Appendix 1. Municipal borehole status report

PRINCE ALBERT MUNICIPALITY

MUNICIPAL BOREHOLE STATUS REPORT

Bh No.	Borehole Site Status	Monitoring Equipment	Recommendations
SRK1 Municipal Monitoring Borehole	**General Security** Fair. The hole is situated at a well-used picnic spot and could be prone to opportunistic vandalism **Borehole Closure** Welded plate on top of casing. Use is made of a 12mm hole to take water level readings **Contamination risk** Low	**Water Levels** None	1. Remove welded plate 2. Install DWAF cap on borehole. 3. Install Solinst F100/M30 LT data logger, serial no: 51023124
SRK2 Municipal Monitoring Borehole	**General Security** Fair. The hole is situated at a well-used picnic spot and could be prone to opportunistic vandalism **Borehole Closure** Stainless steel bolt-on cap **Contamination risk** Low	**Water Levels** Solinst F300/M100 LT data logger, serial no: 51018716	1. Weld on additional length (450mm) of 175mm casing 2. Cast solid concrete collar around top of casing 3. Install DWAF cap on borehole
SRK3 Municipal Production Borehole	**General Security** Good **Borehole Enclosure** Fenced, locked with keyed-alike lock **Borehole Closure** Baseplate holding rising main **Headwork** Good **Contamination risk** Low	**Water Levels** Solinst F300/M100 LT data logger, serial no: 51020416 **Water Meter** Yes **Sampling Tap** Yes	1. Fabricate and install removable expanded metal cover for headworks to prevent baboon damage. 2. Instruct SSE Data to connect pump to telemetry system 3. Cast concrete plinth to protect borehole from flood damage 4. Erect signage explaining the function of the borehole
P1 Municipal Production Borehole	**General Security** Fair **Borehole Enclosure** Good, access chamber locked with keyed-alike lock. **Borehole Closure** Good **Headwork** Good, but telemetry system damaged by baboons **Contamination risk** Low **Other** There is ground collapse at the borehole.	**Water Levels** Solinst F300/M100 LT data logger, serial no: 61020551 **Water Meter** Yes **Sampling Tap** Yes **Comments** Pump, over-sized, severely corroded	1. Replace pump with one of correct specification 2. Fabricate and install removable expanded metal cover for headworks to prevent baboon damage. 3. Instruct SSE Data to repair damaged telemetry wiring 4. Erect signage explaining the function of the borehole. 5. Fill the collapsed ground around the borehole with a concrete sanitary seal.

Bh No.	Borehole Site Status	Monitoring Equipment	Recommendations
P2 Municipal Production Borehole	**General Security** Fair **Borehole Enclosure** Good, access chamber locked with keyed-alike lock **Borehole Closure** Good **Headwork** Good, but telemetry wiring damaged by baboons **Contamination risk** Low	**Water Levels** P-tubes (2) both blocked **Water Meter** Yes **Sampling Tap** Yes	1. Remove existing P-tubes and replace 2. Re-install Solinst F300/M100 LT data logger, serial no: 61023167 3. Fabricate and install removable expanded metal cover for headworks to prevent baboon damage. 4. Instruct SSE Data to repair damaged telemetry wiring 5. Erect signage explaining the function of the borehole
G6 Municipal and DWAF monitoring borehole	**General Security** Good **Borehole Closure** DWAF Cap **Contamination risk** Low	**Water Levels** Solinst F300/M100 LT data logger, serial no: 61023226	None
P3 Municipal Production Borehole	**General Security** Fair **Borehole Enclosure** Fair, locked with keyed-alike lock. Baboons are able to gain access and will damage telemetry wiring **Borehole Closure** Good **Headwork** Good, prone to damage by baboons **Contamination risk** Low	**Water Levels** Solinst F300/M100 LT data logger, serial no 61019617 **Water Meter** Yes **Sampling Tap** Yes	1. Fabricate and install removable expanded metal cover for headworks to prevent baboon damage. 2. Erect signage explaining the function of the borehole. 3. When pump is next removed from borehole, replace P-tube with SABS HDPE 32mm Class 10
P4 Municipal Production Borehole	**General Security** Good **Borehole Enclosure** Good, baboon proof and locked with keyed-alike lock **Borehole Closure** Good **Headwork** Good **Contamination risk** Low	**Water Levels** Solinst F300/M100 LT data logger, serial no: 1019616 **Water Meter** Yes **Sampling Tap** Yes	1. Erect signage explaining the function of the borehole 2. Pump is over-specified, replace in due course

Bh No.	Borehole Site Status	Monitoring Equipment	Recommendations
4A Municipal monitoring borehole	**General Security** Poor **Borehole Closure** Poor **Contamination risk** High	**Water Levels** None	1. Install DWAF specified cap 2. Erect signage explaining the function of the borehole
G1 DWAF and municipal monitoring borehole	**General Security** Good **Borehole Closure** Good, DWAF cap **Contamination risk** Low	**Water Levels** None	None
P5 Municipal Production borehole	**General Security** Good **Borehole Enclosure** Baboon proof, locked with keyed-alike lock **Borehole Closure** Good, inside access chamber with lid **Headwork** Good **Contamination risk** Low	**Water Levels** Solinst F300/M100 LT data logger, serial no: 61023237 **Water Meter** Yes **Sampling Tap** Yes	1. Set pump flow rate 2. When pump is next removed from borehole, replace P-tubes with SABS 32mm CI10 HDPE 3. Erect signage explaining the function of the borehole.
G2 Municipal Monitoring Borehole	**General Security** Good **Borehole Closure** Good, DWAF cap **Contamination risk** Low	**Water Levels** Solinst F300/M100 LT data logger, serial no: 61023241	None

Bh No.	Borehole Site Status	Monitoring Equipment	Recommendations
P6 Municipal Production Borehole	**General Security** Good **Borehole Enclosure** Baboon proof, locked with keyed-alike lock **Borehole Closure** Good, inside access chamber with lid **Headwork** Good **Contamination risk** Low	**Water Levels** Solinst F300/M100 LT data logger, serial no: 1019590 **Water Meter** Yes **Sampling Tap** Yes	1. Set pump flow rate 2. Erect signage explaining the function of the borehole
7A Municipal Monitoring Borehole	**General Security** Fair, borehole is exposed to potential flood damage **Borehole Closure** Defective cap **Contamination risk** Low	**Water Levels** None	1. Reinforce concrete around casing 2. Install DWAF cap 3. Erect signage explaining the function of the borehole
P7 Municipal Production Borehole	**General Security** Good **Borehole Enclosure** Good, locked with keyed-alike lock **Borehole Closure** Fair, potentially prone to flood water ingression **Headwork** Good **Contamination risk** Low	**Water Levels** Solinst F300/M100 LT data logger, serial no: 61019612 **Water Meter** Yes **Sampling Tap** Yes	1. Pump is over-specified, replace soon. 2. When pump is next removed, replace P-tube with SABS 32mm Cl 10 HDPE. 3. Erect signage explaining the function of the borehole.
P8 Municipal Production Borehole	**General Security** Good **Borehole Enclosure** Inside waterworks perimeter fence **Borehole Closure** Fair, potentially prone to flood water ingression **Headwork** Good **Contamination risk** Low	**Water Levels** Solinst F300/M100 LT data logger, serial no: 1019606 **Water Meter** Yes **Sampling Tap** Yes	1. Cast concrete plinth around top of casing. 2. Connect to telemetry system. 3. Erect signage explaining the function of the borehole 4. When pump is next removed, replace P-tubes with SABS HDPE 32mm Cl 10

Bh No.	Borehole Site Status	Monitoring Equipment	Recommendations
P9 Municipal Production Borehole	**General Security** Good **Borehole Enclosure** Inside waterworks perimeter fence **Borehole Closure** Good **Headwork** Good **Contamination risk** Low	**Water Levels** Solinst F300/M100 LT data logger, serial no: 61019582 **Water Meter** Yes **Sampling Tap** Yes	1. Repair damaged pipeline so that this borehole may be used if necessary. 2. Erect signage explaining the function of the borehole

KLAARSTROOM

Bh No.	Borehole Site Status	Monitoring Equipment	Recommendations
KS1 Municipal Production Borehole	**General Security** Good **Borehole Enclosure** Good. Locked with keyed-alike lock **Borehole Closure** Fair **Headwork** Poor **Contamination risk** Low	**Water Levels** Solinst F300/M100 LT data logger, serial no: 61019603 **Water Meter** Yes **Sampling Tap** No **Comments**	1. Install water sampling point 2. Cast sanitary seal around borehole
KS2 Municipal Production / Standby Borehole	**General Security** Good **Borehole Enclosure** Good. Locked with keyed-alike lock **Borehole Closure** Poor **Headwork** Poor **Contamination risk** Low	**Water Levels** Solinst F300/M100 LT data logger, serial no: 61020530 **Water Meter** Yes **Sampling Tap** No **Comments**	1. Install water meter 2. Install water sampling point 3. Cast sanitary seal around borehole

LEEU GAMKA

Bh No.	Borehole Site Status	Monitoring Equipment	Recommendations
LG1 Municipal Production Borehole	**General Security** Good **Borehole Enclosure** Good **Borehole Closure** Fair **Headwork** Good **Contamination risk** Low	**Water Levels** Solinst F300/M100 LT data logger, serial no: 61023249 **Water Meter** Yes **Sampling Tap** No **Comments**	1. Install water sampling point 2. Lock with keyed-alike lock
LG2 Municipal Production Borehole	**General Security** Poor **Borehole Enclosure** Access chamber with broken lid **Borehole Closure** Fair **Headwork** Good **Contamination risk** Medium	**Water Levels** Solinst F300/M100 LT data logger, serial no: 61023169 **Water Meter** Yes **Sampling Tap** No **Comments**	1. Install water sampling point 2. Repair access chamber cover 3. Install locking system 4. Lock with keyed-alike lock
LG3 Municipal Production Borehole	**General Security** Poor **Borehole Enclosure** Fenced. Isolated location **Borehole Closure** Fair **Headwork** Poor **Contamination risk** Medium	**Water Levels** Solinst F300/M100 LT data logger, serial no: 61023171 **Water Meter** Yes **Sampling Tap** No **Comments**	1. Install water sampling point 2. Clear enclosure 3. Erect access chamber with lid 4. Install locking system 5. Lock with keyed-alike lock

Appendix 2. Availability of surface water for AR

Author: Phillip Ravenscroft, Maluti GSM

The irrigation furrow is the source of recharge water for the scheme. The furrow is cleaned annually (during the winter months) at prearranged dates occurring between June and August. The cleaning takes place in two sessions of two weeks each, with a two-week break in-between. It is proposed to utilise the water from the furrow during the four cleaning weeks to artificially recharge the groundwater.

It was understood that Gorra Water was appointed to quantify the flow in the furrow but data from this exercise was not available at the time of writing this report. A rough preliminary estimate of the flow in the furrow is presented based upon rough estimates made on site during October 2006 using the submerged float method and compared with the readings from the upper and lower Parshall flumes. An attempt was also made to measure the flow with a 90-degree v-notch sluice gate found at the treatment works. No accurate reading could be taken because there was insufficient pooling area above the v-notch and insufficient drop below the v-notch, both required to take a reasonably accurate flow reading.

Float method

The float method can be used to get very rough estimates of channel flow. The method is involves the following:

- Timing floats over a length of the furrow to obtain the water velocity
- Measuring the cross section of the furrow at regular intervals
- Calculating the flow using the formula Q=Cva (where C is a constant, v is the velocity and a is the cross sectional area
- Two sets of measurements were taken, one near the upper Parshall flume and one near the lower Parshall flume

Table 1: *Measured flows October 2006*

	Float Method		Parshall Flume	
Upper section	78.5	l/s	78.7	l/s
Lower section	63.5	l/s	63.0	l/s

Notes: *C value of 0.65 used for both readings*
An additional factor of 0.95 applied to upper reading to compensate for the canal not being clean and having growth on the floor and walls.

