty and inadequate access to services is usually more of problem in smaller towns and rural areas (region 6 and region 7 whom will benefit from the augmentation scheme) in comparison to urban areas (direct areas to be supplied by the proposed reservoir). The infrastructure that is used to provide basic services for access to water and sanitation services needs to be improved upon and further expanded upon (proposed additional reservoir). Access to services (basic services- water, energy, sanitation and solid waste management) needs to be provided equally amongst urban and rural areas. The main aspects which need to be addressed is the improvement of service delivery and the increase in development and growth opportunities which will ultimately improve the livelihoods of rural communities and further woman and children. Moreover there needs to be an increase in education (especially skills training) and provision of health services. All of which will reduce poverty.

The lack of water as a basic requirement for all developments is thus a major obstacle for development in Regions 5, 6 and 7, where development of infrastructure is urgently needed to provide basic services to communities as well as economic opportunities for job creation.

17. How does the project fit into the National Development Plan for 2030?	Please explain

The proposed activity plans to contribute to the provision of basic services (quality water) to the local community. In terms of the City's Spatial Development Framework, per the "Tshwane 2055" long term vision, the required additional augmentation is required to ensure optimum utilisation of infrastructure and ensure sufficient water for developments in the medium (+/- 10 years) term and thus fully aligns to the NDP. The project fits in the National Development Plan for 2030 in terms of water provision, service delivery and optimal utilisation of infrastructure and sufficient water provision for development.

The National Water Resource Strategy version 2 purpose is to ensure that national water resources are protected, used, developed, conserved, managed and controlled in an efficient and sustainable manner towards achieving South Africa's development priorities in an equitable manner over the next five to 10 years. This Strategy responds to priorities set by Government within the National Development Plan (NDP) and National Water Act imperatives that support sustainable development. The Strategy recognises that the manner in which water was allocated in the past was unequal and favoured only the white section of the population in South Africa. The National Development Plan (NDP) and National Water Act (NWA) collectively inform the intended means to redress past imbalances in the manner in which water was allocated.

This NWRS2 responds to the NDP and outlines the strategy for protecting, using, developing, conserving, managing and controlling South Africa's scarce water resources towards achieving the 2030 Vision. It is a strategy for all sectors and stakeholders who use and impact upon our water resources. Alignment between the NDP and NWRS2 is important as the NDP identifies a vision for South Africa and this vision makes demands on South Africa's water resources. The water situation in South Africa is already stressed and water scarcity threatens development, specifically in economic activities and food security. Water is required to provide for growth and development but demands are increasing with increased population growth and increased economic activities. Therefore NWRS2 aims to address the current and future water demands for South Africa's 2030 vision and to also ensure sustainability of its water resources

The National Water Resource Strategy (Department of Water Affairs, 2013) confirms that above will assist in ensuring the key goals are achieved, namely:

- Job creation;
- Improved livelihoods
- Increased infrastructure
- Transition to low carbon economy
- Transformation of urban and rural spaces
- Provision of quality health care
- Society is united.

The NWRS is national strategy tool which considers economic, biophysical and social component.. The NWRS provides a framework for water management, and is complemented by catchment management strategies and water service development develops and so forth. The framework achieves uniformity (Department of Water Affairs, 2013). The National Water Resource Strategy 2013 (2nd edition) provides a framework for the protection, use, development, conservation, management and control of water resources for the country as a whole.

Department of Water Affairs (2013) states that the overall purpose of the NWRS is:

- Facilitate the proper management of the nation's water resources;
- Provide a framework for the protection, use, development, conservation, management and control of water resources;
- Provide a framework within which water will be managed at regional or catchment level in defined WMAs;
- Provide information about all aspects of water resource management;
- Identify water related development opportunities and constraints.

The proposed development shall contribute the provision of basic services. Water as a basic requirement for all developments is thus a major obstacle for development in Regions 5 and 7 of the City of Tshwane, where development of infrastructure is urgently needed to provide basic services to communities as well as economic opportunities for job creation.

Housing and commercial developments are increasing in the area as the need for residential space in Gauteng increases. Development in CoT will mean an increase in economic activity and a rise in an economically active population as employment opportunities are created. This will raise household income in the municipality, which will impact positively on education and health activities. Overall the standard of living in the region will increase due to the provision of water services. Reservoirs are critical enabling infrastructure to allow CoT to realise its full development potential.

The proposed development fits into the NDP and NWRS2 through the improvement of livelihoods, increased infrastructure, job created and economic development and growth and realisation of basic rights, namely access to water and sanitation.

18. Please describe how the general objectives of Integrated Environmental Management as set out in section 23 of NEMA have been taken into account.

The proposed project will result in some detrimental environmental impacts during construction. Therefore in terms of the National Environmental Management Act (Act No. 107 of 1998) (as amended) (NEMA), the proposed development triggers a suite of activities, which requires authorisation from the competent environmental authority, the Department of Environmental Affairs (DEA) due to the applicant (Rand Water) being an Organ of State. This authorisation is required prior to the commencement of the activity. According to the provisions of the NEMA, all environmental investigations must comply with the minimum requirements of the act as set out in section 23(2) of NEMA. In addition, suitable mitigation measures have been included in the EMPr to ensure sustainable development.

The proposed development has considered the effects of activities on the environment and have been given adequate consideration. The process followed allowed for the identification of activities that should be subjected approval process and the respective guidelines have been followed, as well as various environmental management tools have been applied to ensure the integrated environmental management of activities. Procedure for the investigation, assessment and communication of the potential impact of activities has been undertaken.

Potential environmental impacts (including biodiversity, surface water and heritage) and risks associated with the construction phase of the project have been identified and assessed according to their significance. Mitigation measures have been recommended for the more significant impacts;

Section 2 of NEMA, which states National Environmental Management Principles in general terms. Section 23 of NEMA has been taken into account therefore an Impact Assessment (Appendix F) is included in the BAR, in order to identify the potential impacts of the project on the surrounding physical and social environment.. Additionally, a Draft EMPr (Appendix G) was also prepared and included for the proposed project to ensure that all environmental impacts are minimised by mitigation measures. Also included in this BAR are Specialist Studies (Appendix D) and details of the public participation process. The proposed development is proposed to be socially, environmentally and economically sustainable. The proposed development has placed people and their needs at the forefront. The project moreover applies a risk averse cautious approach which takes into account the limits of the current knowledge and consequence of the development decisions; this is further supported by specialist assessments. Due to the sensitivities found on site, negative impacts on the environment have been identified and where possible prevented and where they cannot be prevented, these shall be minimised and remedied.

The potential impact of a proposed act or development and the alternatives to lessen the possible harm on the environment has been assessed, with a focus on the socio-economic conditions and cultural heritage aspects that may potentially be affected. The effects of activities on the environment shall be minimised through the implementation of the Environmental Management Programme. Public can participate in decision that might affect the environment.

Besides for the no-go option, the best practical environmental option has been chosen as the preferred layout option. Potential risks have been identified and mitigation measures to alleviate potential negative impacts have been provided for in the Environmental Management Programme (EMPr) compiled in accordance with NEMA.

Various alternatives as detailed in Section A2 above have been considered and rated in Appendix F in order to establish the most optimal option in terms of achieving the developments objective and impacts on the environment.

The principles of NEMA such as the "polluter pays principle" have also been considered within the Environmental Management Programme for the project, where the Rand Water and its appointed Contractors will be responsible for avoiding negative impacts and where not possible, mitigating or rectifying any damages caused to the environment.

The EMPr provides for monitoring and management of impacts, and the effectiveness of such arrangements after their implementation.

The Environmental Basic Assessment report together with the Environmental Management Programme will be submitted to the Department of Environmental Affairs for review and approval prior to the implementation of the project.

19. Please describe how the principles of environmental management as set out in section 2 of NEMA have been taken into account.

The proposed development will be sustainable in terms of the following: Section 2 of the NEMA states National Environmental Management Principles in general terms. Section 23 of NEMA has been taken into account therefore an Impact Assessment (**Appendix F**) is included in the BAR. Additionally, an EMPr (**Appendix G**) was also prepared and included for the proposed project to ensure that all environmental impacts are minimised by mitigation measures. Also included in this BAR are Specialist Studies (**Appendix D**) and details of the public participation process. The proposed development is proposed to be socially, environmentally and economically sustainable. The proposed development has placed people and their needs at the forefront, and serve their physical, psychological, developmental, cultural and social interests equitably and this is being achieved through environmental management processes. The project moreover applies a risk averse cautious approach which takes into account the limits of the current knowledge and consequence of the development decisions, this is further supported by specialist assessments. Due to the sensitivities found on site, negative impacts on the environment have been identified and where possible prevented and where they cannot be prevented, these shall be minimised and remedied.

All efforts are being made to ensure that the project achieves sustainability, environmental justice and that the environmental rights of Interested and Affected Parties (local stakeholders, communities and the construction employees) are protected. This will be achieved by Rand Water and its' Contractors through the implementation of the recommendations provided by the Basic Assessment specialist studies, the project's environmental management programme and Environmental Authorisation, if issued by the Department of Environmental Affairs.

11. APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

List all legislation, policies and/or guidelines of any sphere of government that are applicable to the application as contemplated in the EIA regulations, if applicable:

Title of legislation, policy or guideline	Applicability to the project	Administering authority	Date
Constitution of the Republic of South Africa Act (Act No. 108 of 1996)	Comply with the current constitution. Protection of human rights and environment of the study area.	National and Provincial	18 December 1996
National Environmental Management Act (Act No. 107 of 1998)	Comply with requirements for environmental authorisation for this development. Protection of the environment of the study area and surroundings.	National and Provincial	27 November 1998
Environmental Impact Assessment Regulations, 2014, promulgated in terms of Section 24(5) of NEMA.	Listed activities applied for environmental authorisation for this development.	National and Provincial	04 December 2014
National Water Act (Act No. 36 of 1998)	Comply with requirements for a Water Use License for this development. Protection of Water resources and the environment.	National and Provincial	26 August 1998
National Environmental Management: Biodiversity Act, (Act No. 10 of 2004)	Ensuring biodiversity is protected such as the critically endangered Juliana's golden mole.	National and Provincial	07 June 2004
National Environmental Management: Protected Areas Act, (Act No. 31 of 2004)	Ensure the adequate management of Protected Areas in the study area.	National and Provincial	11 February 2005
National Environmental Management: Air Quality Act (Act No. 39 of 2004)	Air quality management and prevention of air pollution.	National and Provincial	24 February 2005
Conservation of Agricultural Resources Act (Act No. 43 of 1983)	Ensuring protection of agricultural resources, if any.	National and Provincial	21 April 1983
National Forests Act (Act No. 84 of 1998)	Ensuring that no protected trees in terms of the act are removed, disturbed, destroyed without requisite permit.	National and Provincial	30 October 1998
National Environmental Management Waste Act, (Act No. 59 of	Ensuring that waste products are managed successfully.	National and Provincial	10 March 2009

Title of legislation, policy or guideline	Applicability to the project	Administering authority	Date
2008)			
National Heritage Resources Act (Act No. 25 of 1999)	Ensuring protection of heritage resources in the study area.	National and Provincial	28 April 1999
Occupational Health & Safety Act (Act No. 85 of 1993)	Ensuring that health and safety is practiced during construction of the proposed development.	National and Provincial	23 June 1993
Explosives Act (Act No. No. 15 of 2003)	Authorisation may be required for blasting activities during construction.	National and Provincial	January 2004
Promotion of Access to Information Act 2 of 2000 (PAIA)	Gives effect to the constitutional right of access to any information held by the State and any information that is held by another person and that is required for the exercise or protection of any rights.	National and Provincial	March 2001
SANS 10103:2008	This standard covers methods and gives guidelines to assess working and living environments with respect to acoustic comfort, excellence, and with respect to possible annoyance by noise (i.e. whether complaints can be expected).	National and Provincial	January 2008
SANS 10328:2008	Specifies the methods to assess the noise impacts on the environment due to a proposed activity that might impact on the environment. The standard also stipulates the minimum requirements to be investigated for an EIA.	National and Provincial	2008
Gauteng Conservation Plan	Ensuring protection of areas designated as Conservation Priority Areas, Critical Biodiversity Areas and Ecological Support Areas.	Provincial	December 2010
Gauteng Ridges Policy	Conservation of ridges and the area immediately surrounding the ridges, which provide habitat for a wide variety of fauna and flora, some of which are Red List, rare or endemic species or, in the case of certain of the plant species, are found nowhere else in South Africa or the world. The	Provincial	23 June 2006

Title of legislation, policy or guideline	Applicability to the project	Administering authority	Date
	proposed development occurs on a Class 2 Ridge.		
Gauteng Guidelines for Biodiversity Studies	Ensuring the requirements for Specialist Studies are met for this development.	Provincial	March 2014
SANBI Grassland Ecosystem Guidelines	These Ecosystem Guidelines are part of a larger focus of work in grassland ecosystems, coordinated under the SANBI Grasslands Programme. The development occurs within the Bronberg Mountain Bushveld.	National and Provincial	2013
National Veld and Forest Fire Act (Act No. 101 of 1998)	Prevention of veld fires during construction.	National and Provincial	April 1999
Gauteng Environmental Management Framework	Identify areas where certain types of development would be compatible, conditionally compatible, and undesirable.	Provincial	November 2014
City of Tshwane Metropolitan Spatial Development Framework 2014	The purpose of SDF is to provide a spatial representation of the City Vision and to be a tool to integrate all aspects of spatial (physical) planning such as land use planning; planning of a pedestrian, vehicular and other movement patters; planning regarding buildings and built-up areas; planning of open space systems; planning of roads and other service infrastructure; as well as to guide all decision-making processes regarding spatial (physical) development.	Provincial	March 2014
City of Tshwane Integrated Development Plan 2016 – 2021	The IDP provides a concrete plan towards realising the “first decade of game changing” as captured in the Tshwane Vision 2055 through outcomes based planning.	Provincial	May 2016
Fencing Act (Act No. 31 of 1963)	To consolidate the laws relating to fences and the fencing of farms and other holdings and matters incidental thereto.	National and Provincial	27 April 1963
National Road Traffic Act (No 93 of 1996)	Rand Water and the contractor will obey traffic laws by driving at minimal speed approved by local authorities.	National and Provincial	1996
National Water	The National Water Resource	National/Provincial	June 2013

Title of legislation, policy or guideline	Applicability to the project	Administering authority	Date
Resource Strategy version 2	Strategy 2 sets out how to achieve the following core objectives: • water supports development and the elimination of poverty and inequality; • water contributes to the economy and job creation; and • water is protected, used, developed, conserved, managed and controlled sustainably and equitably.		
All relevant Provincial regulations and Municipal bylaws	Rand Water and the Contractor will obey and abide by provincial and municipal bylaws which are related to the proposed project.	Provincial and Local	-

12. WASTE, EFFLUENT, EMISSION AND NOISE MANAGEMENT

a) Solid waste management

Will the activity produce solid construction waste during the construction/initiation phase?	YES ✓
If YES, what estimated quantity will be produced per month?	During the initial stages of construction approximately 22500m^3 of excavated material will be removed on a monthly basis. Thereafter the monthly waste to be produced is undetermined

How will the construction solid waste be disposed of (describe)?

During the construction phase, solid waste will be generated and will be disposed of at a registered landfill site. No solid waste will be dumped on surrounding open areas or adjacent properties. It is proposed that all waste will be sorted into recyclable and non-recyclable materials. The recyclable materials will be re-used where possible or disposed of at a recycling plant.

Solid waste will be managed and disposed of in accordance with the EMPr and may include:

- General waste, consisting of non-hazardous substances and substances that cannot be recycled - this will be collected in a waste skip/bin and disposed of at an appropriated and registered landfill site.
- Re-usable and excess material - which can be used at other construction sites will be carefully packaged and delivered to other sites for reuse.
- Refuse – this will at all times be disposed of at a registered site, which is also approved by the local authority. Refuse will not be burned or buried on or near the site.

Any solid construction waste produced will be stored in a demarcated area, as decided by the contractor in consultation with the Environmental Control Officer (ECO), and removed to a registered waste disposal site. Proof of this must be provided to the ECO for record keeping. Records of the type and quantity of waste disposed of at the waste disposal site shall be kept on site.

The area proposed for the new reservoir currently consists of spoil material. The spoil material shall be utilised for the preparation of the temporary construction access road, specifically for areas were filling is required. Further spoil material shall be stored on site to be used during the rehabilitation of the site, where berms and contours are required to be reinstated to restore the natural drainage in the area. Moreover spoil material shall be utilised to the construct the soil embankment around the built reservoir. The excess spoil material shall be managed as described above.

The Geotechnical Recommendations Report dated June 2016 confirms the bulk of the spoil material consist of angular quartzite rock fragments, ranging in size from gravel to boulders (typically up to 500 mm in diameter, occasionally larger). This material has limited interstitial fines. Two samples of the stockpile material classified as G5 quality. The proposal is utilise the quartzite rock obtained from the excavations for construction of the access road, the material has been assessed as G5 or better. This will reduce the amount of spoil material and quantity of imported materials required for the road construction as wells as for the slopes of the reservoir.

Where will the construction solid waste be disposed of (describe)?

All waste generated will be disposed of at a licensed landfill site. A registered landfill site will be used and permission will be sought from the municipality before commencement of the construction activities. It is assumed that the closest waste disposal site to the approved site and alignment will be used.

The following registered landfill sites have been identified in close proximity to the proposed project site, all of which receive domestic and industrial waste.

- Hatherley: Hans Strydom Drive North. M10 route Nelmapius
- Bronkhorstspruit: Connecting road to R513
- Kwaggasrand: Maunde Road Pretoria West and R5

Will the activity produce solid waste during its operational phase?

YES
✓

If YES, what estimated quantity will be produced per month?
How will the solid waste be disposed of (describe)?

Waste produced during the operational phase will be primarily from maintenance and domestic waste from employees (securities and other). Waste produced will be managed according to the requirements of the EMPr, which will include proper disposal of waste at a registered site as well as recycling where feasible.

If the solid waste will be disposed of into a Municipal waste stream, indicate which registered landfill site will be used.

A registered landfill site will be used and permission will be sought from the Municipality before commencement of the construction activities. It is assumed that the closest waste disposal site to the approved site and alignment will be used, namely:

- Hatherley: Hans Strydom Drive North. M10 route Nelmapius
- Bronkhorstspruit: Connecting road to R513
- Kwaggasrand: Maunde Road Pretoria West and R5

Where will the solid waste be disposed of if it does not feed into a municipal waste stream (describe)?

Waste that does not fit into the Municipal waste stream will be disposed of at a registered hazardous waste disposal site while recyclable and reusable waste will be treated.

If the solid waste (construction or operational phases) will not be disposed of in a registered landfill site or be taken up in a municipal waste stream, then the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Can any part of the solid waste be classified as hazardous in terms of the NEM:WA? NO ✓

If YES, inform the competent authority and request a change to an application for scoping and EIA. An application for a waste permit in terms of the NEM:WA must also be submitted with this application.

Is the activity that is being applied for a solid waste handling or treatment facility? NO ✓

If YES, then the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA. An application for a waste permit in terms of the NEM:WA must also be submitted with this application.

b) Liquid effluent

Will the activity produce effluent, other than normal sewage, that will be disposed of in a municipal sewage system? NO ✓

If YES, what estimated quantity will be produced per month?

Will the activity produce any effluent that will be treated and/or disposed of on site? NO ✓

If YES, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

Will the activity produce effluent that will be treated and/or disposed of at another facility? NO ✓

If YES, provide the particulars of the facility:

Facility name:
Contact person:
Postal address:
Postal code:
Telephone: **Cell:**
E-mail: **Fax:**

Describe the measures that will be taken to ensure the optimal reuse or recycling of waste water, if any:

c) Emissions into the atmosphere

Will the activity release emissions into the atmosphere other that exhaust emissions and dust associated with construction phase activities? YES ✓

If YES, is it controlled by any legislation of any sphere of government?

If YES, the applicant must consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.

If NO, describe the emissions in terms of type and concentration:

Sources of air emissions will include dust generated by construction activities and emissions emanating from construction vehicles and equipment. Low levels of dust emissions may also be created from excavations during the construction phase; this will be site specific and low in significance, provided that mitigation measures are in place. Appropriate dust control measures such as dampening of surfaces will be put in place as may be required. Additional detail on dust management is provided in the EMPr. Best practices to manage emissions are included in the EMPr.

Proposed blasting activities related to the construction activities shall result in emissions released into the atmosphere. The emissions are harmless gas consisting of nitrogen, carbon dioxide and water vapour. These emissions released as the result of blasting activities are not controlled by any legislation relating to atmospheric emissions.

Chemical Blasting is not a listed activity under the Air Quality Act (Section 21: Minimum Emission Standards) and therefore does not require an Atmospheric Emission License (AEL). Blasting will however will give rise to excessive dust emissions. Rand Water is therefore advised to take Duty of Care precautions to ensure that the dust emissions are controlled and contained. This is under the assumption that the blasting will only be undertaken for excavation purposes (i.e. not ongoing) and will be a controlled once off operation for excavation.

d) Waste permit

Will any aspect of the activity produce waste that will require a waste permit in terms of the NEM:WA?		NO ✓

If YES, please submit evidence that an application for a waste permit has been submitted to the competent authority

e) Generation of noise

Will the activity generate noise?	YES ✓	
If YES, is it controlled by any legislation of any sphere of government?	YES ✓	

Describe the noise in terms of type and level:

Construction activities will result in increased noise levels during the construction phase. A Noise Impact Assessment (**Appendix D6**) was conducted for the proposed development and recommended mitigation measures to reduce any possible impacts. Increased noise levels are localised to the construction site and specific construction activities. Best practices to manage sources of noise are also included in the EMPr.

13. WATER USE

Please indicate the source(s) of water that will be used for the activity by ticking the appropriate box(es):

	Water board ✓	

If water is to be extracted from groundwater, river, stream, dam, lake or any other natural feature, please indicate the volume that will be extracted per month:

Does the activity require a water use authorisation (general authorisation or water use license) from the Department of Water Affairs? NO ✓

If YES, please provide proof that the application has been submitted to the Department of Water Affairs.

The only trigger for a Water Use License Application (WULA) for the proposed development is the drainage line crossing by the temporary upgrade of the existing dirt track for use as a construction/service access road, required during construction only.

However, there is an existing R5 Rand Water Pipeline that traverses the proposed site that has an approved WUL (**Appendix J3**). The Department of Water and Sanitation (DWS) have granted Rand Water approval of crossing of the drainage line for the temporary access road in the existing WUL (**Appendix J3**). The road crossing falls within the working strip of the R5 Pipeline and thus construction activities will overlap.

The license authorises Section 21 c and I water use activities as set out in Table 1 and liseted in the water use license application reports submitted to the Department or the Provincial Head for ht duplication Rand Water piopeline from Rietvlei Nature Reserve to Mamelodi (Phase 2) and construction of Bronerg Reservoir. License No: 03/A21A/CI/2498 dated 01 December 2016.

DWS have informed Rand Water that no WUL/General Authorisation is required for the Bronberg Reservoir and Associated Infrastructure project and therefore can be excluded from this application and the Public Participation Process (Refer to correspondence in **Appendix E6**).

14. ENERGY EFFICIENCY

Describe the design measures, if any, which have been taken to ensure that the activity is energy efficient:

The geographical site location allows the system to utilise the gravity feed option which reduces the sites operational reliance on the grid.

Describe how alternative energy sources have been taken into account or been built into the design of the activity, if any:

None.

SECTION B: SITE/AREA/PROPERTY DESCRIPTION

Important notes:

1. For linear activities (pipelines, etc) as well as activities that cover very large sites, it may be necessary to complete this section for each part of the site that has a significantly different environment. In such cases please complete copies of Section B and indicate the area, which is covered by each copy No. on the Site Plan.

Section B Copy No. (e.g. A): **A**

This section will only be completed once (1) as the receiving environment is similar for the entire development.

2. Paragraphs 1 - 6 below must be completed for each alternative.

There is no need for Paragraphs 1 – 6 to be repeated, as each alternative has no difference in the information provided below.

3. Has a specialist been consulted to assist with the completion of this section? YES ✓

If YES, please complete the form entitled "Details of specialist and declaration of interest" for each specialist thus appointed and attach it in Appendix I. All specialist reports must be contained in Appendix D.

