INSTITUTE FOR ENVIRONMENTAL & COASTAL MANAGEMENT
ENVIRONMENTAL CONSULTING AND RESEARCH

ALBANY COAST WATER BOARD

Upgrade of Kenton-on-Sea/Bushmansrivermouth

Bulk Water Supply

Environmental Scoping Report

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October 2004

IECM Report No. C84

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GLOSSARY

Environment	The external circumstances, conditions and objects that affect the existence and development of an individual, organism or group. These circumstances include biophysical, social, economic, historical and cultural aspects.
Environmental Impact Assessment	A study of the environmental consequences of a proposed course of action.
Scoping	A procedure to consult with stakeholders to determine issues and concerns and for determining the extent of and approach to an EIA, used to focus the EIA.
Scoping Report	A written report describing the issues identified to date for inclusion in an EIA.

ABBREVIATIONS

ACWB	The Albany Coast Water Board
DEAE&T	Department of Economic Affairs Environment and Tourism
DWAF	Department of Water Affairs and Forestry
ECA	Environmental Conservation Act
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMP	Environmental Management Plan
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IECM	Institute for Environmental & Coastal Management
IEM	Integrated Environmental Management
KOS/BRM	Kenton-on-Sea/Bushmansrivermouth
NEMA	National Environmental Management Act
PPP	Public Participation Process
RO	Reverse Osmosis

1. INTRODUCTION

1.1. The ACWB

The Albany Coast Water Board (ACWB) came into being in 1982 as a National Government Business Enterprise responsible for supplying water of an adequate and sustainable quality to all members of the community within its area. The area of jurisdiction of the Board comprises the greater Kenton-on-Sea and Bushmansrivermouth community, extending along the coast from just east of the Kariega River mouth to just west of Boknes, and some 10 km inland from the coast.

Before delivery to the community, the ACWB blends water from a variety of sources. The variety of these water sources was developed over the years and became necessary in order to keep up with the ever increasing demand for water from a growing human population. Freshwater is drawn from the Dias Cross coastal aquifer at Kwaaihoek from 7 wells. This water is pumped via a 9 km pipeline to the ACWB. Seawater is abstracted from 8 wells/boreholes adjacent to the mouth of the Bushmans Estuary, which is fed into the Reverse Osmosis (RO) plants for desalination. The purified product is then mixed with the Kwaaihoek water and piped to the customers. Brine is a by-product of the desalination process. The brine produced by the RO plants is being discharged into the Bushmans River estuary by way of two adjacent pipelines at the Deacon sandbag wall on the western shore of the river. The older pipeline serving RO1 is inoperative at present because its associated plant was shut down for refurbishment in 2002. The newer discharge pipeline is operative and serves both RO2 and RO3. Owing to the severe drawdown in the supply wells, there is a shortage of seawater for the RO plants, requiring the construction of an alternate seawater intake from the Bushmans River. Growing demand for potable water also necessitates to increase the output of the RO plants.

1.2. Background to the study

The Institute for Environmental & Coastal Management (IECM) was commissioned by the ACWB to conduct the environmental scoping study for the new seawater intake and new RO plant infrastructure that was being proposed. A scheme for the abstraction and utilisation of ground or surface water for bulk supply purposes is a ‘listed activity’ in terms of the Environmental Conservation Act of 1989 and requires an Environmental Impact Assessment. During public scoping conducted by the IECM for the upgrade of the bulk water system, it came to the fore that several structures commissioned by the ACWB over the years during their ongoing expansion programme of the bulk water system (= the waterworks) were not subjected to an EIA process and are thus operating without the required permit from DEAE&T. This is in violation of environmental legislation. Acting on this information, DEAE&T issued a notice in terms of Section 28(4) of the National Environmental Management Act, directing the ACWB to

"investigate, evaluate and assess the impacts of these activities on the environment" (see Appendix K for a copy of the Notice). As its response to the NEMA Notice, the ACWB then asked the IECM to consider in the Scoping Study the impact on the environment of all of its present operation. This would include infrastructure (wells, pipes, buildings etc.) dating from before the ECA (1989), from before NEMA (1998), and of more recent age; some may be permitted and others not.

1.3 Terms of reference and objectives of scoping

The EIA process is divided into a number of steps, the first of which is the undertaking of a Scoping Study. This report represents the findings of the Environmental Scoping Phase of the authorisation process and is submitted in accordance with the requirements of the Environment Conservation Act (Section 26 of Act no. 73 of 1989). Scoping is the process of identifying the significant issues, alternatives and decision points for an EIA. Potential impacts are identified through a public consultation process aimed at identifying issues and concerns of Interested and Affected Parties (I&APs), and also through desktop studies, dedicated fieldwork as well as limited consultation with specialist engineers and scientists. The report should also satisfy the NEMA directive issued by DEAE&T. Accordingly, the following is presented:

- Description of present operations of the ACWB.
- Description of proposed upgrade of operations of the ACWB.
- Biophysical description of the affected environment.
- Indication of the sensitivity of the affected environment (sensitivity refers to the ability of the affected environment to tolerate disturbance given existing cumulative impacts).
- Terrestrial and marine (sandy beach and nearshore) ecological impact assessment of the potential impacts associated with the present operations and also for the construction of a saltwater intake from the Bushmans River in close proximity to the existing RO plant and the disposal of the brine.
- Identification of potential fatal flaws from an environmental perspective.
- Recommendation of appropriate and practicable mitigation measures to minimise the negative impacts and maximise potential benefits.
- Identification and interaction with Interested and Affected Parties through a public scoping exercise, including a public meeting if there is sufficient response from I&APs.

1.4 Approach to the study

A pre-application meeting was held with representatives of the Department of Economic Affairs, Environment & Tourism (DEAE&T) and a document was sent to the local office of DWAF in Ndlambe

regarding the proposed Plan of Study for Scoping. Given the present state of knowledge of the affected area, potential impacts on the environment were inferred from published sources and professional experience of the project team. Some new fieldwork and measurements were necessary in order to ascertain, under present conditions, the operations of the ACWB, in particular noise generation and the dispersal of the brine discharged from the RO plant and its dilution by river water.

I&APs were identified and informed about the proposed development by means of an advertisement in the newspapers 'Talk of Town' and 'EP Herald' and by direct mail to key I&APs. To assist the Public Participation Process (PPP), a Background Information Document was compiled and distributed. The draft Scoping Report was made available to key I&APs. A public meeting was not held. Comments received during the PPP from stakeholders pertaining to environmental issues were then worked into the final version of the Scoping Report. The draft Scoping Report was subject of review (see Appendix L) by independent environmental consultant Susie Brownlie on the instruction of Mrs Dehlia Enright, who owns property (Erf 954) near the premises of the ACWB and is a registered I&AP. The issues and comments raised by Brownlie in her review were duly considered when this report was written. The Scoping Process benefitted immensely from the extensive input received from DEAE&T after the first draft was submitted[1].

1.5. Limitations

A limitation of the Scoping Study is that a portion of the homeowners of greater Kenton-on-Sea/Bushmansrivermouth are not permanent residents and only make use of their houses during the holiday periods. This may limit the ability of greater Kenton-On-Sea/Bushmansrivermouth homeowners to fully participate in the Scoping Study. (Chapter 4 details the steps that were taken to identify and involve Interested and Affected Parties in the scoping exercise) The IECM is satisfied that the comments raised are representative of the views and concerns of greater Kenton-On-Sea/ Bushmansrivermouth community.

1.6 Legal requirements

The Constitution of South Africa (Act No 108 of 1996) states that everyone has the right to an environment that is not harmful to their health or well-being, to have the environment protected for the benefit of present and future generations though reasonable legislative and other measures that prevent pollution and ecological degradation, promote conservation, secure ecologically sustainable development

[1] this was erroneously subtitled "Environmental 'Impact' Report", when it should have been "Environmental 'Scoping' Report"

and use of natural resources while promoting justifiable economic and social development.[2] One of the purposes of an EIA is to give effect to that right.

The ECA empowers the Minister to identify activities that may have a substantial detrimental effect on the environment.[3] The Minister has identified such activities[4] ("identified activities") and no one may undertake any one of those without written authorisation.[5] The identified activities include, among others, the construction, erection or upgrading of schemes for the abstraction or utilisation of ground or surface water for bulk supply purposes[6] and structures below the high water mark.[7] Authorisation may only be issued after consideration of reports concerning the impact of the proposed activity and alternative activities on the environment.[8] The manner in which those impacts must be assessed is set out in the Environmental Impact Assessment ("EIA") regulations,[9] unless the applicants have been exempted from one or more of its provisions.[10]

Several structures commissioned by the ACWB over the years during the expansion of their waterworks which fell within the ambit of identified activities, were not subjected to an EIA process and are thus operating without the required authorisation from DEAE&T. These are:

1. Four water abstraction wells in the vicinity of the Bushmans River mouth built in 1999;
2. A further water abstraction well upstream of the above units, and located in the Bushmans Estuary inter-tidal zone built in 2000;
3. In 2000 the ACWB also erected an industrial building on their premises and installed in this building a reverse osmosis desalination unit (including pumping equipment), known as RO2, and other bulk water supply infrastructure; and
4. A reverse osmosis desalination unit (including pumping equipment), known as RO3.

[2] Section 24.

[3] Section 21.

[4] In GN R1182 published in *Government Gazette* No. 18261 of 5 September 1997, as amended.

[5] Section 22.

[6] Schedule 1: Reg 1(m).

[7] Schedule 1: Reg 1(e).

[8] Section 22(2).

[9] Published in GN R1183 in *Government Gazette* 18261 on 5 September 1997, as amended.

[10] Under section 28A.

Together with three other (licensed) wells/boreholes adjacent to the mouth of the Bushmans Estuary and with the brine discharge pipeline, these structures present the main components of the operating desalination plant (see Section 2.3), now that RO1 has been disassembled for refurbishment.

The ECA, read with applicable case law, does not permit the undertaking of an EIA under the EIA regulations, once the identified activity concerned is complete. However, there is a provision in the National Environmental Management Act (107 of 1998) ("NEMA") that addresses this situation. It is discussed in more detail below.

NEMA serves as framework legislation promoting sound environmental management, co-operative governance and sustainable development. NEMA also contains the principle that environmental management must place people and their needs at the forefront of its concern, and serve their physical, psychological, developmental, cultural and social interests equitably. DEAE&T, in terms of section 28(4) of NEMA directed the ACWB to "investigate, evaluate and assess the impacts of the existing [illegal] aspects of the water purification plant activities on the environment" (see Appendix K for a copy of the Notice). This report complies with that requirement.

As far as proposed identified activities are concerned (as distinct from existing ones) it is necessary for developers to comply with the EIA regulations, discussed above, and the EIA requirements of NEMA.

NEMA provides for a parallel EIA process which is not triggered by a list of identified activities. Instead, NEMA provides that where an activity both requires authorisation or permission by law and may also significantly affect the environment, then it is necessary for the applicant to undertake an environmental impact assessment and to report on the outcome of that EIA to the organ of state charged with authorising or permitting the proposed activity.[11] The EIA in this situation must comply with the provisions of section 24(7) of NEMA and must include an assessment of the potential impact on the environment, socio-economic conditions and cultural heritage. These are set out below.

> "24(7) Procedures for the investigation, assessment and communication of the potential impact of activities must, as a minimum, ensure the following:
>
> (a) Investigation of the environment likely to be significantly affected by the proposed activity and alternatives thereto;

[11] Section 24(1).

(b) investigation of the potential impact, including cumulative effects, of the activity and its alternatives on the environment, socio-economic conditions and cultural heritage, and assessment of the significance of that potential impact;

(c) investigation of mitigation measures to keep adverse impacts to a minimum, as well as the option of not implementing the activity;

(d) public information and participation, independent review and conflict resolution in all phases of the investigation and assessment of impacts;

(e) reporting on gaps in knowledge, the adequacy of predictive methods and underlying assumptions, and uncertainties encountered in compiling the required information;

(f) investigation and formulation of arrangements for the monitoring and management of impacts, and the assessment of the effectiveness of such arrangements after their implementation;

(g) co-ordination and co-operation between organs of state in the consideration of assessments where an activity falls under the jurisdiction of more than one organ of state;

(h) that the findings and recommendations flowing from such investigation, and the general objectives of integrated environmental management laid down in this Act and the principles of environmental management set out in section 2 are taken into account in any decision made by an organ of state in relation to the proposed policy, programme, plan or project; and

(i) that environmental attributes identified in the compilation of information and maps as contemplated in subsection (2) (e) are considered."

The content of an EIA under section 24(7) of NEMA has certain features which are common to those required by the EIA regulations. These include the obligation to explore alternatives and to consider the "no go" option. However, section 24(7) of NEMA requires consideration of issues not required by the EIA regulations, such as the assessment of cumulative impacts.

The ACWB has requested licences under the National Water Act 36 of 1998 from the Department of Water Affairs and Forestry (DWAF) for the abstraction of water and for the discharge of brine into the estuary.

CHAPTER 2: DEVELOPMENT PROPOSAL

2.1. Proponent

Mr Ron Ball (CEO)

Albany Coast Water Board

PO Box 51

Bushmansrivermouth

6190

2.2. Regional and local setting

The Albany Coast Water Board is situated in the Ndlambe municipal region in the town of Bushmansrivermouth, Eastern Cape Province (Figure 1).