Parshall flume measurements

The plan dimensions of both Parshall flumes were measured and recorded during the site visit of October 2006. Without survey equipment it was not possible to take levels and vertical dimensions were not measured. Both flumes have non-standard dimensions (including the critical throat width dimension) and must be individually calibrated using an accurate flow measurement system.

Figure 3 shows the upper and lower Parshall flume flow measurements from October 2006 to May 2007. The average losses (over the length of the furrow) for this period are calculated to be 18l/s. Compensating for the known dimensional deficiencies of the flumes, this reduces to 14l/s or an annual average of 31%. It is important not to treat these figures as accurate until the flumes are accurately calibrated but they are used here for preliminary planning purposes until accurate data is available.

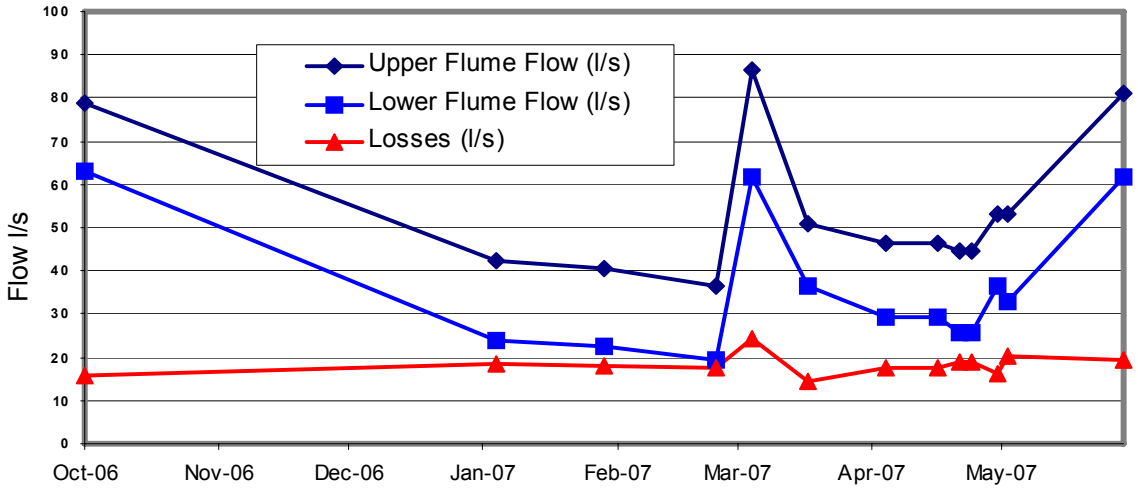

Figure 1: Furrow flow measurements using the upper and lower Parshall flumes

The losses illustrated in figure 3 are only those that occur between the upper and lower Parshall flumes. A significant volume of the furrow water is effectively lost in that it is not utilised productively. The volume of this effective loss is not quantified in this report and includes the following:

- Losses from the furrow below the treatment works
- Water that is lost to the end of the furrow due to anomalies in the sequencing of the water allocations
- Evaporation from lei water dams
- Infiltration from lei water dams
- Transpiration from the high water consumption vegetation on the banks of lei water dams
- Water inefficient irrigation practices (primarily high water wasting sprinkler systems, irrigation timing and crop selection).

Furrow water available for municipal uses

There are three types of water from the furrow that could be used by the municipality for water supply.

1. The existing municipal allocation of 21.25 hours of furrow flow per week. The actual volumes are not known but are estimated based upon estimates of monthly flow and the observations documented above. See table 6.
2. The furrow water not utilised during the four weeks of annual furrow cleaning. This is the water that is proposed as the main source of water for the artificial recharge project. See table 7.
3. The additional water that would be realised if the municipal project to install a pipe in the furrow were implemented.

Existing municipal allocation

Table 2: *Estimated average monthly furrow flows and furrow water available for municipal use based on existing allocation.*

	Top Flume Reading*	Top flume flow	Estimated flow at treatment plant (31% furrow losses)	Municipal allocation (21.25hrs per week)	
Month	Estimated (mm)	kl/month	kl/month	kl/day	kl/month
Jan	140	92,940	64,129	262	8,112
Feb	140	83,946	57,923	262	7,327
Mar	150	103,118	71,152	290	9,000
Apr	160	110,160	76,010	320	9,614
May	200	159,633	110,147	449	13,932
Jun	250	217,210	149,875	632	18,957
Jul	200	159,633	110,147	449	13,932
Aug	180	136,063	93,883	383	11,875
Sep	160	110,160	76,010	320	9,614
Oct	150	103,118	71,152	290	9,000
Nov	150	99,792	68,856	290	8,710
Dec	140	92,940	64,129	262	8,112
Total		1,468,714	1,013,412		128,185

* These top flume readings are the based upon the combined estimates of Prince Albert residents P Arnold, C van Zyl and J Rissik, and are correlated with the few readings obtained in 2006 and 2007.

Water available during furrow cleaning

The volume of water available for artificial recharge during the 4-week cleaning period is estimated based upon a normal July flow of 60 l/s and a drought July flow 35 l/s.

Table 3: *Furrow water available for artificial recharge during furrow cleaning.*

	Estimated drought supply	Estimated normal supply	Units
Furrow supply flow	35	60	l/s
Municipal supply required	12	12	l/s
Flow available for AR	23	48	l/s
1st two weeks	27,821	58,061	kl
2nd two weeks	27,821	58,061	kl
Total	55,642	116,122	kl

Additional water available from new pipeline
The municipality plans to install a 250mm diameter pipeline inside the existing furrow. This can potentially provide additional water in two ways. The first is the water that is normally lost from the furrow between the abstraction point and the treatment plant will be available to be used and the second is the additional water that could be conveyed in the pipeline as a result of the higher capacity of the pipeline compared to the furrow.

Saved water losses
When the project to replace the furrow with a pipeline is implemented, most of the water that is lost along the furrow will be become available at the location of the treatment works. Based upon the estimates of flows detailed above, this will provide an estimated additional 455,300 kilolitres per annum for the town, either to use directly or for artificially recharging the aquifer.

Additional capacity
Before discussing the additional capacity of the pipeline, it must be noted that the current abstraction of water from the Dorps River is at the limit of the existing DWAF abstraction licence of 1,350,480 kl/annum (the estimated use from table 6 exceeds this volume by 9%). Before the additional capacity of the pipeline can be utilised, DWAF authorisation is required for the additional volume.

In addition, the increased capacity of the pipeline is only useable when the Dorps River has sufficient flow and this is only during peak flow conditions where the river flow that can be abstracted exceeds 80l/s.

The capacity of the proposed pipeline is larger than the capacity of the existing furrow. The furrow starts to overflow in places when the (top) flow exceeds 80l/s whereas the pipeline capacity is at least 90l/s of continuous flow. The pipeline capacity estimate of 90l/s is based upon the following:

- Crude estimates of the pipeline length (4.6km)
- Crude estimates of the difference in height between the intake and the treatment plant (90m)
- The assumption that the pipe used is 250mm diameter uPVC Class 9
- The assumption that the pipeline follows the same route as the furrow
- The assumption that the exclusion of air at the abstraction point and along the pipeline is adequately addressed and that the pipeline can run at maximum efficiency.

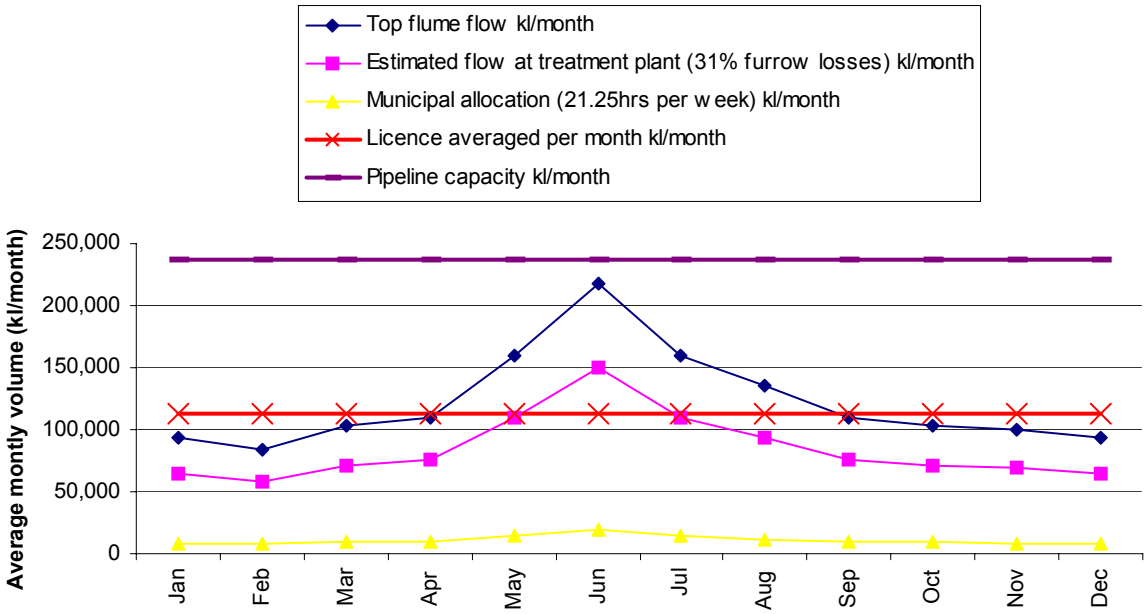

Figure 2: Furrow flow measurements using the upper and lower Parshall

General recommendations

1. Prince Albert is a water rich Karoo town that has sufficient water to supply all its needs and to stimulate growth in priority areas. However the existing water resources are not conserved and are not managed for the good of the whole town. It is recommended that an inclusive water resource management plan for the whole town be developed that includes water demand management and water conservation measures for surface and groundwater and addresses the additional surface water losses identified in section 3.2.
2. Verify the accuracy of all the existing bulk water meters using remote ultrasonic metering.
3. Change the pipe configuration or the location of the meter at the main reservoir outlet to ensure the accurate metering of supply to that reticulation zone.
4. The four bulk meters should be read weekly (or every two weeks). One can then balance the main meter against the 3 bulk reticulation meters and balance both of these against the customer meter readings as well as against the water supplied from the water sources.
5. Calibrate both of the Parshall flumes using an accurate method of measuring the flow in the furrow.
6. Take weekly flow readings at an upper and lower location to accurately quantify the water losses in the furrow.

Appendix 3. Prince Albert Environmental Requirements

Prince Albert Municipality Artificial Recharge Scheme: Environmental Requirements for Implementation

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Prince Albert Municipality Artificial Recharge Scheme: Environmental requirements for implementation

23 February 2007; revised 26 April 2007


Signed Sue Milton

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Prince Albert Municipality Artificial Recharge Scheme: Environmental requirements for implementation

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1. INTRODUCTION

This document summarizes the steps required to obtain authorisation and to implement Artificial Recharge of Municipal borehole in Prince Albert. The recommendations are based on the outcomes of a meeting co-ordinated by Groundwater Africa in Somerset West on 25 January 2007, that brought together representatives from DEAT, DWAF, Environmental and Groundwater consultants. The document has also received input from Yakeen Atwaru of DEA & DP at a meeting in George on 20 February 2007,

The structure of the document follows the flow-chart developed by Groundwater Africa (FIGURE 1 and 2) that were the outcome of the meeting of 25 January 2007. The steps indicated are those that apply to all applicants for permission to implement Artificial Recharge. However the requirements have been customised for the Prince Albert Municipality by addition of contact information pertinent to local authorities **(APPENDIX 1**), and information relevant to the local social-ecological environment.

There are four phases to implementing and operating an Artificial Recharge scheme. Each phase involves activities that may trigger environmental requirements such as permit applications or reports (TABLE 1).

1. **Pre-feasibility** phase involves initial assessment for obtaining authorisation for conducting a detailed feasibility study that includes field testing of recharge (FIG 1).
2. **Feasibility** phase involves a full scale feasibility study (i.e. a pilot recharge project), reporting on the findings, and obtaining permission for implementation (FIG 2).
3. **Implementation** phase involves installation of the recharge scheme (FIG 2)
4. **Operation and maintenance phase**, involving the running of the scheme, monitoring, reporting back to DEAT and DWAF and making any changes required to improve environmental aspects of the operation or maintenance.