Property description/physical address:

Province	Gauteng Province
District Municipality	City of Tshwane Metropolitan Municipality
Local Municipality	
Ward Number(s)	101
Farm name and number	Portion 18 (Remaining Extent) of Tweefontein Farm No. 372 JR; and
Portion number	Remaining Extent of Tweefontein Farm No. 372 JR
SG Code	T0JR00000000037200018; and T0JR00000000037200000

Where a large number of properties are involved (e.g. linear activities), please attach a full list to this application including the same information as indicated above.

Current land-use zoning as per local municipality IDP/records:

According to the City of Tshwane Regional SDF, the development falls within Region 5 and is considered to occur in "Open Space – Ridge" according to the Nodal and Corridor Map. However, the new reservoir is located within the existing Rand Water property. The associated infrastructure (pipeline and road) is located outside the Rand Water property on the adjacent privately owned property.

In instances where there is more than one current land-use zoning, please attach a list of current land use zonings that also indicate which portions each use pertains to, to this application.

Is a change of land-use or a consent use application required?		NO ✓

15. GRADIENT OF THE SITE

Indicate the general gradient of the site.

Flat	1:50 – 1:20	1:20 – 1:15	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5
✓(reservoir site)						✓

16. LOCATION IN LANDSCAPE

Indicate the landform(s) that best describes the site:

2.1 Ridgeline	✓	2.4 Closed valley		2.7 Undulating plain / low hills	
2.2 Plateau	✓	2.5 Open valley		2.8 Dune	
2.3 Side slope of hill/mountain		2.6 Plain		2.9 Seafront	
2.10 At sea					

17. GROUNDWATER, SOIL AND GEOLOGICAL STABILITY OF THE SITE

Is the site(s) located on any of the following?

	New Reservoir:		**Alternative A1, A2 and A3:**		**Alternative B1, B2, B3, C1, C2 and C3:**	
Shallow water table (less than 1.5m deep)		NO ✓		NO ✓		NO ✓
Dolomite, sinkhole or doline areas		NO ✓		NO ✓		NO ✓
Seasonally wet soils (often close to water bodies)		NO ✓	YES ✓		YES ✓	
Unstable rocky slopes or steep slopes with loose soil		NO ✓	YES ✓		YES ✓	
Dispersive soils (soils that dissolve in water)		NO ✓		NO ✓		NO ✓
Soils with high clay content (clay fraction more than 40%)		NO ✓		NO ✓		NO ✓
Any other unstable soil or geological feature		NO ✓		NO ✓		NO ✓
An area sensitive to erosion	YES ✓		YES ✓		YES ✓	

If you are unsure about any of the above or if you are concerned that any of the above aspects may be an issue of concern in the application, an appropriate specialist should be appointed to assist in the completion of this section. Information in respect of the above will often be available as part of the project information or at the planning sections of local authorities. Where it exists, the 1:50 000 scale Regional Geotechnical Maps prepared by the Council for Geo Science may also be consulted.

Refer to Geotechnical Data Report and Geotechnical Recommendations Report in **Appendix J4.**

18. GROUNDCOVER

Indicate the types of groundcover present on the site. The location of all identified rare or endangered species or other elements should be accurately indicated on the site plan(s).

Natural veld - good condition[E] = 50%	Natural veld with scattered aliens[E] = 10%	Natural veld with heavy alien infestation[E] = 0%	Veld dominated by alien species[E] = 27 %	Gardens = 1%
Sport field = 0%	Cultivated land = 0%	Paved surface = 3%	Building or other structure = 7%	Bare soil = 2%

If any of the boxes marked with an "[E] "is ticked, please consult an appropriate specialist to assist in the completion of this section if the environmental assessment practitioner doesn't have the necessary expertise.

19. SURFACE WATER

Indicate the surface water present on and or adjacent to the site and alternative sites?

Perennial River		NO ✓
Non-Perennial River	YES ✓	
Permanent Wetland		NO ✓
Seasonal Wetland		NO ✓
Artificial Wetland		NO ✓
Estuarine / Lagoonal wetland		NO ✓

If any of the boxes marked YES or UNSURE is ticked, please provide a description of the relevant watercourse.

Three non-perennial drainage lines were identified within the vicinity of the proposed development. The proposed temporary access road (Road Option 4) crosses the central drainage line (**Figure 11**). The drainage lines are situated in the upper reaches of the Sub-Quaternary Reach (SQR) catchment and are classified as 1st order tributaries. First order tributaries typically only exhibit surface flow for brief periods following rainfall events. As is expected of first order tributaries all the drainage lines were dry at the time of the August 2015 survey. A second field survey was conducted in January 2016 to confirm the course of the central drainage line. No biomonitoring could be conducted. Therefore, the Present Ecological State (PES), Ecological Sensitivity (ES) and Ecological Importance (EI) of the drainage lines could only be assessed at a Sub-Quaternary Catchment level based on available databases. No freshwater ecosystem priority areas (FEPAs) are listed within SQR A23A-1056.

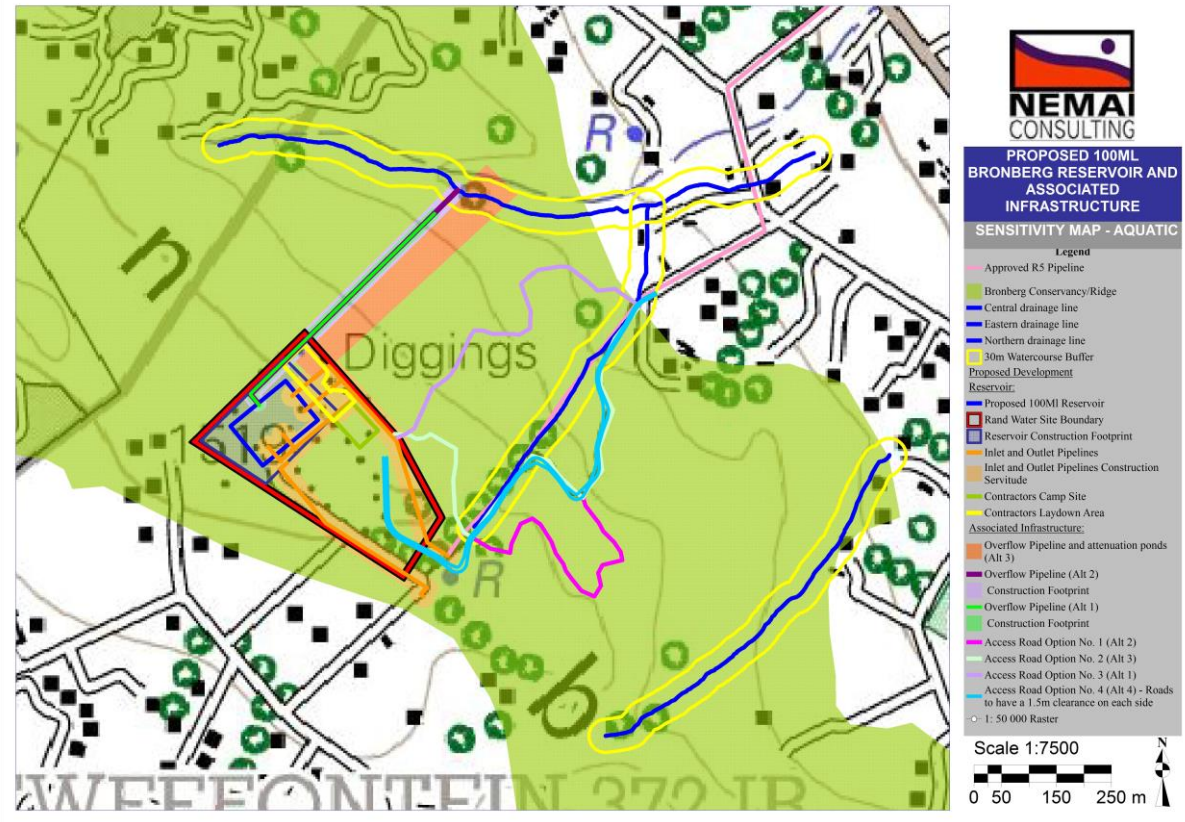

Figure 15: Drainage lines

The northern drainage line is the most clearly defined. It is therefore regarded as the most sensitive. The central and eastern drainage lines are poorly defined and the riparian zones infested with alien vegetation. The central drainage line acts as an overflow for the existing reservoir.

The following conclusions were reached based on the wetland assessment:

- No wetland areas were identified and delineated within the project area;
- The project will make use of existing access routes where possible; and
- The project is for potable water so impacts on downstream water quality is expected to be negligible if any.

Based on the risk assessment the significance of potential impacts were all rated as moderate prior to implementation of recommended mitigation measures. The impact of road crossing the central drainage line was rated as moderate before mitigation and low post mitigation. Implementation of the recommended mitigation measures reduced the significance of the potential impacts to a moderate to low degree.

20. LAND USE CHARACTER OF SURROUNDING AREA

Indicate land uses and/or prominent features that currently occur within a 500m radius of the site and give description of how this influences the application or may be impacted upon by the application:

Natural area	Dam or reservoir	
Low density residential		
Medium density residential	School	
High density residential		
		River, stream or wetland
		Nature conservation area
		Mountain, koppie or ridge
Office/consulting room		Protected Area
		Archaeological site

If any of the boxes marked with an "N "are ticked, how will this impact will / be impacted upon by the proposed activity? Specify and explain:

If any of the boxes marked with an "An" are ticked, how will this impact / be impacted upon by the proposed activity? Specify and explain:

If any of the boxes marked with an "H" are ticked, how will this impact / be impacted upon by the proposed activity? Specify and explain:

Does the proposed site (including any alternative sites) fall within any of the following:

Critical Biodiversity Area (as per provincial conservation plan)	YES ✓	
Core area of a protected area?		NO ✓
Buffer area of a protected area?		NO ✓
Planned expansion area of an existing protected area?		NO ✓
Existing offset area associated with a previous Environmental Authorisation?		NO ✓
Buffer area of the SKA?		NO ✓

If the answer to any of these questions was YES, a map indicating the affected area must be included in Appendix A.

21. CULTURAL/HISTORICAL FEATURES

Are there any signs of culturally or historically significant elements, as defined in section 2 of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), including Archaeological or paleontological sites, on or close (within 20m) to the site? If YES, explain:	YES ✓
The proposed site does contain archaeological sites. There are six Late Iron Age stone walls evident in the study area. Stone walls were located at: Site 1 - S 25° 47' 37.0" E028° 20' 35.1" Site 2 - S 25° 47' 35.5" E028° 20' 34.6" Site 3 - S 25° 47' 41.5" E028° 20' 40.8" Site 4 - S 25° 47' 28.9" E028° 20' 35.7" Site 5 - S 25° 47' 22.9" E028° 20' 43.1" Site 6 - S 25° 47' 42.2" E028° 20' 56.1"	

If uncertain, conduct a specialist investigation by a recognised specialist in the field (archaeology or palaeontology) to establish whether there is such a feature(s) present on or close to the site. Briefly explain the findings of the specialist:

Refer to **Appendix D5** for Heritage Impact Assessment. Six sites with Late Iron Age stone walls were identified in the study area. It is advised that these sites are clearly marked and fenced during construction. Two stone wall sites are situated near the existing reservoir and should be clearly marked and fenced during construction to ensure conservation and preservation thereof.

Two stone wall sites are situated near/on the proposed new Road development. Stone Wall Site Number 2 will not be considerably impacted on, but Stone Wall Site Number 1 will be impacted on by the said development.

Sites dating to the Late Iron Age are found all over the region. Some of them can be related to the Tswana-speakers, whereas others to the Ndebele-speakers and possibly a few also to the Ndebele of Mzilikazi. The Iron Age sites tend to cluster in the Bronberg as well as on the more open flatlands, especially in areas where outcrops (dolorite, etc.) occur. It is possible, although not yet proven, that this distinction can be linked to the difference between the Sotho and Ndebele settlement preference referred to above.

Will any building or structure older than 60 years be affected in any way?	NO ✓
Is it necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999)?	NO ✓

If YES, please provide proof that this permit application has been submitted to SAHRA or the relevant provincial authority.

Two stone wall sites are situated near/on the proposed new Road development. Stone Wall Site Number 2 will not be considerably impacted on, but Stone Wall Site Number 1 will be impacted on by the said development. Three options in this case can be considered;

1. Fence (stabilising), stabilise (strengthen) and clearly mark site, this option is applicable to stone wall site 2;
2. Document, dismantle stone wall site and reconstruct after construction (permit application to relevant heritage authority necessary), this option is applicable to stone wall site 1;
3. Destruct (permit application to the relevant heritage authority necessary), this option is applicable to site 1.

Option 2 is favoured in terms of heritage for stone wall site 1.

- Road alternative 1 (purple line) is favoured in terms of heritage.
- No preference of discharge and overflow pipeline alternatives in terms of heritage impact.
- Stone Wall Site 2 is situated near the existing reservoir and should be clearly marked and fenced during construction to ensure conservation and preservation thereof.
- The discovery of subsurface archaeological and/or historical material as well as graves must be taken into account in the EMPr.

The Draft BAR was submitted to the Provincial Heritage Resources Authority of Gauteng (PHRAG) for comment during the public review period. PHRAG must provide approval on the HIA before construction can proceed. This report was submitted as a Section 38 application to the South African Heritage Resources Agency (SAHRA) or one of its subsidiaries for comment/approval and for the requisite permit.

22. SOCIO-ECONOMIC CHARACTER

a) 1. Local Municipality

The development is located in the City of Tshwane Metropolitan Municipality.

Please provide details on the socio-economic character of the local municipality in which the proposed site(s) are situated.

Level of unemployment:

The proposed development falls within the Shere Small Holdings (SH) sub-place. According to Statistic South Africa (2013), only 3% of the community are unemployed.

Economic profile of local municipality:

The section below outlines the social and economic profile of the community using Census 2011 data and Quantec Research Easy Data (**Table 2**). Refer to The Social Impact Assessment for further information (**Appendix D7**).

Table 3: Profile of Shere SH (Statistics South Africa, 2013)

Description	Total
Highest level of Education Reached: Grade 12	24%
Highest level of Education Reached: Higher Education	45%
Annual Household Income: R 76 401+	65%
Access to piped water: Inside Dwelling	96%
Flush toilet (connected to sewerage system)	83%
Employment Status	70%

Level of education:

The community is well educated. 24% of the community have completed secondary school (Grade 12) while 45% of the population have some form of higher education.

b) Socio-economic value of the activity

What is the expected capital value of the activity on completion?	R200 000 000-00	
What is the expected yearly income that will be generated by or as a result of the activity?	The project construction will run for approximately 3 years. No yearly income is expected.	
Will the activity contribute to service infrastructure?	YES ✓	
Is the activity a public amenity?		NO ✓

How many new employment opportunities will be created in the development and construction phase of the activity/ies?	50 vacancies for skilled, semi-skilled and unskilled labourer (Assuming there will be no rotation of workers, this number may jump to 200 vacancies in case there is rotation of workers every 4 to 6 months).
What is the expected value of the employment opportunities during the development and construction phase?	R12 600 000-00 total over a 3-year period.
What percentage of this will accrue to previously disadvantaged individuals?	80%
How many permanent new employment opportunities will be created during the operational phase of the activity?	Approximately 5 permanent positions. To be confirmed following commissioning of the infrastructure and assessment of the operational needs.
What is the expected current value of the employment opportunities during the first 10 years?	To be confirmed following commissioning of the infrastructure and assessment of the operational needs.
What percentage of this will accrue to previously disadvantaged individuals?	To be confirmed following commissioning of the infrastructure and assessment of the operational needs.

23. BIODIVERSITY

Please note: The Department may request specialist input/studies depending on the nature of the biodiversity occurring on the site and potential impact(s) of the proposed activity/ies. To assist with the identification of the biodiversity occurring on site and the ecosystem status consult http://bgis.sanbi.org or BGIShelp@sanbi.org. Information is also available on compact disc (cd) from the Biodiversity-GIS Unit, Ph (021) 799 8698. This information may be updated from time to time and it is the applicant/ EAP's responsibility to ensure that the latest version is used. A map of the relevant biodiversity information (including an indication of the habitat conditions as per (b) below) and must be provided as an overlay map to the property/site plan as Appendix D to this report.

Refer to **Appendix A3 and D10** for the Biodiversity Information Maps.

a) Indicate the applicable biodiversity planning categories of all areas on site and indicate the reason(s) provided in the biodiversity plan for the selection of the specific area as part of the specific category)

Systematic Biodiversity Planning Category			If CBA or ESA, indicate the reason(s) for its selection in biodiversity plan
Critical Biodiversity Area (CBA) ✓	Ecological Support Area (ESA) ✓	[redacted]	The project area is classified as a CBA and ESA because: • It occurs on the Bronberg Mountain Bushveld Threatened Ecosystem which is listed as Critically Endangered o According to the data sourced from South African National Biodiversity Institute (SANBI); approximately 5% of the proposed development falls within the Bronberg Mountain Bushveld Threatened Ecosystem which is listed as Critically Endangered. • The site falls within a portion of an Irreplaceable Area o The Conservation Plan (C-Plan) for Gauteng is compiled by the Gauteng Department of Agriculture and Rural Development (GDARD). The data from the Gauteng C-Plan 3.3 indicates that the proposed development occurs in a CBA and a small portion of ESA and the CBA of the site is classified as an Irreplaceable Area. o The area proposed for the development falls within a CBA and ESA area, however the project infrastructure is proposed to be sited in previously disturbed areas thus minimising further impact to these sensitive areas, additionally the project layout and design has taken cognizance of the site sensitivities. • There is a Class 2 Ridge o According to the Gauteng C-Plan 3.3, the proposed development site falls within a Class 2 Ridge. However, according to the Terrestrial Ecological Assessment, some sections of the ridge on this proposed development area have been subjected to habitat degradation and disturbances, especially on the proposed reservoir site, due to the construction of the initial reservoir. The site is already highly transformed and dominated by exotics and invasive alien plant species and thus can be viewed as a low sensitivity. • The site is habitat to the Critically Endangered Juliana's Golden Mole (*Neamblysomus julianae*) o The site is habitat to the Critically Endangered Juliana's Golden Mole (*Neamblysomus julianae*); however the specialist report indicates that the reservoir site is comprised mostly of unsuitable golden mole habitat. The area proposed for the associated infrastructure experience higher diversity however is still encroached with alien vegetation. The area proposed for the pipeline and temporary access roads have previously been disturbed. There is an existing dirt track, which will be upgraded and utilised for access, and the area proposed for the pipeline already houses municipal services.

b) Indicate and describe the habitat condition on site

Habitat Condition	Percentage of habitat condition class (adding up to 100%)	Description and additional Comments and Observations (including additional insight into condition, e.g. poor land management practises, presence of quarries, grazing, harvesting regimes etc).
Natural	50 %	Natural vegetation is characterized by open broadleaved woodland such as *Englerophytum magaliesmontanum, Burkea africana* and *Peltophorum africanum, Combretum molle, Dombeya rotundifolia, Strychnos pungens, Ochna pulchra* characteristic of the rocky slopes of the mountain range.
Near Natural (includes areas with low to moderate level of alien invasive plants)	10 %	As a consequence of the high levels of disturbance, the dominant habitat structure comprised primarily of weeds and/or alien invasive plant species. Some of the alien invasive plants species recorded in abundance on the proposed study area are *Campuloclinium macrocephalum, Lantana camara* and *Solanum mauritianum* (all listed as category 1).
Degraded (includes areas heavily invaded by alien plants)	20 %	
Transformed (includes cultivation, dams, urban, plantation, roads, etc)	20 %	Disturbances such as the surrounding human settlements, alien invasive plant species, roads and the existing reservoir (including pipelines and valve chambers, balancing tank, break pressure) were prevalent in the study area.

c) Complete the table to indicate:

(i) the type of vegetation, including its ecosystem status, present on the site; and

(ii) whether an aquatic ecosystem is present on site.

Vegetation Type	Threat Status
Andesite Mountain Bushveld	Least Threatened

Terrestrial Ecosystems		**Aquatic Ecosystems**			
Ecosystem threat status as per the National Environmental Management: Biodiversity Act (Act No. 10 of 2004)	Critical ✓	Wetland (including rivers, depressions, channelled and unchanneled wetlands, flats, seeps pans, and artificial wetlands)		Estuary	Coastline
	Endangered				
	Vulnerable				
	Least Threatened	YES ✓		NO ✓	NO ✓

d) Please provide a description of the vegetation type and/or aquatic ecosystem present on site, including any important biodiversity features/information identified on site (e.g. threatened species and special habitats)

Vegetation Type: Andesite Mountain Bushveld

The Andesite Mountain Bushveld occurs in four provinces: Gauteng, North-West, Mpumalanga and Free State. Its altitude varies between 1 350 – 1 800 metres. It is a dense, medium-tall thorny bushveld with a well-developed grass layer on slopes and some valleys in an undulating landscape. Mean Annual Precipitation ranges between 550 mm in the southwest to about 750 mm in the northeast. Frost is frequent in winter but less on the ridges and hills than in flat areas (Mucina & Rutherford 2006). Currently this vegetation unit is considered to be Least threatened with a conservation target of 24%. About 7% is statutorily conserved mainly in the Suikerbosrand Nature Reserve and the Magaliesberg Protected Nature Area (MPNA). An additional 1–2% is conserved in other reserves mainly in the Hartbeesthoek Radio Astronomy Observatory. Some 15% is already transformed, mainly due to cultivation and some urban development (Mucina & Rutherford 2006).

Threatened Ecosystem: Bronberg Mountain Bushveld

The Bronberg Mountain Bushveld is found in the City of Tshwane Metropolitan Municipality. This ecosystem is located in south-east of Pretoria including Rietvlei dam (2528CD). It is delineated by the Bronberg ridge with associated koppies, drainage lines and rivers. 19 threatened or endemic plant and animal species of special concern known are to be found within ecosystem. The key biodiversity features include Red or Orange Listed plants, for example *Bowiea volubilis* subsp. *volubilis* and *Ceropegia decidua* subsp*. Pretoriensis*. Red or Orange Listed mammals for example Juliana's Golden Mole, and Spotted-necked Otter; Red or Orange Listed birds for example Secretarybird; Red or Orange Listed or priority invertebrates for example Gunning's Rock Scorpion; and three vegetation types including Andesite Mountain Bushveld, Marikana Thornveld and Rand Highveld Grassland. Rivers and wetlands in the ecosystem include the Moretele River, Pienaars River, Swawelpoortspruit and various unnamed wetlands. Approximately 1% of the ecosystem is protected in the Faerie Glen Nature Reserve (Gauteng C-Plan Version 2, 2006). Approximately only 5% of the proposed development site falls within the terrestrial threatened ecosystem identified as the Critically Endangered Bronberg Mountain Bushveld. Besides from the occurrence of the Juliana's Golden Mole, *Adromischus umbraticola* subsp. *umbraticola, Boophane disticha* and *Hypoxis hemerocallidea* on the site, no other Red Data flora or fauna species were found on site.

The Juliana's Golden Mole (*Neamblysomus julianae*)

The species is known from only three isolated and range-restricted subpopulations in South Africa; two of which occur within protected areas; there are no intermediate distribution records suggesting gene flow between them. Only a small part of the range of the subpopulation occurring in and around Nylsvley Provincial Nature Reserve (Modimolle district, Limpopo Province) falls within this protected area, the rest being in adjoining farmlands where suitable habitat is subject to severe alteration, degradation and fragmentation. Although almost the entire range of the Kruger National Park subpopulation (Mpumalanga Province) is protected in the southwestern section of the park, road infrastructure may form barriers that impede golden mole movements. The Bronberg Ridge subpopulation in eastern Tshwane (Gauteng) is not at all protected within a provincial or national reserve, and persistent quartzite mining, rapid urbanization and expansion of suburbs east of Tshwane are causing severe transformation, degradation and loss of remaining intact natural habitat within its very restricted distributional range on the ridge. Hence, the Bronberg Ridge is treated as a distinct subpopulation.

This species is confined to sandy soils, often pockets of weathered sandstone associated with rocky ridges, in the Savanna biome of South Africa, and marginally into the Grassland biome in the Tshwane district (Gauteng). The subpopulation on Nylsvley floodplain occurs in Clay Thorn Bushveld, the Bronberg Ridge subpopulation east of Tshwane in Rocky Highveld Grassland, whereas the Kruger National Park locations occur in Sour Lowveld Bushveld. Common in well-irrigated suburban and rural gardens. Absent from grasslands on the heavier soils of the Mpumalanga escarpment where the larger-sized *A. septentrionalis* and *A. robustus* instead occur.