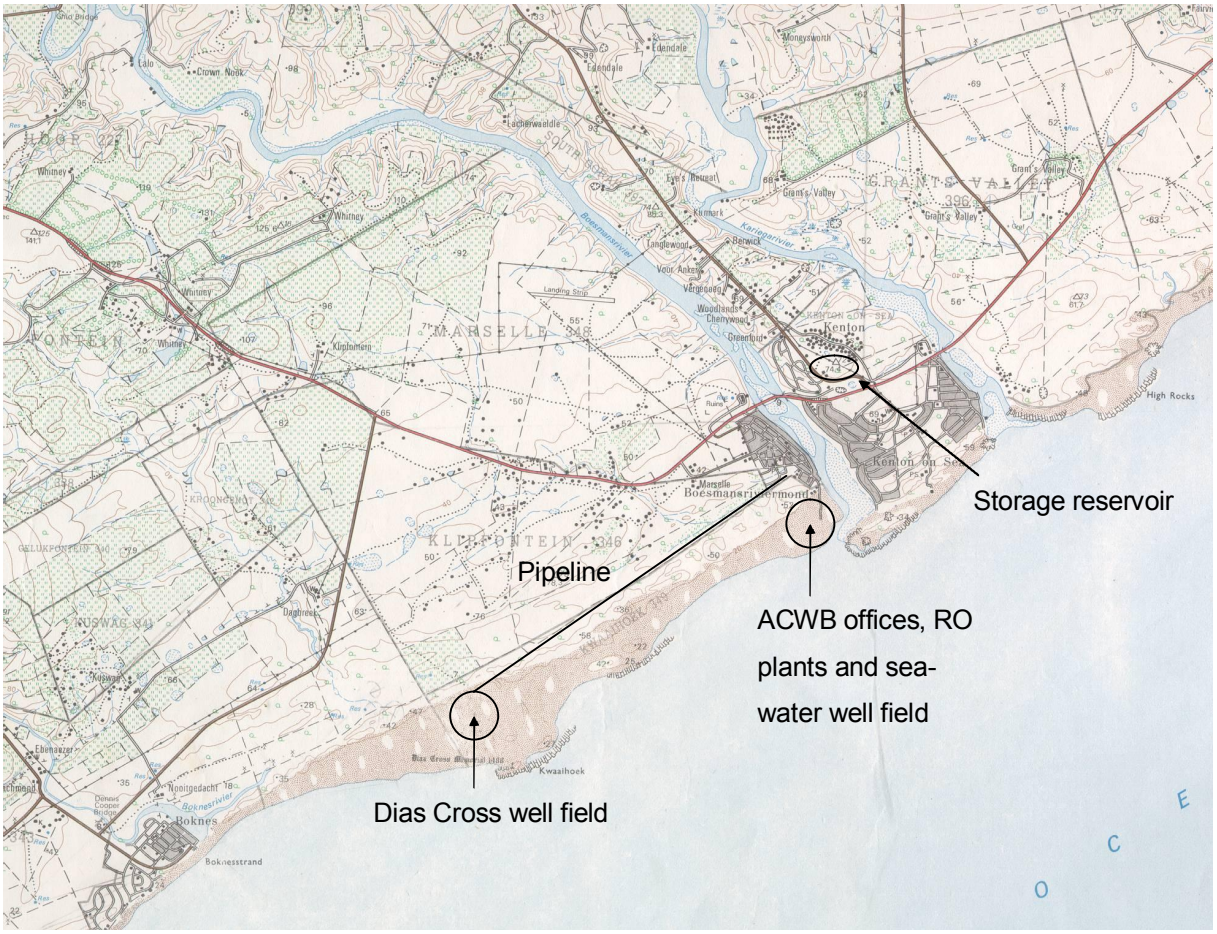

Figure 1. Regional setting of the development showing the ACWB offices and associated infrastructure in and around Bushmansrivermouth.

The Albany Coast Water Board premises are located on the western bank of the Bushmansriver Estuary, 500 m from the mouth (Figure 2). They are situated at the southern edge of the residential area of Bushmansrivermouth, approximately 70 m from the nearest dwelling (there are no immediate neighbours). The well field from which seawater is drawn is situated at the mouth behind the foredune

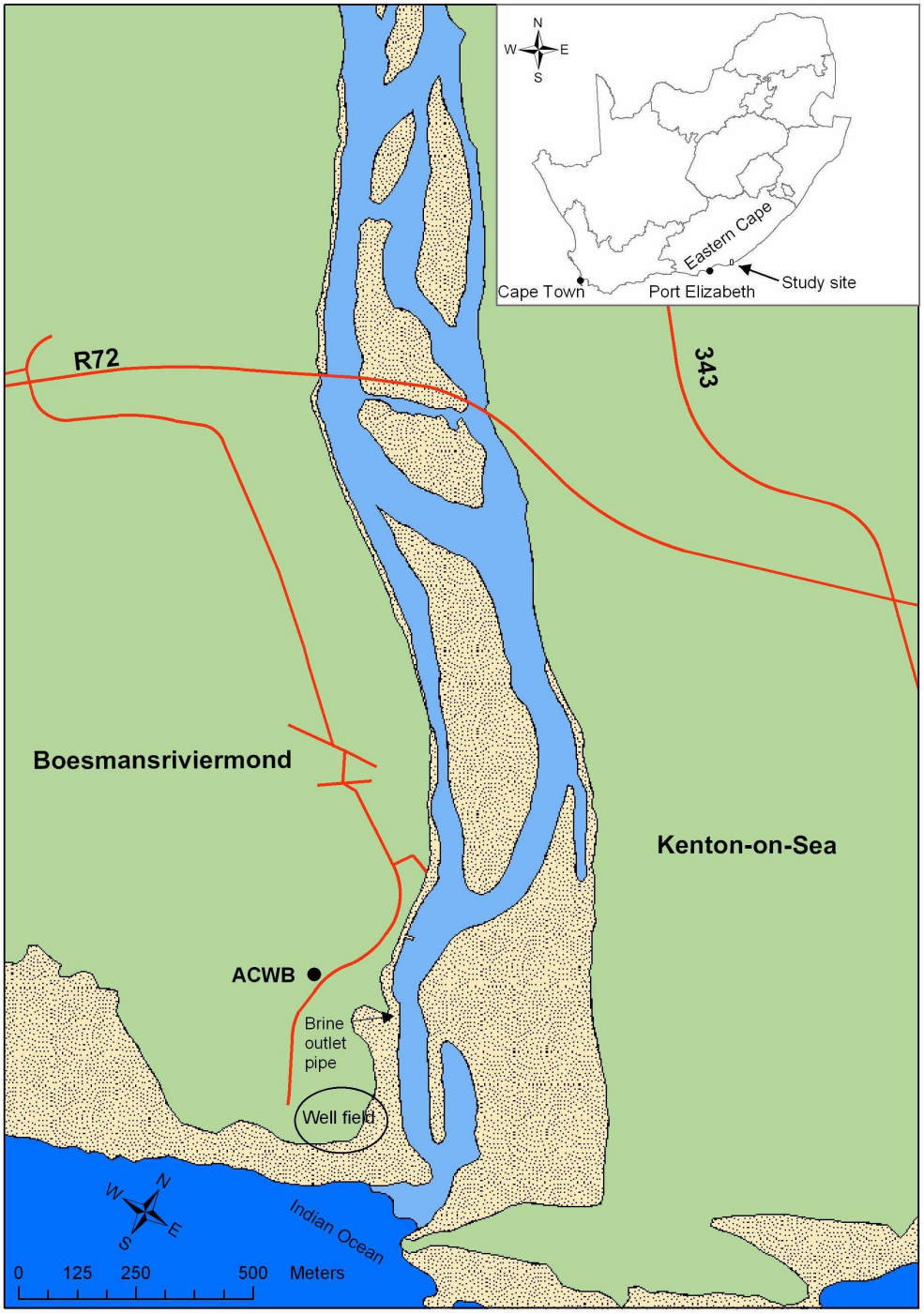

Figure 2. Local setting of the development showing the ACWB offices on Ocean Drive and well field at the mouth of the Bushmans Estuary.

ridge. The brine produced during the reverse osmosis desalination process is discharged into the estuary via a 200 m long underground pipe (200 mm diameter) at the Deacon sandbag wall (Figures 2 and 3). A second discharge pipe of similar construction ends some 20 m downstream from the first pipe; it is presently inoperative.

Figure 3. Upstream view of the western bank of the Bushmans Estuary, showing the position of the discharge pipe at the Deacon sandbag wall. In the background, further upstream is the gabion wall (arrow), which is the proposed location of the seawater inlet pipe.

2.3. Existing infrastructure and present operations

A layout plan of the ACWB premises on Ocean Drive in Bushmansrivermouth is given in Figure 4. The property was registered in 1982, is 5000 m^2 in extent and is zoned as water works (Erf 956: portion of portion 1 Kwaaihoek 349)[12]. Access is gained via two gates from Ocean Drive. The land in the west and in the north is owned by South African National Parks and is part of the Greater Addo Elephant National Park. The land in the north-east, east and south belongs to the Ndlambe Municipality. The core area of the ACWB premises is securely fenced on all sides with welded mesh and contains the office building, garage, water reservoir, as well as two sheds housing the reverse osmosis desalination plants (RO plants), spares, equipment and supplies. There is an overhead power line (6.6 KV) that terminates on the premises and supplies the RO plants.

[12] Paragraph 4 of the title deed: "The Board or its successor in title shall erect or cause to be erected on this erf … such reservoirs, pumpstations, offices and workshops as are required for the proper functioning of the bulk water scheme to supply Boesmansriviermond and Kenton-on-Sea".

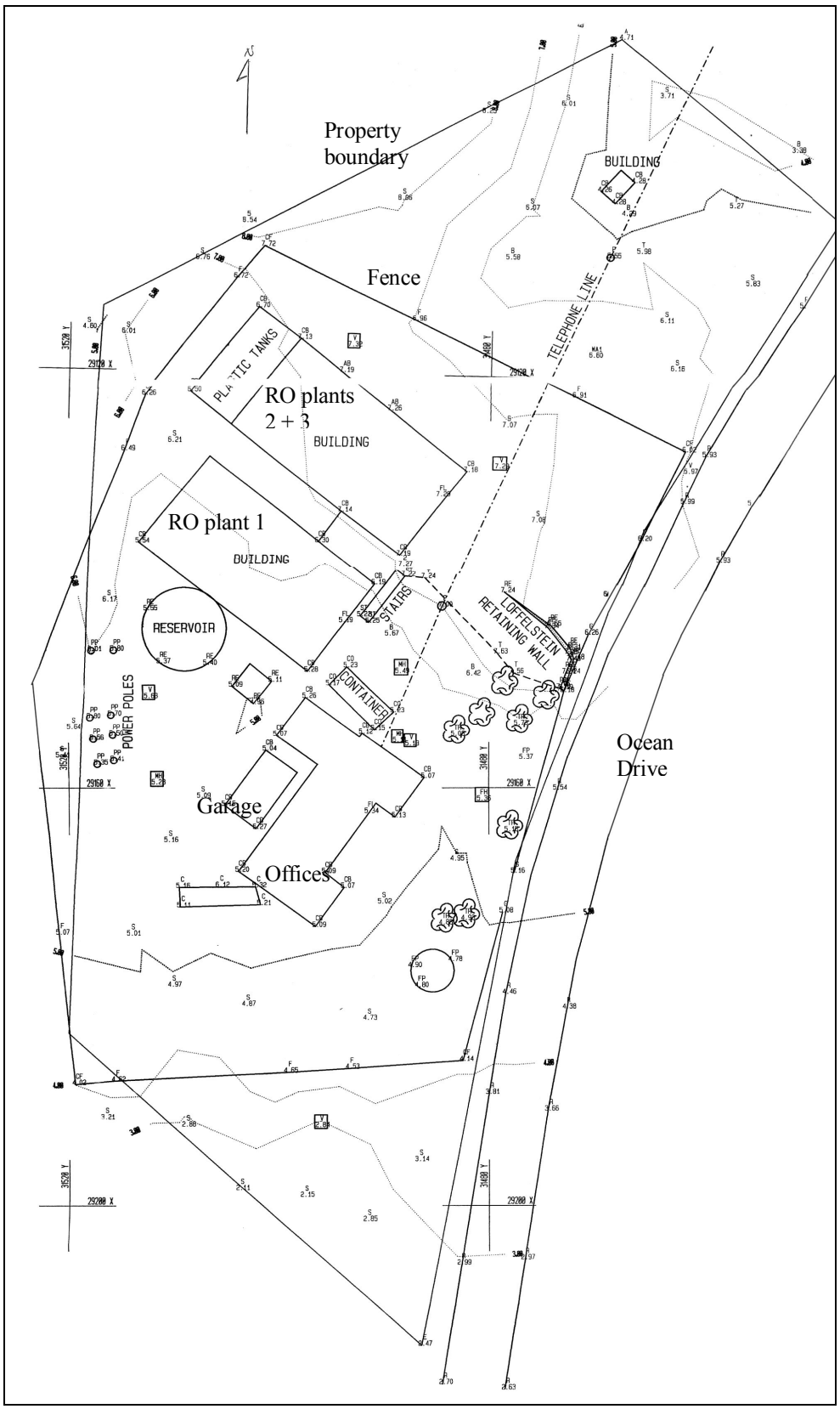

Figure 4. Layout plan of ACWB premises

Before delivery to the community, the ACWB blends water from a variety of sources. Freshwater is drawn from the Dias Cross coastal aquifer at Kwaaihoek from 8 wells. This water is pumped via a 9 km pipeline to the 4 Ml storage facility at Ekuphumleni (north of Kenton-on-Sea) (see Figure 1). Seawater is abstracted from 8 boreholes/wells adjacent to the mouth of the Bushmans Estuary (Figure 5). The present desalination facility is housed in two adjacent sheds. It consists of 3 plants/racks of pressure vessels (RO1, RO2 and RO3) and their pumps, interconnecting pipework and electrical switchgear. RO1, RO2 and RO3 were commissioned in 1998, 2000 and 2002 respectively. RO1 was shut down for refurbishment in late 2002 due to severe corrosion of the pressure chambers. Presently, RO2 is running at full capacity (6 pressure vessels) and RO3 at half capacity (only three of the total of six vessels have been installed (Figure 6)). The final bulk water is a blend of Dias Cross (@ R0.70/m^3) and desalinated water (@ R4.25/m^3) to arrive at an acceptable quality and cost profile (R2.96/m^3; 2003 prices) before distribution.

Brine is a by-product of the desalination process. The brine produced by the RO plants is being discharged into the Bushmans River estuary by way of two adjacent pipelines at the Deacon sandbag wall on the western shore of the river. The older pipeline serving RO1 is inoperative at present because its associated plant was shut down in 2002. The newer pipeline is operative and serves both RO2 and RO3. Close to 400 m^3 of brine is being discharge daily during those months when water demand peaks (see Figure 7).

Figure 5. Wells for the abstraction of seawater near the mouth of the Bushmans Estuary.

Figure 6. RO3 at the ACWB.

Water consumption varies strongly over the course of the year (Figure 7) and the per capita consumption in the greater KOS/BRM is similar to that observed in urban centres in South Africa (Thompson 1998).