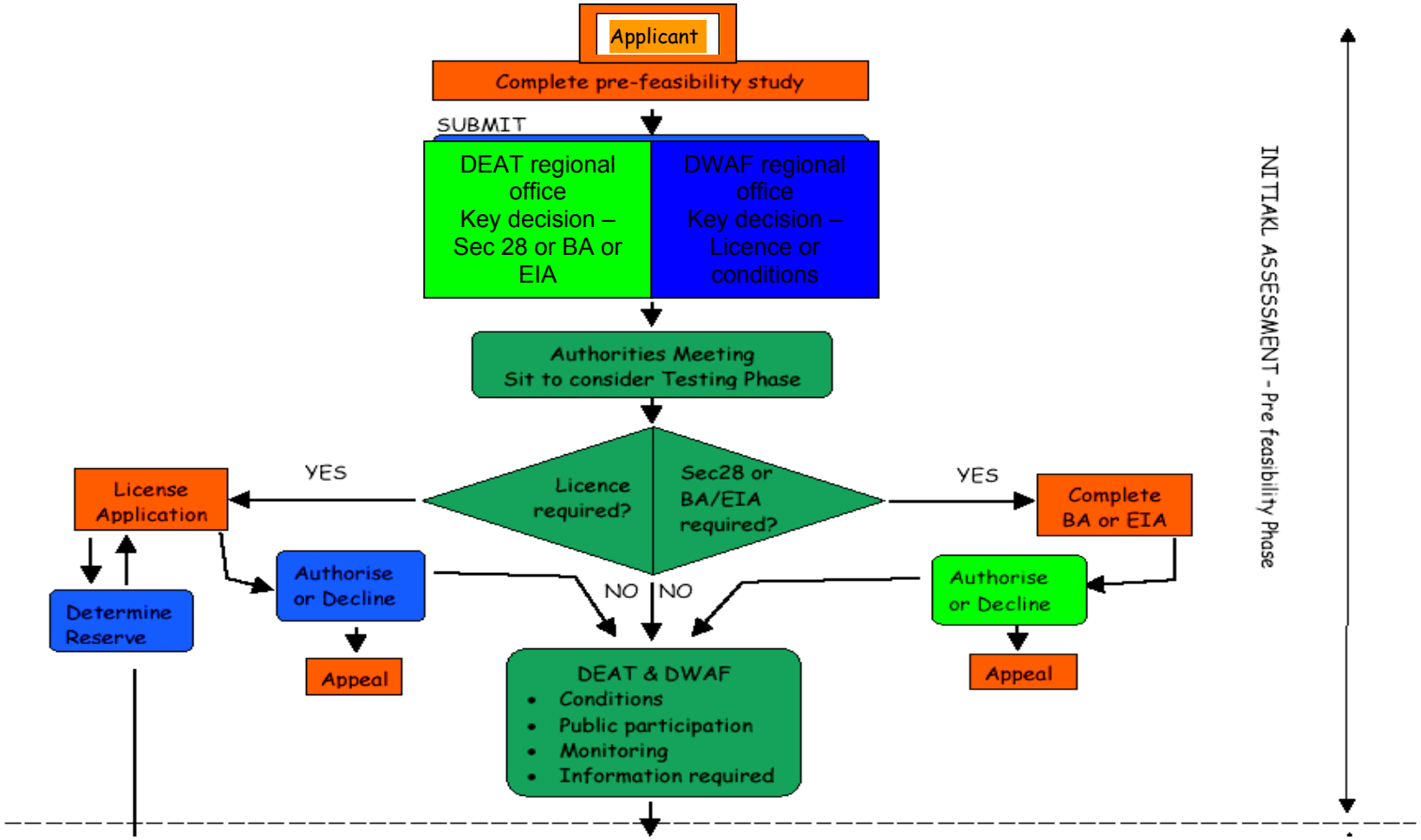

FIGURE 1 Initial Assessment (pre-feasibility) phase: process of obtaining permission for Artificial Recharge Feasibility Study

Table 1. Activities. triggers and environmental requirements for the four phases of Artificial Recharge scheme

Phase	**Activities**	**Triggers and relevant legislation reference**	**Legislation & environmental requirements**	**Authority**
1. Pre-feasibility study	Testing boreholes; mapping geology; identifying landowners; collating information on water use, water abstraction rates	none	National Environmental Management Act (NEMA, Act 107 of 1998, Section 28 Duty of Care)	DEAT via Department of Environmental Affairs and Development Planning (DEA & DP) Western Cape, office in George
2. Feasibility study	1. Drilling of monitoring boreholes, installation of pumphouse and monitoring equipment .	Any purpose in the 1 in 10 yr flood line of a river or stream (or within 32 m from the bank of a river) including canals, dams and weirs (see Notice R385, paragraph 1m)	NEMA section 24(2)(a) & (d) requiring Basic Assessment, and ROD from DEA & DP	DEAT via DEA & DP, George
3. Installation	1. Construction of facilities or infrastructure for the bulk transportation of water, including stormwater, in pipelines .	Peak throughput of 120 L/sec. or more. (see Notice R385, paragraph 1k)	NEMA section 24(2)(a) & (d) requiring Basic Assessment, and ROD from DEA & DP	DEAT via DEA & DP, George
	2. Drilling of monitoring boreholes, installation of pumphouse and monitoring equipment .	Any purpose in the 1 in 10 yr flood line of a river or stream (or within 32 m from the bank of a river) including canals, dams and weirs (see Notice R385, paragraph 1m)	NEMA Basic Assessment, Authorities meeting and ROD from DEA & DP	NEMA via DEA & DP
	3. Construction of pipeline or canal	Construction of a road, pipeline, canal or other similar form of linear development	National Heritage Resources Act (NHRA, 25 of 1998)	Department of Cultural Affairs & Sport of Western Cape via Heritage Western Cape

Phase	**Activities**	**Triggers and relevant legislation reference**	**Legislation & environmental requirements**	**Authority**
4. Operation, maintenance and monitoring	1 Recharge of borehole with the intention of storing water temporarily underground for later extraction	The off-stream storage of water, including dams and reservoirs, with a capacity of 50000 m^3 or more; (see Notice R385, paragraph 1n)	NEMA Basic Assessment, Authorities meeting and ROD from DEA & DP	NEMA via DEA & DP
	2. Abstraction of stored ground water for use in the village of Prince Albert.	The abstraction of groundwater at a volume where any general authorisation issued in terms of the National Water Act, 1998 (Act No. 36 of 1998) will be exceeded. ; (see Notice R385, paragraph 13)	NEMA Basic Assessment, Authorities meeting and ROD from DEA & DP & Water Use Licence	NEMA via DEA & DP
	3.Water use for Artificial Recharge	Use exceeds general exemption at a rate of up to 15 litres per second not exceeding 150000 cubic metres per annum; in terms of the National Water Act No. 36 OF 1998 revision26 March 2004, Notice No. 399 par 1.7 (cii).	National Water Act Water Use License	DWAF administered by DWAF Oudtshoorn
	4. Water storage	Storage of < 50,000 m^3 and storage of water below ground are excluded from the general authorization in terms of the National Water Act No. 36 OF 1998 revision26 March 2004, Notice No. 399 par 1.2)	National Water Act Water Use License	DWAF administered by DWAF Oudtshoorn
	5. Access to monitoring sites on property belonging to Cape Nature and two private landowners.	Activities involving three or more existing erven;	National Heritage Resources Act (NHRA, 25 of 1998)	Department of Cultural Affairs & Sport of Western Cape via Heritage Western Cape

2. PHASES OF ARTIFICIAL RECHARGE PROJECT

2.1 Phase 1 Initial Assessment (Pre-feasibility study)

Objectives? To obtain determine whether the concept of Artificial Recharge has a reasonable probability of being technically feasible, and to apply for permission (DWAF, DEA & DP) to conduct a full Artificial Recharge feasibility study.

When? This study should be carried out as soon as the Council has approved the concept of investigating Artificial Recharge possibilities for the village

Who? The Municipality should appoint expert consultants who have appropriate qualifications in

- Geohydrology Appointee should be registered with South African Council of Natural Scientific Professions (SACNASP)
- Environmental and socio-economic impact assessment Appointee should registered with South African Council of Natural Scientific Professions (SACNASP) and/or Environmental Assessment Practitioners of South Africa (EAPSA)

Contents of pre-feasibility report? The pre-feasibility report is a desktop study that is informed of the local situation by a site visit and discussions with the municipality and other affected parties. It could contain a preliminary evaluation of the pre-feasibility of Artificial Recharge in terms of

- Need for Artificial Recharge, costs and activities, capacity to implement scheme
- Type of recharge appropriate for area (borehole injection
- Quantity, quality and seasonality of water available for recharge
- Ability of receiving aquifer to absorb, store and deliver water
- Quality of groundwater in receiving aquifer relative to quality of recharge water
- Environmental issues including biodiversity
- Socio-economic, environmental justice and Land ownership issues

Where submitted? Simultaneously to the competent regional authorities, namely DEA & DP office in George and the Regional DWAF office in Oudtshoorn.

Authorities' decision? The document will then be considered by both the relevant regional authorities (DWAF and DEA & DP for the Western Cape based in George) and these authorities will hold an authorities meeting to make a decision on requirements for the feasibility study. If a feasibility study is approved by DWAF and DEAT there may be attached conditions, such as Duty of Care (NEMA Section 28) or require a basic Assessment (BA) or full Environmental Impact assessment (EIA). The actions that the Municipality must carry out for each of these requirements are discussed below. A project plan with time frames is given in APPENDIX 10.

Activities? Desktop studies and data gathering

Triggers for environmental legislation compliance requirements? None (TABLE 1), other than NEMA Duty of Care (see below). Any activities that may cause significant pollution or degradation to the environment trigger NEMA Section 28 Duty of Care (see). Although the pre-feasibility study is unlikely to trigger the Duty of Care, it is advisable to inform DWAF and DEA & DP of the intention to carry out this study so that the environmental requirements for the full feasibility study can be determined.

2.1 Phase 2 Feasibility (Full Assessment)

Objectives? To provide a quantitative assessment of the technical feasibility and socioeconomic desirability of implementing an Artificial Recharge scheme for Prince Albert.

Content? According to Murray 2006, the most critical data requirements needed to establish the feasibility of artificially recharging the aquifer, are:

- Groundwater levels and abstraction data
- The water level response in the aquifer to borehole injection
- Full water quality analysis of the source water
- Groundwater quality analyses after borehole injection.

On completion of the study (ca. August 2008), a feasibility report must be submitted by the geohydrologist to the Municipality for consideration by Council. This report based on results obtained from a minimum of 12 months testing of Artificial Recharge of one or more of the Prince Albert Municipal boreholes, and the gathering of public opinion, economic and ecological data should report on:

1. The need for an AR scheme
2. The source water
3. The Artificial Recharge method
4. Water quality (including clogging)
5. Aquifer hydraulics
6. Economics
7. Institutional arrangements
8. Management and technical capacity
9. Environmental issues
10. Legal and regulatory issues

In addition to these requirements it is advisable to establish baseline monitoring of the vegetation (particularly health of trees in the flood plain woodland). This baseline information on tree health near and away from pumpstations and in the upper, middle and lower floodplain will make it possible to answer questions related to impacts of Artificial Recharge on the riparian ecosystem, and to separate the effects of AR from those of background changes in woodland density and condition that might be caused by climate patterns, tree disease or aging, fire, wind or other factors unrelated to AR. Baseline monitoring of vegetation can be done by a combination of photographic records and categorical assessment of the vitality of a sample of trees along a fixed transect associated with monitoring sites near to and far from abstraction and recharge boreholes (see Milton 2007, baseline vegetation study).

Activities

This phase involves Artificial Recharge testing. Activities include drilling of monitoring boreholes, installation of pumphouses and monitoring equipment, and diversion of irrigation furrow water into selected boreholes during the low water use period of the year.