The species' presence is positively correlated with soil features (poorly graded size distribution of sand particles) that determine soil density, drainage, compatibility, and texture and penetration resistance. These influence energy expenditure of these golden moles during sand swimming/tunnelling (Jackson et al. 2007b). Subsurface foraging tunnels are visible as broken ridges on the soil surface; most foraging activity occur within the upper layer (10–20 mm).

The type population on Bronberg Ridge (Gauteng) is severely impacted by degradation, fragmentation and loss of its natural soil habitat owing to intensive urbanization and an expanding quartzite mining operation within its highly restricted range (hence this subpopulation is also assessed separately).

The species' elusive habits often obscure signs of its presence. Developers committed to follow recommendations of Environmental Management Programme (EMPr) and Requirements of Development (RoD) are reliant on golden mole specialists for guidance in respect of minimizing impacts on the species

Within the Bronberg Ridge, two primary dispersal corridors exist for the golden moles on the Bronberg Ridge. It is crucial that these continuous dispersal corridors are preserved and protected to maintain connectivity between golden moles living in the existing Rand Water property, the surrounding Bronberg Conservancy and other neighbouring properties as well as the larger Bronberg Ridge population.

Non-perennial drainage lines

Although there are no rivers in the project area, three drainage lines were identified. The project area is situated in quaternary catchment A23A and the Pienaars River Sub-Quaternary Reach (SQR). These make up the northern and south-eastern boundaries of the project area, along with a drainage line that bisects the project area. The drainage lines will be referred to as the northern, central and eastern drainage lines. The northern drainage line is the most clearly defined. It is regarded as the most sensitive. The central drainage line is a tributary of the northern drainage line. The central drainage line is clearly defined in the upper reaches but not clearly defined on the lower slopes. It appears to act primarily as an overflow for the existing reservoir. It is regarded as being of lower sensitivity than the northern line. The central drainage line exits the project area at the access gate on James Road. At this point it appears as if some of the water flows down James Road, whereas the remainder of the flow drains along the fence down towards the northern drainage line. The eastern drainage line is similar to the central drainage in that it is clearly defined in the upper reaches but the channel is not clearly defined in the lower reaches. The central drainage line intersects with all three alternative temporary access roads at GPS coordinate S 25.790369° and E 28.347331°.

SECTION C: PUBLIC PARTICIPATION

24. ADVERTISEMENT AND NOTICE

Site notices were placed at 3 different locations on the 28 October 2015. A newspaper advert was published on the 30 October 2015 in the Pretoria East Rekord. An additional 2 site notices were placed on 15 February 2017.

Publication name	Pretoria East Rekord	
Date published	30 October 2015	
Site notice position	**Latitude**	**Longitude**
Site Notice 01	25°47'20.64"S	28°20'59.77"E
Site Notice 02	25°47'49.23"S	28°20'27.82"E
Site Notice 03	25°47'32.50"S	28°21'16.54"E
Date placed	28 October 2015	
Nemai Consulting conducted additional public notification in February 2017 to ensure landowners north of the site were aware of the proposed project. The proposed temporary access roads for construction start from James Road and thus site notices were placed in this area as Rand Water proposed to access the site from Graham Road through Struben Road.		
Site notice position	**Latitude**	**Site notice position**
Site Notice 04	25°47'27.08"S	28°21'22.15"E
Site Notice 05	25°47'32.45"S	28°21'15.83"E
Date placed	15 February 2017	

Include proof of the placement of the relevant advertisements and notices in Appendix E1.

Proof of the site notices and newspaper advert are provided in **Appendix E1**.

25. DETERMINATION OF APPROPRIATE MEASURES

Provide details of the measures taken to include all potential I&APs as required by Regulation 41(2)(e) and 41(6) of GN 733.

Below is a summary of the public participation process (with the public and organs of state) for the BAR held to date:

Initial public notification about the proposed development took place in October 2015. The public were notified via the placement of on-site notices, a newspaper advert, hand delivery of Background Information Documents (BIDs) to directly adjacent households, as well as emails to organs of states.

The information in these notifications contained the all the relevant facts about the proposed project, details on how to register as an Interested and Affected Party (IAP), details of the contact details of the Environmental Assessment Practitioner (EAP), and it was stated that only registered IAPs will continue to be notified of the process as it unfolds such as dates of public meetings (if requested) and review periods of the BAR. Site Notices were strategically placed around the site where they would be easily visible and available to community members within the site boundary. Refer to **Appendix E1** and **E2(i)** for proof of notification.

Two focus group meetings have been held to date. The aim of the Focus Group Meetings were to:

- Introduce the project and provide an overview of the proposed development;
- Identify any issues and concerns by the community; and
- Provide a platform for project-related discussions

Focus Group Meeting 01 was held with members of the community from Home Owners Associations and Estates in the area. Focus Group Meeting 02 was held with conservation groups to discuss any potential concerns regarding the sensitive nature of the site from a conservation point of view and thus the following stakeholders were invited to attend the meeting to have an idea of the concerns: GDARD (Biodiversity Unit and Mammal Sciences), DEA (Biodiversity Unit), City of Tshwane (Environmental), SANBI, Endangered Wildlife Trust (EWT), the Golden Mole Specialist and Terrestrial Ecological Specialist on the project. Refer to **Appendix E6(ii)** for minutes of the meeting.

Several meetings with different landowners (direct and adjacent) have been held to date which can be referred to in **Appendix E6(ii)**.

The initial 30-day review period for the BAR took place from 23 June 2016 to 22 July 2016. Refer to proof of notification in **Appendix E2(ii)**. A hardcopy of the BAR was placed at the Shere Satellite Office (43 Shere AH, Cnr Struben Road & Graham Road) and an electronic copy was available on Dropbox from the following link: https://www.dropbox.com/s/klo73ymoidr66x6/10576-Bronberg-BAR%20for%20Public%20Review.pdf?dl=0. The notification included notification regarding the Public Meeting as well. A Public Meeting was held during the initial 30-day review period for the Draft BAR, on 12 July 2016 at the NG Kerk Gemeente Tygerpoort, 51 Henrylaan, Shere AH, Pretoria from 18H00 to 20H00. Refer to **Appendix E6(ii)** for minutes of the meeting.

The BA Process was suspended by DEA on 29 July 2017 in terms of Regulation 14 of Government Notice (GN) R.982 of 04 December 2014 of the EIA Regulations (2014), the matter was regarding a complaint received from the Friends of Faerie Glen Nature Reserve (FFGNR) regarding alleged non-compliance with provisions of Regulation 13 (1) of GN R.982 of the 2014 EIA Regulations. The suspension was uplifted by DEA on 12/12/2016 as it could not find any evidence to support the claims made. The FFGNR then lodged an Appeal against the upliftment of the suspension on 19 December 2016. The DEA dismissed the Appeal on 16 March 2017, the reasons of which can be obtained in the decision. Refer to **Appendix E2(iii and iv) and Appendix E6i** for the above mentioned documents and correspondence.

The BA Process thus continued after 12/12/2016. Nemai Consulting undertook a second public notification period in February 2017 where newly affected IAPs were allowed to register until 03 March 2017. The public were notified via the placement of on-site notices, hand delivery of BIDs to directly adjacent households in north along James Road and Struben Road, as well as emails to the registered IAPs. Refer to **Appendix E2(v)**.

Nemai Consulting received an acknowledgement letter from DEA on 27 March 2017 regarding the time extension for the BA Process in terms of Regulation 19(b) of the EIA Regulations (2014). Refer to **Appendix E6i**.

The second 30-day review period for the BAR took place from 21 June 2017 to 20 July 2017. Proof of notification is available in the Final BAR in **Appendix E2(vi)**. All comments received with regards to the proposed development are contained in the Comments and Responses Report (CRR), refer to **Appendix E3**. The project team has provided responses to these comments/issues to their best ability.

Key stakeholders (other than organs of state) identified in terms of Regulation 41(2)(b) of GN 733

Title, Name and Surname	Affiliation/ key stakeholder status	Contact details (tel number or e-mail address)
Several IAPs have registered to date, please refer to the Bronberg IAP Database in **Appendix E5**.		

Include proof that the key stakeholder received written notification of the proposed activities as Appendix E2. This proof may include any of the following:

- e-mail delivery reports;
- registered mail receipts;
- courier waybills;
- signed acknowledgements of receipt; and/or
- or any other proof as agreed upon by the competent authority.

Refer to **Appendix E2** for proof of notification.

26. ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

Summary of main issues raised by I&APs	Summary of response from EAP
The impacts on the Bronberg Ridge and Threatened Ecosystem.	A Terrestrial Ecological Assessment (Appendix D3 of the BAR) was undertaken which included the assessment of the impact the project will have on the Bronberg Ridge. The Study found that some sections of the ridge on this proposed development area has already been subjected to habitat degradation and disturbances, especially on the proposed reservoir site (highly transformed), due to the initial construction of the reservoir. With regards to the sensitivity of the ridge on which the proposed reservoir will be constructed, the site is already transformed and also dominated by exotics and invasive alien plant species and thus can be viewed as a low sensitivity (Ridge Impact Assessment was undertaken (Appendix D3 of the BAR). The EMPr includes the management actions proposed by the Specialist.
Concern about the loss of Juliana's Golden Mole (*Neamblysomus julianae*) species.	A Juliana's Golden Mole Assessment (Appendix D4 of the BAR) was undertaken which included the assessment of the impact the project will have on *Neamblysomus julianae* population and proposes mitigation measures to minimise impacts to the habitat disturbance for the moles. The EMPr includes the management actions proposed by the Specialist.
Community has a concern over Rand Water's ability to maintain its existing infrastructure as their pipes are being tapped into by developers causing severe storm - water issues and pollution problems.	Rand Water have a Dam Safety Engineer engaging with the Department of Water Affairs and Sanitation. These engagements address design, safety, risk, operational and maintenance issues for the proposed new reservoir. The Department of Water and Sanitation are required to approved the final designs and provide permission to construct once all requisite authorisations are in hand.. Rand Water are committed to investigate the problem and provide

Summary of main issues raised by I&APs	Summary of response from EAP
	feedback. After these comments were received, a meeting was held by Rand Water with the Boardwalk Meander Estate to discuss the solution to these problems. Rand Water confirmed to investigate possible illegal connections to its existing infrastructure and remedy this. It was further confirmed that the issues being experienced with regard to storm water and pollution issues emanate from surrounding Estates and City of Tshwane . Rand Water has committed to assist the Estate in engaging with the relevant authorities in resolving other problems they are experiencing. Rand Water are currently awaiting feedback from the Estate with regards to the status of their previous assessments and Water Use License application status, in order to assist further. Following the above, Rand Water has since identified the illegal storm water connections on its overflow pipeline. Rand Water is currently engaging with the City of Tshwane with regards to removing these illegal connections. Following which the silt in the dam shall be removed.
Traffic impacts during construction for the proposed temporary access road along James Road.	The Traffic Impact Assessments that were undertaken (Appendix D8 and J6 of the BAR) provide measures to minimise the traffic impacts during construction. The EMPr includes the management actions proposed by the Specialist.
Increased traffic along arterial routes to site	Approach route from Graham Road via Frank Avenue, Catherine and James Roads would have been a suitable route as stated by the Traffic report, has it not been for the unsatisfactory intersection spacing of 200m between Silverlakes Road and Frank Road. The Gauteng Provincial Government Department of Public Transport, Roads and Works Road Design Manual Vol. I Geometrics, indicates that the desirable access spacing between intersections on a class 3 urban dual carriage road such as Graham Road is 600m to 800m with 550m as the desirable minimum distance and 500m the absolute minimum. The current minimum intersection spacing on Graham road is 600m, which is acceptable. Traffic safety on mobility roads requires access spacing to be as far apart as possible, thus reducing conflict and the need for stopping and starting. The importance of intersection spacing is similar to that of driveway spacing. As the number of intersections per kilometre increase, the opportunity for crashes increases. The existence of too many intersections per kilometre also increases delay and congestion It is proposed that the Graham and Struben Road intersection be signalised before construction commences. This will significantly improve traffic flow in the south-western and north-eastern directions (Struben Road). Signage at all effected intersections should be improved to ensure that motorists adhere to the traffic regulations. The follow traffic calming measures have been proposed by the specialist and are included in the EMPr: • Temporary traffic accommodation signage shall be displayed along the route to be followed by construction vehicles (between

Summary of main issues raised by I&APs	Summary of response from EAP
	Graham Road and the site access road along Struben Road, Catherine Road and James Road) in order to create awareness of construction vehicles by other road users • Construction vehicles travelling on all public roads shall adhere to the posted speed limits and speeds along proposed access route shall be controlled at 40kph to minimise potential conflict. • Signage at all affected intersections should be improved to ensure that motorists adhere to the traffic regulations. • The Contractor and the Safety Officer is responsible for monitoring compliance to the speed limits.
Storm water concerns along arterial routes to site	The Shere Agricultural Holdings catchment is hilly with slopes resulting in the supercritical flow regime which causes significant erosion. The proposal of a SANRAL Type III stepped energy dissipaters is proposed. Concrete channels are proposed to be installed using hyson cells or steel mesh reinforced. Channel along Struben design: Design storm recurrence period: 2 year; CoT type 5 side drain Length = 250m Flow- 5.894m2/s Velocity = 8.971m/s Channel along Frank Avenue design Design storm recurrence period: 2 year CoT Type 5 side drain Length = 300m Flow = 2.392m3/s Velocity = 7.097 m/s Channel along Catherine Road design Design storm recurrence period: 2 year CoT Type 5 side drain Length = 600m Flow = 2.392m3/s Velocity = 7.097 m/s Channel along James Road design Design storm recurrence period: 2 year CoT Type 5 side drain Length = 300m Flow = 1.407m3/s Velocity = 6.15 m/s.
Deterioration of roads as a result of construction activities	Proposed pavement options (road improvements) • No structural change to existing road • All material existing • Rip surface to 75mm and mix in with dust suppressant spray • Mix well

Summary of main issues raised by I&APs	Summary of response from EAP
	• Shape to required camber • Compact with pneumatic roller or tyre steel roller to required density The following measures as detailed in the EMPr must be adhered to: Suitable erosion protective measures are to be implemented for access roads during the construction phase. • Install water diversion berms from the start of construction. The berms shall be maintained at all times and be repaired at the end of the contract. • Where berms are installed on steep slopes the outflow shall be suitably stone pitched to prevent erosion from starting at the berms outlets. • Maintain all access routes and roads adequately in order to minimise erosion and undue surface damage. • Repair rutting and potholing and maintain storm water control mechanisms. • Runoff from roads must be managed to avoid erosion and pollution problems. • A photographic record should be kept of all existing roads used to ensure that all roads repaired to at least their original status. This will also be available should any claim be instituted by any landowners. • Clean and make good any damage to public or private roads caused by the Contractor during the construction phase.
Security concern of the residents about the increase in crime associated with construction activities.	The EMPr includes the management actions to address security concerns during construction. Rand Water stated that there will be one point of access for construction and a security control point which shall be maintained 24 hours per day. Additional measures have been agreed upon between Rand Water and the Community representative for the community that resides to the west of the development. • The site fence should be continuous throughout the construction period. • All contractor staff should be easily identifiable through their uniforms as being staff members. • There will be a small increase in the risk of opportunistic crime, given that the area will experience some increased visibility due to the construction vehicles. • Construction staff are to always wear PPE to identify themselves and ensure their safety. • Access to the site should be restricted. • Rand Water should approach the local SAPS to increase policing in the area to ensure the safety of residents and construction staff. This is important given the perception of IAPS that the construction will result in increased crime.
Why the temporary access road cannot be from the	The existing operational access to the Rand Water reservoir site from Olympus into Leander is inaccessible by large construction

Summary of main issues raised by I&APs	Summary of response from EAP
south of the development instead of the north (James road).	vehicles due to the existing infrastructure at the entrance of the site (valve chambers, balancing tank, R1 pipeline, H26 pipeline and municipal pipeline (potential asbestos pipeline). Following the comments received from the I&AP during the initial 30 day public participation period, the route from the South was reinvestigated with the same outcome. Turning movement paths for heavy vehicles were modelled and clearly show inadequate space for heavy vehicle to turn as a result of the infrastructure around the entrance. Rand Water additionally engaged the Land owners (Seventh Day Adventist Church) at the Southern operational entrance in order to rent/purchase a portion of their land that would allow sufficient space to enter the construction site with construction vehicles, whilst ensuring the protection of the existing infrastructure and allow space for the required turning circle. The proposal was tabled and Rand Water did not receive positive feedback. The Church indicated they have their own plans for development and use of the property.
The overflow pipeline location	Rand Water proposed siting of the overflow pipeline took into consideration the natural drainage of the site and concerns raised by the by the landowner. The pipeline is sited on the western boundary of the land owner's property to avoid undue segmentation of his property. Additionally as further detailed in the BAR, the working strip for the overflow pipeline is proposed at 10m and the registered servitude at 5m, thus further reducing the land impacted by servitude. This alignment of the overflow pipeline further coincides with a previously disturbed area, where an existing Eastern Gauteng Services Council (EGSC) pipeline exists. The overflow from the existing reservoir is directed to the south to Boardwalk Meander Estate. Following comments received from the public at a Focus group meeting, concerns were raised with regards to the silt in the Boardwalk meander dam. Rand Water investigated and it was confirmed that the overflow pipeline has a number of illegal storm water connections. It was confirmed that the pipeline route has been encroached upon by residential complexes, therefore access is not possible for an upgrade or maintenance, moreover Rand Water does not have a registered servitude right. Following consultation with the City of Tshwane it was further confirmed that the Boardwalk Meander dam does not have capacity for the overflow of the proposed additional reservoir. Therefore the overflow pipeline is proposed on the western boundary of the landowners property.
EAP's Independence	A letter was received from an IAP on 22/07/2016 that requested the DEA to investigate suspected non-compliance of the EAP in terms of section 13(1)(a) of the 2014 EIA Regulations of NEMA. The DEA issued a letter on 27/07/2016 suspending the project until the matter was resolved. Nemai Consulting notified all registered IAPs of the suspension on 29/07/2016. The IAP submitted a further letter to the DEA on 02/08/2016 indicating that their complaint was not only with regards to a complaint of lack of independence, but also about the

Summary of main issues raised by I&APs	Summary of response from EAP
	failure of being objective and disclosing information. Nemai Consulting submitted a response to the allegations to the DEA on 26/08/2016. Nemai Consulting received the decision on the complaint from DEA dated 12/12/2016 which dismissed the allegations lodged by the IAP as it could not find any evidence to support the claims made. Refer to Appendix E6(i)(c) for correspondence. Subsequent to the DEA decision, the FFGNR lodged an appeal to the decision on 19/12/2016. Nemai Consulting provided the Appeal Response Report to DEA on 23/01/2017. DEA sent Nemai Consulting a Promotion of Access to Information Act (PAIA) Request from the IAP on 26/01/2017. Nemai Consulting responded to the PAIA request on 27/01/2017 stating that there is no opposition for the DEA to disclose the requested information. The IAP informed DEA on 27/02/2017 that they do not intend on adding further grounds of appeal Nemai Consulting received the decision on the appeal from DEA dated 16/03/2017 which dismissed the appeal lodged by the IAP. Refer to Appendix E6(i)(c) for correspondence.
Allegations by IAPs of bullying of IAPs by Applicant (Rand Water)	IAPs have alleged that Rand Water has bullied I&APs by providing a long BAR, in which the EAP had not paraphrased responses. Rand Water acknowledges the BAR is extensive, however the site is sensitive and therefore detailed information is required to be included in the BAR, this is aligned to the BAR template and NEMA EIA Regulations.
Independence of Specialist Studies (except the Juliana Golden Mole Assessment) and their methodology not in line with the 2014 EIA Regulations and that the methodology by the Specialists does not follow the same methodology as the EAP's.	All Specialist Studies are independent. The methodology used by the specialists are in line with the 2014 EIA Regulations.

27. COMMENTS AND RESPONSE REPORT

The practitioner must record all comments received from I&APs and respond to each comment before the Draft BAR is submitted. The comments and responses must be captured in a comments and response report as prescribed in the EIA regulations and be attached to the Final BAR as Appendix E3.

Refer to the Comments and Reponses Report in **Appendix E3** of the BAR.

28. AUTHORITY PARTICIPATION

Authorities and organs of state identified as key stakeholders:

Authority/Organ of State	Contact person (Title, Name and Surname)	Tel No	Fax No	e-mail	Address
DEA	Nyiko Nkosi (Case Officer)	012 399 9392	None	Nnkosi@environment.gov.za	Environment House, 473 Steve Biko Rd, Pretoria
GDARD	Boniswa Belot (Environmental Section)	011 240 3377	011 242 700	Boniswa.Belot@gauteng.gov.za	11 Diagonal Street, Diamond Building, Johannesburg
DWS	Thato Mjona (Water Affairs Officer)	012 392 1499; 083 488 0655	None	MjonaT@dws.gov.za	285 Francis Baard, Bothongo Plaza, 15th Floor, Pretoria, 0001
Provincial Heritage Resources Authority - Gauteng (PHRAG)	Tebogo Molokomme (Archaeologist for PHRAG)	011 355 2545	011 355 2500	Tebogo.Molokomme@gauteng.gov.za	38 Rissik Street, NBS Building, Johannesburg, 2000.
Department of Agriculture, Forestry and Fisheries (DAFF) - Gauteng Regional Office	Themba Dlamini (Head of Forestry)	012 309 5733	012 309 5833	thembad@daff.gov.za	20 Steve Biko (Formerly Beatrix) Street, Arcadia, Pretoria
City of Tshwane Metro Municipality: City Manager	Ninette Botha	012 358 4901 / 4904	086 214 9544/012 358 1112	citymanager@tshwane.gov.za	22nd Floor, Isivuno House, Cnr Lilian Ngoyi and Madiba Streets, Pretoria
City of Tshwane Metro Municipality: Environmental	Marlah Hammond (Environmental Assessor)	012 358 8714	None	marlah@tshwane.gov.za	2nd Floor, Mercedes Benz Building,11 Francis Baard Street
Ward Councillor 101	Mike Strange (Ward Councillor)	076 701 5286	None	mike58strange@gmail.com	Shere Satellite Office

Include proof that the Authorities and Organs of State received written notification of the proposed activities as appendix E4.

Refer to proof of notification in **Appendix E4.**

In the case of renewable energy projects, Eskom and the SKA Project Office must be included in the list of Organs of State.

This is not a renewable project.

29. CONSULTATION WITH OTHER STAKEHOLDERS

Note that, for any activities (linear or other) where deviation from the public participation requirements may be appropriate, the person conducting the public participation process may deviate from the requirements of that sub-regulation to the extent and in the manner as may be agreed to by the competent authority.

Proof of any such agreement must be provided, where applicable. Application for any deviation from the regulations relating to the public participation process must be submitted prior to the commencement of the public participation process.

A list of registered I&APs must be included as appendix E5.

Refer to the Bronberg IAP Database in **Appendix E5**.

Copies of any correspondence and minutes of any meetings held must be included in Appendix E6.

All correspondence can be referred to in **Appendix E6i**.

Minutes of all relevant Meetings that have been held to date can be referred to in **Appendix E6ii**.

SECTION D: IMPACT ASSESSMENT

The assessment of impacts must adhere to the minimum requirements in the EIA Regulations, 2014 and should take applicable official guidelines into account. The issues raised by interested and affected parties should also be addressed in the assessment of impacts.

30. IMPACTS THAT MAY RESULT FROM THE PLANNING AND DESIGN, CONSTRUCTION, OPERATIONAL, DECOMMISSIONING AND CLOSURE PHASES AS WELL AS PROPOSED MANAGEMENT OF IDENTIFIED IMPACTS AND PROPOSED MITIGATION MEASURES

Provide a summary and anticipated significance of the potential direct, indirect and cumulative impacts that are likely to occur as a result of the planning and design phase, construction phase, operational phase, decommissioning and closure phase, including impacts relating to the choice of site/activity/technology alternatives as well as the mitigation measures that may eliminate or reduce the potential impacts listed. This impact assessment must be applied to all the identified alternatives to the activities identified in Section A(2) of this report.

A complete impact assessment in terms of Regulation 19(3) of GN 733 must be included as Appendix F.