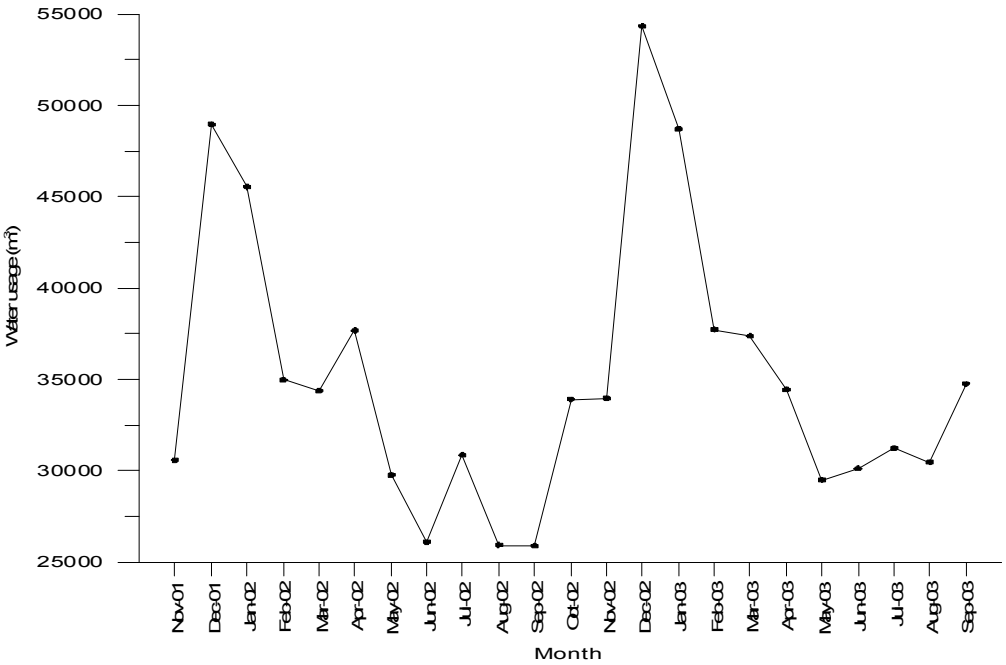

Figure 7. Monthly water usage in the greater KOS/BRM area over the last 2 years.

2.4. Motivation for the development

The ACWB has been supplying bulk water to the greater KOS/BRM area since 1982. Initially, the water supply was drawn from the Bushmans River mouth aquifer. Salinisation of this aquifer and unfavourable water quality of the Dias Cross coastal aquifer resulted in the commissioning of the first reverse osmosis plant in 1998 (RO1) to keep up with the ever increasing demand for water from a growing human population. Sixty percent of the bulk supply is drawn from the Dias Cross coastal aquifer. This groundwater source is vulnerable, as it depends on rainfall for recharge. DWAF has limited the sustainable yield from the Dias Cross coastal aquifer at 300 000 m^3/annum. The remaining 40 % of the needed bulk water supply is manufactured in the RO facility. The wells/boreholes adjacent to the mouth of the Bushmans River supply 100 m^3/hour of raw input for the RO process.

The 432 200 m^3 that the ACWB was able to supply in 2001 was insufficient to satisfy the requirements of the community. At present there is an inadequate supply of seawater to the RO process due to severe drawdown in the supply wells. To work sufficiently, the RO plant requires an alternative dedicated inlet pipe, drawing marine water from the Bushmans River. This will ensure a reliable source of marine water during times of peak demand.

Groundwater abstraction ultimately affects down-gradient surface water and prolonged overpumping of a coastal aquifer could have disastrous results. Under these circumstances desalination offers a reliable

and sustainable source of water that is not subjected to the seasonal changes or locally extreme weather events associated with freshwater sources. There is minimal use of chemicals in the process, the plants are modular in design and can easily be expanded. If properly operated, there is a low environmental impact.

2.5 The desalination process

What is reverse osmosis?

It is necessary to briefly describe the principles of reverse osmosis before details of the proposed development are described. Desalination refers to a water treatment process whereby salts are removed from saline water to produce potable water. Osmosis is the process whereby a semi-permeable membrane is placed between two solutions of different concentrations and osmotic pressures, resulting in a flow of solvent (and some solute) through the membrane from the less concentrated solution to the more concentrated one (Einav *et al.* 2002). In the process of reverse osmosis (RO), the direction of the solvent flow is reversed by exerting external pressure, higher than the difference in osmotic pressures, on the more concentrated solution.

Figure 8. A rack with 6 pressure vessels. The pump is in the foreground right.

Accordingly, a reverse osmosis plant consists of a group of pressure vessels arranged in one or several racks, high-pressure pumps, a turbine for recovering energy, and interconnecting pipe work. A typical setup is shown in Figure 8 and a schematical drawing of the desalination process is presented in Figure 9.

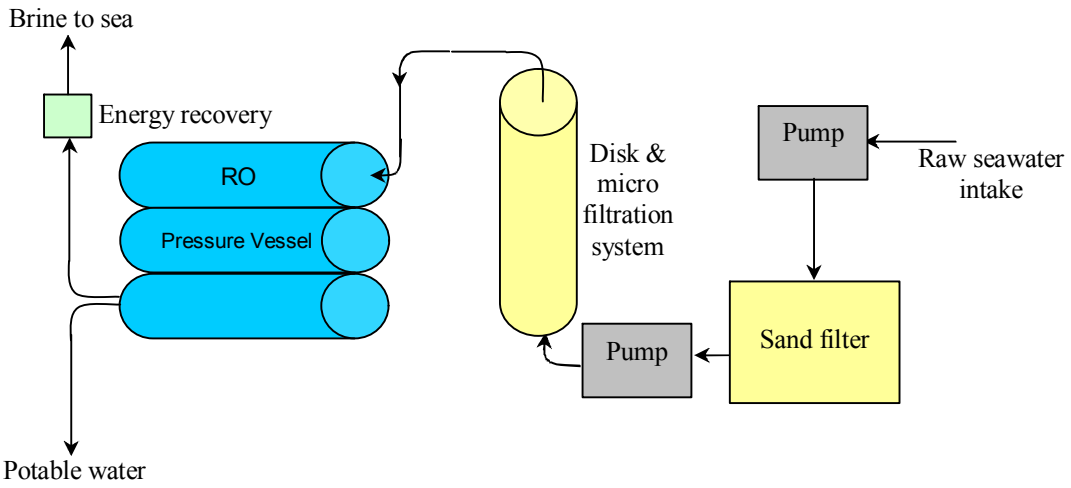

Figure 9. General layout of a desalination plant employing reverse osmosis technology

The desalination plant

Saline water for the desalination plant employing reverse osmosis technology (RO) can be obtained either through direct pumping from the sea or from beach wells. Beach wells are preferred for the intake system as the feedwater contains limited suspended solids, which require no sand filtration system in the plant. Unfortunately beach wells cannot sustain a high supply rate of saline water due to drawdown in the wells.

The seawater enters a pre-treatment system for the removal of solids and suspended solids. The filtered seawater is then pumped through the reverse osmosis pressure vessels, operating at 55 to 80 bar pressure, using high-pressure pumps. As a portion of the water passes through the membrane (in the RO vessel), the remaining feed water increases in salt concentration. At the same time, a portion of this feed water is discharged without passing through the membrane. The amount of the feed water discharged to waste in this brine stream varies from 60% to 50% of the feed flow, depending on the salt content of the feed water. The discharged brine passes through an energy recovery device and is then discharged.

The RO process has an overall recovery rate of 40 – 50 %. For instance, a production of 500 m^3 of potable water per day therefore translates to approximately 500 - 750 m^3 of brine that is discharged daily as the water is made up. The RO process is free of hazardous chemicals. Daily backwashing of the filtration system is necessary though and the backwash is discharged into the sea, but this does not pose a troublesome environmental threat as some of the generated freshwater is used and the material in the filters is of marine origin to which it is returned.

2.6. Details of the development

The following developments are proposed:

1. Marine intake and pipeline: Construction of a dedicated intake pipeline (underground, 250 mm diameter, length approx. 250 m) from the Bushmans River at the existing gabion wall to the ACWB premises. The intake will require a submerged sump, pump, electrical supply, suction pipe and rising main with a capacity to supply marine water at a rate of 200 $m^3 \cdot h^{-1}$. Figure 10 shows the proposed route of the new intake pipeline.
2. Filtration: The raw marine water requires upgrading via filtration to achieve RO input standards so as to prevent clogging of the semi-permeable membranes. Different options include pre-fabricated sand filters with integral carousel units or a traditional sand filtration plant built on site with a capacity of 100 $m^3 \cdot h^{-1}$. A modular design is planned for the expansion of an additional 100 $m^3 \cdot h^{-1}$ as it is intended to phase out the marine boreholes at the Bushmans River Mouth in the medium term.
3. Electricity: Additional pumping systems will increase the load on the existing electricity supply, requiring ESKOM to upgrade their service. The ACWB periodically suffers unscheduled shutdowns during times of peak demand owing to the load being placed on the existing equipment.
4. RO expansion: Rebuild of RO1 and expansion of RO3 plant, which will run at full capacity (6 pressure vessels each). The extra vessels will require upgrading of the existing pump system to cope with the additional output.
5. Brine disposal: At present close to 400 m^3 of brine (saline waste product of the RO process) is being pumped into the Bushmans Estuary on a daily basis. With the RO plants running at full capacity after their upgrade, a doubling of the present output to 800 m^3 of brine daily is envisaged at times of peak demand (December/January; see Figure 7). This volume would be discharged in approximately 10 hours.

Technical details on the proposed development together with conceptional design sketches, which were provided by ACWB's consulting engineers WSM Leshika (Pty) Ltd., are given in Appendix I. A comprehensive design report compiled by WSM Leshika (Pty) Ltd. has been submitted already to the offices of DEAE&T on 24 July 2004 (Haydam & Mouton 2004).

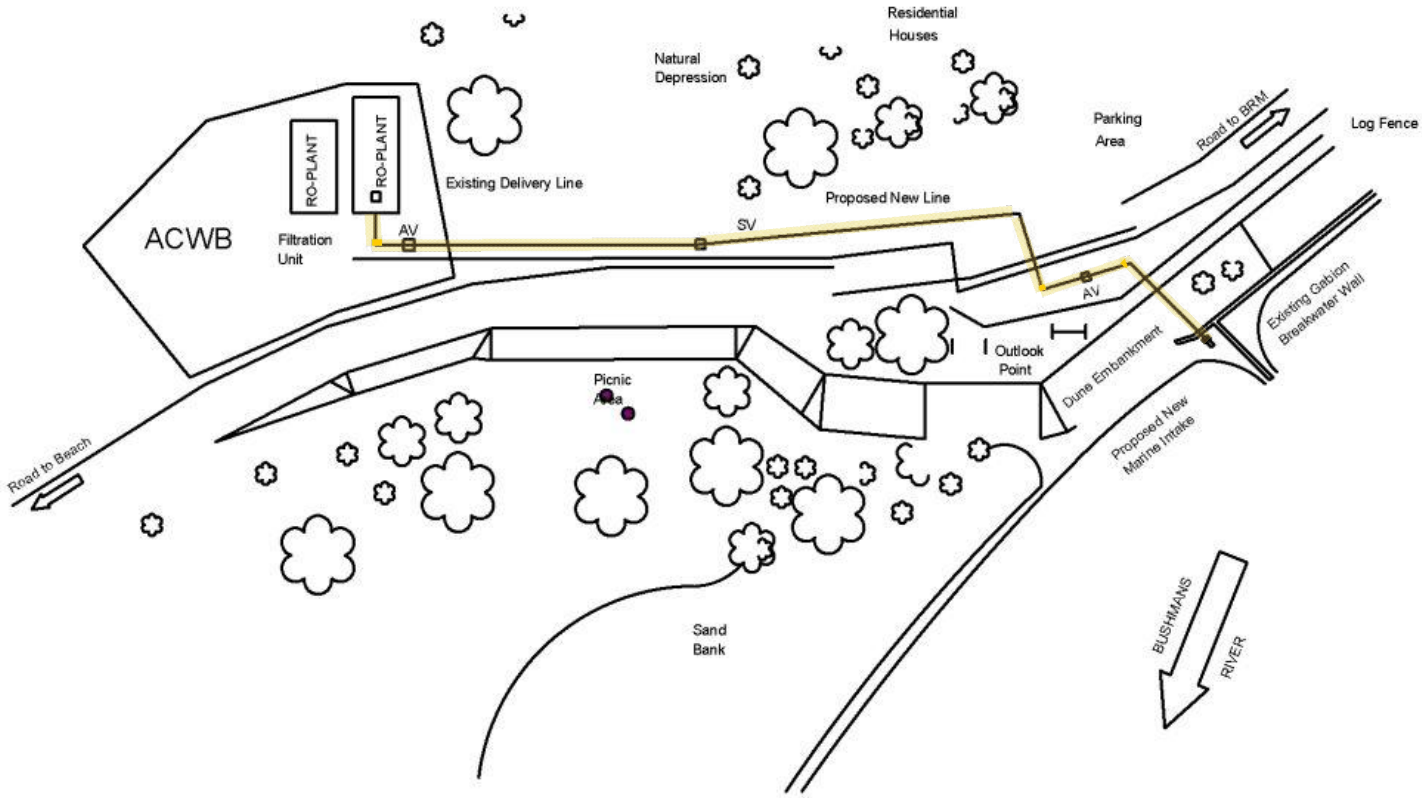

Figure 10. Proposed route of the new seawater intake pipeline

CHAPTER 3: THE AFFECTED ENVIRONMENT

This chapter describes the environment in its present state, whereas chapters 5 and 6 discuss how the environment may be affected by the proposed activity or its alternatives.

3.1. Climate

The study area has a bi-modal rainfall pattern with peaks in precipitation during March and October. The mean annual rainfall (1961 to 1990) is 717 mm (Figure 11). The Bushmans River receives in its catchment area annual precipitation ranging from 300 - 400 mm in the upper reaches to 801 – 900 mm in the lower reaches of the Bushmans Estuary (Reddering & Esterhuizen 1981). The peak number of rainy days occurs during the summer season at approximately 10 – 11 days with rain per month (Figure 12).

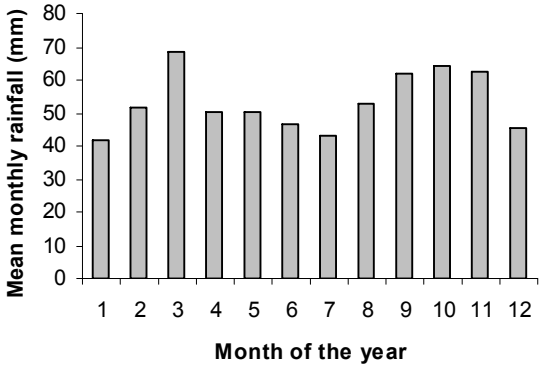

Figure 11. The 30-year average rainfall measured at Port Alfred (SAWS).

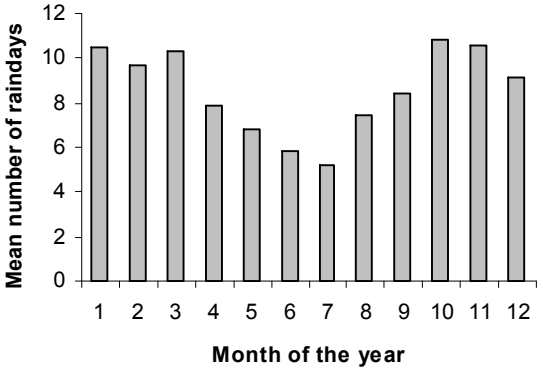

Figure 12. The 30-year average number of rain days measured at Port Alfred (SAWS).