Triggers for environmental legislation compliance requirements

The drilling of boreholes in the river bed and the construction of pumphouses may trigger NEMA section 24(2)(a) & (d) requiring Basic Assessment (See under Basis Assessment), and ROD from DEA & DP. (TABLE 1)

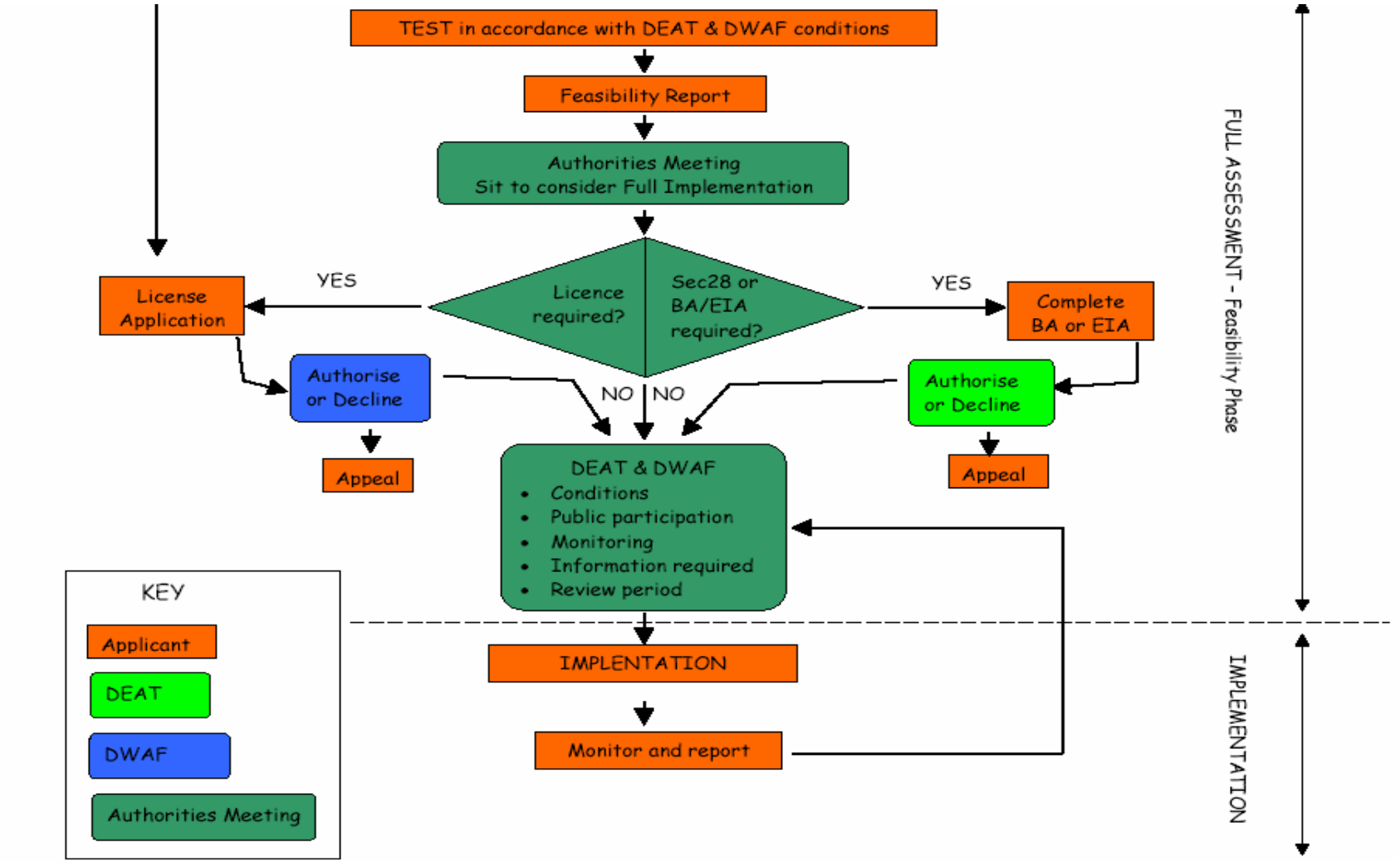

FIGURE 2 Full assessment (feasibility) and implementation phase requirements for Artificial Recharge scheme

2.3 Phase 3 Installation

Once the ROD has been received from DEA & DP following a Public Participation Process and Basic Assessment (see sections 3.2, 3.3 of this report for details), water may be diverted to the Artificial Recharge boreholes on a regular basis.

***Activities*?**

1. Construction of facilities or infrastructure for the bulk transportation of water, including stormwater, in pipelines;

2. Drilling of monitoring boreholes, installation of pumphouse and monitoring equipment;

3. Construction of pipeline or canal.

Triggers for environmental legislation compliance requirements

The following are triggers for a Basic Assessment if this was not done during Phase 2,

1. Peak throughput of 120 L/sec. or more. (see Government Notice R385, paragraph 1k)
2. Construction for any purpose in the 1 in 10 yr flood line of a river or stream (or within 32 m from the bank of a river) including canals, dams and weirs (see Government Notice R385, paragraph 1m)

The construction of a road, pipeline, canal or other similar form of linear development may trigger a permit application in terms of the National Heritage Resources Act (NHRA, 25 of 1998).

2.4 Phase 4 Implementation and Adaptive Management

Should Artificial Recharge prove feasible and desirable, an adaptive management approach (FIG 3) should be taken to implementation. This is because Artificial Recharge is a new intervention in South Africa, and the process may need to be modified depending on feedback from monitoring data.

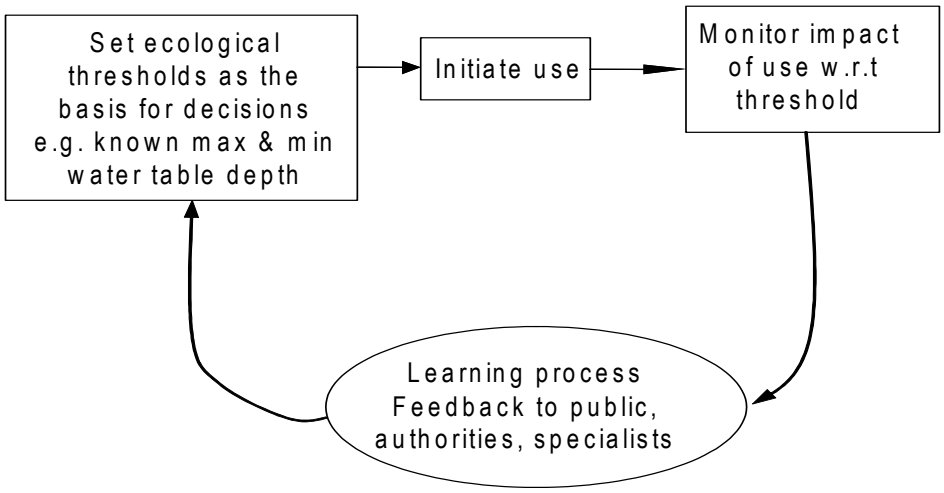

Figure 3 Adaptive management concept applicable to Artificial Recharge.

The Municipality must therefore ensure that two staff members are trained for Artificial Recharge management, monitoring of water and vegetation resources, and with communicating the data to the public. If sufficient technical staff is not available, a new technical post should be created in the Municipality. The incumbent should be familiar with all aspects of water resource management including maintenance of pipeline, sampling of water quality, monitoring of water levels, maintenance of electronic loggers, site management, ecological monitoring, data management and communication of results to the public at monthly intervals. The incumbent should also be able to collaborate with experts to develop and improve the water resource management strategy for the village.

***Activities*?**

1 Recharge of borehole with the intention of storing water temporarily underground for later extraction

2. Abstraction of stored ground water for use in the village of Prince Albert.

3. Water use for Artificial Recharge

4. Water storage below ground

5. Access to monitoring sites on property belonging to Cape Nature and two private landowners.;

Triggers for environmental legislation compliance requirements

1. NEMA Basic Assessment The off-stream storage of water, including dams and reservoirs, with a capacity of 50 000 m^3 or more; (see Notice R385, paragraph 1n)

2. Water Use Licence: "The abstraction of groundwater at a volume where any general authorisation issued in terms of the National Water Act, 1998 (Act No. 36 of 1998) will be exceeded. (see Notice R385, paragraph 13)

3. Water Use Licence: Use exceeds general exemption at a rate of up to 15 litres per second not exceeding 150 000 cubic metres per annum; in terms of the National Water Act No. 36 OF 1998 revision26 March 2004, Notice No. 399 par 1.7 (cii).

4. Water Use Licence: Storage of < 50,000 m^3 and storage of water below ground are excluded from the general authorization in terms of the National Water Act No. 36 OF 1998 revision26 March 2004, Notice No. 399 par 1.2)

5. Permission from Heritage Western Cape for activities involving three or more existing erven.

3. ENVIRONMENTAL LEGISLATION COMPLIANCE PROCESSES

3.1 NEMA Section 28 Duty of Care and remediation of environmental damage

NEMA section 28 (**APPENDIX 2**) requires that the landowner (Prince Albert Municipality) must take *reasonable measures* to prevent pollution or degradation from occurring, continuing or recurring, or, to minimise and rectify such pollution or degradation of the environment that might result from an activity such as Artificial Recharge. In brief, taking *reasonable measures* required that the Municipality:

(a) investigate, assess and evaluate the impact on the environment:

(b) inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed in order to avoid causing significant pollution or degradation of the environment:

(c) prevent, control or remedy the pollution or degradation. For example, ensure that, where diesel or other fuels are used, drip trays are provided, spills absorbed with Peatsorb or similar product and properly disposed of, and no unsightly or environmentally damaging garbage lest at recharge-related work sites.

When? If the authorities' meeting grants permission for the full feasibility study without a Basic Assessment or EIA, then, with reference to NEMA Section 28, the Municipality, as landowner, is responsible a, b, and c above at the planning and implementation phases of the feasibility study.

Who? The Municipality should appoint an Environmental Control Officer for the duration of the pre-feasibility and full feasibility phases to ensure that any small scale negative impacts on the environment are mitigated, and arrange for training of those employees involved with borehole monitoring, test hole drilling and water diversion. These employees should be instructed about their duty of care in carrying out feasibility study related activities (such as gaining access to monitoring sites though private or Cape Nature land, protecting monitoring sites, monitoring water levels in test boreholes), and preventing any damage to above or below ground resources that could be caused by water recharge activities (flooding, pollution of ground water).

Documentation? It is advisable for the Municipality to keep records of the steps taken to ensure compliance to Section 28 of NEMA. These records would include name, qualifications and contact details of the consultant employed for environmental assessment and training, nature of the training, and measures taken to protect the ground water resource and the environment in which the feasibility study is being carried out. It should also specify how any environmental damage caused by the feasibility study will be restored on completion of the study (e.g. closure of access roads and tracks, removal of equipment).

Penalties? Any member of the public can report failure to discharge the duty of care to the relevant authorities. If failure is proven this could result in the Municipality being fined by the regulatory body (DWAF, DEAT, DEA & DP). See EnAct (2003).

3.2 Public Participation Processes (APPENDIX 3)

These are an essential component of Basic Assessment, Scoping and EIA procedures. They include all provisions in 56, 57, 58, and 59 of Government Notice R358 in terms of NEMA. Details are also given in Western Cape DEA & DP Guidelines on public participation (Nov. 2006), a document that can be downloaded from Cape Gateway. In summary, these processes and include the following actions by the EAP:

(i) notifying potentially interested and affected parties of the proposed application;

(ii) retaining proof that notice boards, advertisements and notices notifying potentially interested and affected parties of the proposed application have been displayed, placed or given;

(iii) maintaining a list of all persons, organisations and organs of state that were registered in terms of regulation as interested and affected parties in relation to the application; and

(iv) maintaining a summary of the issues raised by interested and affected parties, the date of receipt of and responding in writing to those issues.