Please note the impacts provided below are the impacts **AFTER mitigation**. The full Impact Assessment is provided in **Appendix F.**

Table 4: Impact assessment for the proposed Bronberg 100ML reservoir and associated infrastructure

Activity	Impact summary	Significance	Proposed mitigation
The following activities apply to the entire development as well as ALL alternatives (Alternatives A1, A2, A3, B1, B2, B3, and B4) and are summarised below. Impacts to specific alternatives are discussed thereafter.			
Climate (Construction Phase)	***Direct impacts:*** Greenhouse gas emissions (such as from vehicle emissions)	Low	• Materials with a high recycled content should be used where possible and the re-use of site materials should be considered. • In terms of transportation of workers and materials, collective transportation arrangements should encouraged to reduce individual car journeys. • All vehicles used during the project must be properly maintained and in good working order.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Geology and Soil (Construction and Operation Phase)	***Direct impacts:*** Soil erosion on steep slopes	Low	• Stabilisation of cleared areas to prevent and control erosion. The method chosen (e.g. watering, planting, retaining structures, commercial anti-erosion compounds, mulching, re-vegetation) will be selected according to the site-specific conditions. • Consideration should be given to vegetating working strips during construction (*Teff*). • Drainage management measures should also be implemented to ensure the minimization of potential erosion. • Acceptable reinstatement and rehabilitation of affected project area (footprint). • Install suitable buttressing to prevent future erosion of the structures of the drainage line affected by construction, if required. • Monitoring to be conducted to detect erosion (e.g. steep sections along access road and pipelines, crossing of drainage line, etc.), where necessary corrective measures to be implemented. • Slopes steeper than 1(V):3(H) or slopes where the soils are by nature dispersive or sandy must be stabilised. One or more of the following

Activity	Impact summary	Significance	Proposed mitigation
			methods may be required: o Topsoil covered with a geotextile plus a specified grass seed mixture. o A 50:50 by volume rock : topsoil mix 200mm thick, plus specified grass seed mixture. o Logging or stepping (logs placed in continuous lines following the contours). o Earth or rock-pack cut-off berms. o Benches (sand bags). o Packed branches. o Stormwater berms. • Near vertical slopes of 1(V):1(H) or 1(V):2(H) must be stabilised using hard structures, preferably with a natural look, and with facilities allowing for plant growth. One or more of the following methods may be required: o Retaining walls (loffel or otherwise). o Stone pitching. o Gabions.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Flora (Pre-Construction Phase)	***Direct impacts:*** Destruction of plant species of conservation concern	Low	• Three species of conservation concern were noted on site, namely *Adromischus umbraticola* subsp. *umbraticola, Boophane disticha* and *Hypoxis hemerocallidea*. It is recommended that prior to construction, these species must be rescued and relocated to either the Rand Water Environmental Management Services (EMS) nursery where the on-site horticultural team will care for them or a nursery in close proximity to the site or alternatively an onsite nursery may be established and then following construction they can be re-established at the site. Another recommended option is to relocate the plant species outside of the construction footprint.

Activity	Impact summary	Significance	Proposed mitigation
			Given that the species of conservation importance were observed, it is important that an Environmental Control Officer should be on site prior to construction to identify other species of conservation importance and threatened species which may occur on site and also to oversee the search and rescue. • A species such as *Ceropegia decidua* is confirmed to be found on site by GDARD even though it was not observed during the field assessment and it is imperative that detailed searches for this threatened species is made during the appropriate time of year when plant is likely to be more visible. • If protected species are found, a Biodiversity Permit application for the removal or destruction of the species must be obtained from GDARD. • A search and rescue operation must be undertaken prior to construction to rescue protected plant and animal species, in collaboration with knowledgeable plant specialist. • Clearing of vegetation to be conducted in a phased manner (where possible), with due consideration of the search and rescue activities. • Vegetative cover for sensitive areas such is to remain for as long as possible. • Sensitive areas outside of the construction footprint must be marked as "no go areas" prior to construction commencing. • Prior to construction activities, fences (with regards to Bronberg Conservancy) should be erected to prevent access to any sensitive areas in close proximity to the development footprint. • During site preparation, topsoil and subsoil are to be stripped separately from each other and must be stored separately from spoil material for use in the rehabilitation phase. • Topsoil stock piles must not exceed 1.5 m in height and must be placed in designated areas in consultation with the appointed ECO. • Top soil stockpiles should be should be protected from wind and rain, as well as contamination from diesel, concrete or wastewater.
	Indirect impacts:	-	-

Activity	Impact summary	Significance	Proposed mitigation
	None		
	Cumulative impacts: The Terrestrial Ecological Study (**Appendix D3**) identified species of conservation importance that could be adversely affected by the project activities. These studies took into consideration the existing local impacts to the biodiversity and the incremental loss of conservation-worthy species within the context of the provincial conservation goals and targets.	Low	• Search, Rescue and Relocation must be undertaken prior to site establishment this will assist to prevent the loss of Red Data, protected and endangered fauna and flora species that will be affected by the project. With the relocation of these species to suitable habitat the cumulative impact to biodiversity could be adequately managed. • Further through the proper soil management in terms of top soil removal and storage. The seed bank of naturally occurring species will be protected for the duration of construction, following which the area will re-establish.
Flora (Pre-Construction Phase)	***Direct impacts:*** Destruction of indigenous flora	Low	• A search and rescue operation must be undertaken prior to construction to rescue protected plant and animal species, in collaboration with knowledgeable plant specialist. • Clearing of vegetation to be conducted in a phased manner (where possible), with due consideration of the search and rescue activities. • Indigenous plants naturally growing on the development site, but that would be otherwise destroyed during clearing for development purposes should be incorporated into landscaped areas. • Vegetation clearing should be kept to a minimum, and this should only occur where it is absolutely necessary and the use of a brush-cutter is highly preferable to the use of earth-moving equipment. • Rehabilitate all disturbed areas as soon as the construction is completed within the proposed development area. • Ensure that all personnel have the appropriate level of environmental awareness and competence to ensure continued environmental due diligence and on-going minimisation of environmental harm and this can be achieved through provision of appropriate awareness to all personnel.
	Indirect impacts: None	-	-

Activity	Impact summary	Significance	Proposed mitigation
	Cumulative impacts: None	-	-
Flora (Pre-Construction Phase)	***Direct impacts:*** Loss of Habitat & Habitat Fragmentation	Low	• The most significant way to mitigate the loss of habitat is to limit the footprint within the natural habitat areas remaining. • No structures should be built outside the area demarcated for the development. • Although it is unavoidable that some roads will need to traverse areas of potential sensitivity, the existing road infrastructure should be upgraded in such cases so as to avoid further impact to these areas. • In areas where roads are to be widened, the adjacent vegetation that is to be lost should be assessed by a qualified plant specialist before construction to ensure that rare, protected or endangered species are not being impacted by the road and if necessary plants be relocated to a similar nearby environment.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Flora (Construction Phase)	***Direct impacts:*** Loss of vegetation due to fuel and chemical spills.		• Appropriate measures should be implemented in order to prevent potential soil pollution through fuel and oil leaks and spills and then compliance monitored by an appropriate person. • Make sure construction vehicles are maintained and serviced to prevent oil and fuel leaks. • Emergency on-site maintenance on vehicles and equipment should be done over appropriate drip trays and all oil or fuel must be disposed of according to waste regulations. • Implement suitable erosion control measures. • Suitable remedial measures, depending on the nature of the contaminant and the receiving environment, to be instituted for spillages. • Hazardous substances must be stored and handled in accordance with the

Activity	Impact summary	Significance	Proposed mitigation
			appropriate legislation and standards, which include the Hazardous Substances Act (Act No. 15 of 1973), the Occupational Health and Safety Act (Act No. 85 of 1993), relevant associated Regulations, and applicable SANS and international standards. • Staff that will be handling hazardous materials must be trained to do so. • Any hazardous materials (apart from fuel) must be stored within a lockable store with a sealed floor. Suitable ventilation to be provided. • All storage tanks containing hazardous materials must be placed in bunded containment areas with impermeable surfaces. The bunded area must be able to contain 110% of the total volume of the stored hazardous material. • Spill kits must be available for the cleanup of hazardous material spillages. • Provide secondary containment where a risk of spillage exists. • Drip trays to be placed under parked construction vehicles and mobile plant, equipment and other receptacles of hazardous material to prevent spillages. • In the event of spillages of hazardous substances, the appropriate clean up and disposal measures are to be implemented. • Spill reporting procedures to be displayed at all locations where hazardous substances are being stored. • Hazardous materials will be disposed of at registered sites or handed to registered hazardous waste disposal facilities for disposal / recycling. •
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Flora (Construction Phase)	***Direct impacts:*** Introduction of alien species.	Low	• During construction, the construction area and immediate surroundings should be monitored regularly for emergent invasive vegetation • Promote awareness of all personnel. • The establishment of pioneer species should be considered with the natural cycle of rehabilitation of disturbed areas, which assists with erosion control,

Activity	Impact summary	Significance	Proposed mitigation
			dust and establishment of more permanent species. • This can be controlled during construction phase and thereafter more stringent measures should be implemented during the rehabilitation and post rehabilitation. • Monitor the site to prevent alien invasive trees spreading out into the larger environment.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Flora (Construction Phase)	***Direct impacts:*** Destruction of alien vegetation.	Low	• All alien seedlings and saplings must be removed as they become evident for the duration of construction phase • Promote awareness of alien invasive species identification and control to all personnel. • Manual / mechanical removal is preferred to chemical control.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Flora (Construction Phase)	***Direct impacts:*** Increased soil erosion	Low	• Topsoil should be stored in such a way that does not compromise its plant-support capacity. • Topsoil from the construction activities should be stored for post-construction rehabilitation work and should not be disturbed more than is absolutely necessary. • Protect topsoil in order to avoid erosion loss on steep slopes (notably on drainage crossings). • Protect topsoil from contamination by aggregate, cement, concrete, fuels, litter, oils, domestic and wastes. • An ecologically-sound stormwater management plan must be implemented

Activity	Impact summary	Significance	Proposed mitigation

			during construction and appropriate water diversion systems put in place.
			• Implement suitable erosion control measures, these must be appropriated to the site: .
			  o Silt fences on slopes
			  o Hay bales
			  o Sand bags
			  o Hessian cover or similar protection of topsoil left exposed for longer than 14 days (unless seeded with local indigenous grasses)
			  o Hessian or similar type product for all slopes that start to erode
			• All rehabilitation efforts including erosion control as well as re-vegetation must be monitored.
			• Common excavation and filling exposes natural soil to wind and water, which may erode the soil. Water erosion could cause significant damage to the area. The final design must include specific consideration for the installation and maintenance of erosion control structures in accordance with the plans as directed by the Engineer. The types of erosion control structures, which may be used, include:
			  o Diversion ditches;
			  o Sediment flow checks;
			  o Riprap erosion control for ditches; and
			  o Sediment control fences.
			• When temporary erosion control structures are no longer necessary, these structures shall be removed in accordance with procedures established by the project Engineer. Care need to be taken that all erosion control materials and any retained sediment are excavated with minimal disturbance to the underlying ditches or slopes.
			• Accumulated sediment shall be disposed of before sediment control fences and flow checks are removed.. After removal of the erosion control materials retained sediments, the affected ditches and slopes shall be shaped to match the adjustment final ditch and slope grades and immediately protected from erosion.

Activity	Impact summary	Significance	Proposed mitigation
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Flora (Construction Phase)	***Direct impacts:*** Impacts on the Bronberg ridge.	Low	• Vehicles and construction workers should under no circumstances be allowed outside the site boundaries to prevent impact on the surrounding vegetation. • Where possible, natural vegetation must not be cleared and encouraged to grow. • All stockpiles, construction vehicles, equipment and machinery should be situated away from the natural vegetation. • Disturbance of vegetation must be limited only to areas of construction. • Prevent contamination of natural grasslands by any pollution. • Areas cleared of vegetation must be re-vegetated prior to contractor leaving the site. • Any fauna (mammal, bird, and reptile) that becomes trapped in the trenches or in any construction or operational related activity may not be harmed and must be placed rescued and relocated by an experienced person. • Proliferation of alien and invasive species is expected within the disturbed areas and they should be eradicated and controlled to prevent further spread into the ridge. • No trapping or any other method of catching of any animal or bird may be performed on site.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Flora (Operation Phase)	***Direct impacts:*** The proposed construction activities may affect biodiversity through the	Low	• Newly cleared soils will have to be re-vegetated and stabilised as soon as construction has been completed and there should be an on-going monitoring program to control and/or eradicate newly emerging invasives.

Activity	Impact summary	Significance	Proposed mitigation
	encroachment of exotic vegetation following soil disturbance, in addition the maintenance of the area would disturb naturalised species within the area; and disturbance/loss of natural vegetation		• All areas to be affected by the proposed project will be rehabilitated after construction and all waste generated by the construction activities will be stored in a temporary demarcated storage area, prior to disposal thereof at a licensed registered landfill site. • As much vegetation growth as possible should be promoted within the proposed development site in order to protect soils and to reduce the percentage of the surface area which is left as bare ground. In this regard special mention is made of the need to use indigenous vegetation species as the first choice during landscaping. In terms of the percentage of coverage required during rehab and also the grass mix to be used for rehabilitation, the Bronberg EMPr will be consulted for guidance. However, the plant material to be used for rehabilitation should be similar to what is found in the surrounding area. • The entire scarred area is to be grassed with no omissions whatsoever. • Monitor the site to prevent alien invasive trees spreading out into the larger environment.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Flora (Operation Phase)	***Direct impacts:*** Loss of habitat due to construction activities	Low	• All areas to be affected by the proposed project will be rehabilitated after construction and all waste generated by the construction activities will be stored in a temporary demarcated storage area, prior to disposal thereof at a licensed registered landfill site. • As much vegetation growth as possible should be promoted within the proposed development site in order to protect soils and to reduce the percentage of the surface area which is left as bare ground. In this regard special mention is made of the need to use indigenous vegetation species as the first choice during landscaping. In terms of the percentage of coverage required during rehab and also the grass mix to be used for rehab, the Bronberg EMPr will be consulted for guidance. However, the plant

Activity	Impact summary	Significance	Proposed mitigation
			material to be used for rehabilitation should be similar to what is found in the surrounding area.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Fauna (Pre-Construction Phase)	***Direct impacts:*** Destruction of animals on site.	Low	• Prior to construction, animals must be rescued and relocated. An experienced person who knows the animals in the region well will identify any possible Red Data fauna on site and acquire the necessary permits to relocate fauna will be obtained if avoidance is not possible. • Training of construction workers to recognise threatened animal species will reduce the probability of fauna being harmed unnecessarily. • The contractor must ensure that no faunal species are disturbed, trapped, hunted or killed during the construction phase. • Vehicles must adhere to a speed limit, 30-40 km/h is recommended for light vehicles and a lower speed for heavy vehicles. • All construction and maintenance vehicles must stick to properly demarcated and prepared roads. Off-road driving should be strictly prohibited. • No fires should be allowed at the site • No dogs or other pets should be allowed at the site. • The Contractor shall ensure that all works are undertaken in a manner, which minimizes the impact on the local fauna and shall apply the following specifications with respect to fauna management and protection • The contact detail for animal rescue such as snake and bee removal shall be made available at the construction site, so as to rescue them should they be found on the construction site. • Trenches shall be inspected regularly for fauna that may have fallen into them and become trapped. All fauna found in trenches must be rescued. • Under no circumstances shall any animals be handled, removed, killed,

Activity	Impact summary	Significance	Proposed mitigation
			scared or interfered with by the Contractor, his/her Employees, his/her sub - contractors, or his/her sub-contractors' Employees. • No species of animals may be poached, snared, hunted, captured or willfully damaged or destroyed. • Any incidents of poaching, willful disturbance or damage to wild animals as well as accidental damage to or death of wild animals should be reported to the EMS representative and recorded. It shall be treated in terms of the law. • The Contractor and his/her Employees shall not bring any domestic animals onto site. • The Contractor shall ensure that domestic animals and native animals belonging to the local community are kept away from unprotected works. • The Contractor shall ensure that the work site is kept clean and tidy and free from rubbish, which would attract animal pest species. • Anthills that occur should not be disturbed unless it is unavoidable for construction purposes. Before construction starts, construction workers should be educated with regards to littering and poaching; • No fishing is allowed. • Photographs of sensitive animals (e.g. Otter) must be displayed in the construction camp to heighten awareness of the creatures. • Toolbox talks should be provided to Employees regarding snakes. All snakes all reptiles on site must be removed by a qualified snake handler and all attempts should be made to ensure snakes and reptiles are not killed or collected. • Nesting sites of birds should not be disturbed. • Construction activities should be limited to daylight hours, in order to minimise impacts on nocturnal fauna. • Trucks should travel at a minimum speed to avoid unnecessary killings of animals found on site. • Animals residing within the designated area shall not be killed nor unnecessarily disturbed. Where sensitive species occur, these shall be

Activity	Impact summary	Significance	Proposed mitigation
			relocated by the relevant conservation authority. A cooler box with vermiculite will be used to move hibernating animals to reduce their stress. All relocations are to be reported and ideally photographed. • Comply with the requirements of the National Environmental Management: Biodiversity Act (Act No. 10 of 2004), Nature and Environmental Conservation Ordinance (19 of 1974) and Animal Protection Act (No. 71 of 1962). • Stringent and dedicated control of poaching. • No wilful harm to any animals, unless a direct threat is posed to a worker's health or safety. • Captured animals to be safely released to a similar habitat.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Fauna (Pre-Construction Phase)	***Direct impacts:*** Loss of Habitat & Habitat Fragmentation	Low	• The most significant way to mitigate the loss of habitat is to limit the footprint within the natural habitat areas remaining. • No structures should be built outside the area demarcated for the development. • Although it is unavoidable that some roads will need to traverse areas of potential sensitivity, the existing road infrastructure should be upgraded in such cases so as to avoid further impact to these areas. • In areas where roads are to be widened, the adjacent vegetation that is to be lost should be assessed by a qualified botanist before construction to ensure that rare, protected or endangered species are not being impacted by the road and if necessary plants be relocated to a similar nearby environment.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-

Activity	Impact summary	Significance	Proposed mitigation
Fauna (Construction Phase)	***Direct impacts:*** Impacts on the Bronberg ridge.	Low	• Vehicles and construction workers should under no circumstances be allowed outside the site boundaries to prevent impact on the surrounding vegetation. • Where possible, natural vegetation must not be cleared and encouraged to grow. • All stockpiles, construction vehicles, equipment and machinery should be situated away from the natural vegetation. • Disturbance of vegetation must be limited only to areas of construction. • Prevent contamination of natural grasslands by any pollution. • Areas cleared of vegetation must be re-vegetated prior to contractor leaving the site. • Any fauna (mammal, bird, and reptile) that becomes trapped in the trenches or in any construction or operational related activity may not be harmed and must be placed rescued and relocated by an experienced person. • Proliferation of alien and invasive species is expected within the disturbed areas and they should be eradicated and controlled to prevent further spread into the ridge. • No trapping or any other method of catching of any animal or bird may be performed on site.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Fauna (Construction Phase)	***Direct impacts:*** Disturbance to animals	Low	• Animals residing within the designated area shall not be unnecessarily disturbed. • During construction, refresher awareness training can be conducted to personnel about littering and poaching and other environmental concerns and sensitivities. • The Contractor and his/her employees shall not bring any domestic animals onto site.

Activity	Impact summary	Significance	Proposed mitigation
			• Toolbox talks should be provided to contractors regarding disturbance to animals. Particular emphasis should be placed on talks regarding snakes and the Golden Mole species. • No wild animal may be fed on site. • Regularly undertake checks of the surrounding natural vegetation, in fences to ensure no traps have been set. • Remove and dispose of any snares or traps found on or adjacent to the site. • Ensure that the Work Site is kept clean, tidy and free of rubbish that would attract animal pests. • Photographs of protected and sensitive fauna species must be displayed in the construction camp to heighten awareness.Ensure that domesticated animals belonging to the local community are kept away and are safe from any unprotected Works.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Fauna (Construction Phase)	***Direct impacts:*** Animal passage out of construction site	Low	• Where permissible, allow for safe animal passage through and specifically out of the construction site.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Juliana's Golden mole (Pre-Construction Phase)	***Direct impacts:*** Loss of moles and mole habitat.	Medium to High	• A 30m conservation/buffer zones to be demarcated around Sensitivity Areas in respect of the Juliana's golden mole and suitable habitat in close proximity to the proposed footprint of the New 100 ML Reservoir and the entire associated infrastructure. Where these buffers overlap with construction footprint and/or servitudes these should not be developed. • The same buffer zones to be incorporated into the composite sensitivity plan to inform the final development layout plan presented for

Activity	Impact summary	Significance	Proposed mitigation

			Environmental Authorisation (EA).
			
			Zone Delineation and Fencing
			• Pegging must be conducted as a priority and should include:
			  o Footprint pegging.
			  o Working area (servitude) pegging.
			  o Access and service roads pegging.
			• Fencing of sensitive areas in close proximity to the construction footprint and working area to ensure that heavy machinery and construction operations do not impact on the golden moles and their habitat beyond these areas. Zones where golden mole activity was recorded (outside of the construction footprint/working area) are considered "no go" zones.
			• Fences to be erected prior to onset of site preparation (vegetation clearance) and construction operations.
			• Fence location to be at the perimeter of the footprint/clearance area and recommended to be a standardised Veldspan or diamond mesh fence with intervals of poles are predetermined. However, caution must be exercised that stakes supporting fences is placed where no golden mole activity is visible or has been recorded before as far as possible. Stakes must be planted using manual labour.
			• Access road: If the EA allows a Temporary Access Road to the north of the Bronberg Ridge, the fences must be erected on either side of the Construction Footprint for a Temporary Access Road (including working strips) on either side according to engineering requirements.
			• Overflow pipeline: Similar fences should be erected along the edge of the 10m working strip on each side of the pipeline northwest to the New 100 Ml Reservoir along the northwestern boundary of the Bronberg Conservancy
			
			Vegetation clearance
			• Manual labour to be used for clearing vegetation in Sensitivity Areas that overlap with the footprint and required working zones (servitudes)

Activity	Impact summary	Significance	Proposed mitigation
			surrounding the New Reservoir and along new Inlet/ Outlet pipelines, Contractors Camp Site and Construction Laydown Area and the Associated infrastructure in the existing Rand Water property and the Bronberg Conservancy, including an Overflow pipeline (length dependent on final design; 500 m, 800 m or 1000 m) and 10m-wide servitude, of any Temporary Access Road or the existing Operations Access Road and existing Informal Service Roads). • Large indigenous trees in these buffer zones to be preserved , where possible, as the removal of its large root systems severely disturbs the top soil layer where sub-surface foraging tunnels and deeper more permanent tunnels of golden moles are found. **Soil management** • No further disturbance or compaction of soils to occur in sensitive areas, which do not overlap with construction footprint. • Firebreaks along the concrete palisade boundary fences should be cleared of vegetation using a manual approach, as in currently the case. Rand Water confirmed that firebreaks are maintained twice per year through the use of brush cutters. • Topsoil removal: In the event that suitable habitat for the Juliana's golden mole disturbed by heavy machinery, topsoil must be removed by manual labour (e.g. within the construction footprints and working strips). • Topsoil must be stripped in at least three layers and stockpiled accordingly, based on the analysis of a professional soils scientist and a golden mole specialist. Typically the layers would be defined as: i. Top 20 cm – unit 1 (forging tunnels). ii. Following 30 - 40 cm – unit 2 (deeper, more permanent tunnels). iii. Remaining soil. • The topsoil must be returned on a first out last in basis as soon as possible during construction operations where relevant in the existing Rand Water property and the areas for the Associated Infrastructure in the Bronberg

Activity	Impact summary	Significance	Proposed mitigation
			Conservancy.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Juliana's Golden mole (Construction Phase)	***Direct impacts:*** Destruction of mole burrow systems and habitat and loss of moles through extensive excavations, heavy machinery and blasting will undoubtedly cause injury or the death of many moles and near 100% destruction of limited suitable habitat remaining in the existing Rand Water property. These activities will involve filling and grading and soil compaction by heavy vehicles and subsequent use for operations (road), and also excavations using heavy machinery for the discharge and overflow pipe. These activities will cause habitat destruction, disruption of foraging tunnels and injury/death of several moles.	Medium to High	Construction operations should be done during the wet season, where possible when the Juliana's golden moles are active. **Environmental Compliance Monitoring** • An ECO must be appointed to prior to site establishment to oversee the pre-construction and construction phases of the proposed reservoir and associated infrastructure to ensure compliance to the EMP and EA in respect of the conservation of the Juliana's golden mole. • The ECO is responsible for the monitoring, implementation and managing and reporting on issues that may arise during construction operations. The ECO must be suitably qualified in respect of: a. Appropriate knowledge of environmental management and auditing b. For this purpose the ECO should receive on-site training from a suitable qualified Golden Mole Specialist with extensive knowledge of Juliana's golden mole regarding technical aspects related to the species (identifying and recording signs of activity using GPS technology and the handling of live and dead animals on site until GMS/qualified veterinarian arrives to evaluate its condition). • The ECO must conduct bi-weekly site audits for the full duration of the project • The ECO must oversee the Contractors Environmental Representative (CER). • The CER must be appointed prior to site establishment and must be suitably qualified in: a. On-site training and briefing by GMS with extensive knowledge of Juliana's golden mole in basic technical knowledge (identification of