The highest rainfall intensities are experienced during the summer months, with a peak in July. There appears to be no seasonal pattern in the maximum rainfall intensity days. The most rain that fell in the Port Alfred area during the period (1961 – 1990) measured was 175 mm in 24 hours. Above average rainfall, as was experienced in 2003, did not result in a freshwater run-off with pronounced erosion of the banks of the Bushmans River.

The mean monthly maximum and minimum temperatures follow a seasonal pattern with the highest temperatures measured in summer in the lowest temperatures occurring in winter. The highest mean maximum temperature is 26.3 °C during January and February. The coldest mean minimum temperature is 10.2 °C during July. The difference between mean monthly maximum and mean monthly minimum temperature is smaller for winter months than it is for summer months. Mean monthly temperatures are

between 21.7 °C in January and 15.4 °C in July. The temperatures in the area are mild due to the moderating influence of the sea.

Westerly winds are prevalent in the region for both summer and winter. The wind regime in the Port Alfred area is influenced by seasonal circulation systems. During the summer months, onshore easterly winds are common. Westerly and especially northwesterly winds dominate in the region during the winter months. Winds with a velocity of more than 30 $m \cdot s^{-1}$ occur most frequently during the summer months, from September to December (Figure 13).

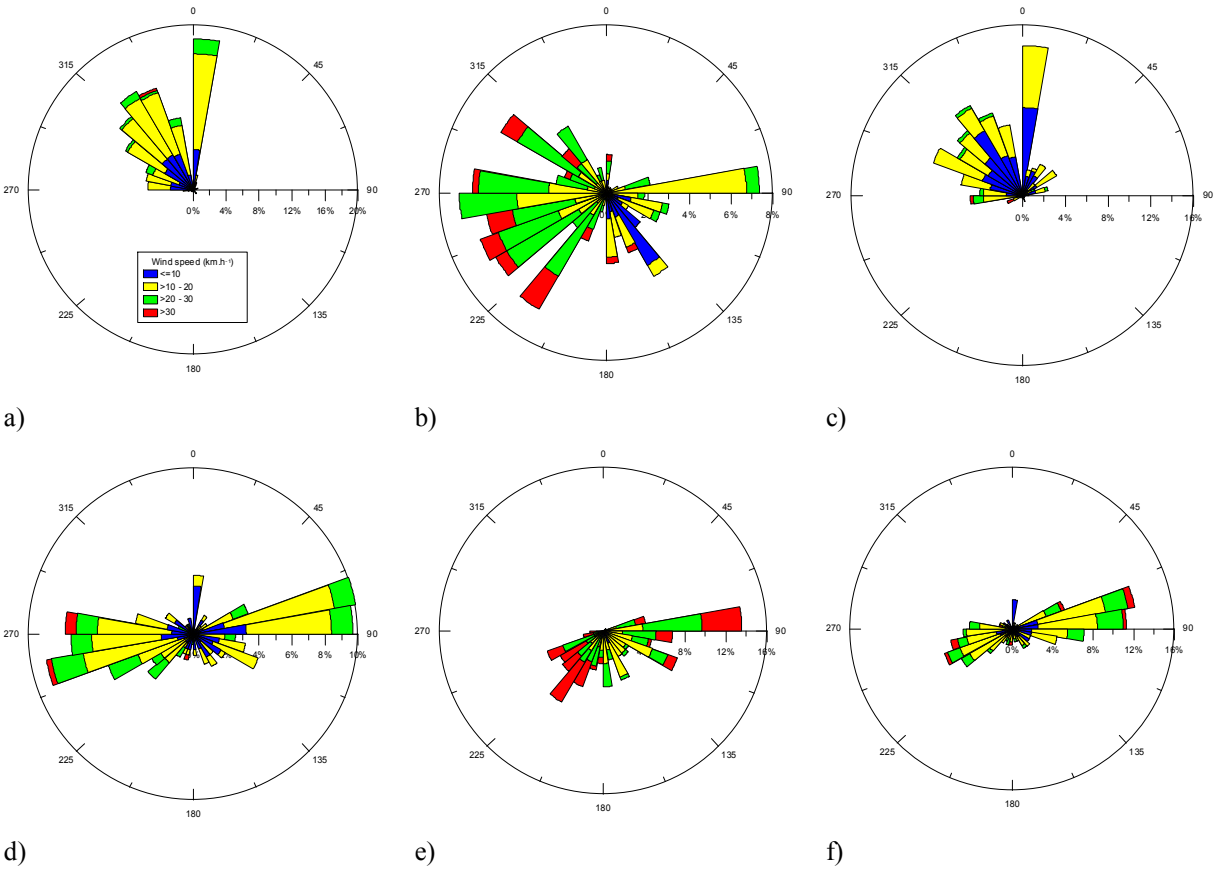

Figure 13. Mean wind speed, direction and frequency over the last 10 years (1993 to September 2003) for June; a) 08:00, b) 14:00 and c) 20:00 and December; d) 08:00, e) 14:00 and f) 20:00

The average monthly evaporation rates for the region ranges seasonally from 105 mm in winter to 211 mm in summer and follows a similar trend as the mean temperatures for Port Alfred and Bathurst. Runoff volumes can be estimated from the rainfall and evaporation data, and indicate that the maximum runoff should occur during the summer months. The annual relative humidity in the area shows seasonal fluctuations and ranges from a maximum of 80 % to a minimum of 40 % for summer and winter, respectively. The mean relative humidity of the air is 72 %.

The Port Alfred and Bathurst region has few incidences of thunderstorms, with about 19 thunderstorms per year on average. Most of these occur in the months from spring through summer into early autumn. March is the month with the highest number of thunderstorms. Fog is uncommon in the area and seems to be the result of moist air from the sea being blown inland and up valleys. The highest incidence of fog in the Port Alfred/Bathurst area is two days of fog per month recorded during the months of March and November. Hail and snow are extremely rare in the region with less than one day with either snow or hail recorded per year.

3.2. Geology and geomorphology

The major part of the lower reaches of the Bushmans River flows through the black shale, compact siltstone and olive-grey sandstone of the Bokkeveld Group (Reddering & Esterhuysen 1981). Bokkeveld siltstone and shale weather away relatively rapidly, forming valleys and low rolling hills. Along the coast overlying and resting on the shale, one finds a succession of thin marine sediments, which are referred to as the Alexandria Formation. The Alexandria Formation (Miocene to Pliocene in age) is mostly of marine origin, deposited during a complex series of regressions of sea level (Rust 1998). Being a limestone, the Alexandria Formation is a good aquifer and is responsible for some karst topography in the coastal zone. Karstic landforms may accumulate rainwater for a short while after heavy rain and some emerge from the base of the limestone just above high tide level at Bushmans River. Unconsolidated beach deposits and bare dunes occur right at the coast.

Floodtide delta sediment is supplied by a mobile dunefield updrift of the estuary mouth (Harrison *et al.* 1996). The Bushmans Estuary is dominated by sandy sediment and as a result has wide intertidal and supratidal flats and comparatively shallow channels (Reddering & Rust 1990). The Bushmans River drains through mud-depleted source rocks (Reddering 1988a). Sediments move as bed-load into the estuary in response to asymmetric flood and ebb tidal currents (Baird *et al.* 1981). The presence of marine sand in the lower reaches of the Bushmans Estuary is due to the marine sand moving up and down channel as bed-load during flood and ebb tides. The bed in the upper reaches of the estuary (> 3.5 km) is covered with mud derived from freshwater discharges (Baird *et al.* 1981). An average of 20 m^3 of sand is transported into the estuary over a single spring tidal cycle (Baird *et al.* 1981).

The western bank has a short stretch of rocky shoreline starting from the bridge and extending approximately 800 m upstream. Rock banks are present along the eastern bank starting at the mouth and extending up-river for approximately 3 km (Figure 14). During the 1940s, wind-transported sand caused the inlet channel to migrate northwards, creating a navigable channel for small boats on the Kenton side of the estuary. When the inlet migrated back to its original position due to reduced sand input as a direct

result of sand stabilisation, the channels at the Kenton-on-Sea and Bushmans riverfronts naturally filled with sediment (Reddering & Esterhuysen 1981). Continued south-westerly migration of the channel meander in the lower reaches during the 1980s led to the construction of the Deacon cement bag wall on the western bank by the then Boesmansrivier Municipality. This wall essentially canalised part of the lower reaches of the Bushmans Estuary. A gabion jetty (Figure 3) was also installed on the western river bank upstream from the Deacon sand bag wall to deflect the waters towards the east. This structure consists of rocks packed into wire mesh cages and forms a convenient place for the proposed seawater intake. The presence of the sandbag wall and gabion jetty may be of dubious benefit for the river, as they violate the principle of unimpeded river flow. However, as is shown in Section 3.3, the ills of the river lie in its upper reaches where it is starved from water by excessive abstraction.

Figure 14. The western bank of the river near the mouth.

3.3. The estuarine environment

A map of the lower Bushmans Estuary showing the study area is given in Figure 2. The estuary is classified as a large, permanently open system and is dominated by marine water with a tidal effect reaching as far as 40 km upstream. It is navigable for approximately 30 km and the widest portion (in the lower reaches) is approximately 200 m. The head of the estuary is situated at Harvest Vale, some 33 km from the mouth. The main channel depth of the estuary ranges from 2 to 5 m in the navigable portion of the system. The catchment of the Bushmans Estuary is estimated at 2678 km^2, with a mean annual run-off of 38 million m^3 per year. Estuaries in the region are generally shallow (< 5 m), channel-like systems with small tidal prisms.

The Bushmans Estuary has a constricted by permanently open tidal inlet that is 50 – 60 m wide and 2 –3 m deep and is constrained on one bank by bedrock outcrop (Harrison *et al.* 1996). As a result, the estuary is dominated by flood tides, causing an accumulation of sand on flood-tide deltas in the lower estuary (Reddering 1988a). The tidal currents have their highest value of about 1 $m \cdot s^{-1}$ at the tidal inlet during

spring tides and have low values (< 0.3 $m \cdot s^{-1}$) at distances greater than 6 km from the tidal inlet (Baird *et al.* 1981). The volume of water exchanged over a tidal cycle is called the tidal prism, and is estimated to be in the order of 1 x 10^6 m^3 (Reddering 1988a, b; Reddering & Rust 1990).

Due to low freshwater inputs caused by several dams and weirs (approximately 30), salinity levels are usually high and the water is very clear. Salinities higher than that of seawater (> 35 ppt) are often recorded during drought years. The system has a low turbidity (< 10 NTU) and is well mixed with almost no salinity or thermal stratification of the water column at any stage of the tidal cycle. Seasonal water temperatures range from 13 °C (winter) to 23 °C (summer). The coastal road (R72) forms a bridge over the estuary approximately 1.3 km from the mouth. The Bushmans Estuary is ranked 44th in term of conservation importance and 18th as a desired protected area (Turpie *et al*. 2002). No part of the Bushmans Estuary is protected at this moment (Turpie *et al*. 2002). The Bushmans Estuary scored 8 out of 9 on the overall estuarine health (Harrison *et al.* 1996).

The long-term reductions in freshwater have changed the Bushmans from an estuary characterised by salinity gradients to an essentially homogeneous marine system. This has caused a significant change in the distribution of organisms, e.g. a decrease in phytoplankton biomass and an increase in submerged macrophytes (most notably *Zostera capensis* and *Codium*) (Hilmer & Bate 1990), possible extinction of the river pipefish (*Syngnathus watermeyerii*) (Whitfield & Ter Morshuizen 1992) and reduced food resources for suspension feeders (Grange & Allanson 1995). Estuarine biota in the Bushmans Estuary are typical of permanently open estuaries in the Eastern Cape and are reported in Jubb (1972); Palmer (1980), Heydorn & Grindley (1982), Robertson (1984), Whitfield & Ter Morshuizen (1992), Harrison *et al.* (1996), Robertson (1996) and Lubke & de Moore (1998).

3.4. The marine environment

The nearshore marine environment consists out of rocky shores and sandy beaches. These ecosystems comprise not only the intertidal sands and rocks but also the surf zone seaward of the low water mark. Together, these components constitute the littoral active zone of sand transport, which contains both terrestrial and marine elements that meet in the intertidal (Brown & McLachlan 2002). This portion of the coast has received no discernable attention in the published literature.

Phytoplankton is an important component of the surf zone food chain and 13 species of surf-zone microalgae, dominated by *Anaulus australis,* have been recorded along the beach west of the Bushmans River mouth (B. Clarke, pers. comm.).

The rocky shore consists mostly of aeoleonite dune-rock outcrops that have become eroded and undercut by strong winds and heavy seas. Macroalgae are dominated by *Porphyra capensis* in the upper shore, *Gelidium pristoides* and *Ulva* sp. in the mid to low shore and coralline spp., *Codium* spp and *Caulerpa filiformis* in the low shore and rock pools. In terms of abundance and biomass, the intertidal rocky shore epibenthic community is dominated by filter feeders, principally barnacles on the upper- to mid-shore and mussels and red bait on the mid- to low-shore. There are several subsidiary species, but these are either in low abundance or low in biomass (due to small individual sizes).

3.5. The coastal environment (terrestrial)

The general terrestrial vegetation, reptiles, amphibians, birds and mammals have been described by Heydorn & Grindley (1982) for the Kowie region and by several authors in the Field Guide to the Eastern and Southern Cape Coasts (Lubke & de Moor (eds.) 1998).

3.6. Socio-economic environment

The districts of Bushmansrivermouth and Kenton-on-Sea fall under the jurisdiction of the Ndlambe Municipality that is part of the Cacadu District Municipality. The Cacadu District Municipality is the district local authority for the western third of the Province of the Eastern Cape, South Africa. Key socio-economic data are presented below. Source: Statistics South Africa (Census 2001).