3.3 Basic Assessment (APPENDIX 4,5,6,7,8, 10)

When? If the authorities' meeting requires a Basic Assessment (APPENDIX 4), the following **3** forms should be completed and submitted to DEA & DP (George). They can be downloaded from Cape Gateway **http://www.capegateway.gov.za/eng/yourgovernment/gsc/406/services/11537/10199 or**

from the website DEA & DP **website http://www.westerncape.gov.za/eadp**

1. **Notice of intent to submit an application** in terms of Reg. 22 of Government notice R385 in terms of NEMA (14 days before initiating Basic Assessment) APPENDIX 5
2. An ***application for environmental authorisation*** of an activity must be made to the competent authority (to be submitted together with 3. Basic Assessment Report) APPENDIX 6
3. Basic Assessment Report APPENDIX 7

Who? The basic Assessment form should be completed by a registered Environmental Assessment Practitioner (EAP)

Documentation? This 34 page form requires site visits to obtain information on all potentially impacted sites, including the proximity of the sites to heritage and water resources, information on the nature of the impact, and the description of the public process followed. Information to be included as appendices are:
a) Location map,
b) Site plan(s),
c) Owner consent (where structures or access roads are on land not owned by the Municipality),
d) Photographs,
e) Public participation information including a copy of the register of interested and affected parties, the comments and responses report, proof of notices, advertisements,
f) relevant permits such as proof of existing legal use or water use license(s)
g) approval from **Heritage Western Cape Heritage** APPENDIX 8
h) Specialist Reports, namely the geohydrologist's prefeasibility study (Murray 2006) and the ecologist's baseline vegetation study (Milton 2007).

Timeframe. A more detailed project plan with time frame is given in APPENDIX 10. The earliest date for implementation of a feasibility study appears to be 30 July 2007.

Where submitted? DEA & DP, George office

3.4 Scoping & Environmental Impact Assessment (EIA) Appendix 6 & 9

When? If the authorities' meeting requires an EIA (APPENDIX 9),

What? An EIA involves FOUR steps (completed forms or reports). All application forms and reports must be submitted to DEA & DP (George)

1. ***Application for Environmental Authorisation*** of an activity (APPENDIX 6, above) must *first be made* to the competent authority;
2. **Public participation** process must be completed in full (APPENDIX 3);
3. **Scoping** report which must contain all the information that is necessary for a proper understanding of the issues identified including the plan of study to assess impacts;
4. **EIA:** If the scoping report is accepted, then the EIA should be initiated. This is a detailed study of potential positive and negative impacts on the social and natural environment, and a description of how potential impacts can be mitigated..

Who? The Scoping and EIA reports must be prepared by a registered Environmental Assessment Practitioner (EAP) with inputs from specialists as required (Botanists, Zoologists, Geohydrologists, Archaeologists, Heritage specialists, Social Scientists)

Documentation? Completed EIA report must be submitted to the competent authority, together with, among other items (see Appendix 4) –
(i) specialist reports
(ii) summary of all issues raised in public participation process and how these have been addressed by adoption or mitigation
(iii) impacts assessments and methods used to determine impacts
(iv) Comparative assessment of alternatives (including no action)
(v) Description of assumptions, uncertainties and gaps in knowledge
(vi) draft environmental management plan

Where submitted? DEA & DP, George office

The municipal official will be acting unlawfully if he or she approves the application without being satisfied that the NEMA minimum requirements for impact assessment have been satisfied. These include:

- investigating the potential impact, including the cumulative effects, of the activity and its alternatives;
- assessing the significance of the potential impact;
- investigating mitigation measures which minimise adverse environmental impacts;
- considering the option of not implementing the activity;
- ensuring that there is public participation, independent review and conflict resolution in all phases of the investigation and assessment of impacts; and
- ensuring that there is co-ordination and co-operation between organs of state where an activity falls within the jurisdiction of more than one organ of state.

3.5 Water Use Licence application

Prince Albert has an existing lawful right to use water. However the quantities used have greatly increased over time. Current registered groundwater use is 229,000 m^3/yr (627 m^3/day). The Artificial Recharge Feasibility study application involves the piping and injection of a maximum of 160,000 m^3 of river water into a borehole so as to store it for later abstraction and use. Storage of < 50,000 m^3 and storage of water below ground are excluded from the general authorization in terms of the National Water Act No. 36 OF 1998 revision26 March 2004, Notice No. 399 par 1.2) (DWAF 2004) and therefore trigger the requirement for a Water Use Licence application. Should the authorization meeting for Artificial Recharge require a Water Licence application, this process will involve the Determination by DWAF of the allocatable reserve of the Dorps River and associated aquifers (DWAF 1999 Water use licensing). “Reserve" means the quantity and quality of water required:

(a) to satisfy **basic human needs**, for people who are now or who will, in the reasonably near future, be (i) relying upon; (ii) taking water from; or (iii) being supplied from, the relevant water resource; and

(b) to **protect aquatic ecosystems** in order to secure ecologically sustainable development and use of the relevant water resource; (National Water Act 1998).

Application for a Water Use Licence should be made to the regional DWAF office in Oudtshoorn.

Regardless of the need for application of a Water Use Licence, it is recommended that the Dorps River be split at the furrow offtake point so as to allow a minimum of 20% of the minimum flow to continue downstream to feed the riparian ecosystem.

3.6 Appeals

According to the Western Cape DEA & DP guidelines on appears (2006) Notice of intention to appeal (on the official "*Notice of intention to Appeal*" form obtained from the Department's website at http://www.capegateway.gov.za/eadp).– must be lodged with the MEC within 10 days of being notified of the Department's decision not to grant permission for a listed activity to take place. All registered I &AP's/Applicant must be supplied with a copy of the notice of intention to appeal.

The appeal to the Minster for Environment, Planning and Economic Development, Cape Town must be submitted to the Department within 30 days of the notice of intention to appeal being lodged. It must be submitted on the official "*Appeal form in terms if NEMA and EIA regulations*" obtained from the Department's website at http://www.capegateway.gov.za/eadp

4. ENVIRONMENTAL OPPORTUNITIES & CONSTRAINTS

4.1 Opportunities related to Artificial Recharge

- Municipal will staff receive appropriate training for Artificial Recharge management, monitoring of water and vegetation resources, and with communicating the data to the public. Alternatively, a new technician is appointed to the Municipality.
- Regular feedback of information on borehole performance to public via notice boards, meetings, the Municipal bulletin and the local newspaper generates public awareness of water-resource management issues;
- The detailed geohydrological, ecological and economic investigation carried out for the Artificial Recharge feasibility study form a baseline for a water resource management strategy (see for example the Alice Springs Water Resource Strategy 2005 draft prepared to promote discussion and input from the community);
- Improved water resource management (efficient water transport from source, conservation, private rain water tanks, water-saving gardens) is in keeping with the constitutional requirement for environmental and intergenerational justice;
- Improved water security encourages economic development.

4.2 Constraints related to Artificial Recharge

- The Artificial Recharge feasibility study may reveal that the aquifers are unsuitable for recharge because the water is not retained for later abstraction, because water quality deteriorates, or because the availability of water is too low

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APPENDIX 1 CONTACT DETAILS FOR RELEVANT AUTHORITIES

Appeals in terms of NEMA and EIA regulations should be addressed to Provincial Minister for Environment, Planning and Economic Development, Private Bag X9186, CAPE TOWN, 8000, Fax: (021) 483-4174

Basic Assessment and EIA Application Forms and guidelines can be downloaded from DEA & DP **website http://www.westerncape.gov.za/eadp**

Environmental Assessment queries on should be directed to the Directorate: Integrated Environmental Management (Region A1) at: Department of Environmental Affairs and Development Planning, Private Bag X 6509, George, 6530. Street address Registry Office 4th Floor, York Park Building 93 York Street George. Tel: (044) 874-2160 Fax (021) 874-2423. For updates of documents see DEA & DP website **http://www.westerncape.gov.za/eadp** Contacts in the DEA & DP Environmental Impact Management office are:

Mr Yakeen Atwaru - Assistant Director: Environmental Impact Management (Central Region), tel (021) 483 2788, email yatwaru@pawc.wcape.gov.za.

Mr Francois Naude - Assistant Director: Environmental Impact Management (Southern Region), tel (044) 874 2160, email fnaude@pawc.wcape.gov.za.

Mr Danie Swanepoel dswanepo@pawc.wcape.gov.za,

Environmental Assessment Practitioners names of registered EAPs can be obtained from http://www.eapsa.co.za

Heritage Western Cape Contact person: Monique Coerecuis, Heritage Resource Council, Private Bag X9067, Cape Town, 8000, e-mail hwc@pgwc.gov.za TELEPHONE: 021 483 9695 FAX: 021 483 9842

Stream Flow Reduction Activities and Water Use Licence applications for registration and licensing of should be made to DWAF Regional Office, Oudtshoorn Contact Deon Haasbroek, e-mail HaasbrD@dwaf.gov.za, Tel 0834807577

APPENDIX 2: NEMA SECTION 28 DUTY OF CARE

M No. 19519 GOVERNME~ GUE~, 27 NOVEMBER 1998 Act No. 107, 1998 NATIONAL ENVIRONMENTAL MANAGEMENT ACT, 1998

COMPLIANCE. ENFORCEMENT AND PROTECTION

Part 1: Environmental hazards

Duty of care and remediation of environmental damage

28. (1) Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.

(2) Without limiting the generality of the duty in subsection (1), the persons on whom subsection (1) imposes an obligation to take reasonable measures. include an owner of land or premises, a person in control of land or premises or a person who has a right to use the land or premises on which or in which—
(a) any activity or process is or was performed or undertaken; or
(b) any other situation exists, which causes. has caused or is likely to cause significant pollution or degradation of the environment.

(3) The measures required in terns of subsection (1) may include measures
(a) investigate, assess and evaluate the impact on the environment:
(b) inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed in order to avoid causing significant pollution or degradation of the environment:
(c) cease, modify or control any act, activity or process causing the pollution or degradation;
(d) contain or prevent the movement of pollutants or the causant of degradation:
(e) eliminate any source of the pollution or degradation: or
(f) remedy the effects of the pollution or degradation. ~o

(4) The Director-General or a provincial head of department may, after consultation with any other organ of state concerned and after having given adequate opportunity to affected persons to inform him or her of their relevant interests. direct any person who fails to take the measures required under subsection (1) to
(a) investigate. evaluate and assess the impact of specific activities and report thereon:
(b) commence taking specific reasonable measures before a given date;
(c) diligently continue with those measures; and
(d) complete them before a specified reasonable date: Provided that the Director-General or a provincial head of department may. if urgent action is necessary for the protection of the environment. issue such directive. And consult and give such opportunity to inform as soon thereafter as is reasonable.

(5) The Director-General or a provincial head of department, when considering any measure or time period envisaged in subsection (4), must have regard to the following:
(a) the principles set out in section 2: 35
(b) the provisions of any adopted environmental management plan or environmental implementation plan:
(c) the severity of any impact on the environment and the costs of the measures being considered:
(d) any measures proposed b> the person on whom measures are to be imposed:
(e) the desirability of the State fulfilling its role as custodian holding the environment in public trust for the people:
(j) any other relevant factors.

(6) If a person required under this Act to undertake rehabilitation or other remedial work on the land of another. reasonably requires access to. use of or a limitation on use of that land in order to effect rehabilitation or remedial work. but is unable to acquire it on reasonable terms. the Minister may
(a) expropriate the necessary rights in respect of that land for the benefit of the person undertaking the rehabilitation or remedial work. who will then be vested with the expropriated rights: and
(b) recover from the person for whose benefit the expropriation was effected all costs incurred.

(7) Should a person fail to comply, or inadequately comply. with a directive under subsection (4), the Director-General or provincial head of department may take reasonable measures to remedy the situation.

(8) Subject to subsection (9), the Director-General or provincial head of department may recover all costs incurred as a result of it acting under subsection (7) from any or all of the following persons—

(a) any person who is or was responsible for. or who directly or indirectly contributed to, the pollution or degradation or the potential pollution or degradation:
(b) the owner of the land at the time when the pollution or degradation or the potential for pollution or degradation occurred. or that owner's successor in title;
(c) the person in control of the land or any person who has or had a right to use the land at the time when—
(i) the activity or the process is or was performed or undertaken: or
(ii) the situation came about: or
(d) any person who negligently failed to prevent—
(i) the activity or the process being performed or undertaken: or
(ii) the situation from coming about:
Provided that such person failed to take the measures required of him or her under subsection (1).