Activity	Impact summary	Significance	Proposed mitigation
			activity and handling dead and live moles) – similar to that of ECO (see point b above). b. Daily site monitoring must be conducted for full duration of the project c. Weekly reporting to the ECO and relevant parties. • Construction staff must be briefed and educated by GMS in respect of the sensitivity of the area and measures to be implemented to protect the Juliana's golden mole. A Golden Mole Specialist with extensive experience to be appointed to advise ECO on aspects of Juliana's golden mole as per approved EMPr. As per GDARD Biodiversity Assessment Guidelines version 3 of 2014, a Golden Mole Specialist must be Professional Natural Scientists in accordance with the Natural Scientific Professions Act (No. 27 of 2003) within the field of Zoology and with qualifications and experience relevant to mammal biology and conservation and recognized expertise pertaining to the species. • GMS responsibilities to include: a. Site-specific environmental training in technical aspects in respect of the Juliana's golden mole prior to commencement of construction phase. b. Advise Rand Water on activities of golden moles identified in the study area (the GMS to a pre-construction survey immediately before site preparations and construction operations commence i.e. vegetation clearance, topsoil removal). c. Provide on-site training to ECO and CER. d. Advise ECO and CER with implementation, mitigation and compliance of the conditions set out in the EA and EMPr in respect of the Juliana's golden mole. e. Brief and educate construction staff on detecting the presence of the species in the construction area. f. Arrange with a suitably qualified person to collect live or injured animals that are unearthed during construction operations, or appropriate storage of dead animals in case the GMS is unavailable at

Activity	Impact summary	Significance	Proposed mitigation
			the time. To be undertaken in accordance with the required permits. g. Advise on construction activities in close proximity to golden moles and suitable habitat on a regular basis (before, during and after construction, bi-weekly or at least weekly). **Contractor** • Stock piling a. Stockpiling of material required for the different phases of construction of the New 100 Ml Reservoir must be phased. Rand Water indicated that some spoil material would be used for berms around edges of the Proposed New Reservoir. These materials must be stored within Habitat Zone A (Orange, Fig. 9a-d) on the existing Rand Water property, which is unsuitable habitat for golden moles. Rand Water to advise on exact locations where spoil material will be stored for inclusion in the EMPr for this development (pending EA approval). b.Raw material (e.g. pipes, cement) only to be stored in predetermined Construction Laydown Area that is fenced within unsuitable habitat in the existing Rand Water property (Zone A - Orange; Fig. 9a-d). • Access control – construction vehicles and heavy machinery. a. No heavy machinery must be permitted in the Sensitive Areas (Zones B, C and D, Fig. 9a-d) that are fenced. b. Construction vehicles must access the existing Rand Water property and the Bronberg Conservancy through a SINGLE ENTRY POINT. This is to avoid soil compaction and unnecessary destruction of sensitive golden mole habitat. The proposed access point for the construction of the proposed reservoir and associated infrastructure is at James Road, the northern point of the proposed road alignments. • Blasting Chemical blasting to be used during construction of the New Reservoir and Associated Infrastructure to avoid excessive vibrations that would result in the death of golden moles living in close proximity of construction

Activity	Impact summary	Significance	Proposed mitigation
			operations. • Soil Management Appropriate to soil management is key to minimizing impact on golden mole habitat and success of post-construction rehabilitation. a. All unavoidable work in Sensitivity Areas related to topsoil during the construction period must be conducted by manual labour following the procedures outlined under Pre-construction. b. As much as possible of the excavated soil and rocks (spoil material) of the reservoir must be loaded on trucks and removed from the construction site. Rand Water indicated that most of the spoil material will be removed from site, but some would be stored for reuse i.e. for embankment construction or filling of Temporary Access Road on the north side of the ridge. c. Excavated soil and rocks must not be dumped on Sensitivity Areas within the Rand Water property (Zones B and D) and the Bronberg Conservancy (Zones B, C and D). **Measures to promote connectivity of suitable golden mole habitat and movement/dispersal of animals by installing experimental connectivity corridors at strategic point along a temporary access road** • Measures to be implemented for the Associated Infrastructure Development for New 100 Ml Reservoir in the Bronberg Conservancy and on portions of the existing Rand Water property and would apply to a Temporary Access Road for the Construction Period along one of four alternative alignments proposed by Rand Water. All four routes pass through designated Sensitivity Areas (Zones B, C and D) for the Juliana's golden mole in the Bronberg Conservancy and Rand Water property along the northern slopes of the Bronberg that are designated as "no-go" zones for development. If, indeed, a temporary access road is built on the northern slope of the Bronberg then connectivity corridors (pipes under the road surface) should be installed at strategic points along a Temporary Access Road to the

Activity	Impact summary	Significance	Proposed mitigation
			existing Rand Water property during the construction period, in an attempt to minimize the impact of road construction on the Juliana's golden moles. These connectivity corridors assist with maintaining connectivity between areas of suitable habitat for golden moles. • Connectivity corridors must be installed at strategic points along the temporary access road according to the following specifications: a. Sturdy but flexible pipes with a diameter of 150 mm (maximum 200 mm) at intervals of between 20 m and 50 m apart along the entire length of road alignment. b. Pipes to be placed in close proximity to prime golden mole habitat, which will determine final intervals between pipes in final road design at the time of construction. c. The installed pipe must extend 300 mm beyond the sturdy fence (1.5 m shoulder boundary). d. Berms are to be installed at these points to drain any storm water or lose material away from the entrance/exit of the pipe. e. The pipe must be filled to 60% with suitable topsoil found on site and as close as possible to where the connectivity pipe is installed. f. The pipe must be positioned so that the soils inside are equal to (level) or just below the ground surface. g. The entrance/exit points of pipe must be level with topsoil, as foraging tunnels occur in the topsoil layer (up to ~ 20 cm). h. After completion of the construction, the pipes or other tools to enhance connectivity must remain.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Juliana's Golden mole (Construction	***Direct impacts:*** Loss of connectivity corridors for the Juliana's Golden Mole:	Medium to High	Proper rehabilitation of areas affected by the construction of the Proposed New 100 Ml Reservoir and the areas proposed for the Associated Infrastructure in the Bronberg Conservancy will be key to ensure that connectivity is restored

Activity	Impact summary	Significance	Proposed mitigation
Phase)	The Critically Endangered status of the Bronberg Ridge (subpopulation of the Juliana's golden mole), is due to severe anthropogenic threats that is rapidly eroding and fragmenting the remaining suitable habitat. The fragmented population is exacerbated by narrow habitat tolerances due to extremely specific habitat requirements (soft sandy soil) that are used to forage for suitable insect prey, dispersal and breeding (gene flow). In the Bronberg Conservancy, two primary dispersal corridors for golden moles exist. The two primary corridors are currently regarded as the most important for gene flow (producing viable offspring). The proposed Infrastructure development of a temporary access road will bisect the conservancy and result in animals being trapped on either side of the road and result in disruption of connectivity corridors and gene flow for a period of around 3 years. It will affect connectivity between moles living within the conservancy and with those on neighbouring properties. The proposed construction of the discharge and overflow pipe will also impact on natural undisturbed habitat, and will cut though a large portion if the		between fragments of suitable habitat for golden moles and their return to the area after the proposed development have been completed. Numerous signs of golden mole activity have been recorded along the existing R1 pipeline of Rand Water, which indicates that rehabilitation of the soil was such that golden moles returned to the area, even though it was transformed. Careful management of topsoil would enhance the success of post-construction rehabilitation. • Soil Management The topsoil layers that have been stockpiled (different layers separately) are to be returned by means of manual labour on a first out last in basis as soon as possible after different phases of the construction operations related to the Proposed New 100 Ml Reservoir in the existing Rand Water property and the Associated Infrastructure in the Bronberg Conservancy have been completed. • Maintenance of Connectivity Corridors for Golden Moles a. Connectivity corridors must be maintained regularly while in place to avoid blockage (clear blocked soil at the ends). b. If so, various designs could be implemented to connect moles that have been isolated in high-density developments in the vicinity of the Bronberg e.g. pipes in conduits for suburban tar roads or in foundations of boundary walls. • Vegetation Rehabilitation Natural vegetation must be rehabilitated in all areas that would have been affected by the construction operations, which include footprints and working servitudes inside fences and other areas that were disturbed during construction. This must be achieved by seeding (grasses and herbs) and re-establishment of indigenous trees and shrubs after construction has been completed. This must be done in areas where the construction footprint and working zones (servitudes) of different structures and infrastructure overlapped with Sensitivity Areas (Zones B; C; D) • Research – Recolonization

Activity	Impact summary	Significance	Proposed mitigation
	ridge along the northwestern boundary fence of the Bronberg Conservancy.		GIS mapping surveys must be conducted after construction to determine whether, and if so, and how long after construction stopped, golden moles returned to the rehabilitated habitat.
	Indirect impacts: None	-	-
	Cumulative impacts: This development will contribute the increasing fragmentation to the subpopulation of the golden moles further decreasing the gene pool for this Critically Endangered species.	-	-
Juliana's Golden mole (Post-Construction Phase)	***Direct impacts:*** Reclaim suitable golden mole habitat and ensuring connectivity corridors are restored	Low	Proper rehabilitation of areas affected by the construction of the Proposed New 100 Ml Reservoir and the areas proposed for the Associated Infrastructure in the Bronberg Conservancy will be key to ensure that connectivity is restored between fragments of suitable habitat for golden moles and their return to the area after the proposed development have been completed. Numerous signs of golden mole activity have been recorded along the existing R1 pipeline of Rand Water, which indicates that rehabilitation of the soil was such that golden moles returned to the area, even though it was transformed. Careful management of topsoil would enhance the success of post-construction rehabilitation. • Soil Management The topsoil layers that have been stockpiled (different layers separately) are to be returned by means of manual labour on a first out last in basis as soon as possible after different phases of the construction operations related to the Proposed New 100 Ml Reservoir in the existing Rand Water property and the Associated Infrastructure in the Bronberg Conservancy have been completed. • Maintenance of Connectivity Corridors for Golden Moles a. Connectivity corridors must be maintained regularly while in place to avoid blockage (clear blocked soil at the ends). b. If so, various designs could be implemented to connect moles that

Activity	Impact summary	Significance	Proposed mitigation
			have been isolated in high-density developments in the vicinity of the Bronberg e.g. pipes in conduits for suburban tar roads or in foundations of boundary walls. • Vegetation Rehabilitation Natural vegetation must be rehabilitated in all areas that would have been affected by the construction operations, which include footprints and working servitudes inside fences and other areas that were disturbed during construction. This must be achieved by seeding (grasses and herbs) and re-establishment of indigenous trees and shrubs after construction has been completed. This must be done in areas where the construction footprint and working zones (servitudes) of different structures and infrastructure overlapped with Sensitivity Areas (Zones B – Yellow; C – Blue; D – Green). Refer to Golden Mole Rehabilitation Plan in **Appendix J10** of the BAR. • Research – Recolonization GIS mapping surveys must be conducted after construction to determine whether, and if so, and how long after construction stopped, golden moles returned to the rehabilitated habitat.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Heritage Resources (Pre-Construction, Construction and Operation Phase)	***Direct impacts:*** Destruction or damage to cultural heritage sites.	Low	• Two stone wall sites are situated near/on the proposed access road. Stone Wall Site Number 2 will not be considerably impacted on, but Stone Wall Site Number 1 will be impacted on by the development. Three options in this case can be considered; 1. Fence (stabilising), stabilise (strengthen) and clearly mark site, this option is applicable to stone wall site 2; 2. Document, dismantle stone wall site and reconstruct after construction (permit application to relevant heritage authority necessary), this option is applicable to stone wall site 1;

Activity	Impact summary	Significance	Proposed mitigation
			3. Destruct (permit application to the relevant heritage authority necessary), this option is applicable to site 1. Option 2 is favoured in terms of heritage for stone wall site 1. • Stone Wall Site 2 is situated near the existing reservoir and should be clearly marked and fenced during construction to ensure conservation and preservation thereof. • During construction, if any heritage resources are found (chance finds) the following protocol must be followed: o All work must stop in the vicinity of the find. o The Contractor or ECO must be informed and the find barricaded off to prevent further interference or damage. o PHRAG must be informed and a registered heritage specialist must be appointed to undertake an assessment of the find. o Depending on what is found and the significance thereof, the specialist will advise on the way forward. o If the resource needs to be removed/altered/destroyed then the necessary permit/s must be obtained from PHRAG. o Only once the specialist gives the go-ahead can work commence in the area. o Under no circumstance can heritage material be destroyed or removed from the site. o Should any remains be found that could potentially be human remains then the SAPS must be contacted.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Air Quality (Construction Phase)	***Direct impacts:*** Excessive dust levels as a result of construction activities	Low	• Appropriate dust suppression measures or temporary stabilising mechanisms to be used when dust generation is unavoidable (e.g. dampening with water, chemical soil binders, straw, brush packs, chipping), particularly during prolonged periods of dry weather. Dust suppression to be

Activity	Impact summary	Significance	Proposed mitigation
			undertaken for all bare areas, including construction area and access roads. Speed limits to be strictly adhered to. • Measures in the Revolutionary Road Solutions (Pty) Ltd Roads Assessment to be adhered to, namely: o The gravel road surfaces have been assessed and where required a product like hydro road stabiliser shall be applied to bind the existing surface and water proof it to prevent deterioration and dust generation. Where existing road conditions are extremely poor, these roads shall be graded, contoured and suitable aggregate applied to address the road surface and repeated when necessary during the construction period in order to ensure that the road condition does not deteriorate resulting in possible damage to other road user vehicles. o A water-based polymer product (such Hydro Road Stabiliser or similar) shall be used. The product will have been designed for the stabilisation, binding and waterproofing of natural in-situ gravels/soils, specifically suited to un-tarred roads. The product will achieve the following: ▪ stabilisation, binding and waterproofing of natural in-situ gravels/soils; ▪ ability to cross-link, coat and bind soil particles together into a durable, strong and hard wearing surface; ▪ The product must be: ▪ hydrophobic; ▪ UV resistant for longevity; ▪ alkali resistant; ▪ have cross-linking properties leading to superior binding and bonding; ▪ have unsurpassed penetration and migrating characteristics; ▪ flexibility.

Activity	Impact summary	Significance	Proposed mitigation
			• The Contractor will take preventative measures to minimise complaints regarding dust nuisances (e.g. screening, dust control, timing, pre-notification of affected parties). • Regular and effective damping down work areas (especially during the dry and wind periods) must be carried out to avoid dust pollution. When necessary these areas should be dampened down at least twice a day and should no other dust suppression methods be implemented, dampening down must be increased to three times a day. • Dust suppression to be undertaken for all bare areas, including construction area and access roads. • Speed limits to be strictly adhered to. • The Contractor will take preventative measures to minimise complaints regarding dust nuisances (e.g. screening, dust control, timing, pre-notification of affected parties). • Reduce and control dust through the use of approved dust suppression techniques as and when required.
	Indirect impacts: None	-	-
	Cumulative impacts: The proposed activity and the introduction of construction vehicles will contribute to the cumulative effect of dust in the area.	Low	Measures in the Revolutionary Road Solutions (Pty) Ltd Roads Assessment to be adhered to, as summarised above.
Noise (Construction Phase)	***Direct impacts:*** Excessive noise levels as a result of construction activities (such as HGVs along the temporary access road, chemical blasting/drilling and mobile equipment noise)	Low	• Working hours to be agreed upon with Project Manager, so as to minimise disturbance to landowners/occupiers and community members. The construction operations should occur every weekday, during part of the daytime only (07:00-17:30) including Saturdays before 13:30. No night-time or Sunday construction operations are envisaged nor will be permitted prior to consultation with Interested and Affected Parties. • Noise preventative measures (e.g. screening, muffling, timing, and proper maintenance of equipment and machinery, pre-notification of affected

Activity	Impact summary	Significance	Proposed mitigation
			parties) to be employed. • Maintenance of equipment and operational procedures: Proper design and maintenance of silencers on diesel-powered equipment, systematic maintenance of all forms of equipment, training of personnel to adhere to operational procedures that reduce the frequency of occurrence and magnitude of individual noisy events. • Blasting operations to be controlled to ensure sound pressure levels are kept below the generally accepted 'no damage' level of 140 decibels. • Blasting will be restricted to working hours, and further with the restriction of 10h00 to 15h00. Additionally, prior to any blasting taking place neighbouring properties (affected parties) will be notified. • Equipment and vehicles utilised on site must be in good working order and serviced and maintain regularly (Maintain equipment conscientiously). • Noise monitoring is recommended at intervals of six months at positions at or near to the nearest affected properties, SR1 and SR2 and at positions to be selected on the north and east of the site at dwellings nearest the access routes at residential buildings. • Where possible, material stockpiles should be placed so as to protect the western boundaries from noise from individual operations. • Where possible the following remedial measures should be implemented: o Select vehicle routes carefully by internalising the roads. o Fit efficient silencers and enclose engine compartments. o Damp mechanical vibrations. o Maintain equipment conscientiously. o Erect berm, screen or barrier at permanent sites.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Noise (Operation	***Direct impacts:*** Fixed reservoir noise	Low	Where possible the following remedial measures should be implemented: • Carefully select permanent reservoir site.

Activity	Impact summary	Significance	Proposed mitigation
Phase)			• Reduce noise at source by acoustic treatment, etc. • Isolate source by acoustic enclosure, etc. • Maintenance of equipment and operational procedures: Proper design and maintenance of silencers on diesel-powered equipment, systematic maintenance of all forms of equipment, training of personnel to adhere to operational procedures that reduce the frequency of occurrence and magnitude of individual noisy events.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Traffic (Construction Phase)	***Direct impacts:*** • Increased Construction Traffic on Approach Route (Route 4) through adjacent residential community. • Increased Traffic Volumes on Main Road Network. • Deterioration Road Condition. • Generation of Dust. • Traffic Safety.	Medium	• Temporary road construction and traffic accommodation signage in accordance with Volume 2 Chapter 13 of the SADC Road Traffic Signs Manual shall be displayed along the route to be followed by construction vehicles (between Graham Road and the site access road along Frank Avenue, Catherine Road and James Road) in order to create awareness of construction vehicles by other road users and to ensure that construction vehicle speeds are restricted. Such signage, to be determined by the appointed contractor as per the required Health and Safety Plan and approved by the Engineer shall include speed restrictions, warning of construction workers and construction vehicles and information signs advising motorists of the hours the route will be used by construction vehicles . Such signage shall be placed at least:: o At and on the approaches to all junctions along route 4; o On the approaches to sharp bends/curves along route 4; o Be visible to traffic from both/all approaches along route 4; and o Be fixed so that it is not affected by wind and is immovable for the duration of construction (i.e. planted in the ground). • While access to the site can occur from 07:00 to 17:30 every effort shall be made to restrict operation of heavy construction traffic to periods outside of peak commuter operating times – off-peak periods, between the hours of

Activity	Impact summary	Significance	Proposed mitigation
			08:00 and 17:00 so that impact on commuter traffic is kept to a minimum. • When construction takes place on Sundays the contractor must make all reasonable effort to advise residents and ensure that the same management measures as weekdays are enforced. • Construction vehicle speeds along Route 4 shall be controlled at 40kph to minimise potential conflict and damage to the existing gravel roads. • As recommended in the Road Upgrading report prepared by Revolutionary Road Solutions (Pty) Ltd, affected gravel road surfaces will be assessed and where necessary a product such as hydro road stabiliser could be applied to bind the existing surface and water proof it to prevent deterioration and dust generation. Where existing road conditions are extremely poor, these roads shall be graded, contoured and suitable aggregate applied to address the road surface and repeated when necessary during the construction period in order to ensure that the road condition does not deteriorate resulting in possible damage to other road user vehicles. • Should the above maintenance regime not be sufficient to minimise the generation of dust which can lead to visibility problems, then the roads must be stabilised with a spray-on application to ensure dust generation is limited. • Designated access to the site must be created to ensure that no unauthorised vehicles are permitted onto the construction site and to ensure safe entry to and exit from the site. • All construction vehicles shall be in possession of the necessary licenses and roadworthy certificates in terms of the National Road Traffic Act (Act 93 of 1996). • Vehicles transporting hazardous substances shall comply with the requirements of the Hazardous Substances Act (Act 15 of 1973). • Vehicle loads shall be secured such that no loads or part thereof fall from the vehicle and damage other road users. • All vehicles used during construction must be roadworthy, regularly maintained and repaired when required. • Drivers of construction vehicles shall be in possession of the necessary

Activity	Impact summary	Significance	Proposed mitigation
			licenses in terms of the National Road Traffic Act (Act 93 of 1996). • Construction vehicles travelling on all public roads shall adhere to the posted speed limits. • Increase arterial road traffic: • Route 4 approaching from Graham Road via Frank Avenue, Catherine and James Roads would have been a suitable route as stated by the Traffic report, had it not been for the unsatisfactory intersection spacing of 200m between Silverlakes Road and Frank Road. The Gauteng Provincial Government Department of Public Transport, Roads and Works Road Design Manual Vol. I Geometrics, indicates that the desirable access spacing between intersections on a class 3 urban dual carriage road such as Graham Road is 600m to 800m with 550m as the desirable minimum distance and 500m the absolute minimum. The current minimum intersection spacing on Graham road is 600m, which is acceptable. • Traffic safety on mobility roads requires access spacing to be as far apart as possible, thus reducing conflict and the need for stopping and starting. The importance of intersection spacing is similar to that of driveway spacing. As the number of intersections per kilometre increase, the opportunity for crashes increases. The existence of too many intersections per kilometre also increases delay and congestion o It is proposed that the Graham and Struben Road intersection be signalised before construction commences. This will significantly improve traffic flow in the south-western and north-eastern directions (Struben Road). o Signage at all effected intersections should be improved to ensure that motorists adhere to the traffic regulations. • Proposed pavement options (road improvements) o No structural change to existing road o All material existing o Rip surface to 75mm and mix in with dust suppressant spray o Mix well

Activity	Impact summary	Significance	Proposed mitigation
			○ Shape to required camber ○ Compact with pneumatic roller or tyre steel roller to required density • The follow traffic calming measures have been proposed by the specialist and shall be included in the EMPr: ○ Temporary traffic accommodation signage shall be displayed along the route to be followed by construction vehicles (between Graham Road and the site access road along Struben Road, Catherine Road and James Road) in order to create awareness ○ of construction vehicles by other road users ○ Construction vehicles travelling on all public roads shall adhere to the posted speed limits and speeds along proposed access route shall be controlled at 40kph to minimise potential conflict. ○ Signage at all effected intersections should be improved to ensure that motorists adhere to the traffic regulations.
	Indirect impacts: None	-	-
	Cumulative impacts: The construction period will be associated with traffic-related impacts to the local road network	Low	The Graham and Struben Road intersection be signalised before construction commences and the signalling shall remain in situ follwong construction. This will significantly improve traffic flow in the south-western and north-eastern directions (Struben Road). Signage at all effected intersections should be improved to ensure that motorists adhere to the traffic regulations.
Traffic (Operation Phase)	***Direct impacts:*** • Increased Traffic Volumes on Main Road Network. • Road Condition. • Road Capacity.	Low	None Required.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Waste	***Direct impacts:***	Low	• No ablution facilities to be positioned within drainage line areas.