At the time of the 2001 census, the total population in the greater KOS/BRM area was 9577. This figure is augmented by more than 15 000 during the Christmas holiday season. The population is fairly young, more than 60 % are younger than 35 years of age, and there is a marked difference in the first home language between Bushmansrivermouth and Kenton-on-Sea. The majority of the population in the greater KOS/BRM area is resident in Ekuphumleni where the water infrastructure is poorly developed and present water usage is suspected to be lower than in the rest of the town. The large informal settlement at Kenton-on-Sea is the cause for the low percentage of services provided per dwelling. The low percentage of piped water available to each house will have to be addressed in the future and is bound to put more strain on the water resources in the area. Pertinent demographic parameters are provided in the following four tables:

Population density, age structure and language preferences								
District	Population	Age (%)				First home language (%)		
		Children	Youth	Middle age	Elderly	IsiXhosa	Afrikaans	English
BRM	3697	30.1	30.9	28.2	9.9	45.2	43.8	10.4
KOS	5880	28.5	33.6	26.6	9.6	84.0	1.8	13.8

Race, gender and marital status									
District	Race (%)					Gender (%)		Marital status %	
	African	Coloured	Indian	White	Other	Male	Female	Unmarried	Married
BRM	44.9	26.6	0.1	27.6	0.7	47.4	52.7	33.9	47.8
KOS	84.1	0.3	0.0	15.3	0.2	47.1	52.8	47.3	40.2

Literacy and employment			
District	Literacy (%)	Employment status	
	Illiterate	Employed	Unemployed
BRM	17.5	83.9	16.1
KOS	24.2	73.4	26.6

Housing and services						
District	Households	Formal dwellings (%)	Telephone at home (%)	Electricity (%)	Sanitation (%)	Piped water to dwelling (%)
BRM	911	73.8	45.3	69.3	61.9	62.8
KOS	1544	42.2	29.7	58.8	30.0	24.1

Much of the attractiveness of Bushmansrivermouth and Kenton-on-Sea as a place of residence and as a holiday destination derives from the rivers, arguably the major draw card together with the magnificent beaches. Any significant long term impact of negative status on the Bushmansriver could make this less attractive and spell disaster to tourism targets. Tourists want water but not at the expense of the usefulness of the river as a place of recreation.

CHAPTER 4: PUBLIC PARTICIPATION PROCESS

4.1. Purpose of public scoping

The purpose of public scoping is to ensure that all interested and affected parties (I&APs) are afforded the opportunity to comment on development projects applications submitted in terms of section 22 of the Environment Conservation Act (Act No. 73 of 1989).

4.2. Identification of and interaction with I&APs

I&APs were identified (Appendix C) and provided the opportunity to raise issues and concerns pertinent to the proposed activity by means of press advertising, on-site advertising, and direct mail and internet communication. As only three I&APs expressed an interest in the proposed development (see below) during the entire public participation process, which lasted almost one year, a public meeting was not deemed necessary by the consultant.

Press and on-site advertising

An advertisement notifying that an EIA process has been initiated was placed in the daily 'Eastern Province Herald' and in the weekly 'Talk of Town' on 31 October 2003 (Appendix A). Interested and Affected Parties were provided 14 days after the advertisement date to submit issues and concerns to the environmental consultant.

On-site advertising was undertaken in accordance with EIA regulations, the advert format identical to that used for press advertising purposes (Appendix B) but with minimum size specifications (60 cm height x 42 cm width). The advertisement was posted in English and Afrikaans at the front gate of the Albany Coast Water Board premises as well as at selected notice boards in the greater KOS/BRM area.

Distribution of documentation by direct mail and internet downloads

To assist the Public Participation Process (PPP), a Background Information Document (Appendix D) was compiled and distributed by direct mail to all identified I&APs on commencement of the public scoping process.

Thereafter (on 4 February 2004), the draft Scoping Report (which was erroneously entitled Environmental Impact Report, see footnote 1) was made available to I&APs as hardcopy for perusal at the ACWB offices, as hardcopy by direct mail, or as an internet download from the environmental consultant's ftp site, as appropriate under the prevailing circumstances of each identified stakeholder.

The comments on the EIA process received from stakeholders at the draft stage led to a substantial revision of the document. When the draft of the Final Scoping Report was completed on 6 October 2004, all identified I&APs were notified by direct mail of another opportunity to comment, in writing, on the substance of the report. The Final Scoping Report draft was made available for inspection at the offices of the Albany Coast Water Board and at the IECM offices, it was sent as hardcopy to key I&APs, and it was made publicly accessible as an internet download from the environmental consultant's ftp site.

4.3 Responses received from I&APs

In response to the PPP, correspondence was received from Delia Enright, Dennis Laubscher and DWAF (Eastern Cape) pertaining to the proposed development. Their submissions are reproduced in Appendices E and M of this report. Their key issues and concerns are addressed in Section 4.4 of this report. No-one else commented on the substance of the report, i.e. the environmental consequences of the proposed development.

The draft Scoping Report was subject of review (see Appendix L) by independent environmental consultant Susie Brownlie on the instruction of Mrs Delia Enright, who owns property (Erf 954) near the premises of the ACWB and is a registered I&AP. The issues and comments raised by Brownlie in her review were duly considered when this report was written. Also on the instruction of Mrs Delia Enright, comment on the draft of the Final Scoping Report was submitted by AJ van Greunen of van Niekerk Groenewoud & van Zyl Attorneys, Notaries & Conveyancers. The letter is reproduced in Appendix M and the response of the IECM to the issues raised therein is given in Section 4.4.

Extensive input was received from Winstanley Smith & Cullinan Inc., environmental law specialists and advisors of the Albany Coast Water Board, especially on legal aspects pertaining to the 28(4) NEMA directive (see Section 1.6).

The final document also benefited from the extensive input received from DEAE&T at all stages of the scoping process.

4.4. Key Issues and concerns

List of concerns raised by Interested and Affected Parties and the response of the IECM.

Issue	Response	Raised by
The brine will mix minimally with seawater and its higher density will cause it to sink to the river bed to be carried upstream by the flood tide	Complete mixing of the brine occurs within 10 m^2 of the outlet pipe under calm conditions during neap low tide (worst-case scenario). See Section 6.2.3.	Dennis Laubscher; Delia Enright
There has been a noticeable decrease in the fish in the Bushmans River compared to other estuaries in the Eastern Cape, e.g. Fish River. Is this due to the high salinity?	The Great Fish Estuary and the Bushmans/Kariega estuary differ markedly in respect to their freshwater inflow and cannot be compared (Grange & Allanson 1995). Kariega (35 spp.) and Bushmans (31 spp.) have very similar fish assemblages that are rated as good (Harrison *et al.* 1996). Fish assemblages have changed in these estuaries due to decreased river inflow (more marine species). The effect of the brine on the estuary salinity is negligible and will not affect the fish assemblages further	Dennis Laubscher
Should the effluent not be discharged into the sea out of harms way?	The discharge of brine into the sea is not without its own environmental effects, most notably the effect of permanent fixed structures on the dynamics of a sandy beach. However, this issue has been evaluated in the scoping report.	Dennis Laubscher; Delia Enright
If the brine has to be discharged into the estuary then this should only be done at ebb tide, by using a holding tank during the flood tide period.	This suggestion has been incorporated as one of the possible mitigation measures into the report.	Dennis Laubscher
Present operations of the ACWB were set-up without due procedure in respect of the Environmental Conservation Act, as no public participation took place.	This is only partly correct. Some structures pre-date the ECA and therefore the Act does not apply. Importantly, construction and operation of RO1 has a valid permit under ECA. The lack of a permit for RO2 and RO3 and of some of the wells is addressed in this scoping report.	Delia Enright
Upgrade of the bulk water supply infrastructure (installation of additional reverse osmosis vessels) leads to excessive noise and vibration causing neighbouring houses to vibrate and sleeplessness of inhabitants.	ACWB will only install equipment complying with South African health and safety regulations and municipal bylaws. This will minimise vibration and noise to nationally accepted standards. It is disputed that the present operation is unduly noisy. See Section 6.2.7.	Delia Enright
It is unacceptable that the environmentally sensitive river estuary be further degraded by concrete structures and pumping plants.	The size of supporting structures and pumping plants will be considerably smaller for seawater abstraction from the estuary than it would be from the sea. However this issue has been evaluated in the scoping report.	Delia Enright

Issue	Response	Raised by
The industrial nature of the operation is not in keeping with the residential character of the area.	Siting of the ACWB premises is dictated by the close proximity to the well field and to the brine discharge point. The ACWB is situated in a cul-de-sac at the outskirts of town. Distances of 80, 170 and 170 m separate them from the nearest residences. Moreover, establishment of the ACWB in 1982 precedes Mrs Enright's acquisition of erf 954 in 1998.	Delia Enright
Discharging water containing waste into the estuary will require a license in terms of Section 21 (f) of the National Water Act	The ACWB intends to comply fully with the permitting requirements and has submitted the necessary permit application to DWAF.	Department of Water Affairs and Forestry: Eastern Cape.
The public participation process has been inadequate as far as non-resident holiday makers are concerned.	The participation of Mrs Enright in the PPP, who is an absentee property owner, shows that the public participation process has been effective, even for non-residents.	Sue Brownlie for Delia Enright
There has been insufficient consideration of alternatives and the overall water supply strategy is not addressed.	Alternatives are discussed in depth in Chapter 5. The overall water supply strategy of the ACWB is clearly spelt out in Section 2.4.	Sue Brownlie for Delia Enright
The ACWB could increase their storage capacity for water currently extracted and treated in order to meet the holiday season demand.	Made up drinking water is a perishable commodity with a short shelf life. In any event, the ACWB currently does not have the spare capacity to produce extra water. Moreover, this suggestion vastly underestimates the quantities involved: to store the quantity needed for the holiday season would require a massive reservoir of some 50 x 30 x 100 metres.	Sue Brownlie for Delia Enright
That the impact rating system used by the IECM in its assessment is somehow flawed.	This is disputed. A technical reply to Brownlie's contention is provided in Appendix J.	Sue Brownlie for Delia Enright
Social factors pertaining to the river as a place of recreation were not sufficiently discussed.	A discussion has been inserted in Section 3.6 and additional comment is made elsewhere in this document.	Sue Brownlie for Delia Enright
The scoping report lacks explicit mitigation measures and mitigation assurance.	This would be part of a detailed environmental management programme for the development. The IECM's brief by the client for the scoping study does not include drafting of an EMP. However, the scoping report has made comprehensive suggestions of possible mitigation measures that could be applied to the various facets of the ACWB's operation, present and future.	Sue Brownlie for Delia Enright AJ van Greunen for Delia Enright

Issue	Response	Raised by
The whole process of public participation was totally insufficient for non-residents. Our client [Delia Enright] accidentally heard about the proposed development from other sources and not from any effort by the independent consultants [i.e. IECM].	This is disputed. Precisely because D. Enright was regarded as an important stakeholder she was sent personal hardcopies of the Draft Scoping Report and of the draft Final Scoping Report as soon as they became available and invited to comment and submit issues of concern to her	AJ van Greunen for Delia Enright
Noise levels were measured with only two pumps running, while it is common knowledge that a third pump is currently undergoing repairs which, when up and running, might contribute significantly to the noise impact.	The assumption that an additional operating pump might contribute significantly to the noise impact is not based on physical fact. The applicable acoustic laws predict that when two sound sources of equal intensity are measured together, their combined intensity level is 3 dB higher than the level of either separately. Thus, the predicted increase from an extra pump would lead to an overall intensity that is less than the ambient difference measured between the two adjacent residential properties off Ocean Drive shown in Fig. 19, Section 6.2.7. (the two uppermost green dots).	AJ van Greunen for Delia Enright
Our client [D. Enright] believes the information contained in the scoping report is not sufficient for the consideration of the application without further investigation and submits that it should, (at least), be supplemented by an environmental impact assessment	We presume that the writer demands that the environmental impact assessment process should proceed from the scoping stage to a full EIA and production of an Environmental Impact Report. The IECM does not share this view, but the final call on this issue is the prerogative of DEAE&T	AJ van Greunen for Delia Enright

CHAPTER 5: DESCRIPTION OF ALTERNATIVES

5.1. Alternate drinking water sources

With its present set-up the Albany Coast Water Board cannot meet the demand for potable water by the community, but the ACWB's options to make up for the shortfall are severely restricted (Sami 2004):

- DWAF has limited the sustainable yield from the Dias Cross coastal aquifer at 300 000 m^3/annum, which is not sufficient, as the present demand is 1 400 m^3/day out of season and 3 000 m^3/day during the holiday season.
- The wellfield near Bushmanns River mouth is exhausted and cannot deliver more water. Severe drawdown in the wells already has led to the salinisation of the aquifer.
- Freshwater cannot be taken from the Bushmanns River as it suffers already from excessive abstraction in its upper reaches.
- No alternate conventional sources of potable water (groundwater, surface water) are available due to the unfavourable geological conditions in the region. Exploration boreholes recently drilled by DWAF at Merville Farm 20 km north of Kenton-on-Sea confirmed this. Since this water is of poor quality in its raw state, relatively little advantage would be gained from this potential new source and blending with freshwater from a RO source would be necessary.
- Although rainwater harvesting from rooftops of residential houses may alleviate the shortfall of drinking water to some extent, it is unrealistic to assume that rainwater collection can ever supply the required quantity of drinking water necessary for the development of the community.

With all other conventional options exhausted, at the end of the 1990s the ACWB therefore turned to desalinisation technology in order address the water needs of the community. The remainder of this chapter therefore investigates the environmental impacts and problems associated with a desalination plant.

5.2. Brine discharge

The major environmental problem associated with a desalination plant is how to get rid of the surplus of concentrated brines. In most cases, these brines cannot remain on land because of the danger they pose to the underlying groundwater and because of other potentially severe environmental impacts. A natural disposal site for these brines is the sea, but an appropriate technology is required in order to insure the proper dispersion of the concentrated solutions and thus minimize their adverse effects on the marine environment. Currently the brine produced by the RO plant is being discharged into the Bushmans Estuary. Several alternative techniques for brine disposal are discussed below, taking into consideration the environmental, engineering and economical aspects.

5.2.1 Direct discharge by pipeline into the sea

Brine disposal is generally a less significant problem in coastal marine environments because the brine is easily diluted to ambient levels, especially if discharged in the high-energy surf zone. If thorough mixing and dilution is obtained, the desalination process does not disturb the natural hydrological cycle. Direct discharge into the sea is the second most economical method of disposal. However, this method has a large environmental impact on beach functioning.

Advantages:

- Consistent high-energy wave action through most of the year will reduce the chances of a dense hypersaline plume forming.
- Biodiversity and number of rare and endangered species in the surf zone and sandy beach environment are lower than in the adjacent estuary.
- The rocky shore environment to the east of the Bushmans River mouth provides sites of attachment for the discharge pipe. The impact of the waves on the rocks also creates more turbulence than is found on the adjacent beach or in the estuary.

Disadvantages:

- The physical presence of a pipeline will have a considerable aesthetic impact on the pristine nature of the coastline.
- An above surface pipeline will restrict and alter sand movement along the beach, resulting in changes in beach topography. Aeolian and wave induced sand transport occurs generally parallel to the shore and the pipe, acting as a barrier to this natural movement, will cause sand deposition upwind erosion downwind. This might influence the mouth and sediment dynamics of the already impacted Bushmans Estuary.
- Placing the pipe under the sand will be extremely costly as the pipe will have to be buried deep and extend further into the sea to prevent the pipe silting up when the RO plant is not operational. The above surface extension of the pipe in the surf zone will also alter sand and wave movement. Mixing and dilution of the brine will be reduced if the pipe extends past the surf zone.
- Surf zone and sandy beach organisms are not as adapted to salinity and temperature fluctuations as the estuarine fauna and flora.
- Rocky shore areas are situated far from the RO plant and this will increase the construction cost of the discharge pipe and pumps. Increasing the length of the pipe also increases the risk of contamination of the surrounding land and groundwater should an accident or pipe failure occur.