(9) The Director-General or provincial head of department may in respect of the recovery of costs under subsection (8). claim proportionally from any other person who benefited from the measures undertaken under subsection (7).

(10) The costs claimed under subsections (6). (8) and (9) must be reasonable and may include. without being limited to. labour. administrative and overhead costs. ~

(11) If more than one person is liable under subsection (8). the liability must be apportioned among the persons concerned according to the degree to which each was responsible for the harm to the environment resulting from their respective failures to take the measures required under subsections (I) and (4).

(12) Any person may. after giving the Director-Gen] or provincial head of department 30 days' notice. apply to a competent court for an order directing the Director-General or any provincial head of department to take any of the steps listed in subsection (4) if the Director-General or provincial head of department fails to inform such person in writing that he or she has directed a person contemplated in subsection (8) to take one of those steps. and the provisions of section 32(2) and (3) shall apply to such proceedings with the necessary changes.(13) When considering arty application in terms of subsection (12). the court must take into account the factors set out in subsection (5).

APPENDIX 3 PUBLIC PARTICIPATION PROCESSES

(Sections 56-59 of Government Notice R358)

56. (1) This regulation only applies where specifically required by a provision of these Regulations.
(2) The person conducting a public participation process must take into account any guidelines applicable to public participation and must give notice to all potential interested and affected parties of the application which is subjected to public participation by –
(a) fixing a notice board at a place conspicuous to the public at the boundary or on the fence of -
(i) the site where the activity to which the application relates is or is to be undertaken; and
(ii) any alternative site mentioned in the application;
(b) giving written notice to –
(i) the owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site;
(ii) the owners and occupiers of land within 100 metres of the boundary of the site or alternative site who are or may be directly affected by the activity;
(iii) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represents the community in the area;
(iv) the municipality which has jurisdiction in the area; and
(v) any organ of state having jurisdiction in respect of any aspect of the activity;
(c) placing an advertisement in –
(i) one local newspaper; or
(ii) any official *Gazette* that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations; and
(d) placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or local municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official *Gazette* referred to in subregulation (c)(ii).
(3) A notice, notice board or advertisement referred to in subregulation (2) must –
(a) give details of the application which is subjected to public participation; and
(b) state –
(i) that the application has been or is to be submitted to the competent authority in terms of these Regulations, as the case may be;
(ii) whether basic assessment or scoping procedures are being applied to the application, in the case of an application for environmental authorisation;
(iii) the nature and location of the activity to which the application relates;
(iv) where further information on the application or activity can be obtained; and
(v) the manner in which and the person to whom representations in respect of the application may be made.
(4) A notice board referred to in subregulation (2) must –
(a) be of a size at least 60cm by 42cm; and
(b) display the required information in lettering and in a format as may be determined by the competent authority .
(5) If an application is for a linear or ocean-based activity and strict compliance with subregulation (2) is inappropriate, the person conducting the public participation process may deviate from the requirements of that subregulation to the extent and in the manner as may be agreed to by the competent authority.
(6) When complying with this regulation, the person conducting the public participation process must ensure that –
(a) information containing all relevant facts in respect of the application is made available to potential interested and affected parties; and
(b) participation by potential interested and affected parties is facilitated in such a manner that all potential interested and affected parties are provided with a reasonable opportunity to comment on the application.

Register of interested and affected parties

57. (1) An applicant or EAP managing an application must open and maintain a register which contains the names and addresses of –
(a) all persons who, as a consequence of the public participation process conducted in respect of that application in terms of regulation **56**, have submitted written comments or attended meetings with the applicant or EAP;

(b) all persons who, after completion of the public participation process referred to in paragraph (a), have requested the applicant or the EAP managing the application, in writing, for their names to be placed on the register; and
(c) all organs of state which have jurisdiction in respect of the activity to which the application relates.
(2) An applicant or EAP managing an application must give access to the register to any person who submits a request for access to the register in writing.

Registered interested and affected parties entitled to comment on submissions
58. (1) A registered interested and affected party is entitled to comment, in writing, on all written submissions made to the competent authority by the applicant or the EAP managing an application, and to bring to the attention of the competent authority any issues which that party believes may be of significance to the consideration of the application, provided that –
(a) comments are submitted within –
(i) the timeframes that have been approved or set by the competent authority; or
(ii) any extension of a timeframe agreed to by the applicant or EAP;
(b) a copy of comments submitted directly to the competent authority is served on the applicant or EAP; and
(c) the interested and affected party discloses any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application.
(2) Before the EAP managing an application for environmental authorisation submits a report compiled in terms of these Regulations to the competent authority, the EAP must give registered interested and affected parties access to, and an opportunity to comment on the report in writing.
(3) Reports referred to in subregulation (2) include –
(a) basic assessment reports;
(b) basic assessment reports amended and resubmitted in terms of regulation **25** (4);
(c) scoping reports;
(d) scoping reports amended and resubmitted in terms of regulation **31**(3);
(e) specialist reports and reports on specialised processes compiled in terms of regulation **33**;
(f) environmental impact assessment reports submitted in terms of regulation **32**; and
(g) draft environmental management plans compiled in terms of regulation
(4) Any written comments received by the EAP from a registered interested and affected party must accompany the report when the report is submitted to the competent authority.
(5) A registered interested and affected party may comment on any final report that is submitted by a specialist reviewer for the purposes of these Regulations where the report contains substantive information which has not previously been made available to a registered interested and affected party.

Comments of interested and affected parties to be recorded in reports submitted to competent authority
59. The EAP managing an application for environmental authorisation must ensure that the comments of interested and affected parties are recorded in reports submitted to the competent authority in terms of these Regulations: Provided that any comments by interested and affected parties on a report which is to be submitted to the competent authority may be attached to the report without recording those comments in the report itself.

APPENDIX 4: BASIC ASSESSMENT PROCEDURE

Complete forms 1, 2, 3 downloadable from **http://www.westerncape.gov.za/eadp**

1. Notice of intend to submit an application in terms of regulation 22 (b) of Government Notice R385 (APPENDIX 5)
2. Application in terms of the National Environmental Management Act (APPENDIX 6)
3. Basic Assessment Report (APPENDIX 7)

STEPS TO BE TAKEN BEFORE SUBMISSION OF APPLICATION

[DEAT 2006. Regulations *in terms of Chapter 5 of the National Environmental Management Act, 1998*. No. R. 385 Department of Environment and Tourism, 21 April 2006.]

22. If basic assessment must be applied to an application, the Environmental Assessment Practitioner (EAP) managing the application must before submitting the application to the competent authority –
(a) conduct at least a public participation process as set out in regulation
(b) give notice, in writing, of the proposed application to –
(i) the competent authority; and
(ii) any organ of state which has jurisdiction in respect of any aspect of the activity;
(c) open and maintain a register of all interested and affected parties in respect of the application in accordance with regulation;
(d) consider all objections and representations received from interested and affected parties following the public participation process conducted in terms of paragraph (a), and subject the proposed application to basic assessment by assessing –
(i) the potential impacts of the activity on the environment;
(ii) whether and to what extent those impacts can be mitigated; and
(iii) whether there are any significant issues and impacts that require further investigation;
(e) prepare a basic assessment report in accordance with regulation; and
(f) give all registered interested and affected parties an opportunity to comment on the basic assessment report in accordance with regulation

Content of basic assessment reports

23. (1) The EAP managing an application to which this Part applies must prepare a basic assessment report in a format published by, or obtainable from, the competent authority.
(2) A basic assessment report must contain all the information that is necessary for the competent authority to consider the application and to reach a decision contemplated in regulation, and must include –
(a) details of –
(i) the EAP who prepared the report; and
(ii) the expertise of the EAP to carry out basic assessment procedures;
(b) a description of the proposed activity;
(c) a description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is –
(i) a linear activity, a description of the route of the activity; or
(ii) an ocean-based activity, the coordinates within which the activity is to be undertaken;
(d) a description of the environment that may be affected by the proposed activity and the manner in which the geographical, physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;
(e) an identification of all legislation and guidelines that have been considered in the preparation of the basic assessment report;
(f) details of the public participation process conducted in terms of regulation **22**(a) in connection with the application, including –
(i) the steps that were taken to notify potentially interested and affected parties of the proposed application;
(ii) proof that notice boards, advertisements and notices notifying potentially interested and affected parties of the proposed application have been displayed, placed or given;
(iii) a list of all persons, organisations and organs of state that were registered in terms of regulation as interested and affected parties in relation to the application; and
(iv) a summary of the issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues;
(g) a description of the need and desirability of the proposed activity and any identified alternatives to the proposed activity that are feasible and reasonable, including the advantages and disadvantages that the proposed activity or alternatives will have on the environment and on the community that may be affected by the activity;

(h) a description and assessment of the significance of any environmental impacts, including cumulative impacts, that may occur as a result of the undertaking of the activity or identified alternatives or as a result of any construction, erection or decommissioning associated with the
undertaking of the activity;
(i) any environmental management and mitigation measures proposed by the EAP;
(j) any inputs made by specialists to the extent that may be necessary; and
(k) any specific information required by the competent authority.
(3) In addition, a basic assessment report must take into account –
(a) any relevant guidelines; and
(b) any practices that have been developed by the competent authority in respect of the kind of activity which is the subject of the application.

Submission of application to competent authority
24. After having complied with regulation **22**, the EAP managing the application may –
(a) complete the application form for environmental authorisation of the relevant activity; and
(b) submit the completed application form to the competent authority, together with –
(i) the basic assessment report;
(ii) copies of any representations, objections and comments received in connection with the application or the basic assessment report;
(iii) copies of the minutes of any meetings held by the EAP with interested and affected parties and other role players which record the views of the participants;
(iv) any responses by the EAP to those representations, objections, comments and views;
(v) a declaration of interest by the EAP on a form provided by the competent authority; and
(vi) the prescribed application fee, if any, and any documents referred to in regulation **13**(2)(b).

Consideration of applications
25. (1) A competent authority must within 30 days of acknowledging receipt of an application in terms of regulation **14**(2)(a), consider the application and the basic assessment report.
(2) If the competent authority is unable to decide the application on the basic assessment report alone, the competent authority must request the EAP managing the application –
(a) to submit such additional information as the competent authority may require;
(b) to submit a report on any specialist study or specialised process as the competent authority may require in relation to any aspect of the proposed activity;
(c) to suggest, consider or comment on feasible and reasonable alternatives; or
(d) to subject the application to scoping and environmental impact assessment.
(3) The competent authority may reject the basic assessment report if –
(a) it does not comply with regulation **23** in a material respect; or
(b) it is based on an insufficient public participation process.
(4) (a) A basic assessment report that has been rejected in terms of subregulation (3), may be amended and resubmitted by the EAP to the competent authority.
(b) Comments that are made by interested and affected parties in respect of an amended basic assessment report must be attached to the report, but the EAP need not make further changes to the report in response to such comments.
(5) On receipt of any information, reports, suggestions or comments requested in terms of subregulation (2)(a), (b) or (c) or any amended basic assessment report submitted in terms of subregulation (4), as the case may be, the competent authority must reconsider the application.
(6) If the competent authority requests in terms of subregulation (2) (d) that the application be subjected to scoping, the application must be proceeded with in accordance with regulations **30**, **31**, **32**, **33**, **34**, **35** and **36**.

Decision on applications
26. (1) A competent authority must within 30 days of acknowledging receipt of an application in terms of regulation **14** or, if regulation **25**(2)(a), (b) or (c) has been applied or if the basic assessment report has been rejected in terms of regulation **25**(3), within 30 days of receipt of the required information,
reports, suggestions or comments or the amended basic assessment report, in writing –
(a) grant authorisation in respect of all or part of the activity applied for; or
(b) refuse authorisation in respect of all or part of the activity.
(2) To the extent that authorisation is granted for an alternative, such alternative must for the purposes of subregulation (1) be regarded as having been applied for.
(3) On having reached a decision, the competent authority must comply with regulation **10**(1).