Activity	Impact summary	Significance	Proposed mitigation
Management (Construction Phase)	• Use of veld/ drainage line areas for ablution purposes • Land, air and water pollution through poor waste management practises		• Sufficient ablution facilities to be provided at the Construction Camp and along construction servitude. • Suitable litter receptacles to be positioned strategically across the site (where required) at all working areas and must be available at the construction camp. • Waste must be separated at source (e.g. containers for glass, paper, metals, plastics, organic waste and hazardous wastes). • The Contractor shall dispose of all refuse generated on site or from the activities of construction or its related activities. The contractor shall on a weekly basis dispose of all refuse at an approved refuse disposal site. Proof of disposal must be kept on record. • Littering by the workers is prohibited. Clearly marked litterbins must be provided on site and awareness regarding littering provided to all personnel by the ECO. • Monitor the presence of litter on site. All staff shall be sensitised to this effect. • The entire site will be cleared of, metal, tins, glass bottles, and food packaging or any other type of empty container or waste material or waste equipment used by the construction team on a daily basis. • Waste material that may harm man or animals should be removed immediately. • No hazardous materials, e.g. oil, diesel and fuel should be disposed of in the veldt. Any diesel, oil or petrol spillages are to be collected and stored in specially marked containers and disposed of at a permitted waste disposal site and must be treated as hazardous waste. • No refuse or litter is allowed to be burnt on site. • The recycling of all waste is to be encouraged of both the contractor and staff. • All vehicle parking areas and vehicle servicing areas are to be inspected carefully for diesel, oil and other spillages weekly.

Activity	Impact summary	Significance	Proposed mitigation
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Visual Aesthetics (Construction and Operation Phase)	***Direct impacts:*** Potential visual impact on the landscape character and sense of place.	Low	• Keep disturbed areas to the approved footprints, i.e. activity already approved by the authorities and the minimum required footprint to complete the activity. • No clearing of land to take place outside the demarcated footprint of the reservoir and associated infrastructure (including construction camp). • Following construction, low-scale landscaping must be instituted throughout the project site and along the northern wall of the new reservoir to soften the visually prominent base structure and to minimise direct views onto the proposed activity. • Consider planting shrubs and plant species with a shallow root system on the banks of the reservoir. • Only indigenous plant species to be introduced and planted, the Bronberg Conservancy Plant list must be utilised as a guide. • All infrastructure must be set as low down as possible on their respective footprints to reduce impacts on skyline.
	Indirect impacts: None	-	-
	Cumulative impacts: It is expected that the cumulative effect of the proposed activity would be indirect as the existing project site would be expanded by the addition of the new reservoir. The cumulative effect would also be synergistic (e.g. the incremental increase in size of the proposed activity).	-	-
Visual	***Direct impacts:***	Low	• Reduce and control dust through the use of approved dust suspension

Activity	Impact summary	Significance	Proposed mitigation
Aesthetics (Construction Phase)	Potential visual impact of construction activities.		techniques as and when required. • Rehabilitate any exposed soils as soon as construction has been completed to stabilise loose soils.
	Indirect impacts: None	-	-
	Cumulative impacts: The proposed activity and the introduction of construction vehicles will contribute to the cumulative effect of dust in the area.	-	-
Visual Aesthetics (Construction and Operation Phase)	***Direct impacts:*** Potential visual impact on recreational value of the area.	Low	• Keep disturbed areas to the approved footprints, i.e. activity already approved by the authorities and the minimum required footprint to complete the activity. • No clearing of land to take place outside the demarcated footprint of the reservoir and associated infrastructure (including construction camp). • Following construction low-scale landscaping must be instituted throughout the project site and along the northern wall of the new reservoir to soften the visually prominent base structure and to minimise direct views onto the proposed activity. • Consider planting shrubs and plant species with a shallow root system on the banks of the reservoir. • Only indigenous plant species to be introduced and planted the Bronberg Conservancy Plant list must be utilised as a guide. . • All infrastructure must be set as low down as possible on their respective footprints to reduce impacts on skyline. • Access road to be reinstated and rehabilitated. And clearance areas to be re vegetated.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-

Activity	Impact summary	Significance	Proposed mitigation
Socio-Economic Environment – Impact on Economy (Construction and Operation Phase)	***Direct impacts:*** Development Potential Impact on Municipal Revenues Increase in the standard of living	High (Positive)	• The development potential of the supply area of the reservoir is expected to increase, since an increase in water provision will allow additional residential and commercial and industrial development. This will be a positive impact for the municipality as developers invest in the area. • Employment opportunities will be generated through the development which will increase household income. • Community infrastructure. • The additional reservoir will provide revenue for the municipality as water consumers are required to pay for the additional water consumption that the reservoir will make available. • The provision of additional water will enable an increased number of households in the supply region, and potentially, in areas where service delivery standards are low. • Realisation of right to access to water and sanitation and the subsequent eradication of poverty and improvement in health and livlihood.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Socio-Economic Environment – Sense of Place (Construction and Operation Phase)	***Direct impacts:*** Sense of Place	Low	• It is important that the EMPr include rehabilitation measures to ensure that recreational use of the study area is unimpeded after construction. • A maintenance plan for the infrastructure must be implemented by Rand Water. • All rehabilitation and maintenance measures must take into account the specialist studies recommendations as undertaken for this project.
	Indirect impacts: None	-	-
	Cumulative impacts: The routes of linear infrastructure associated with the project may impact	-	-

Activity	Impact summary	Significance	Proposed mitigation
	on properties that are already traversed by existing infrastructure. These properties will thus have a network of infrastructure with the associated servitude restrictions.		
Socio-Economic Environment – Construction (Construction Phase)	***Direct impacts:*** • Impact on Traffic • Increase in Dust • Influx of Workers • Safety and Security • Noise • Communication • Waste Generation	Medium	• Ensure that the necessary signage and traffic measures are implemented for safe and convenient access to the site. • The mitigation measures referred to in the Traffic Management Plan developed by Engineering Advice and Services (PTY) Ltd should be adhered to at all times. • The EMPr must include restrictions on the Contractor and its sub-contractors related to minimising impacts on the safety of road users. Restrictions should include appropriate speed limitations, travel times, communication measures etc. • Measures must be put in place to ensure that roads and any access points do not get built up with mud or sand. Roads are to be cleared of such build-up periodically. • Dust and disturbance can be mitigated through the use of appropriate dust suppression mechanisms. Mitigation measures management should be adhered to according the EMPr. • All employment of locally sourced labour should controlled on a contractual basis between Rand Water and the appointed contractor. If possible, , the employment should include the Ward Councillor of affected wards, where deemed necessary following consultation with the Councillor. • Rand Water should avoid bringing in labour from areas outside the ward, however, given the socio-economic status of the project area, it may be necessary to do so. In this case the broader region of the City of Tshwane can be treated as the labour supply area. • Employment of females and youth is encouraged to ensure the empowerment of vulnerable member of society. • The site fence should be continuous throughout the construction period.

Activity	Impact summary	Significance	Proposed mitigation
			• All contractor staff should be easily identifiable through their uniforms as being staff members. • There will be a small increase in the risk of opportunistic crime, given that the area will experience some increased visibility due to the construction vehicles. • Construction staff are to always wear PPE to identify themselves and ensure their safety. • Access to the site should be restricted. • Rand Water should approach the local SAPS to increase policing in the area to ensure the safety of residents and construction staff. This is important given the perception of IAPS that the construction will result in increased crime. • Mitigation measures management for noise impacts should be adhered to according the relevant specialist studies. • Based on the negative perception of the project on the receiving community, Rand Water should establish a line of communication with the community to ensure they are kept abreast of the development. • The community should have a channel to air any construction related grievances, to which Rand Water should respond to. • The contractor should conform to waste management practices as prescribed by the National Environmental Management Waste Act 59 of 2008 and the Occupational Health and Safety Act 85 of 1993.
	Indirect impacts: Indirect Employment	Medium	• Spaza shops will open next to the site as a consequence of construction. These should be monitored by the contractor to limit their footprint and to ensure that City of Tshwane Municipality - Street Trading By-Laws are complied with. Deviations to the By-Laws should be communicated to the respective authorities.
	Cumulative impacts: None	-	-
Specific Impacts to Alternative A1			

Activity	Impact summary	Significance	Proposed mitigation
Juliana's Golden Mole (Construction Phase)	***Direct impacts:*** Loss of moles and mole habitat.	High	• There are no mitigation measures that would offset the severe potential impact of the construction operations for the development on the viability, conservation status and long term survival potential of the Juliana's golden mole, other than implementing measures to avoid or minimise the spatial impact on designated Sensitivity Areas: • Stay outside "no-go" zones outside construction footprints as much as possible • Conservation buffer zones to be demarcated around sensitive areas • Training of ECO, CER and contractor staff on technical aspects related to species (identifying and recording signs of activity and procedure to be followed when a mole is encountered. • Remove top soil manually in sensitive areas • Manual removal of vegetation in sensitive areas • Large indigenous trees to be preserved where possible • Only make use of chemical blasting which reduces vibrations • Fence off sensitive areas • Only have one point of access • Stock pile in previously disturbed areas (zones A) • Ensure top soil management which aides in rehabilitation and has previously resulted in the return of moles to disturbed areas; • Install connectivity corridors prior to construction to avoid habit fragmentation and all these to remain following construction. . • Ensure proper rehabilitation: proper topsoil management, maintenance of connectivity corridors, and establishment of indigenous vegetation: o Connectivity pipes to remain in situ following the completion of construction; o Access roads no longer required are to be ripped to 300 mm centre to centre and to a depth of at least 300 mm parallel to the contours to alleviate soil compaction and establish a seedbed suitable for the establishment of growth

Activity	Impact summary	Significance	Proposed mitigation
			○ Fill material to be removed from the temporary access road ○ The topsoil layers that have been stockpiled (different layers separately) are to be returned by means of manual labour on a first out last in basis as soon as possible after different phases of the construction operations related to the development have been completed. Golden moles would likely to return to the rehabilitated topsoil and may re-establish their foraging there. ○ Indigenous plant species to be established as per the Bronberg Conservancy Plant List ▪ (In addition the following species will be introduced: trees such as Burkea africana and Croton gratissimus are associated with golden-moles when they occur in open and closed woodland. In rocky grassland, the black stick lily (Xerophyta retinervis) is often present, and in scrubland Englerophytum magalismontanum. And Terminalia sericea, the silver cluster leaf or Vaalboom, often grows in the sandy soils where Juliana's golden mole might be found. ○ Additional topsoil (sandy soil) to be imported and strategically placed to re-establish connectivity corridors and increase the percentage of suitable habitat ▪ It must be free of stones and organic matter in excess of 50mm. ▪ It must be loose and friable ▪ It must be poorly graded soils (similar to beach /coastal sand) ▪ It must be of a similar texture and moisture retaining ability to that on site (specific to zones of high mole activity). ▪ It must have a comparable or improved nutrient base to that on site. ○ Re -vegetation must be monitored. 80% of the total surface area

Activity	Impact summary	Significance	Proposed mitigation
			shall be covered and there shall be no bare patches of more than 1000 mm in maximum diameter (after 3 years) o Alien invasive vegetation must be curtailed o Monitoring of GM activity to be undertaken following construction and rehabilitation • The above measures shall be undertaken in consultation with the GMS • Re-colonisation surveys to be undertaken following construction
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Specific Impacts to Alternative A2			
Surface Water (Operation Phase)	***Direct impacts:*** Increased base flows; Scouring of instream habitats	Medium	• Erosion control measures such as gabion baskets need to be placed at the point of discharge and at downstream nick points to prevent erosion.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Specific Impacts to Alternative A3			
Surface Water (Operation Phase)	***Direct impacts:*** Increased base flows; Scouring of instream habitats	Medium	• Erosion control measures such as gabion baskets need to be placed at the point of discharge and at downstream nick points to prevent potential erosion.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Specific Impacts to Alternative B1			
Surface Water (Construction	***Direct impacts:*** Erosion of roads may lead to increased	Medium	• Adequate stormwater management structures must be installed along roads and regularly maintained and inspected and kept clear of blockages.

Activity	Impact summary	Significance	Proposed mitigation
Phase)	sedimentation in aquatic ecosystems		
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Juliana's Golden Mole (Construction Phase)	***Direct impacts:*** Except for a short section at the base of the ridge near the James Road entrance, this route follows an existing dirt track through prime golden mole habitat where a very high frequency of activity was recorded in natural and undisturbed vegetation.	Medium to High	• There are no mitigation measures that would offset the severe potential impact of the construction operations for the development on the viability, conservation status and long term survival potential of the Juliana's golden mole, other than implementing measures to avoid or minimise the spatial impact on designated Sensitivity Areas: • Stay outside "no-go" zones outside construction footprints as much as possible • Conservation buffer zones to be demarcated around sensitive areas • Training of ECO, CER and contractor staff on technical aspects related to species (identifying and recording signs of activity and procedure to be followed when a mole is encountered. • Remove top soil manually in sensitive areas • Manual removal of vegetation in sensitive areas • Large indigenous trees to be preserved where possible • Only make use of chemical blasting which reduces vibrations • Fence off sensitive areas • Only have one point of access • Stock pile in previously disturbed areas (zones A) • Ensure top soil management which aides in rehabilitation and has previously resulted in the return of moles to disturbed areas; • Install connectivity corridors prior to construction to avoid habit fragmentation and all these to remain following construction. . • Ensure proper rehabilitation: proper topsoil management, maintenance of connectivity corridors, and establishment of indigenous vegetation: o Connectivity pipes to remain in situ following the completion of

Activity	Impact summary	Significance	Proposed mitigation
			construction; o Access roads no longer required are to be ripped to 300 mm centre to centre and to a depth of at least 300 mm parallel to the contours to alleviate soil compaction and establish a seedbed suitable for the establishment of growth o Fill material to be removed from the temporary access road o The topsoil layers that have been stockpiled (different layers separately) are to be returned by means of manual labour on a first out last in basis as soon as possible after different phases of the construction operations related to the development have been completed. Golden moles would likely to return to the rehabilitated topsoil and may re-establish their foraging there. o Indigenous plant species to be established as per the Bronberg Conservancy Plant List ▪ (In addition the following species will be introduced: trees such as Burkea africana and Croton gratissimus are associated with golden-moles when they occur in open and closed woodland. In rocky grassland, the black stick lily (Xerophyta retinervis) is often present, and in scrubland Englerophytum magalismontanum. And Terminalia sericea, the silver cluster leaf or Vaalboom, often grows in the sandy soils where Juliana's golden mole might be found. o Additional topsoil (sandy soil) to be imported and strategically placed to re-establish connectivity corridors and increase the percentage of suitable habitat ▪ It must be free of stones and organic matter in excess of 50mm. ▪ It must be loose and friable ▪ It must be poorly graded soils (similar to beach /coastal sand)

Activity	Impact summary	Significance	Proposed mitigation
			▪ It must be of a similar texture and moisture retaining ability to that on site (specific to zones of high mole activity). ▪ It must have a comparable or improved nutrient base to that on site. o Re -vegetation must be monitored. 80% of the total surface area shall be covered and there shall be no bare patches of more than 1000 mm in maximum diameter (after 3 years) o Alien invasive vegetation must be curtailed o Monitoring of GM activity to be undertaken following construction and rehabilitation • The above measures shall be undertaken in consultation with the GMS. • Re-colonisation surveys to be undertaken following construction.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Surface Water (Construction and Operation Phase)	***Direct impacts:*** Impeding of flow in the central drainage line; Modification of instream habitat - central drainage line	Low	• Ensure adequate drainage is installed to prevent impoundment upstream of culverts • The project footprint should be limited to a minimum and should be clearly demarcated. • Heavy machinery should not be permitted to move beyond the demarcated footprint • A spill containment measures are required to be in place prior to construction to minimize the potential impacts of spills or leaks of hazardous substances
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Specific Impacts to Alternative B2			
Surface Water	***Direct impacts:***	Medium	• Make sure adequate stormwater management structures are in place along

Activity	Impact summary	Significance	Proposed mitigation
(Construction Phase)	Erosion of roads may lead to increased sedimentation in aquatic ecosystems		roads. • Suitable erosion protective measures are to be implemented for access roads during the construction phase. • Install water diversion berms from the start of construction. The berms shall be maintained at all times and be repaired at the end of the contract. • Where berms are installed on steep slopes the outflow shall be suitably stone pitched to prevent erosion from starting at the berms outlets. • Maintain all access routes and roads adequately in order to minimise erosion and undue surface damage. • Repair rutting and potholing and maintain storm water control mechanisms. • Runoff from roads must be managed to avoid erosion and pollution problems.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Surface Water (Construction and Operation Phase)	***Direct impacts:*** Impeding of flow in the central drainage line; Modification of instream habitat - central drainage line	Low	• Ensure adequate drainage is installed to prevent impoundment upstream of culverts • The project footprint should be limited to a minimum and should be clearly demarcated. • Heavy machinery should not be permitted to move beyond the demarcated footprint • A spill containment measures must be in place prior to construction to minimize the potential impacts of spills or leaks of hazardous substances
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Juliana's Golden Mole	***Direct impacts:*** The route passes through unsuitable	Medium to High	• There are no mitigation measures that would offset the severe potential impact of the construction operations for the development on the viability,

Activity	Impact summary	Significance	Proposed mitigation
(Construction Phase)	golden mole habitat and equally passes through suitable but transformed habitat and prime golden mole habitat with a high frequency of golden mole activity recorded.		conservation status and long term survival potential of the Juliana's golden mole, other than implementing measures to avoid or minimise the spatial impact on designated Sensitivity Areas: • Stay outside "no-go" zones outside construction footprints as much as possible • Conservation buffer zones to be demarcated around sensitive areas • Training of ECO, CER and contractor staff on technical aspects related to species (identifying and recording signs of activity and procedure to be followed when a mole is encountered. • Remove top soil manually in sensitive areas • Manual removal of vegetation in sensitive areas • Large indigenous trees to be preserved where possible • Only make use of chemical blasting which reduces vibrations • Fence off sensitive areas • Only have one point of access • Stock pile in previously disturbed areas (zones A) • Ensure top soil management which aides in rehabilitation and has previously resulted in the return of moles to disturbed areas; • Install connectivity corridors prior to construction to avoid habit fragmentation and all these to remain following construction. . • Ensure proper rehabilitation: proper topsoil management, maintenance of connectivity corridors, and establishment of indigenous vegetation: o Connectivity pipes to remain in situ following the completion of construction; o Access roads no longer required are to be ripped to 300 mm centre to centre and to a depth of at least 300 mm parallel to the contours to alleviate soil compaction and establish a seedbed suitable for the establishment of growth o Fill material to be removed from the temporary access road o The topsoil layers that have been stockpiled (different layers

Activity	Impact summary	Significance	Proposed mitigation
			separately) are to be returned by means of manual labour on a first out last in basis as soon as possible after different phases of the construction operations related to the development have been completed. Golden moles would likely to return to the rehabilitated topsoil and may re-establish their foraging there. o Indigenous plant species to be established as per the Bronberg Conservancy Plant List ▪ (In addition the following species will be introduced: trees such as Burkea africana and Croton gratissimus are associated with golden-moles when they occur in open and closed woodland. In rocky grassland, the black stick lily (Xerophyta retinervis) is often present, and in scrubland Englerophytum magalismontanum. And Terminalia sericea, the silver cluster leaf or Vaalboom, often grows in the sandy soils where Juliana's golden mole might be found. o Additional topsoil (sandy soil) to be imported and strategically placed to re-establish connectivity corridors and increase the percentage of suitable habitat ▪ It must be free of stones and organic matter in excess of 50mm. ▪ It must be loose and friable ▪ It must be poorly graded soils (similar to beach /coastal sand) ▪ It must be of a similar texture and moisture retaining ability to that on site (specific to zones of high mole activity). ▪ It must have a comparable or improved nutrient base to that on site. o Re -vegetation must be monitored. 80% of the total surface area shall be covered and there shall be no bare patches of more than 1000 mm in maximum diameter (after 3 years)

Activity	Impact summary	Significance	Proposed mitigation
			○ Alien invasive vegetation must be curtailed ○ Monitoring of GM activity to be undertaken following construction and rehabilitation • The above measures shall be undertaken in consultation with the GMS. • Re-colonisation surveys to be undertaken following construction.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Specific Impacts to Alternative B3			
Surface Water (Construction Phase)	***Direct impacts:*** Erosion of roads may lead to increased sedimentation in aquatic ecosystems	Medium	Make sure adequate stormwater management structures are in place along roads. • Suitable erosion protective measures are to be implemented for access roads during the construction phase. • Install water diversion berms from the start of construction. The berms shall be maintained at all times and be repaired at the end of the contract. • Where berms are installed on steep slopes the outflow shall be suitably stone pitched to prevent erosion from starting at the berms outlets. • Maintain all access routes and roads adequately in order to minimise erosion and undue surface damage. • Repair rutting and potholing and maintain storm water control mechanisms. • Runoff from roads must be managed to avoid erosion and pollution problems. • A photographic record should be kept of all existing roads used to ensure that all roads repaired to at least their original status. This will also be available should any claim be instituted by any landowners. • Clean and make good any damage to public or private roads caused by the Contractor during the construction phase.
	Indirect impacts: None	-	-

Activity	Impact summary	Significance	Proposed mitigation
	Cumulative impacts: None	-	-
Surface Water (Construction and Operation Phase)	***Direct impacts:*** Impeding of flow in the central drainage line; Modification of instream habitat - central drainage line	Low	• Ensure adequate drainage is installed to prevent impoundment upstream of culverts • The project footprint should be limited to a minimum and should be clearly demarcated. Heavy machinery should not be permitted to move beyond the demarcated footprint • A spill containment measures are in place prior to construction to minimize the potential impacts of spills or leaks of hazardous substances
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Juliana's Golden mole (Construction Phase)	***Direct impacts:*** The largest portion of this road alignment passes through unsuitable golden mole habitat, or suitable but transformed habitat where a moderate to high frequency of moles were found and a short section through undisturbed natural habitat with narrow corridors of suitable soil.	Medium to High	• Where possible construction of the proposed reservoir should overlap with the Rand Water R5 pipeline project as almost the entire area that will be affected by the construction of the R5 pipeline overlaps with a portion the road alignment. • There are no mitigation measures that would offset the severe potential impact of the construction operations for the development on the viability, conservation status and long term survival potential of the Juliana's golden mole, other than implementing measures to avoid or minimise the spatial impact on designated Sensitivity Areas: • Stay outside "no-go" zones outside construction footprints as much as possible • Conservation buffer zones to be demarcated around sensitive areas • Training of ECO, CER and contractor staff on technical aspects related to species (identifying and recording signs of activity and procedure to be followed when a mole is encountered. • Remove top soil manually in sensitive areas • Manual removal of vegetation in sensitive areas

Activity	Impact summary	Significance	Proposed mitigation
			• Large indigenous trees to be preserved where possible • Only make use of chemical blasting which reduces vibrations • Fence off sensitive areas • Only have one point of access • Stock pile in previously disturbed areas (zones A) • Ensure top soil management which aides in rehabilitation and has previously resulted in the return of moles to disturbed areas; • Install connectivity corridors prior to construction to avoid habit fragmentation and all these to remain following construction. . • Ensure proper rehabilitation: proper topsoil management, maintenance of connectivity corridors, and establishment of indigenous vegetation: o Connectivity pipes to remain in situ following the completion of construction; o Access roads no longer required are to be ripped to 300 mm centre to centre and to a depth of at least 300 mm parallel to the contours to alleviate soil compaction and establish a seedbed suitable for the establishment of growth o Fill material to be removed from the temporary access road o The topsoil layers that have been stockpiled (different layers separately) are to be returned by means of manual labour on a first out last in basis as soon as possible after different phases of the construction operations related to the development have been completed. Golden moles would likely to return to the rehabilitated topsoil and may re-establish their foraging there. o Indigenous plant species to be established as per the Bronberg Conservancy Plant List ▪ (In addition the following species will be introduced: trees such as Burkea africana and Croton gratissimus are associated with golden-moles when they occur in open and closed woodland. In rocky grassland, the black stick lily (Xerophyta retinervis) is often present, and in scrubland

Activity	Impact summary	Significance	Proposed mitigation
			Englerophytum magalismontanum. And Terminalia sericea, the silver cluster leaf or Vaalboom, often grows in the sandy soils where Juliana's golden mole might be found. o Additional topsoil (sandy soil) to be imported and strategically placed to re-establish connectivity corridors and increase the percentage of suitable habitat ▪ It must be free of stones and organic matter in excess of 50mm. ▪ It must be loose and friable ▪ It must be poorly graded soils (similar to beach /coastal sand) ▪ It must be of a similar texture and moisture retaining ability to that on site (specific to zones of high mole activity). ▪ It must have a comparable or improved nutrient base to that on site. o Re -vegetation must be monitored. 80% of the total surface area shall be covered and there shall be no bare patches of more than 1000 mm in maximum diameter (after 3 years) o Alien invasive vegetation must be curtailed o Monitoring of GM activity to be undertaken following construction and rehabilitation • The above measures shall be undertaken in consultation with the GMS. • Re-colonisation surveys to be undertaken following construction.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Specific Impacts to Alternative B4 (preferred alternative)			
Surface Water (Construction	***Direct impacts:*** Erosion of roads may lead to increased	Medium	• Make sure adequate stormwater management structures are in place along roads.