5.2.2 Subsurface injection

A common practice in the disposal of brine around the world is to discharge it down deep boreholes. It is actually not a disposal process, but rather storage of the brine in underground reservoirs. This method cannot be employed in the area because the Bokkeveld shale is virtually impermeable. The limestone and karst formations in the area are important groundwater sources and can therefore not be utilised for this function. Another form of subsurface injection that could be used is the release of the brine in a shallow well behind the foredune complex. The idea is that the brine will flow down the natural gradient to the sea and discharge diffusely below the high water mark. The advantages and disadvantages are discussed below.

Advantages:

- No physical structures required on the dynamic section of the lower beach.
- Diffuse discharge along a broader area of the surf zone

Disadvantages:

- The amount of brine discharged will cause fluidisation of the sand and slumping creating an open trench extending from the site of discharge to the sea. This will be aesthetically unpleasant and may be a health and safety risk.
- The long-term soaking of the intertidal zone with hypersaline water will essentially denude the area of any invertebrate organisms.
- The discharge wells must be horizontally and vertically separated from the seawater boreholes to ensure that there is no recirculation of the brine.
- Groundwater fluctuations due to tidal pulsing will influence the subsurface movement of the brine. Spring high tide conditions will prevent the flow of brine to the sea causing damming and slumping in and around the injection wells. Hypersaline water on or close to the surface of the sand will cause dieback of the dune vegetation.
- Increasing the salt concentration of the soil will result in a decrease in the soil water potential. To enable the plants in the area to continue taking up water they need to decrease their tissue water potential and water content (Antlfinger & Dunn 1983; Short & Colmer 1999; Khan *et al.* 2002). Growth inhibition will occur associated with dehydration at high salinity, which is due to increased salinity stress and the resultant loss of cell turgor because of inadequate tissue osmotic adjustment (Ungar 1991). Although dune vegetation is considered halophytic (salt tolerant) any increase in salinity will affect the community structure and zonation patterns. The indigenous dune vegetation plays an important role in the stabilisation of the dune sand. Mobilisation of the dune sand will increase the rate of sedimentation in the already stressed Bushmans Estuary.

5.2.3 Evaporation ponds

Converting the brine into a saleable project was identified by Buckley (1999) as one of the most environmentally friendly means of disposing of the brine. The brine could be discharged into shallow ponds where evaporation will concentrate the salt. Unfortunately no salt works are found in the immediate vicinity and the ACWB premises are too small for them. Co-operation between the ACWB and a (newly created) salt work would be beneficial to both parties. Firstly, the brine is disposed of in an environmentally friendly way and the salt works obtain brine relatively cheaply. Although this alternative is not considered an option at present, we recommend that this be looked into for any further upgrade of the RO plant.

Advantages:

- No direct, unconfined release of brine into the environment.
- Possible financial benefits through the sale of salt and/or brine.

Disadvantages:

- Risk of pollution is increased. Ponds must be properly lined and dyked so that brine is not allowed to seep downward into aquifers or move into surface watercourses.
- The large volume of brine produced will require extensive tracks of flat land. Pond sizes will have to be large taking into consideration such factors as rainfall and evaporation rate of the area as well as the concentration of the brine.
- Pumping costs will be increased if evaporation ponds are situated far from the RO plant.
- The economic viability of new salt works in South Africa is unknown.

5.2.4 Mixing brine with municipal effluent

The two sewerage farms situated in Bushmansrivermouth and Kenton-on-Sea discharge their treated effluent into the Bushmans Estuary upstream of the R72 road bridge. The brine could be mixed with the effluent prior to the release into the Bushmans Estuary.

Advantages:

- The impact of the brine on the estuary will be reduced due to mixing of the brine with the effluent prior to release.

Disadvantages:

- The influence of freshwater in the middle and upper reaches of the estuary are more pronounced and the release of brine in these areas would have a greater impact than at its present discharge position.
- Decreased tidal action in the middle and upper reaches will reduce mixing and dilution of the brine, creating a situation where the brine could possibly form a dense hypersaline lens not mixing with the surrounding water.

- Increased risk of pollution. The effluent outfalls are situated several kilometres from the RO plant thus increasing the risk of pollution should the pipes carrying the brine be damaged.
- Increased cost. The brine needs to be pumped a considerable distance to the sewerage plant and the mixing of the brine with the effluent need to be engineered at the facility.

5.3. Feedwater source and location

For the intake of seawater, desalination plants can use either a pipeline in the sea or beach wells. At present there is an inadequate supply of seawater to the RO process due to severe drawdown in the supply wells at the mouth of the Bushmans Estuary. An alternative reliable source of feedwater has to be found for the proposed upgrade. The ACWB suggested a dedicated inlet pipe that draws water from the Bushmans River. A description of alternatives with their advantages and disadvantages are given below.

5.3.1 Use of saline groundwater

The supply of feedwater from wells is a reliable technology. The use of beach wells is encouraged for seawater intake wherever feasible and where the wells will not cause significant adverse impacts to either beach topography or potable groundwater supplies. Unfortunately no more seawater can be drawn from the well field at the mouth of the Bushmans Estuary. Alternative wells along the coast and along the banks of the estuary could be drilled.

Advantages:

- Provision of clean and filtered seawater (eliminating impingement and entrainment[13]) (Einav *et al.* 2002). This reduces the cost of pretreatment and increases the time between cleaning of filters.
- Significant reduction in the danger of pollution (Einav *et al.* 2002).
- Stable temperature of the feedwater, which reduces the electricity costs of the plant (Einav *et al.* 2002).
- The strong marine influence in the lower reaches of the estuary reduces the impact of abstraction of feedwater from wells adjacent to the estuary.

Disadvantages:

- Danger of disturbing the water table and the aquifer.
- To reduce drawdown, the wells should be spaced wide apart, increasing costs.
- Above surface structures over the wells are aesthetically unpleasant, especially along the estuary.

[13] Impingement is when organisms collide with screens at the intake, and entrainment is when species are taken into the plant with the feed water and are killed during plant processes.

5.3.2 Direct abstraction from the sea

Advantages

- Biodiversity and number of rare and endangered species in the surf zone and sandy beach environment are lower than in the adjacent estuary.
- The rocky shore environment to the far west and immediate east of the Bushmans River mouth provides sites of attachment for the discharge pipe with minimum impact to the environment. The impact of the waves on the rocks also creates more turbulence than is found on the adjacent beach or in the estuary.

Disadvantages

- The physical presence of a pipeline, even when partly buried, will have a considerable aesthetic impact on the pristine nature of the coastline.
- An above surface pipeline will restrict and alter sand movement along the beach, resulting in changes in beach topography. Aeolian and wave induced sand transport occurs generally from west to east and the pipe acting as a barrier to this natural movement will cause sand deposition to the west of the pipe and erosion to the east. This might influence the mouth and sediment dynamics of the already impacted Bushmans Estuary.
- Placing the pipe under the sand will be very costly as the pipe will have to be buried deep and extend further into the sea to prevent the pipe silting up when the RO plant is not operational. The above surface extension of the pipe in the surf zone will also alter sand and wave movement.
- GrahamTek reverse osmosis desalination technology used by the Albany Coast Water Board require that the turbidity of the raw feedwater be less than 5 NTU (Nephelometric Turbidity Units). Turbidity of seawater normally varies between 0 – 5 NTU, but rough sea conditions can increase the turbidity of the entire water column of the inshore area to above 20 NTU. An increase in turbidity will also be experienced when the Bushmans Estuary is in flood that has to be handled by a water pre-treatment filtration plant. However, river floods are less common than rough sea conditions in Bushmansrivermouth.
-

5.3.3 Use of municipal effluent

Advantages

- Reduction in the disposal of treated wastewater to the sensitive river and estuary.

Disadvantages

- The sewerage farms are a long distance away from the ACWB.

- Scientific concerns pertaining to, amongst others, issues of human health, bioaccumulation impacts and groundwater pollution.
- The physical presence of a pipeline will have an aesthetic impact.
- Social "acceptance" issues may pose a barrier to the effective use of this resource. Connotations linked to the original source of such water might be offensive to many potential users and hint at the possibility of associated risk.
- Water recycling entails the beneficial use of treated wastewater for various non-potable demand purposes including urban (domestic), industrial, and municipal and agriculture. Splitting the provision into potable and non-potable water will be costly, especially when water shortages are only recorded for one or two months of a year.

5.4. Do nothing alternative

People have a basic right to water that cannot be withheld. This entitlement to water is affirmed in the National Water Act of 1998, which also recognises that the discriminatory laws and practices of the past have prevented equal access to water and use of water resources. This is particularly pertinent in the study area where the Black townships of Klipfontein, Marselle and Ekuphumleni are topographically higher than the old KoS and BRM municipalities. As such, the townships are first to lose water when reservoirs run dry and will be last to receive water once levels have been restored (Sami 2004). Under these circumstances the 'Do Nothing Alternative' would be socially unacceptable for the Albany Coast Water Board, who is the local custodian of the water resources, as it would amount to racial discrimination. Moreover, the ACWB is bound by the Water Services Act of 1997, which says in section 11.4: "A water services authority may not unreasonably refuse or fail to give access to water services to a consumer or potential consumer in its area of jurisdiction".

Advantages

- No further impact on the environment.

Disadvantages

- Chronic water shortages in the greater KOS/BRM area, especially during the Christmas holidays.
- Curbs any future development of the greater KOS/BRM area. Water becomes the main factor governing development and upliftment of local communities.

CHAPTER 6: ANALYSIS OF ENVIRONMENTAL IMPACTS

6.1. Positive impacts

6.1.1. Preservation of groundwater resources

The pumping of seawater, either from the river or from the nearshore, to supply the RO plants reduces the quantity that needs to be extracted from the Dias Cross coastal aquifer. Firstly, the preservation of the aquifer is important, as over pumping during times of drought and summer peak demand periods may result in saltwater intrusion rendering the supply undrinkable. Encroachment of salt water into coastal aquifers has become a major environmental problem, particularly in rapidly developing coastal areas (Carter 1988). It is extremely costly and sometimes impossible to rehabilitate groundwater once polluted. A second argument for the preservation of the coastal aquifer is that the near-shore foodweb is dependent on the freshwater that seeps through below the high water mark. Nitrate input from this freshwater source maintains populations of surf zone diatoms, especially *Anaulus australis*, that form a vital link in surf zone ecology in the region.

Enhancement:

- This benefit could be further enhanced by increasing the output from the desalination plant, but may prove to be too costly.

6.1.2. Provision of good quality water

The availability of good quality water is a prerequisite for economic and social development of local communities. Water from the surrounding aquifers is of a poor quality and its quantity is limited. The ACWB blends the expensive good quality RO water with the poorer quality water from Dias Cross aquifer to arrive at an acceptable quality and cost profile before distribution.

Enhancement:

- The quality of the water can only be improved by blending in more than 40 % RO water, but this would increase the cost of the water proportionally.

6.1.3. Reliable long term source of water

Desalination is a reliable source of water that is not subjected to the seasonal changes or locally extreme weather events associated with freshwater sources. There is minimal use of chemicals in the process, the plants are modular in design and can be easily expanded. If properly operated, there is low environmental impact.

Enhancement:

- Having a redundancy system in place can enhance the reliability of the RO plant. Back-up pumps and generators will ensure continued water production during mechanical and electrical failure of some systems.

6.2. Negative impacts

Seawater desalination activities have potential adverse impacts on the environment. Most of the impacts derive from the positioning of the feed pipes and the brine discharge pipes. (Einav *et al.* 2002).

6.2.1. Geological structure and stability

The geological structure of the area will be affected by the construction of the seawater inlet and brine outlet pipes. Both alternatives suggested in Chapter 5 will result in a change in the local geology. Building of fixed structures below the high water mark in the estuary will influence the water circulation in the estuary resulting in the deposition and erosion of sediment either side of the structure. Placing permanent supporting structures for a pipeline on the dynamic sandy beach will hinder the natural movement of sand through wave and aeolian processes. The structure will also result in the erosion of the beach downstream of the longshore drift.

Possible mitigation measures:

- The size of the supporting structures should be kept to a minimum.
- Pipes and supporting structures should be placed below the surface where feasible.
- Highly dynamic areas (e.g. sandy beach, river mouth, etc.) should be avoided.
- Existing physical structures and/or rocky outcrops should be used to site inlet and outlet pipes.

6.2.2. Topography

Topographical changes will be related to changes in the geology, in that sand dunes will build up against a structure on the beach and the beach profile will decrease as sand is eroded away down current of the structure. Fixed structures in the estuary will change the profile of the channel (deepening at the structure and shoaling on the opposite bank) and cause altered sedimentation and erosion upstream and downstream of the structure. The placing of physical structures below the high water mark on the beach and in the estuary will result in altered sedimentation and erosion patterns. Erosion will take place downstream of the structure, especially on the sandy beach. Erosion around a structure is not so pronounced in the estuary as the lower reaches are characterised by flood and ebb tides causing both deposition and erosion either way. The discharge of brine from a point source will result in erosion of the surrounding soft sediment, both in the sea and in the estuary. The magnitude of this impact is considered as minor.

Possible mitigation measures:

- The size of the supporting structures should be kept to a minimum.
- Pipes and supporting structures should be placed below the surface where feasible.
- Highly dynamic areas (e.g. sandy beach, river mouth, etc.) should be avoided.
- Existing physical structures and/or rocky outcrops should be used to site inlet and outlet pipes. (Hard physical structures surrounding the discharge pipe will prevent the erosion of soft sediments).

6.2.3. Impacts on the aquatic environment

The aquatic environment will be affected by the construction and operation of the RO facility. These effects either act on the sea or on the estuary or on both, depending on the final design and location of the inlet and outlet pipes. The impacts derive from the abstraction of water and discharge of brine.

6.2.3.1. Discharge of brine, heat and chemicals

Evaluation of these aspects required some field measurements by the IECM as there was no published data available. Measurements were made on a high and a low tide during a neap tidal cycle (22 October 2003). The reduced water circulation during neap tide would have resulted in hydrodynamic trapping of the brine within the estuary, thus presenting the worst-case scenario. *In situ* measurements of salinity and temperature[14] were made using an YSI 6-Series Multi-Probe (6600 Sonde with 650 MDS Display/Logger). RO2 and RO3 plants were operational at the time and brine was discharged. Sampling was done at three stations along each of 11 transects across the river from the mouth of the Bushmans River to past the R72 road bridge (Figure 15). At each station, data was recorded every 10 cm from the surface down to the bottom. Additionally the fate of the brine was tracked near the brine outlet pipe. Physico-chemical data was recorded during low neap tide along three 10 m transects (directly opposite and perpendicular to the outlet pipe, 10 m downstream and 10 m upstream of the pipe). Six stations were evenly placed along each transect and recordings taken every 10 cm from the surface to the bottom using the YSI 6-Series Multi-Probe.