APPENDIX 5 (TO ACCOMPANY BASIC ASSESSMENT APPLICATIONS)
Notice of intent to submit an application in terms of 22b of Government notice R385

APPENDIX 6 (TO ACCOMPANY BASIC ASSESSMENT AND EIA APPLICATIONS)
Application for authorisation in terms of the National Environmental Management Act
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APPENDIX 7 BASIC ASSESSMENT REPORT (JULY 2006)
Basic Assessment Report in terms of the National Environmental Act
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APPENDIX 8 NATIONAL HERITAGE RESOURCES ACT 25 OF 1999

This Act may be applicable to Artificial Recharge if the pumps, pipes or canal in any way affect the historic Swartberg Pass or views from the Pass. Written comment from Heritage Western Cape must therefore be obtained as part of the public participation process. Section 38 of the Act states as follows:
38. (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as-

(a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;
(b) the construction of a bridge or similar structure exceeding 50m in length;
(c) any development or other activity which will change the character of a site-
(i) exceeding 5 000 m2 in extent; or
(ii) involving three or more existing erven or subdivisions thereof; or
(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or
(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;
(d) the re-zoning of a site exceeding 10 000 m2 in extent; or
(e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

Heritage Western Cape

The Built Environment and Landscape Committee (BELCOM) is responsible for considering applications for permits and approvals including formally declaring provincial heritage sites, heritage areas, public monuments and memorials and structures older than 60 years. The Committee also considers proposals regarding heritage resource management for certain categories of development and comments on applications in terms of the Environmental Conservation Act, 73 of 1989.

Heritage Western Cape was established as the provincial heritage resources authority for the province in terms of the National Heritage Resources Act, 25 of 1999. It is responsible for promoting co-operation between national, provincial and local authorities for the identification, conservation and management of heritage resources for all communities in the Western Cape.

APPENDIX 9. SCOPING AND ENVIRONMENTAL IMPACT ASSESSMENT

see DEAT 2006 Regulation R385 or For more information see
http://www.capegateway.gov.za/eng/yourgovernment/gsc/406/services/11537/10199

Submission of application to competent authority
27. If scoping must be applied to an application, the EAP managing the application must –
(a) complete the **application form for environmental authorisation** of the relevant activity; and
(b) submit the completed application form to the competent authority, together with –
(i) a declaration of interest by the EAP on a form provided by the competent authority; and
(ii) the prescribed application fee, if any, and any documents referred to in regulation **13**(2)(b) (see box below)

APPLICATIONS FOR ENVIRONMENTAL AUTHORISATIONS
Part 1: General matters
Applications
13. (1) An application for environmental authorisation of an activity must be made to the competent authority referred to in regulation **3**.
(2) An application must –
(a) be made on an **official application form** published by or obtainable from the relevant competent authority; and
(b) when submitted in terms of regulation **24**(b) or **27**(b) be accompanied by –
(i) the written **consent of the owner** referred to in regulation **16**(1) or proof that regulation **16**(3) has been complied with, if the applicant is not the owner of the land on which the activity is to be undertaken; and
(ii) the prescribed **application fee**, if any.

Steps to be taken after submission of application
28. After having submitted an application, the EAP managing the application must –
(a) conduct at least the **public participation** process set out in regulation;
(b) give notice, in writing, of the proposed application to any organ of state which has jurisdiction in respect of any aspect of the activity;
(c) open and maintain a register of all interested and affected parties in respect of the application in accordance with regulation;
(d) consider all objections and representations received from interested and affected parties following the public participation process;
(e) subject the application to scoping by identifying –
(i) issues that will be relevant for consideration of the application;
(ii) the potential environmental impacts of the proposed activity; and
(iii) alternatives to the proposed activity that are feasible and reasonable;
(f) prepare a scoping report in accordance with regulation **29**; and
(g) give all registered interested and affected parties an opportunity to comment on the scoping report in accordance with regulation **58**.

Content of scoping reports
29. (1) A scoping report must contain all the information that is necessary for a proper understanding of the nature of issues identified during scoping, and must include –
(a) details of –
(i) the EAP who prepared the report; and
(ii) the expertise of the EAP to carry out scoping procedures;
(b) a description of the proposed activity and of any feasible and reasonable alternatives that have been identified;
(c) a description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is –
(i) a linear activity, a description of the route of the activity; or
(ii) an ocean-based activity, the coordinates where the activity is to be undertaken;
(d) a description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;

(e) an identification of all legislation and guidelines that have been considered in the preparation of the scoping report;
(f) a description of environmental issues and potential impacts, including cumulative impacts, that have been identified;
(g) information on the methodology that will be adopted in assessing the potential impacts that have been identified, including any specialist studies or specialised processes that will be undertaken;
(h) details of the public participation process conducted in terms of regulation **28**(a), including –
(i) the steps that were taken to notify potentially interested and affected parties of the application;
(ii) proof that notice boards, advertisements and notices notifying potentially interested and affected parties of the application have been displayed, placed or given;
(iii) a list of all persons or organisations that were identified and registered in terms of regulation **57** as interested and affected parties in relation to the application; and
(iv) a summary of the issues raised by interested and affected parties, the date of receipt of and the response of the EAP to those issues;
(i) a **plan of study for environmental impact assessment** which sets out the proposed approach to the environmental impact assessment of the application, which must include –
(i) a description of the tasks that will be undertaken as part of the environmental impact assessment process, including any **specialist reports** or specialised processes, and the manner in which such tasks will be undertaken;
(ii) an indication of the stages at which the competent authority will be consulted;
(iii) a description of the proposed method of assessing the environmental issues and alternatives, including the option of not proceeding with the activity; and
(iv) particulars of the **public participation process** that will be conducted during the environmental impact assessment process; and
(j) any specific information required by the competent authority.
(2) In addition, a scoping report must take into account any guidelines applicable to the kind of activity which is the subject of the application.

Submission of scoping reports to competent authority
30. The EAP managing an application must submit the scoping report compiled in terms of regulation **28**(f) to the competent authority, together with –
(a) copies of any representations, objections and comments received in connection with the application or the scoping report from interested and affected parties;
(b) copies of the minutes of any meetings held by the EAP with interested and affected parties and other role players which record the views of the participants; and
(c) any responses by the EAP to those representations, objections, comments and views.

Consideration of scoping reports
31. (1) The competent authority must, within 30 days of receipt of a scoping report, consider the report, and in writing –
(a) accept the report and the plan of study for environmental impact assessment contained in the report and advise the EAP to proceed with the tasks contemplated in the plan of study for environmental impact assessment;
(b) request the EAP to make such amendments to the report or the plan of study for environmental impact assessment as the competent authority may require;
(c) reject the scoping report or the plan of study for environmental impact assessment if it –
(i) does not contain material information required in terms of these Regulations; or
(ii) has not taken into account guidelines applicable in respect of scoping reports and plans of study for environmental impact assessment.
(2) In addition to complying with subregulation (1), the competent authority may advise the EAP of any matter that may prejudice the success of the application.
(3) A scoping report or plan of study for environmental impact assessment that has been rejected by the competent authority in terms of subregulation (1)(d) may be amended and resubmitted by the EAP.
(4) On receipt of the amended scoping report or plan of study for environmental impact assessment, the competent authority must reconsider the scoping report or plan of study for environmental impact assessment in accordance with subregulation (1).

Environmental impact assessment reports

32. (1) If a competent authority accepts a scoping report and advises the EAP in terms of regulation **31**(1)(a) to proceed with the tasks contemplated in the plan of study for environmental impact assessment, the EAP must proceed with those tasks, including the public participation process for environmental impact assessment referred to in regulation **29**(1)(i)(iv) and prepare an environmental impact assessment report in respect of the proposed activity.

(2) An environmental impact assessment report must contain all information that is necessary for the competent authority to consider the application and to reach a decision contemplated in regulation **36**, and must include –

(a) details of –

(i) the EAP who compiled the report; and

(ii) the expertise of the EAP to carry out an environmental impact assessment;

(b) a detailed description of the proposed activity;

(c) a description of the property on which the activity is to be undertaken and the location of the activity on the property, or if it is –

(i) a linear activity, a description of the route of the activity; or

(ii) an ocean-based activity, the coordinates where the activity is to be undertaken;

(d) a description of the environment that may be affected by the activity and the manner in which the physical, biological, social, economic and cultural aspects of the environment may be affected by the proposed activity;

(e) details of the public participation process conducted in terms of subregulation (1), including –

(i) steps undertaken in accordance with the plan of study;

(ii) a list of persons, organisations and organs of state that were registered as interested and affected parties;

(iii) a summary of comments received from, and a **summary of issues** raised by registered interested and affected parties, the date of receipt of these comments and the response of the EAP to those comments; and

(iv) copies of any representations, objections and comments received from registered interested and affected parties;

(f) a description of the need and desirability of the proposed activity and identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity;

(g) an indication of the **methodology used in determining the significance** of potential environmental impacts;

(h) a description and comparative assessment of all alternatives identified during the environmental impact assessment process;

(i) a summary of the findings and recommendations of any **specialist report** or report on a specialised process;

(j) a description of all environmental issues that were identified during the environmental impact assessment process, an assessment of the significance of each issue and an indication of the extent to which the issue could be addressed by the adoption of mitigation measures;

(k) an assessment of each identified potentially significant impact, including –

(i) cumulative impacts;

(ii) the nature of the impact;

(iii) the extent and duration of the impact;

(iv) the probability of the impact occurring;

(v) the degree to which the impact can be reversed;

(vi) the degree to which the impact may cause irreplaceable loss of resources; and

(vii) the degree to which the impact can be mitigated;

(l) a description of any assumptions, uncertainties and gaps in knowledge;

(m) an opinion as to whether the activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;

(n) an environmental impact statement which contains –

(i) a summary of the **key findings of the environmental impact assessment**; and

(ii) a comparative assessment of the positive and negative implications of the proposed activity and identified alternatives;

(o) a **draft environmental management plan** that complies with regulation **34**;

(p) copies of any specialist reports and reports on specialised processes complying with regulation **33**; and

(q) any specific information that may be required by the competent authority.

Specialist reports and reports on specialised processes
33. (1) An applicant or the EAP managing an application may appoint a person who is independent to carry out a specialist study or specialized process.
(2) A specialist report or a report on a specialised process prepared in terms of these Regulations must contain –
(a) details of –
(i) the person who prepared the report; and
(ii) the expertise of that person to carry out the specialist study or specialised process;
(b) a declaration that the person is independent in a form as may be specified by the competent authority;
(c) an indication of the scope of, and the purpose for which, the report was prepared;
(d) a description of the methodology adopted in preparing the report or carrying out the specialised process;
(e) a description of any assumptions made and any uncertainties or gaps
in knowledge;
(f) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives, on the environment;
(g) recommendations in respect of any mitigation measures that should be considered by the applicant and the competent authority;
(h) a description of any consultation process that was undertaken during the course of carrying out the study;
(i) a summary and copies of any comments that were received during any consultation process; and
(j) any other information requested by the competent authority.

Content of draft environmental management plans
34. A draft environmental management plan must include –
(a) details of –
(i) the person who prepared the environmental management plan; and
(ii) the expertise of that person to prepare an environmental management plan;
(b) information on any proposed management or mitigation measures that will be taken to address the environmental impacts that have been identified in a report contemplated by these Regulations, including environmental impacts or objectives in respect of –
(i) planning and design;
(ii) pre-construction and construction activities;
(iii) operation or undertaking of the activity;
(iv) rehabilitation of the environment; and
(v) closure, where relevant.
(c) a detailed description of the aspects of the activity that are covered by the draft environmental management plan;
(d) an identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b);
(e) where appropriate, time periods within which the measures contemplated in the draft environmental management plan must be implemented; and
(f) proposed mechanisms for monitoring compliance with the environmental management plan and reporting thereon.