Activity	Impact summary	Significance	Proposed mitigation
Phase)	sedimentation in aquatic ecosystems		• Suitable erosion protective measures are to be implemented for access roads during the construction phase. • Install water diversion berms from the start of construction. The berms shall be maintained at all times and be repaired at the end of the contract. • Where berms are installed on steep slopes the outflow shall be suitably stone pitched to prevent erosion from starting at the berms outlets. • Maintain all access routes and roads adequately in order to minimise erosion and undue surface damage. • Repair rutting and potholing and maintain storm water control mechanisms. • Runoff from roads must be managed to avoid erosion and pollution problems. • A photographic record should be kept of all existing roads used to ensure that all roads repaired to at least their original status. This will also be available should any claim be instituted by any landowners. • Clean and make good any damage to public or private roads caused by the Contractor during the construction phase.
	Indirect impacts: None	-	-
	Cumulative impacts: None	-	-
Surface Water (Construction and Operation Phase)	***Direct impacts:*** Impeding of flow in the central drainage line; Modification of instream habitat - central drainage line	Low	• Ensure adequate drainage is installed to prevent impoundment upstream of culverts • The project footprint should be limited to a minimum and should be clearly demarcated. Heavy machinery should not be permitted to move beyond the demarcated footprint • A spill containment measures are in place prior to construction to minimize the potential impacts of spills or leaks of hazardous substances
	Indirect impacts: None	-	-
	Cumulative impacts:	-	-

Activity	Impact summary	Significance	Proposed mitigation
	None		
Juliana's Golden mole (Construction Phase)	***Direct impacts:***	Medium to High	• Where possible construction of the proposed reservoir should overlap with the Rand Water R5 pipeline project as almost the entire area that will be affected by the construction of the R5 pipeline overlaps with a portion the road alignment. • There are no mitigation measures that would offset the severe potential impact of the construction operations for the development on the viability, conservation status and long term survival potential of the Juliana's golden mole, other than implementing measures to avoid or minimise the spatial impact on designated Sensitivity Areas: • Stay outside "no-go" zones outside construction footprints as much as possible • Conservation buffer zones to be demarcated around sensitive areas • Training of ECO, CER and contractor staff on technical aspects related to species (identifying and recording signs of activity and procedure to be followed when a mole is encountered. • Remove top soil manually in sensitive areas • Manual removal of vegetation in sensitive areas • Large indigenous trees to be preserved where possible • Only make use of chemical blasting which reduces vibrations • Fence off sensitive areas • Only have one point of access • Stock pile in previously disturbed areas (zones A) • Ensure top soil management which aides in rehabilitation and has previously resulted in the return of moles to disturbed areas; • Install connectivity corridors prior to construction to avoid habit fragmentation and all these to remain following construction. . • Ensure proper rehabilitation: proper topsoil management, maintenance of connectivity corridors, and establishment of indigenous vegetation: o Connectivity pipes to remain in situ following the completion of

Activity	Impact summary	Significance	Proposed mitigation
			construction; o Access roads no longer required are to be ripped to 300 mm centre to centre and to a depth of at least 300 mm parallel to the contours to alleviate soil compaction and establish a seedbed suitable for the establishment of growth o Fill material to be removed from the temporary access road o The topsoil layers that have been stockpiled (different layers separately) are to be returned by means of manual labour on a first out last in basis as soon as possible after different phases of the construction operations related to the development have been completed. Golden moles would likely to return to the rehabilitated topsoil and may re-establish their foraging there. o Indigenous plant species to be established as per the Bronberg Conservancy Plant List ▪ (In addition the following species will be introduced: trees such as Burkea africana and Croton gratissimus are associated with golden-moles when they occur in open and closed woodland. In rocky grassland, the black stick lily (Xerophyta retinervis) is often present, and in scrubland Englerophytum magalismontanum. And Terminalia sericea, the silver cluster leaf or Vaalboom, often grows in the sandy soils where Juliana's golden mole might be found. o Additional topsoil (sandy soil) to be imported and strategically placed to re-establish connectivity corridors and increase the percentage of suitable habitat ▪ It must be free of stones and organic matter in excess of 50mm. ▪ It must be loose and friable ▪ It must be poorly graded soils (similar to beach /coastal sand)

Activity	Impact summary	Significance	Proposed mitigation
			▪ It must be of a similar texture and moisture retaining ability to that on site (specific to zones of high mole activity). ▪ It must have a comparable or improved nutrient base to that on site. o Re -vegetation must be monitored. 80% of the total surface area shall be covered and there shall be no bare patches of more than 1000 mm in maximum diameter (after 3 years) o Alien invasive vegetation must be curtailed o Monitoring of GM activity to be undertaken following construction and rehabilitation • The above measures shall be undertaken in consultation with the GMS. • Re-colonisation surveys to be undertaken following construction
	Indirect impacts:	-	-
	Cumulative impacts:	-	-
No-go option			
New reservoir and associated infrastructure are not constructed.	***Direct impacts:*** No impacts on the environment.	-	-
	Indirect impacts: The no-go alternative would result in the demand for bulk potable water exceeding the supply and the Constitutional right of people will not be adhered to, overall the basic needs of water provision to the Bronberg and Mamelodi community, and even beyond to Bronkhorstspruit, Cullinan and Ekandustria, will not be met. Further pressure on the existing reservoir would occur creating a huge	High	The proposed 100ML Bronberg reservoir should be constructed as early as possible should Rand Water wish to maintain strategic storage equivalent to 24 hours water demand expressed as annual average daily demand. The proposed additional 100ML reservoir at Bronberg will suffice until 2035 up to a compound growth rate for the area of 2,5%. The reservoir is required to be commissioned by 2020.

Activity	Impact summary	Significance	Proposed mitigation
	negative impact to the community in that there will not be enough water supply.		
	Cumulative impacts: The communities without water may start striking for their entitled water services. Development in City Of Tshwane would be hampered and there would no job creation nor opportunities for skilled and unskilled workers during the construction of the project. Existing infrastructure (reservoir) would be under strain and ultimately fail, further water disruption would occur.	High	Construct proposed development.

Please note that currently there is no decommissioning and closure phase that will take place for the proposed development. However if decommissioning will be undertaken, a separate Basic Assessment Report inclusive of a site decommissioning EMPr should be developed and implemented.

31. ENVIRONMENTAL IMPACT STATEMENT

Taking the assessment of potential impacts into account, please provide an environmental impact statement that summarises the impact that the proposed activity and its alternatives may have on the environment after the management and mitigation of impacts have been taken into account, with specific reference to types of impact, duration of impacts, likelihood of potential impacts actually occurring and the significance of impacts.

Table 4 summarises the various relevant specialist studies in terms of their respective preferences for the project alternatives.

Table 5: Summary of Specialists' preferred options

Specialist Study Preference	A1	A2	A3	B1	B2	B3	B4
Aquatic and Wetland	✓			✓			
Terrestrial Ecological	✓			✓			
Juliana's Golden Mole	✓						✓
Heritage	-			✓			
Noise							
Social							
Traffic							
Visual							

***Note:** The Noise, Social, Traffic and Visual Studies did not assess the associated infrastructure as part of their scope. The dash (-) represents no preference.

It can be seen that there is a clear preference for Alternative A1 by the majority of the specialists.

With regards to Alternative B, all specialists except for the Golden Mole Specialist preferred Alternative B1. The Golden Mole Specialist preferred Alternative B4 because part of the route traverses unsuitable habitat and another part follows the existing servitude of the R5 pipeline that is about to be built. However, if the construction of the R5 pipeline and the temporary road Option 4 do not happen within a short timespan (< 1 year) the environmental effects of these two separate construction projects will be magnified.

Table 5 summarises the various relevant advantages and disadvantages from the biophysical perspective in terms of the respective preferences for the project alternatives.

Table 6: Biophysical Factors

Project Alternatives	Advantages	Disadvantages
A1	• This option is the shortest in length option and will thus have less environmental impacts to natural vegetation and golden moles. The central drainage line will also not be impacted upon. • A narrow zone at the base of the ridge will not be impacted by its construction. • The option involves the construction of submerged pipeline and will allow for dispersal of moles (gene flow) between the Bronberg Conservancy and the adjacent property . • It will have the least impact on the northern drainage line as the construction footprint falls outside of the 30m buffer of the drainage.	Potential impacts on the environment discussed in Impact Assessment.
A2	-	• This option will have a slightly larger impact on natural vegetation and the golden moles than A1. • This option impedes on the natural drainage line (Sphere) and will result in an increased impact to the watercourse.
A3	-	• This option will have the largest impacts on natural vegetation and the golden moles and water course, as it is the option with the largest footprint. • This option will impede on the Sphere drainage line; • The option involves the construction of above ground structures which will permanently disrupt the movement of fauna to neighbouring corridors. • Areas of vegetation will permanently be lost.
B1	Alternative B1 follows the existing dirt track and would need to be temporarily upgraded. Option requires the least grading and filling. But it is situated almost entirely within the natural vegetation (except the tip of the southern and northern parts). Even though this option is situated in natural vegetation, it is not situated along the drainage lines (except the northern tip which is situated in residential areas) and coincides with the R5 pipeline construction footprint. The central drainage line is not clearly defined in the southern portion and has low sensitivity.	• Except for a short section at the base of the ridge near the James Road entrance, this route passes through prime golden mole habitat where a very high frequency of activity recorded in natural and undisturbed vegetation. • This option crosses the central drainage line at the James Road gate and thus not preferred from an Aquatic perspective, however all options impeded on then central drainage line. • The upgrading of the road would further impact on the surrounding vegetation communities.
B2	All 4 road options impede on the buffer zone of the central drainage line. Alternative B2 follows the northern portion of Alternative B3 but splits from B3 at a point and thus avoids impeding further on the buffer zone of the central drainage line. However it then rejoins Option B3. The road follows an existing road which is currently in a moderately good state.	• The route passes through unsuitable golden mole habitat and equal passes through suitable, but transformed habitat and prime golden mole habitat with a high frequency of golden mole activity recorded. • Alternative B2 is situated in areas dominated by alien plants (gum trees) and also natural

	This road is the longest of the 4 options as it is a combines with Alternative B3, it would require the least amount of upgrading.	vegetation but they also run along the central drainage line, which could be impacted upon by soil erosion should any of this route be chosen. • This option is the longest of the Alternatives. • This option would require blasting at the northern tip to create a road of an acceptable slope for construction vehicles.
B3	The largest portion of this road alignment passes through unsuitable golden mole habitat or suitable, but transformed habitat where a moderate to high frequency of moles were found and a short section through undisturbed natural habitat with narrow corridors of suitable soil. It overlaps with almost the entire area that will be affected by the construction of the R5 pipeline that will result in severe habitat destruction and transformation along the central drainage line.	• The road impedes on the buffer zone for the central drainage line. • The road is in moderately good condition, although the southernmost portion of the road goes up a very steep incline. Regular heavy vehicle traffic on this section of road would be problematic as it could result in increased erosion and impacts on the central drainage line. • This option also follows R1 pipeline and proposed R5 potable water pipeline. Traffic over this pipeline will be prohibited as the line cannot bear the weight of construction vehicles as the integrity of the pipelines are at risk. • Should this route be approved protective civil works will need to be undertaken in the form of concrete encasement and bridges. Additionally construction periods would be extended as traffic would not be permitted over the pipeline until they were sufficient protected. • Alternative B3 is situated in areas dominated by alien plants (gum trees) and also natural vegetation but they also run along the central drainage line, which could be impacted upon by soil erosion should any of this route be chosen. • Alternative B3 is too steep and would require blasting to be undertaken and cutting and filling to make the road passable for construction vehicles. • High mole activity was recorded along the proposed alignment.
B4	Part of the route traverses unsuitable habitat and another part follows the existing servitude of the R5 pipeline that is about to be built. However, if the construction of the R5 pipeline and the temporary road Option 4 do not happen within a short timespan (< 1 year) the environmental effects of these two separate construction projects will be magnified.	• Road option 4 follows the same road as option 2 for most of its length but deviates from option 2 in its southernmost extent. The southernmost portion of road option 4, which connects to the proposed reservoir site, is situated within the fenced off area. The limitations to road option 4 are the same as those for option 2, namely a very steep gradient, proximity to the central drainage line and R1 / R5 pipelines. • Alternatives 4 is situated in areas dominated by alien invasive plant species (gum trees) and also on natural vegetation and they also run along the central drainage line, which could be impacted upon by soil erosion should any of this route be chosen. The drainage lines are source of water for fauna (mammals, bird, frogs) on site.

Table 6 summarises the various relevant advantages and disadvantages from the technical team in terms of their respective preferences for the project alternatives.

Table 7: Summary of Technical Team's Preferred Options

Project Alternatives	Advantages	Disadvantages	Preference
A1	This option has the shortest length. It will have the least impact on the northern drainage line as the construction footprint falls outside of the 30m buffer zone. It is a submerged pipeline and thus would not result in a barrier for wild life. This alternative has the smallest construction footprint. The pipeline is directed to a natural drainage line. The pipeline is on the boundary of the private land owners property. The pipeline is aligned to an existing Council pipeline and therefore falls within a previously disturbed area.	-	✓
A2	-	This option impedes on the Shere drainage line – a water use license for impeding the water course would be required and for changing and altering the course characteristics. This would cause considerable delay to the start of construction. Due to the urgency of the project, this option is not favoured.	
A3	-	This option requires pipework and attenuation ponds resulting in a large footprint and a water use license for impeding the watercourse would be required and for changing and altering the course characteristics This option creates a permanent barrier to wildlife movement and results in the largest clearance of vegetation. Attenuation ponds are not favoured as it results in the largest footprint and is considered building a white elephant (a structure that is more than likely won't be utilised). Due to the urgency of the project, this option is not favoured.	
B1	This is the preferred route from an engineering and design perspective. The slope is not too steep and the turns not too sharp for heavy construction vehicles, it Has an acceptable gradient and least turns which are required for safe travel of the construction vehicles. This is also the shortest route. This access road option requires the least grading and filling.	-	✓
B2	-	The slope is too steep for large 20 ton construction vehicles to drive along. The access road cannot cross or run close to the R5 pipeline to be constructed, as very heavy trucks and other construction vehicles would damage the pipe and disturb the bedding material. The slope	

		along this route is too steep for large construction vehicles. The alignment involves turns and steep inclines, which are not, favoured for large construction vehicles (abnormal loads) where safety of the driver is of the utmost importance. Further earthworks (inclusive of extensive blasting through rocky ridge areas) and infrastructure required to make this option feasible are costly and would result in an increased cumulative impact to the environment, which is not favourable considering the proposed road is only required for the construction period (temporary). The route additionally will cross the R1 pipeline and R5 which is not preferred as this puts the pipeline integrity at risk and can result in failure of the pipe and resulting water disruptions. High volumes of construction traffic can damage pipe joints, result in soil subsidence and possibly pipe failure.	
B3	-	This alignment option is unsuitable for the same reasons as Alternative B2 (crossing the R1/R5 pipelines; slope too steep in places). The bends are also too sharp for heavy trucks and construction vehicles to turn. The alignment involves turns and steep inclines, which are not, favoured for large construction vehicles (abnormal loads) where safety of the driver is of the utmost importance. Further earthworks (inclusive of extensive blasting through rocky ridge areas) and infrastructure required to make this option feasible are costly and would result in an increased cumulative impact to the environment, which is not favourable considering the proposed road is only required for the construction period (temporary). The route additionally will cross the R1 pipeline and R5 which is not preferred as this puts the pipeline integrity at risk and can result in failure of the pipe and resulting water disruptions. High volumes of construction traffic can damage pipe joints, result in soil subsidence and possibly pipe failure.	
B4	-	This route follows the R5 pipeline alignment, with the exception of a loop, where the incline is steep and will require blasting, cutting and filling. The route is in close proximity to the	

		pipeline. To protect the pipeline, it is proposed that the road is prepared prior to the installation of the R5 pipeline. The road will be a one way road, with a stop and go signal system. This is not the preferred option, as the one way system shall result in a prolonged construction period and the road will require additional clearance along the sharp corners and additional cutting and filling is required to make the road trafficable for large construction vehicles, which may require some chemical rock breaking. Traffic in close proximity to a potable supply water pipeline is not preferred due to the risk imposed on the infrastructure and possible damage and subsequent supply failure. The option is feasible and follows an existing dirt track, this option overlaps with a portion of the R5 servitude.	

Comparative Analysis of Alternatives:

The overall advantages and disadvantages determined which alternative for each alternative type is the best practical environmental option (BPEO). Reference can be made to Table 5, which summarises the various relevant advantages and disadvantages from the biophysical perspective in terms of the respective preferences for the project alternatives. Table 6 summarises the various relevant advantages and disadvantages from the technical team in terms of their respective preferences for the project alternatives.

Discharge and overflow pipeline Alternatives:

The reason why Alternative 1 is the preferred alternative when compared to alternative A2 and A3 is because this option is the shortest in length option (the alternative with the smallest construction footprint) and will thus have less environmental impacts to natural vegetation and golden moles. The central drainage line will also not be impacted upon. The pipeline is aligned to an existing Council pipeline and therefore falls within a previously disturbed area. The pipeline is directed to a natural drainage line. The pipeline is on the boundary of the private land owners property thus reducing the impact to the landowners property in terms property division and restricted use as per servitude agreements. This option is the shortest in length option and will thus have less environmental impacts to natural vegetation and golden moles. The central drainage line will also not be impacted upon. A narrow zone of prime golden mole habitat at the base of the ridge will not be impacted by its construction. The option involves the construction of submerged pipeline and will allow for dispersal of moles (continuation of gene flow) between the Bronberg Conservancy and the adjacent property, following proper rehabilitation. It will have the least impact on the northern drainage line as the construction footprint falls outside of the 30m buffer of the drainage.

Alternative access routes:

The reason why alternative B4 is the preferred alternative when compared to alternative B1, B2 and B3 is because part of the route traverses unsuitable habitat for golden moles and another part follows the existing servitude of the R5 pipeline that will be constructed soon by Rand Water. This alternative was considered the route with the least impact on the golden moles (from the four feasible routes considered in the BAR). The Golden Mole Specialist preferred Alternative B4 because part of the route traverses unsuitable habitat and another part follows the existing servitude of the R5 pipeline that is about to be

built. The impact on the golden moles are considered to be more sensitive than the impact on the natural vegetation and central drainage line, in which there is a higher probability of mitigation on the impacts on these sensitive features than the impact on the golden moles. The route will be utilised during the R5 pipeline construction, therefore the route is further preferred to limit disturbance in the Bronberg to one footprint. This route follows the R5 pipeline alignment, with the exception of a loop, where the incline is steep and will require blasting, cutting and filling. The route is in close proximity to the pipeline. To protect the pipeline, it is proposed that the road is prepared prior to the installation of the R5 pipeline. The road will be a one way road, with a stop and go signal system.

Environmental Impact Statement:

If the proposed Bronberg reservoir was not constructed, any potentially significant environmental issues associated with the project would be irrelevant and the status quo of the local receiving environment would not be affected by the project-related activities. The no-go alternative would result in the demand for bulk potable water exceeding the supply and the Constitutional right of people will not be adhered to, overall the basic needs of water provision to the Bronberg and Mamelodi community and greater City of Tshwane (Cullinan and Ekandustria) will not be met. Further pressure on the existing reservoir would occur creating a huge negative impact to the community in that there will not be enough water supply and potential service disruptions. However, at the same time, there would be no impact to the critically endangered Juliana's golden mole species and the Bronberg Ridge as well as no impact on the other environmental sensitives on the site. There would also be no disturbance to the heritage stone walls within the study area. There would also be no disturbance to the surrounding community/landowners such as construction impacts including noise, traffic, dust, security and sense of place.

The proposed reservoir is required to meet current and future demand as population growth increases in the communities of Bronberg, Mamelodi, Cullinan and Ekandustria. The socio-economic implications that would result if this development is not provided would be detrimental to these communities. That said, the proposed site for the development is highly environmentally sensitive as a result of the Bronberg Conservancy/Ridge and the subpopulation of the Critically Endangered Juliana's Golden Mole (*Neamblysomus julianae*). The proposed development also has a significant impact on the adjacent landowners in the area in terms of dust, traffic, noise, security and sense of place. Rand Water have investigated other site locations to avoid impacting the sensitive features of this site; however, as explained in Section 2(a) of the BAR, there are no feasible site alternatives. It has also been explained that the temporary access road has to be located in the north via James Road as access via the south is not possible.

The proposed site in Bronberg is also a well suited site technically, as the location of the new reservoir is proposed adjacent to the existing 100ML reservoir (within the existing Rand Water property) and the location on the Bronberg Ridge would add to efficient functioning of the proposed reservoir as it depends on the gravitational flow of the water.

The EMPr and all the Specialist Studies show that there are measures to mitigate the impacts caused by the proposed development, but that these measures will not prevent the complete loss certain sensitive features, particularly the Juliana's Golden Mole. The DEA must therefore decide if these measures can adequately mitigate all environmental impacts with the recommended mitigation measures in the Impact Assessment and EMPr. As discussed in the Golden Mole Specialist Study (Appendix D4 of the BAR) and the Impact Assessment, there are no mitigation measures that will prevent the loss of golden moles and their habitat, only measures to minimise this impact. However due to the assumptions that rehabilitation has proven to be successful historically for the golden mole species in this area (Rand Water R1 pipeline), there is evidence available that rehabilitation could result in recovery of the golden mole

species in this area in future. But the proposed development during construction will result in habitat that will be lost and fragmentation of the Juliana's golden mole species may increase post-construction. The stringent mitigation measures proposed by the golden mole specialist (such as connectivity corridors) must be adhered to minimise the impacts on the golden moles during construction, if the proposed development is approved.

If the DEA provide a positive Environmental Authorisation (EA) for this project, the period for which the EA is required would be 5 years (but is dependent on the date the EA is received) and thus the estimated date on which the activity will be concluded (as per 3(1) (q) of Appendix 3 of GN R. 982) is the 31 December 2023. The five year period is inclusive of the undertaking of the rehabilitation measures.

It is therefore the opinion of the EAP that based on the recommendations of the specialists, technical considerations and the comparison of the impacts, the development is recommended to proceed, and the following layout was identified as the BPEO for the related project components (**Figure 12**):

- Proposed 100ML Reservoir;
- Inlet and Outlet Pipelines;
- Construction Camp;
- Laydown Area;
- Upgrade of the existing Rand Water palisade fence;
- Alternative A1 – Discharge and overflow pipeline with construction footprint; and
- Alternative B4 – Temporary Access Road Option 04

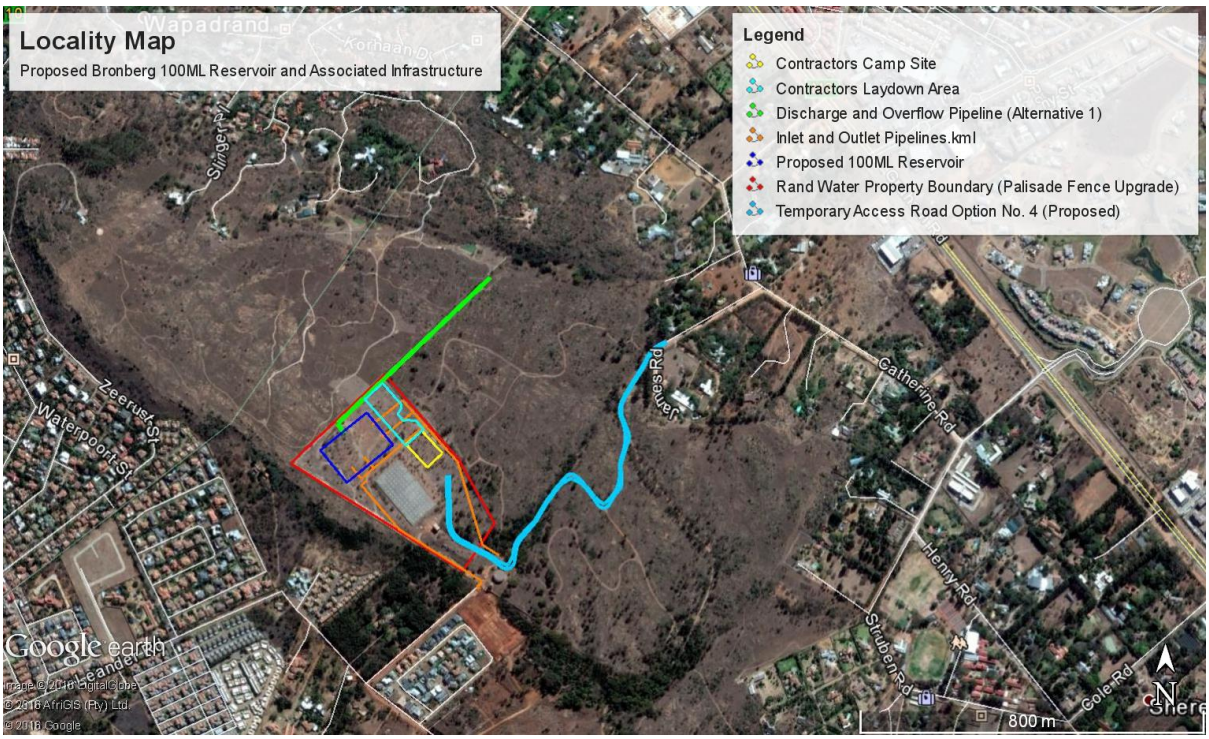

Figure 16: Proposed BPEO for the Bronberg development

Where the other alternatives were more favourable, the residual impacts following the recruitment of suitable mitigation measures were not regarded as sufficiently significant or overriding to sway the ultimate selection of the alternative.