The results showed that the lower Bushmans River has lost the physical characteristics of an estuary and functions more as a marine embayment. During high tide a mean salinity of 36.15 ppt (± 0.005 S.E) was measured in the Bushmans Estuary, which was significantly ($p < 0.05$, $n = 420$) higher than the mean recorded during low tide (35.66 ppt ± 0.078 S.E). The water column was also more stratified during low tide, most notably at stations T4 (brine outlet pipe) and T10 (road bridge).

[14] Dissolved oxygen (DO); pH, total dissolved solids (TDS) and turbidity were also measured.

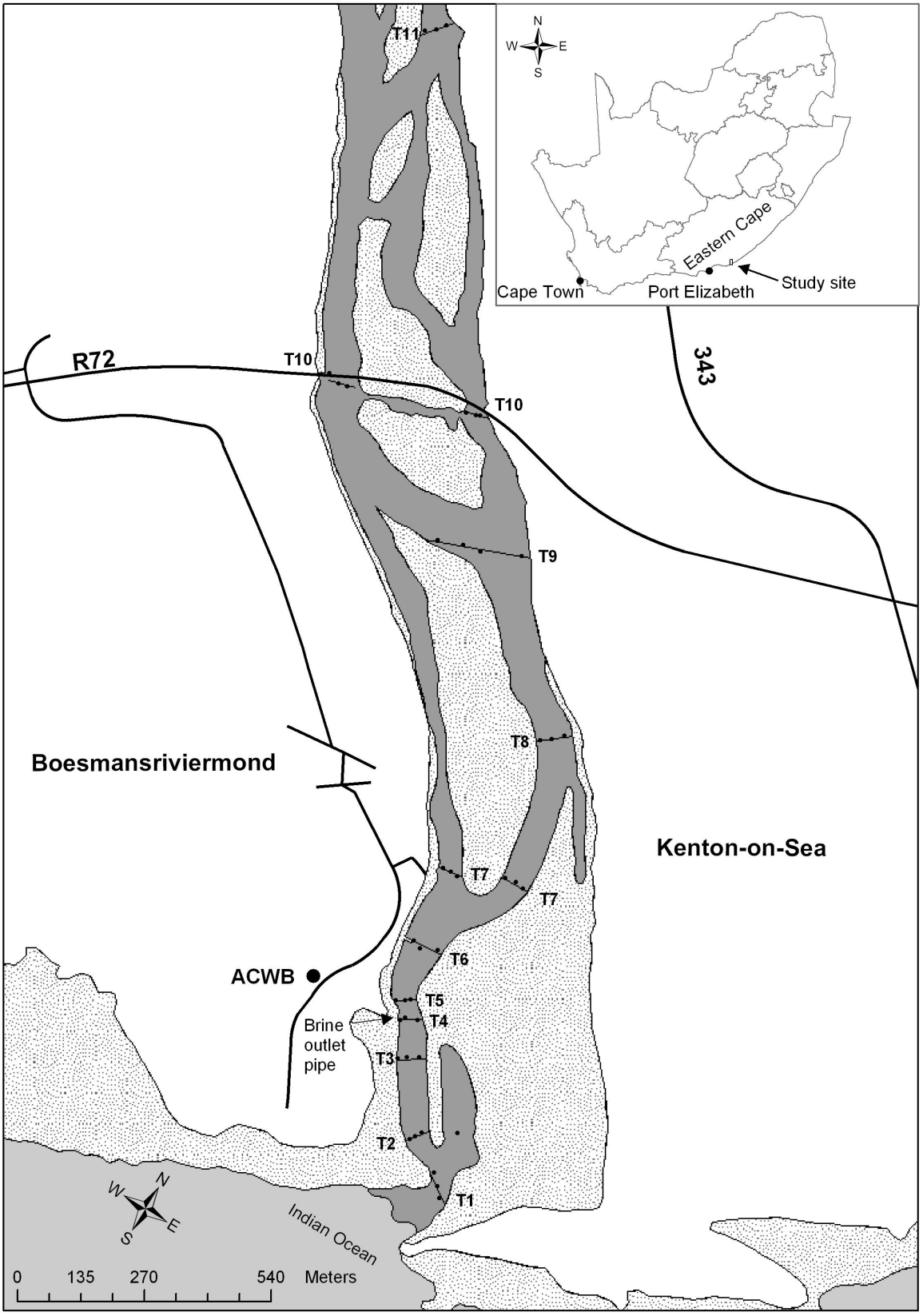

Figure 15. Map of the lower reaches of the Bushmans Estuary showing the location of the brine outlet pipe and the position of the 11 hydrological transects.

The highest measured salinity in the estuary at the mouth of the outlet pipe was 43.5 ppt. The salinity of the water surrounding the outlet pipe decreased to background levels (35.5 - 36.5 ppt) within 1 m vertically and 4 m horizontally (Figure 16). No increase in salinity was noted at the two transects situated 10 m upstream and downstream of the discharge pipe. The interpolated surface plot (Figure 17) shows the complete mixing of the hypersaline effluent within a radius of 10 m.

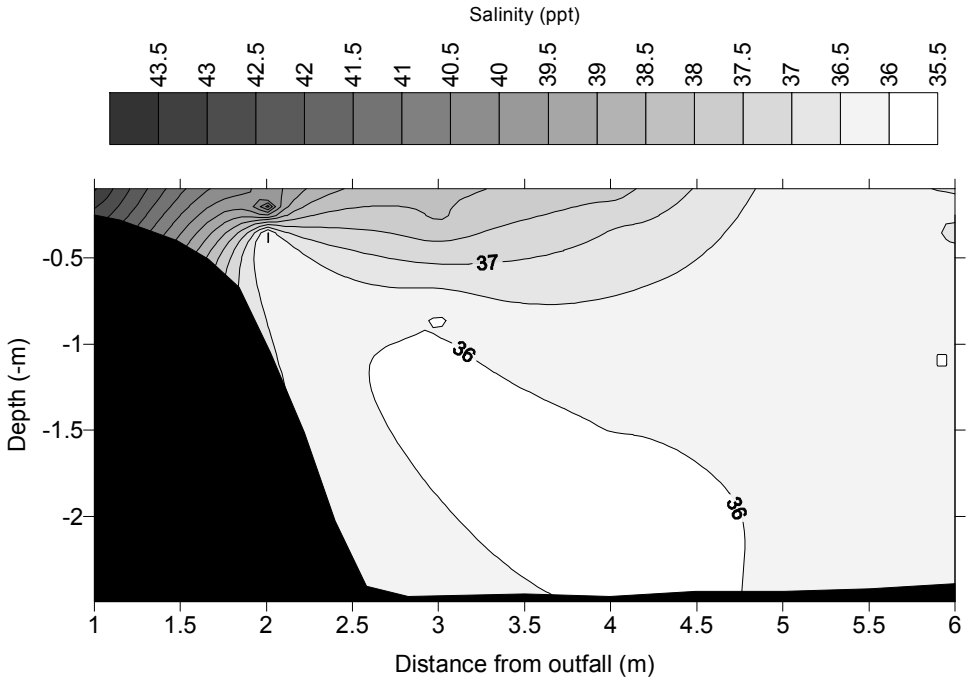

Figure 16. Vertical contour plot of salinity (ppt) at the brine outlet pipe

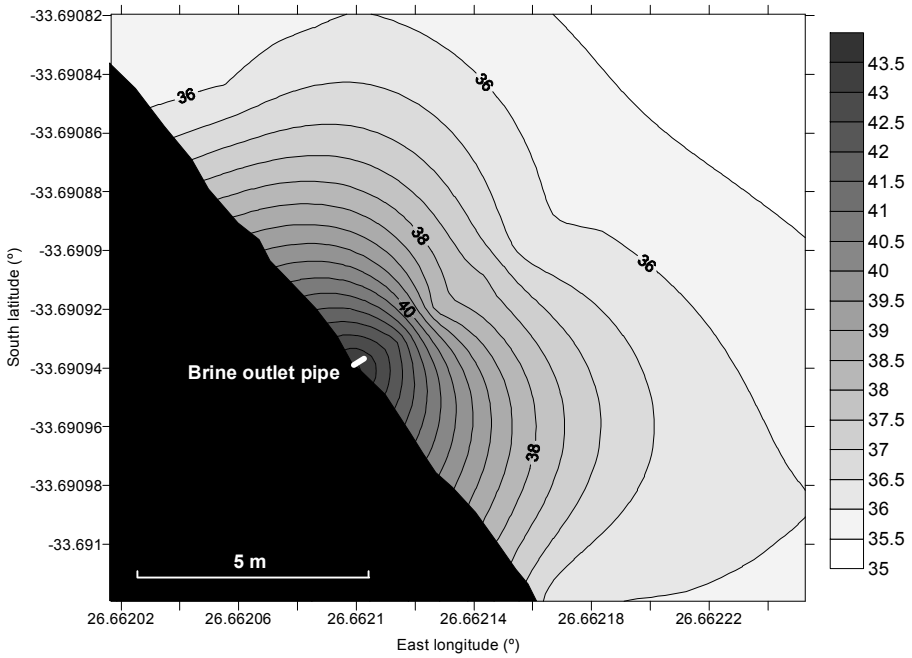

Figure 17. Interpolated surface plot of salinity at the brine outlet pipe.

The water temperature in the estuary ranged from a mean of 18.88 (± 0.0196 S.E) during low tide to a mean of 16.77 (± 0.031 S.E) during high tide owing to the influx of cool marine water. Pronounced vertical and horizontal stratification was not evident from the data, as demonstrated by the low standard error of the mean. The changes in the vertical profile of the water temperature around the outlet pipe are very similar to that of salinity. The effluent water temperature was more than 2 ºC higher than the channel water. The influence of the increased temperature dissipated rapidly with distance from the source (Figure 18).

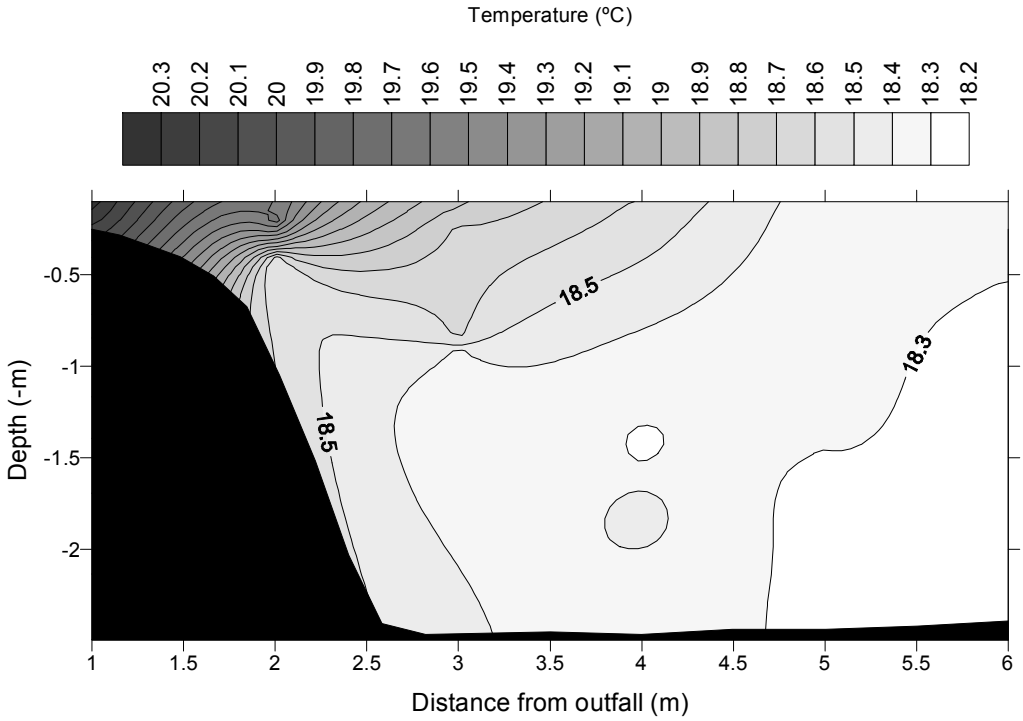

Figure 18. Vertical contour plot of temperature (ºC) at the brine outlet pipe

Abstraction of water upstream for agricultural use is regarded as the main reason why the Bushmans River estuary has become hypersaline (Whitfield & Morshuizen 1992). Impoundments (there are an estimated 30 dams within the catchment) have substantially reduced freshwater inflow into the estuary (Schumann *et al.* 1999). This has resulted in a prolonged residence time of water and the absence of a typical longitudinal salinity gradient. Similar conditions of low river inflow and poor tidal exchange leading to a reversal of the salinity gradient have been observed in the neighbouring Kariega Estuary (Grange & Allenson 1995).

Estuaries in the region have tidal prisms in the order of 1 x 10^6 m^3 (Reddering 1988a, b; Reddering & Rust 1990). Considering that the amount of brine discharged into the system during one tidal cycle is 0.0004 x 10^6 m^3, the total amount of brine discharged is small (10 000 times smaller) compared to the

tidal prism (i.e. the volume of water flowing past the outlet pipe during one tidal cycle). Therefore the capability of the brine to elevate the salinity levels in the estuary is severely limited: the addition of 400 m^3 of brine at 51 ppt to 1 x 10^6 m^3 of tidal water at 35 ppt increases the salinity by only 0.0064 ppt, assuming complete mixing. If the volume of brine was to be doubled to 800 m^3, as is proposed, the increase in salinity of the entire tidal volume will amount to only 0.013 ppt. The actual increase in salinity is predicted to be even lower, as these calculations do not make allowance for the dilution effects of freshwater run-off into the estuary.

According to the Water Quality Criteria for the South African Coastal Zone (Lusher 1984), non-natural influences should not change the salinity beyond the range of background values recorded in the estuary over an extended period. The target range for the coastal zone of South Africa is 33 – 36 ppt (DWAF 1995). Based on these guidelines, the addition of brine to the estuary is not a cause for concern at the moment. The water quality criteria also state that the maximum acceptable variation in ambient temperature caused by artificial sources should not exceed the normal range by more than 2 ºC (Lusher 1984). The maximum acceptable variation is not exceeded by the present discharge set-up.