Consideration of environmental impact assessment reports
35. (1) The competent authority must, within 60 days of receipt of an environmental impact assessment report, in writing –
(a) accept the report;
(b) notify the applicant that the report has been referred for specialist review in terms of section 24I of the Act ;
(c) request the applicant to make such amendments to the report as the competent authority may require for acceptance of the environmental impact assessment report; or
(d) reject the report if it does not comply with regulation **32**(2) in a material respect.
(2) (a) An environmental impact assessment report that is rejected in terms of subregulation (1)(d) may be amended and resubmitted by the EAP.

(b) On receipt of the amended report, the competent authority must reconsider the report in accordance with subregulation (1).

Decision on applications
36. (1) A competent authority must within 45 days of acceptance of an environmental impact assessment report in terms of regulation **35** or, if the report was referred for specialist review in terms of section 24I of the Act, within 45 days of receipt of the findings of the specialist reviewer, in writing –
(a) grant authorisation in respect of all or part of the activity applied for; or
(b) refuse authorisation in respect of all or part of the activity.
(2) To the extent that authorisation is granted for an alternative,
such alternative must for the purposes of subregulation (1) be regarded as having been applied for.
(3) On having reached a decision, the competent authority must comply with regulation **10**(1).

APPENDIX 10. PROJECT PLAN FOR PHASE I (ASSUMING BASIC ASSESSMENT IS REQUIRED)

TASK	Description of tasks required from pre-feasibility study to implementation of Artificial Recharge Feasibility study See Assumptions below	Responsibility	W 1	W 2	W 3	W 4	W k5	W 6	W 7	W 8	k 9	W 10	W 11	W 12	W 13	W 14	W 15	W 16	W 17	W 18	W 18	W 19	W 20	Wk 21
1	Conduct pre-feasibility study	RM for PAM																						
2	Submit pre-feasibility study simultaneously to DWAF (Oudtshoorn) and DEA&DP (George)	RM for PAM	x																					
3	Authorities meeting to decide on conditions for feasibility study	DWAF & DEA& DP		x	x	x																		
4	Appoint EAP	PAM					x																	
5	Submit of "Notice of intent to submit application" to DEA & DP	EAP						x																
6	Start public participation process 14 days after submitting notice of intent	EAP									x	public commenting period 30 days												
7	Notify owners of intention to conduct Basic Assessment																							
8	Obtain permission of landowners for Municipal representatives to access boreholes and conduct feasibility study.																							
9	Collate and respond to public comments	EAP														x	x	x						
10	Appoint specialists Heritage and Visual determine whether Heritage Western Cape (HWC) application is triggered by possible impacts on heritage resources. If so prepare application to HWC	EAP																	Specialists complete reports					

TASK	Description of tasks required from pre-feasibility study to implementation of Artificial Recharge Feasibility study See Assumptions below	Respon sibility	W 1	W 2	W 3	W 4	W k5	W 6	W 7	W 8	k 9	W 10	W 11	W 12	W 13	W 14	W 15	W 16	W 17	W 18	W 18	W 19	W 20	Wk 21
11	Conduct study of investing cost, feasibility, impacts of activity alternatives including a) use of water from Oukloof Dam, b) water extraction from sand in Dorpsrivier, c) new above-ground or underground	EAP																	x					
12	Appoint specialist to peer review baseline vegetation study (e.g. D . Le Maitre, CSIR), and other specialist reports																			x				
13	Complete BA or EIA and submit to DEA & DP	EAP																			x			
14	Authorities review application for feasibility study and return record of decision with conditions under which it may be conducted.	DEA& DP, DWAF																				Decisio n		
15	Municipality appoints Geohydrologist to initiate feasibility study, makes people and other resources available for the pilot project.	PAM																						Imple-ment-ation
16	Initiate training and activities to implement feasibility study	RM for PAM																						

Assumption 1: Only Basic Assessment is required to make a decision on implementation of the full feasibility study
Assumption 2. No water Use Licence is required for feasibility study
Assumption 3: Baseline vegetation survey is adequate for initiating feasibility study
Assumption 4. A desktop study of alternatives is adequate for initiating feasibility study

Appendix 4. DWAF Authorisation

DWAF authorisation to conduct borehole injection tests

REPUBLIC OF SOUTH AFRICA : REPUBLIEK VAN SUID AFRICA
DEPARTMENT OF WATER AFFAIRS : DEPARTEMENT VAN WATERWESE
Private Bag X16, Sanlamhof, 7532
17 Strand Street, Bellville, 7530
Tel: (021) 950 7100 Fax: (021) 950 7224

Enquiries: M C Smart
Reference: 19/4/1/1/K60G
19/4/1/1/J23F

10 July 2007

Groundwater Africa
Box 162
Lyendoch
7603

REQUEST TO CONDUCT INJECTION TESTS IN PLETTENBERG BAY AND PRINCE ALBERT

The Department approves the feasibility testing as requested in your letter of 12 June 2007.

A condition is that DWAF and DEADP are invited to an onsite meeting prior to commencement of testing so that any inputs to the monitoring plan can be made.

pp 10/7/2007.

Chief Director
DWAF
Bellville

GROUNDWATERAFRICA
GWA CONSULTING HYDROGEOLOGISTS cc T\A
Reg. No.: CK 2004-059516-23

PO Box 162
Lynedoch
7603

Mr M Smart
DWAF
Private Bag X16
Bellville
7532

12 June 2007

Dear Mr Smart

REQUEST TO CONDUCT BOREHOLE INJECTION TESTS IN PRINCE ALBERT

The Prince Albert Municipality would like to conduct borehole injection tests on three boreholes during July and August 2007. This follows on from the Artificial Recharge Pre-feasibility study (see attached) conducted by Groundwater Africa in 2006, the intensive groundwater monitoring programme that has been carried out since July 2006, and after addressing all the issues raised in the Artificial Recharge Pre-feasibility study. A Feasibility Report is planned for September 2007 after conducting the borehole injection tests.

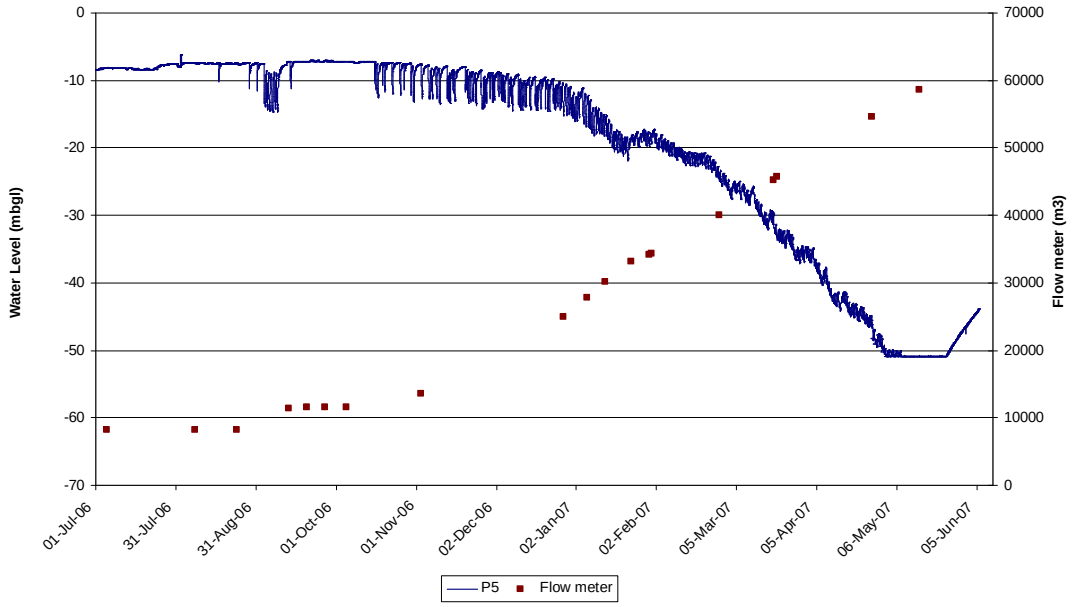
Key points are:

1. Only the aquifer near town has been identified for artificial recharge. The water levels in this aquifer dropped by about 40 m during the summer months. The aquifer to the south, at the base of the Swartberg Mountains, shows no signs at all of stress – artificial recharge is not needed in these areas.
2. In order to meet the summer demand, the municipality has historically dropped the water levels in the artificial recharge-targeted area. This is known from past borehole water level measurements (of which there are only a few), and from the pump operator who says that the boreholes "run dry" during summer (ie water levels are drawn down to pump intakes).
3. Three boreholes have been identified for recharge – they are called Pumps 5, 6 & 7. The injection capacities for each are estimated at about 5 - 10 L/s.
4. The planned injection volume is around 50,000 m^3. Ideally it would be better to inject about double this as this is the volume of surface water available for recharge and the volume of water that was abstracted from these boreholes this summer. But the boreholes are now being rested, and because of the good rains last year, the summer abstraction started at "aquifer full-levels", and by the time of the planned injection tests, I estimate that 50,000 m^3 of aquifer space, at the most, will be available for recharge.
5. The source water (the injectant) would be untreated river water that is diverted down an existing furrow. Its quality is suitable for injection. This is described in the Pre-feasibility Report, and it is currently being updated with new data. Key factors are EC, DOC, Fe and turbidity. The source water has an EC of ~ 4 mS/m, DOC of < 1, Fe of < 0.2 and is absolutely clear. This is perfect artificial recharge source water and fortunately treatment is not necessary. If the water becomes turbid during the injection test due to a rain-storm, the injection will be stopped immediately. Note that the water quality data in the Pre-feasibility Report has been updated, and this is available on request.
6. Blending of waters in the aquifer has been studied, and no problems are anticipated in this regard (please refer to the Pre-feasibility Report).
7. Two new monitoring boreholes will be drilled near each injection borehole – one shallow and one deep. DWAF is doing this and they (DWAF, Pretoria) have awarded the drilling

tender and drilling is due to start within a week or so. These boreholes will be closely monitored during the injection tests.

8. An environmental study was conducted by Professor S Milton (see attached). She met with DEAT officials in George and concluded that no environmental authorisation is needed for artificial recharge testing.
9. Borehole water levels, injection rates and volumes, and injectant water quality will be monitored at regular intervals during the injection tests.
10. The tests to be carried out will include step injection and constant injection tests. The step injection tests will typically consist of 4-hour steps; and the constant rate injection tests will continue for as long as water is available for recharge (estimated to be 4 weeks; or when water levels near "aquifer full" levels). A recovery period of a few months will be held before the usual summer abstraction begins. During this recovery period water quality and water levels will be monitored.
11. Following the injection tests a Feasibility Study Report will be written, where recommendations regarding the next step, the Production Phase, are made. At this stage a licence application will be made to DWAF if the project is to continue.
12. Currently the Prince Albert Municipality abstracts more water than the Registered Use. The actual figure for the past year will be available soon, but it is already evident that the town will exceed the Registered Use, of 229,000 m^3. Once I have collated all the data and established the optimum annual abstraction volumes from each borehole, I will recommend to the Prince Albert Municipality that they apply for an increase in the Registered Use (graphs for each borehole showing water levels and abstraction will accompany the request).
13. It is evident that because the town relies so heavily on groundwater that all efforts must be made to maximise both surface and groundwater resources in a sustainable and environmentally acceptable manner. The artificial recharge project aims to assist in achieving this.

An example of one of the planned artificial recharge boreholes is Pump 5 shown below. Note that the water level was drawn down to pump intake in May 2007. The water level is now rising because the borehole is being rested. While this year it may recover to "aquifer full" levels without artificial recharge because the aquifer was full prior to this year's abstraction (last year's rainfall was exceptional), in future it may require recharging.



In summary, this request is to conduct borehole injection tests to establish the feasibility of artificially recharging a particular aquifer in Prince Albert. The source water for injection will be from the furrow which is an existing lawful use, and the planned injection volume will be in the order of 50,000 m^3. The tests are planned for July and August 2007.

If there are any aspects of the injection tests that you would like to discuss with me, please let me know. I can assure you that the tests will be carried out in a responsible manner with on-site supervision, and that the necessary monitoring data will be collected and reported on in the Feasibility Report.

Yours sincerely

Dr EC "Ricky" Murray
Project Manager

cc Mr E September (Prince Albert Municipality)