With the selection of the BPEO, the adoption of the mitigation measures included in the BAR and Impact Assessment, and the dedicated implementation of the EMPr, it is believed that the significant environmental aspects and impacts associated with this project can be mitigated and minimised. With the

aforementioned in mind, it can be concluded that there are no fatal flaws associated with the project and that authorisation can be issued, based on the findings of the specialists and the impact assessment, through the compliance with the identified environmental management provisions.

SECTION E. RECOMMENDATION OF PRACTITIONER

Is the information contained in this report and the documentation attached hereto sufficient to make a decision in respect of the activity applied for (in the view of the environmental assessment practitioner)?	YES ✓

If "NO", indicate the aspects that should be assessed further as part of a Scoping and EIA process before a decision can be made (list the aspects that require further assessment).

If "YES", please list any recommended conditions, including mitigation measures that should be considered for inclusion in any authorisation that may be granted by the competent authority in respect of the application.

As discussed in the EMPr, various forms of monitoring are required to ensure that the receiving environment is suitably safeguarded against the identified potential impacts, and to ensure that the environmental management requirements are adequately implemented and adhered to during the execution of the project. The types of monitoring to be undertaken include:

1. Baseline Monitoring needs to be undertaken to determine to the pre-construction state of the receiving environment, and serves as a reference to measure the residual impacts of the project by evaluating the deviation from the baseline conditions and the associated significance of the adverse effects;
2. Environmental Monitoring entails checking, at pre-determined frequencies, whether thresholds and baseline values for certain environmental parameters are being exceeded; and
3. Compliance Monitoring and Auditing for the Independent ECO to monitor and audit compliance against the EMPr and Environmental Authorisation.
4. Given the sensitivity of the project, the EAP recommends that an Environmental Monitoring Committee (EMC) is established before commencement of any construction activities to serve as an additional mechanism for monitoring compliance of the EMPr and EA as well as improving communication amongst key stakeholders. The EMC will have an advisory, monitoring and "watch-dog" role for the duration of the construction phase of the project. The EMC will report to DEA. The EMC should convene quarterly for the duration of the construction phase. Appropriate Terms of Reference for the EMC will need to be prepared, which will include roles and responsibilities, membership and functionality (amongst others). The ECO will facilitate and provide secretarial support to the Chairperson of the EMC. The Chairperson will compile and submit a quarterly report to DEA.
5. Pertinent recommendations from the Wetland and Aquatic Impact Assessment (The Biodiversity Company, 2017) include:

- Prevent erosion on steep slopes. Erosion control measures such as gabion baskets need to be placed at the point of discharge and at downstream nick points to prevent erosion at the discharge pipeline point.
- Minimise influence to downstream flow regime when diverting and impeding flow for the temporary access road. Ensure adequate drainage is installed to prevent impoundment upstream of culverts.
- Reinstate (shaping) and rehabilitate (indigenous riparian vegetation) affected areas.
- No construction facilities (including storage areas, containers, chemical toilets, etc.) to be located within natural drainage lines.

- The project footprint should be limited to a minimum and should be clearly demarcated. Heavy machinery should not be permitted to move beyond the demarcated footprint
- Spill containment measures are required to be in place prior to construction to minimise the potential impacts of spills or leaks of hazardous substances
- Make sure adequate stormwater management structures are in place along temporary access road.
- No waste water to be released to natural drainage lines.
- Ensure proper storage of material (including fuel, paint) that could cause water pollution. Ensure proper storage and careful handling of hazardous substances with spill prevention materials at hand.

6. Pertinent recommendations from the Terrestrial Ecological Impact Assessment (Nemai Consulting, 2017) include:

- Search, rescue and relocation plan is to be developed for sensitive flora and fauna species (threatened species or species of conservation concern) within the construction domain. In this regard, attention will be given to the following plant species of conservation importance: *Adromischus umbraticola* subsp*. Umbraticola*, *Boophane disticha* (known as the Century plant) and *Hypoxis hemerocallidea* (known as the Star flower/African potato).
- Implement a monitoring programme for eradication of alien invasive plants and noxious weeds.
- The establishment of pioneer species should be considered with the natural cycle of rehabilitation of disturbed areas, which assists with erosion control, dust and establishment of more permanent species. This can be controlled during construction phase and thereafter more stringent measures should be implemented during the rehabilitation and post rehabilitation.
- Construction activities should be restricted to the development footprint area and then the compliance in terms of footprint can be monitored by ECO.
- Retain vegetation within the construction site, wherever possible.
- During construction, refresher training can be conducted to construction workers with regards to littering, ad hoc veld fires, and dumping.
- Where possible, transplant plant material to designated areas.
- Removal of medicinal plants by construction workers is not permitted.
- Photographs of protected and sensitive flora species must be displayed in the construction camp to heighten awareness.

7. Pertinent recommendations from the Juliana's Golden Mole Specialist Impact Assessment (Maree, 2017) include:

- A 30m conservation/buffer zones to be demarcated around Sensitivity Areas in respect of the Juliana's golden mole and suitable habitat in close proximity to the proposed footprint of the New 100 ML Reservoir and the entire associated infrastructure. Where these buffers overlap with construction footprint and/or servitudes these should not be developed.
- The same buffer zones to be incorporated into the composite sensitivity plan to inform the final development layout plan presented for Environmental Authorisation (EA).

Zone Delineation and Fencing

- Pegging must be conducted as a priority and should include:
  Footprint pegging.
  Working area (servitude) pegging.
  Access and service roads pegging.
- Fencing of sensitive areas in close proximity to the construction footprint and working area to ensure that heavy machinery and construction operations do not impact on the golden moles and

their habitat beyond these areas. Zones where golden mole activity was recorded (outside of the construction footprint/working area) are considered "no go" zones.

- Fences to be erected prior to onset of site preparation (vegetation clearance) and construction operations.
- Fence location to be at the perimeter of the footprint/clearance area and recommended to be a standardised Veldspan or diamond mesh fence with intervals of poles are predetermined. However, caution must be exercised that stakes supporting fences is placed where no golden mole activity is visible or has been recorded before as far as possible. Stakes must be planted using manual labour.
- Access road: If the EA allows a Temporary Access Road to the north of the Bronberg Ridge, the fences must be erected on either side of the Construction Footprint for a Temporary Access Road (including working strips) on either side according to engineering requirements.
- Overflow pipeline: Similar fences should be erected along the edge of the 10m working strip on each side of the pipeline northwest to the New 100 Ml Reservoir along the northwestern boundary of the Bronberg Conservancy and the existing Rand Water property (lower portion).

Vegetation clearance

- Manual labour to be used for clearing vegetation in Sensitivity Areas that overlap with the footprint and required working zones (servitudes) surrounding the New Reservoir and along new Inlet/ Outlet pipelines [1000 and 1500 diameter], Contractors Camp Site and Construction Laydown Area and the Associated infrastructure in the existing Rand Water property and the Bronberg Conservancy, including an Overflow pipeline (length dependent on final design; 500 m, 800 m or 1000 m) and 10m-wide servitude, of any Temporary Access Road or the existing Operations Access Road and existing Informal Service Roads).
- Large indigenous trees in these buffer zones to be preserved as the removal of its large root systems severely disturbs the top soil layer where sub-surface foraging tunnels and deeper more permanent tunnels of golden moles are found.
- Three species of conservation concern were noted on site, namely *Adromischus umbraticola subsp. umbraticola, Boophane disticha* and *Hypoxis hemerocallidea*. It is thus recommended that prior to construction, these species must be rescued and relocated to the Rand Water Environmental Management Services nursery where the on-site horticultural team will care for them and then following construction they can be re-established on site. Given that the species of conservation importance were observed, it is important that an Environmental Control Officer should be on site prior to construction to identify other species of conservation importance and threatened species which may occur on site and also to oversee the search and rescue. A species such as *Ceropegia decidua* is confirmed to be found on site by GDARD even though it was not observed during the field assessment and it is imperative that detailed searches for this threatened species is made during the appropriate time of year when plant is likely to be more visible.
- If protected species are found, a Biodiversity Permit application for the removal or destruction of the species must be obtained from GDARD.
- A search and rescue operation must be undertaken prior to construction to rescue protected plant and animal species.

Soil management

- No further disturbance or compaction of soils to occur in sensitive areas, which do not overlap with construction footprint.
- Firebreaks along the concrete palisade boundary fences should be cleared of vegetation using a manual approach, as in currently the case. Rand Water confirmed that firebreaks are maintained twice per year through the use of brush cutters.

- Topsoil removal: In the event that suitable habitat for the Juliana's golden mole disturbed by heavy machinery, topsoil must be removed by manual labour (e.g. within the construction footprints and working strips).
- Topsoil must be stripped in at least three layers and stockpiled accordingly, based on the analysis of a professional soils scientist and a golden mole specialist. Typically the layers would be defined as:

a. Top 20 cm – unit 1 (forging tunnels).
b. Following 30 - 40 cm – unit 2 (deeper, more permanent tunnels).
c. Remaining soil.

- The topsoil must be returned on a first out last in basis as soon as possible during construction operations where relevant in the existing Rand Water property and the areas for the Associated Infrastructure in the Bronberg Conservancy.
- Construction operations should be done during the wet season when the Juliana's golden moles are active.

Environmental Compliance Monitoring

- An ECO must be appointed to prior to site establishment to oversee the pre-construction and construction phases of the proposed reservoir and associated infrastructure to ensure compliance to the EMP and EA in respect of the conservation of the Juliana's golden mole.
- The ECO is responsible for the monitoring, implementation and managing and reporting on issues that may arise during construction operations. The ECO must be suitably qualified in respect of:

a. Appropriate knowledge of environmental management and auditing
b. For this purpose the ECO should receive on-site training from a suitable qualified Golden Mole Specialist with extensive knowledge of Juliana's golden mole regarding technical aspects related to the species (identifying and recording signs of activity using GPS technology and the handling of live and dead animals on site until GMS arrives to evaluate its condition).

- The ECO must conduct bi-weekly site audits for the full duration of the project
- The ECO must oversee the Contractors Environmental Representative (CER).
- The CER must be appointed prior to site establishment and must be suitably qualified in:

a. On-site training and briefing by GMS with extensive knowledge of Juliana's golden mole in basic technical knowledge (identification of activity and handling dead and live moles) – similar to that of ECO (see point b above).
b. Daily site monitoring must be conducted for full duration of the project
c. Weekly reporting to the ECO and relevant parties.

- Construction staff must be briefed and educated by GMS in respect of the sensitivity of the area and measures to be implemented to protect the Juliana's golden mole. A Golden Mole Specialist with extensive experience to be appointed to advise ECO on aspects of Juliana's golden mole as per approved EMPr. As per GDARD Biodiversity Assessment Guidelines version 3 of 2014, a Golden Mole Specialist must be Professional Natural Scientists in accordance with the Natural Scientific Professions Act (No. 27 of 2003) within the field of Zoology and with qualifications and experience relevant to mammal biology and conservation and recognized expertise pertaining to the species.
- GMS responsibilities to include:

a. Site-specific environmental training in technical aspects in respect of the Juliana's golden mole prior to commencement of construction phase.
b. Advise Rand Water on activities of golden moles identified in the study area (the GMS to a pre-construction survey immediately before site preparations and construction operations commence i.e. vegetation clearance, topsoil removal).
c. Provide on-site training to ECO and CER.

d. Advise ECO and CER with implementation, mitigation and compliance of the conditions set out in the EA and EMPr in respect of the Juliana's golden mole.
e. Brief and educate construction staff on detecting the presence of the species in the construction area.
f. Arrange with a suitably qualified person to collect live or injured animals that are unearthed during construction operations, or appropriate storage of dead animals in case the GMS is unavailable at the time.
g. Advise on construction activities in close proximity to golden moles and suitable habitat on a regular basis (before, during and after construction, bi-weekly or at least weekly).

Contractor

- Stock piling

a. Stockpiling of material required for the different phases of construction of the New 100 Ml Reservoir must be phased. Rand Water indicated that some spoil material would be used for berms around edges of the Proposed New Reservoir. These materials must be stored within Habitat Zone A (Orange, Fig. 9a-d) on the existing Rand Water property, which is unsuitable habitat for golden moles. Rand Water to advise on exact locations where spoil material will be stored for inclusion in the EMPr for this development (pending EA approval).
b. Raw material (e.g. pipes, cement) only to be stored in predetermined Construction Laydown Area that is fenced within unsuitable habitat in the existing Rand Water property (Zone A - Orange; Fig. 9a-d).

- Access control – construction vehicles and heavy machinery.

a. No heavy machinery must be permitted in the Sensitive Areas (Zones B, C and D, Fig. 9a-d) that are fenced.
b. Construction vehicles must access the existing Rand Water property and the Bronberg Conservancy through a SINGLE ENTRY POINT. This is to avoid soil compaction and unnecessary destruction of sensitive golden mole habitat. The proposed access point for the construction of the proposed reservoir and associated infrastructure is at James Road, the northern point of the proposed road alignments.

- Blasting

Chemical blasting to be used during construction of the New Reservoir and Associated Infrastructure to avoid excessive vibrations that would result in the death of golden moles living in close proximity of construction operations.

- Soil Management:
- The recommendations below are based on the detrimental effect of soil compaction on Juliana's golden moles and their shallow sub-surface foraging tunnels. Appropriate to soil management is key to minimizing impact on golden mole habitat and success of post-construction rehabilitation.
- a. All unavoidable work in Sensitivity Areas related to topsoil during the construction period must be conducted by manual labour following the procedures outlined under Pre-construction.
- b. As much as possible of the excavated soil and rocks (spoil material) of the reservoir must be loaded on trucks and removed from the construction site. Rand Water indicated that most of the spoil material will be removed from site, but some would be stored for reuse i.e. for embankment construction or filling of Temporary Access Road on the north side of the ridge.
- c. Excavated soil and rocks must not be dumped on Sensitivity Areas within the Rand Water property (Zones B and D) and the Bronberg Conservancy (Zones B, C and D).

Measures to promote connectivity of suitable golden mole habitat and movement/dispersal of animals by installing experimental connectivity corridors at strategic point along a temporary access road

- Measures to be implemented for the Associated Infrastructure Development for New 100 Ml Reservoir in the Bronberg Conservancy and on portions of the existing Rand Water property and would apply to a Temporary Access Road for the Construction Period along one of four alternative

alignments proposed by Rand Water. All four routes pass through designated Sensitivity Areas (Zones B, C and D) for the Juliana's golden mole in the Bronberg Conservancy and Rand Water property along the northern slopes of the Bronberg that are designated as "no-go" zones for development. If, indeed, a temporary access road is built on the northern slope of the Bronberg then connectivity corridors (pipes under the road surface) should be installed at strategic points along a Temporary Access Road to the existing Rand Water property during the construction period, in an attempt to minimize the impact of road construction on the Juliana's golden moles. These connectivity corridors assist with maintaining connectivity between areas of suitable habitat for golden moles.

- Connectivity corridors must be installed at strategic points along the temporary access road according to the following specifications:

a. Sturdy but flexible pipes with a diameter of 150 mm (maximum 200 mm) at intervals of between 20 m and 50 m apart along the entire length of road alignment.
b. Pipes to be placed in close proximity to prime golden mole habitat, which will determine final intervals between pipes in final road design at the time of construction.
c. The installed pipe must extend 300 mm beyond the sturdy fence (1.5 m shoulder boundary).
d. Berms are to be installed at these points to drain any storm water or lose material away from the entrance/exit of the pipe.
e. The pipe must be filled to 60% with suitable topsoil found on site and as close as possible to where the connectivity pipe is installed.
f. The pipe must be positioned so that the soils inside are equal to (level) or just below the ground surface.
g. The entrance/exit points of pipe must be level with topsoil, as foraging tunnels occur in the topsoil layer (up to ~ 20 cm).
h. After completion of the construction, the pipes or other tools to enhance connectivity must remain.

Proper rehabilitation of areas affected by the construction of the Proposed New 100 Ml Reservoir and the areas proposed for the Associated Infrastructure in the Bronberg Conservancy will be key to ensure that connectivity is restored between fragments of suitable habitat for golden moles and their return to the area after the proposed development have been completed. Numerous signs of golden mole activity have been recorded along the existing R1 pipeline of Rand Water, which indicates that rehabilitation of the soil was such that golden moles returned to the area, even though it was transformed. Careful management of topsoil would enhance the success of post-construction rehabilitation.

Soil Management

The topsoil layers that have been stockpiled (different layers separately) are to be returned by means of manual labour on a first out last in basis as soon as possible after different phases of the construction operations related to the Proposed New 100 Ml Reservoir in the existing Rand Water property and the Associated Infrastructure in the Bronberg Conservancy have been completed.

Maintenance of Connectivity Corridors for Golden Moles

a. Connectivity corridors must be maintained regularly while in place to avoid blockage (clear blocked soil at the ends).
b. If so, various designs could be implemented to connect moles that have been isolated in high-density developments in the vicinity of the Bronberg e.g. pipes in conduits for suburban tar roads or in foundations of boundary walls.

Vegetation Rehabilitation

Natural vegetation must be rehabilitated in all areas that would have been affected by the construction operations, which include footprints and working servitudes inside fences and other areas that were

disturbed during construction. This must be achieved by seeding (grasses and herbs) and re-establishment of indigenous trees and shrubs after construction has been completed. This must be done in areas where the construction footprint and working zones (servitudes) of different structures and infrastructure overlapped with Sensitivity Areas (Zones B – Yellow; C – Blue; D – Green). The Golden Mole Rehabilitation Plan in Appendix J10 of the BAR must be implemented.

Research – Recolonization
GIS mapping surveys must be conducted after construction to determine whether, and if so, and how long after construction stopped, golden moles returned to the rehabilitated habitat.

8. Pertinent recommendations from the Heritage Impact Assessment (Marais-Botes, 2017) include:

- Six sites with Late Iron Age stone walls are located in the project area and must be demarcated with a steel wire fence and be avoided.
- Structures must be avoided by project activities. The structures must be clearly marked and fenced during construction to ensure conservation and preservation thereof.
- All employees to be informed of all the identified sensitive features on the site during their initial environmental inductions. Ongoing awareness and enforcement to be made thereon by the contractor's environmental officer and construction supervisors.
- During construction, if any heritage resources are found (chance finds) the following protocol must be followed:
  - All work must stop in the vicinity of the find.
  - The Contractor or ECO must be informed and the find barricaded off to prevent further interference or damage.
  - PHRAG must be informed and a registered heritage specialist must be appointed to undertake an assessment of the find.
  - Depending on what is found and the significance thereof, the specialist will advise on the way forward.
  - If the resource needs to be removed/altered/destroyed then the necessary permit/s must be obtained from PHRAG.
  - Only once the specialist gives the go-ahead can work commence in the area.
  - Under no circumstance can heritage material be destroyed or removed from the site.
  - Should any remains be found that could potentially be human remains then the SAPS must be contacted.

9. Pertinent recommendations from the Noise Impact Assessment (Hassall, 2017) include:

- The provisions of SANS 10103:2008 Code of Practice will apply to all areas within audible distance of residents. Working hours to be agreed upon with Project Manager, so as to minimise disturbance to landowners/occupiers and community members. The construction operations should occur every weekday, during part of the daytime only (07:00-17:30) including Saturdays before 13:30. No night-time construction operations are envisaged.
- Construction activities generating output levels of 85 dB or more will be confined to normal working hours. Noise preventative measures (e.g. screening, muffling, timing, pre-notification of affected parties) to be employed.
- Blasting operations to be controlled to ensure sound pressure levels are kept below the generally accepted 'no damage' level of 140 decibels. Blasting will be restricted to working hours, and further with the restriction of 10h00 to 15h00. Additionally, prior to any blasting taking place neighbouring properties (affected parties) will be notified.

- Noise to be monitored (baseline and during construction). Sampling locations to consider major noise sources and sensitive receptors. Noise monitoring is recommended at intervals of six months at positions at or near to the nearest affected properties, SR1 and SR2 and at positions to be selected on the north and east of the site at dwellings nearest the access routes at residential buildings.

10. Pertinent recommendations from the Social Impact Assessment (Nemai Consulting, 2017) include:

- A maintenance plan for the infrastructure must be implemented by Rand Water.
- All employment of locally sourced labour should controlled on a contractual basis between Rand Water and the appointed contractor. Rand Water should avoid bringing in labour from areas outside the ward, however, given the socio-economic status of the project area, it may be necessary to do so. In this case the broader region of the City of Tshwane can be treated as the labour supply area.
- Employment of females and youth is encouraged to ensure the empowerment of vulnerable member of society.

11. Pertinent recommendations from the Traffic Management Plan (Engineering Advice and Services, 2017) include:

- Suitable erosion protective measures are to be implemented for access roads during the construction phase.
- Traffic safety measures (e.g. traffic warning signs, flagmen) are to be implemented where applicable.
- Temporary road construction and traffic accommodation signage shall be displayed along the route to be followed by construction vehicles (between Graham Road and the site access road along Frank Avenue, Catherine Road and James Road) in order to create awareness of construction vehicles by other road users and to ensure that construction vehicle speeds are restricted.
- While access to the site can occur from 07:00 to 17:30 every effort shall be made to restrict operation of heavy construction traffic to periods outside of peak commuter operating times – off-peak periods, between the hours of 08:00 and 17:00 so that impact on commuter traffic is kept to a minimum.

12. The Pertinent recommendations from the Visual Impact Assessment (Zone Solutions, 2017) include:

- No clearing of land to take place outside the demarcated footprint of the reservoir and associated infrastructure (including construction camp).
- Institute low-scale landscaping throughout the project site and along the northern wall of the new reservoir to soften the visually prominent base structure and to minimise direct views onto the proposed activity.
- All infrastructure must be set as low down as possible on their respective footprints to reduce impacts on skyline.
- Reduce and control dust through the use of approved dust suppression techniques as and when required. Should water be used such water must be obtained from a licensed source.
- Rehabilitate any exposed soils as soon as construction has been completed to stabilise loose soils.
- Institute low-scale landscaping throughout the project site to act as biofilters.
- On-going housekeeping to maintain a tidy construction area.

Is an EMPr attached?

YES
✓

The EMPr must be attached as Appendix G.

The details of the EAP who compiled the BAR and the expertise of the EAP to perform the Basic Assessment process must be included as Appendix H.

If any specialist reports were used during the compilation of this BAR, please attach the declaration of interest for each specialist in Appendix I.

Any other information relevant to this application and not previously included must be attached in Appendix J.

KRISTY ROBERTSON
NAME OF EAP

SIGNATURE OF EAP

28/07/2017
DATE

SECTION F: APPENDIXES

The following appendixes must be attached:

Appendix A: Maps

Appendix B: Photographs

Appendix C: Facility illustration(s)

Appendix D: Specialist reports (including terms of reference)

Appendix E: Public Participation

Appendix F: Impact Assessment

Appendix G: Environmental Management Programme (EMPr)

Appendix H: Details of EAP and expertise

Appendix I: Specialist's declaration of interest

Appendix J: Additional Information