The IECM's measurements showed that the brine released into the Bushmans Estuary mixes and disperses completely within 10 m^2 of the source. The process of brine dilution is a combination of two physical processes, i.e. primary dilution and natural dilution (Einav *et al.* 2002). Firstly, the momentum, the rate of flow and the velocity at the outlet of the discharge pipe causes primary dilution, especially at low tide when the discharge is above the surface of the water. Secondly, dilution is achieved through processes of diffusion and mixing generated by natural currents and waves in the system.

Because stratification is not well developed, the influence of density currents in the Bushmans Estuary is very small (Baird *et al*. 1981; Schumann *et al.* 1999). Therefore mixing is dominated by tidal turbulence which, due to the shallow nature of the estuary, extends to the water surface. The brine outlet pipe is situated in the lower reaches where tidal mixing is severe and a residence time of the water is short. Mixing is aided by friction at the Deacon Sand Bag Wall and is important in the local redistribution of the brine. Mixing of the brine is further aided by the sandy nature of the lower reaches. Sand, as opposed to mud which retains water like a sponge, ensures more efficient and complete flushing resulting in low residence times and the reduced likelihood of stratification (Reddering 1988a).

Mixing of the brine is expected to be more efficient during high tide. The cross-sectional area of a constricted estuary mouth is very small at low tide, significantly retarding ebb-tidal flow due to the high frictional drag (Reddering & Schumann 2003). The resultant tidal curve in the estuary is asymmetric,

exhibiting a long, slow ebb (7.4 hours) and a brief, fast-flowing flood tide (5 hours) (Baird *et al.* 1981; Reddering & Schumann 2003). The inflowing flood tidal currents allow surface gravity waves to penetrate into the estuary, and the additional orbital velocities serve to mix the lower reaches further. The out flowing ebb tide inhibits the penetration of such ocean waves into the estuary, and this means that turbulent mixing will be reduced (Reddering & Schumann 2003). The difference between spring and neap tides is not large in the Bushmans Estuary (20 cm), because constriction of the estuary mouth inhibits water exchange at spring tides to a much greater extent than at neap tides (Reddering & Schumann 2003). This suggests that it would be advantageous to discharge the brine during high tide.

The desalination technology employed by ACWB does not require pre-treatment of the feedwater. Chlorine and other biocides, which are hazardous to the marine environment, will be used regularly to clean the pipes and other equipment. Cleaning and storage of the membranes can also produce potentially hazardous wastes. These chemicals will have to be neutralised before discharge in the sea or estuary. Cleaning of the membranes is conducted 3 or 4 times a year, and the chemicals used are mainly weak acids and detergents (citric acid, sodium polyphosphate and EDTA which is used in order to remove carbonate deposits). The rinse water is kept in a titration container and after being treated (titration, neutralization of the cleaning materials), it is disposed off either by transporting it in closed containers to an authorized salt disposal site, or by the continuous flow of small quantities together with the discharged brine back to the sea. (Einav *et al.* 2002). The magnitude of the effect on the environment will be low if the above is being adhered to.

Possible mitigation measures:

- Dilute the brine with marine water before returning it to the estuary/sea.
- Increase the momentum, the rate of flow and the velocity at which the brine is discharged. This will aid primary dilution of the brine with the estuary water. This will require over engineering of the seawater intake to produce the spare capacity for this purpose.
- Discharge the brine in the surf zone where natural mixing processes are stronger.
- Discharge the brine on the ebb tide.
- Avoid discharge of chemical constituents whenever possible.

6.2.3.2. Abstraction of seawater

For the intake of seawater, desalination plants can use either a pipeline in the sea or beach wells. Intake of water directly from the ocean or the estuary results in entrainment by the system of small marine organisms and impingement on intake screens. Not only do impingement and entrainment adversely affect biotic productivity in estuaries directly by killing individuals, they also decrease the food supplies

and thereby may have an influence on the structure of food webs (Kennish 1992). Biodiversity and number of rare and endangered species in the surf zone and sandy beach environment are lower than in the adjacent estuary and therefore the magnitude of the impact will be significantly less in the sea. The intake of feedwater can also affect marine resources by altering natural currents in the area of the intake structure. At a maximum proposed pumping rate of 200 m^3 per hour, the magnitude of the impact on natural currents will be low both in the sea and the estuary.

The groundwater wells scattered around the foredune area adjacent to the mouth of the Bushmans Estuary might become redundant if an alternative source of feedwater is found. Most of these wells consist of a cylindrical cement structure protruding above ground level. Although these structures have been designed to blend in with the natural environment, they will, if left unmaintained, become a safety hazard.

A health and safety risk will be associated with the intake pipe in the sea/estuary. An inlet pipe must be designed and sited to prevent injury to recreational users of the estuary/sea.

Possible mitigation measures:

- Low flow velocities in the intake pipe.
- Appropriate sized screens at the intake.
- Special intake design to reduce the potential for entrainment and impingement, e.g. screens, onshore intake wells and/or sand filtration plants.
- The inlet pipe could be placed within a gabion wall or other structure to prevent easy access and to dissipate the force of the intake.
- Aboveground well structures, casings, pumps, etc. should be removed and the boreholes filled in should the seawater well field become redundant.

6.2.4. Impacts on the terrestrial environment

These impacts relate to the construction (and operation) of the intake and outlet pipelines from the ACWB premises to the estuary and/or sea. In each instance these pipelines can be installed adjacent to existing roads and pathways. The initial impact during the laying of the pipes is temporary and confined to the location of the works, and due to the disturbed nature of the area it is expected to have a low impact on the terrestrial environment. Impacts will be minimised further should the intake pipe be sited at the existing gabion wall and the increased volume of brine discharged through the existing discharge pipe. Possible significant impacts may occur during the operational phase should damage occur to an

underground pipe and seawater/brine is released into the groundwater or onto the surface. A health and safety risk will be associated with any physical structures situated aboveground.

Possible mitigation measures:

- The length of the pipeline should be kept to a minimum.
- All exposed structures must be designed to provide minimum risk of injury to people and animal life and should be clearly marked and signposted.
- Structures should be constructed to withstand extreme weather conditions.

6.2.5. Impacts on archaeological and historical sites

No sites of archaeological or historical interest are present at the study site.

6.2.6. Electrical energy use

Desalination plants require significant amounts of electrical energy for their operation. The plant should incorporate means to conserve energy or reduce energy use. The ACWB has done so by choosing the technological options indicated below:

- Energy recovery. Converting hydraulic pressure in the brine to electricity or by transferring this energy to the feedwater. The discharged brine passes through the turbine, which recovers 30 – 40 % of the energy invested by the process pump and is then returned to the sea.
- Reduce electricity costs by operating at night when tariffs are lower.

6.2.7. Noise impacts

No previous quantitative information on noise was available for the study site. The IECM therefore made its own measurements. Sound pressure levels were measured with a digital sound level meter (Major Tech model 8928) set at slow response. Measurements were taken on 23 June 2004 from 15:00 – 16:00. A moderate (10 – 15 $km.h^{-1}$) south-westerly wind was prevailing at the time. This air movement would have the tendency of enhancing the propagation of sound from the ACWB premises to the town of Bushmansrivermouth. RO2 and RO3 plants were operational at the time. Sound pressure levels (dB; decibels) were recorded at 9 sites. The mean value and the standard error of the mean for each site (n = 15) are indicated in Figure 19.

The highest value of 89.6 dB was measured inside the shed housing the high-pressure pumps for the RO plants. The sound pressure levels decreased by more than 10 dB in the open doorway of the shed and dropped by another 15 dB in Ocean Drive (15 m from the sound source). All other stations had a

significantly lower reading. Note that the station on the beach registered 66.1 dB owing to the sound of the surf (moderate surf conditions).

Figure 19. Sound pressure level measurements

Present noise levels are so high inside the RO building owing to the high-pressure, multistage centrifugal pumps used in the reverse osmosis desalination process, that ear muffs must be worn by machine attendants. The RO sheds are built on sandy soil that is a good sound insulator owing to the airspaces between sand grains. The existing pumps are also set on anti-vibration mounts. For its upgrade, the

ACWB intends to use submersible pumps. These pumps produce minimal noise and vibration, require no cooling and are cheaper to run (use less electricity). As a further measure to muffle the sound the ACWB is presently fitting sound proofing to the shed walls and roof with a thickness of 75 mm, which would reduce outside sound levels significantly on completion (see Figure 20).

Figure 20. Sound proofing

Even without the sound proofing of the shed walls and roof completed, and without the changeover to submersible pumps, the measurements made by the IECM team showed that the sound pressure readings with two running plants (RO2, RO3) had decreased to ambient levels at the property boundary. With all the mitigation measures in place, the sound levels at the property boundary are expected to be lowered further, even with all three RO plants operational. However, as some people may regard the humming noise of a pump as irritating, despite its low sound pressure level, the plant operators should continue to search for means that could be incorporated to reduce noise further.

6.2.8. Sense of place and aesthetics

One of the solutions for minimizing the use of coastal land when building desalination plants is locating the plants further inland. This introduces the problem of using pipes for transporting large amounts of seawater and brine, with the danger of pollution to the underlying aquifer from potential leakage. Placing the desalination plant adjacent to areas with established and operating infrastructure, in the framework of infrastructure unification, will minimize this impact. With this in mind the siting of the ACWB premises is acceptable. Unconcealed pipelines running on the surface are very likely to be perceived as aesthetically distracting and are not in keeping with the main human use of the estuary, which is outdoor recreation.

Mitigation:

- To reduce visual impacts it is highly desirable that pipes be buried underground.

6.2.9. Social issues

The upgrade of the bulk water supply has no implications for the present complement of employees of the ACWB as no new permanent jobs will be created, but may provide short-term employment during the construction phase. Under present operating conditions the impact on the river as a recreational resource is clearly negligible. Before this scoping study, many people were aware of the presence of the ACWB but had no deeper insight how their water was being made up. The present water crisis has certainly increased public awareness.

Mitigation:

- Strong, community wide water conservation and reclamation measures to reduce the need for new water projects.
- Coordination of water supply with regional growth management goals.

6.2.10. Cumulative impacts

Limited water is often the major constraint to development in many parts of the coast. Water provision through desalination is not a cure-all, because the water is expensive to make and the environmental effects of abstraction and brine discharge are cumulative. Although the discharge of brine in the envisaged quantities is not a cause of concern at the moments, as was elaborated on earlier in this chapter (6.2.3), the estuary's capacity to absorb the impacts without major change in its hydrological structure is not endless. Therefore, water will also be a severely limited commodity in the greater KOS/BRM area. This constraint should be duly recognized and addressed in the Integrated Development Plan for the area.

6.3. Environmentally preferred option

Having discussed the alternatives in Chapter 5 and the potential environmental impacts of sourcing feedwater from and discharging brine to the sea or the estuary, the following scenario emerges as the environmentally preferred option:

- Sourcing the feedwater from the existing gabion wall in the estuary minimises the length of pipeline that needs to be laid, is economical and the least damaging to the environment as well as technologically undemanding. This pipeline should be laid underground.
- Discharging the brine into the estuary through the existing outlet requires no new construction and the magnitude of the impact on the estuary is environmentally acceptable.

The impacts of this preferred option are formally rated in Section 6.4.

Selection of the above option raises questions of the status, stability and likely future of the gabion jetty that cradles the marine intake, and of the Deacon sand bag wall in which the brine discharge outlets are embedded. It perpetuates the presence of both structures that were put in by the then Boesmansrivier Municipality during the 1980s. Jetty and wall have stood the test of time and they have had some success in preventing the lower river from swinging westwards. It would be unwise to tamper with the status quo of the river configuration, with wall and jetty in place, at a time when the town is in urgent need of a seawater supply to feed the desalination plant. Should on solid hydrological advice it become desirable one day to remove said structures, this advice will have to include a different technical solution to the anchoring problem of inlet and outlets.

6.4. Rating of impacts

6.4.1. Introduction and methodology of rating

The most important component, and in fact the underlying purpose, of EIA is the identification, analysis and evaluation of the significance of potential environmental consequences associated with a proposed action. From this process of appropriate environmental management programmes are developed in order to avoid, minimize, rectify or compensate for negative impacts, or in the case of positive impacts, to enhance these. The purpose of this chapter is to describe the impact assessment methodology and to make an assessment of the environmental consequences of the proposed actions.

The range of impacts considered in EIA has broadened substantially in recent years to include social, health, and economic and other issues. OECD/DAC (1994) defined environment for the purposes of EIA to include:

- effects on human health, well-being, environmental media, ecosystems and agriculture;
- effects on climate and the atmosphere;
- use of natural resources (regenerative and mineral);
- utilization and disposal of residues and wastes; and
- resettlement, archaeological sites, landscape, monuments and social consequences as well as upstream, downstream and trans-boundary effects.

The purpose of this assessment is then to isolate those elements of the environment that may be affected in this specific case, and to rate the extent and magnitude of any anticipated effect or change.

6.4.2. Impact Assessment Methodology

Impacts are assessed in terms of the criteria presented in Table 1.

Table 1. Criteria used to determine the significance ratings

Criteria	Description
Spatial extent	The extent of impact describes the region in which the impact will be experienced: • Site specific • Local (< 2km from site) • Regional (within 30km of the site) • National
Intensity or Magnitude of impact	The intensity describes the magnitude or size of the impact: • High: Natural and/or social functions and/or processes are severely altered • Medium: Natural and/or social functions and/or processes are notably altered • Low: Natural and/or social functions and/or processes are negligibly altered
Duration	The duration is the time frame in which the impact will be experienced: • Temporary (<1 year) • Short term (1 to 6 years) • Medium term (6 to 15 years) • Long term (15 - 30 years) • Permanent
Probability	The probability of the impact occurring: • Improbable (little or no chance of occurring) • Probable (< 50% chance of occurring) • Highly probable (50% - 90% chance of occurring) • Definite (>90% chance of occurring)

The impacts are assessed (rated) in terms of their significance (high, medium, low), status and confidence through a synthesis of the criteria in Table 1. The rating system is outlined in Table 2.

Table 2: Method for Rating of Impacts

Class	Description
Significance	• High: impacts of high magnitude locally for longer than 6 years and/or regionally and beyond. The impact results in major alterations to the environment even if effective mitigation measures are implemented and will have an influence on decision-making. • Medium: impacts of moderate magnitude locally to regionally in the short term. The impact results in medium alterations to the environment and can be reduced or eliminated by the implementation of effective mitigation measures. • Low to very low: impacts will be localised and temporary. Impacts result in minor alterations to the environment and can easily be alleviated by the implementation of effective mitigation measures. • No impact: a potential concern or impact, which, upon evaluation, is found to have no significant impact at all.
Status	The status is the overall effect on the environment: • Positive - a 'benefit' • Negative - a 'cost' • Neutral

Class	Description
Confidence	The degree of confidence in predictions based on available information and specialist knowledge: • Low • Medium • High

Impacts are assessed both with and without suggested mitigation measures and presented in the format presented by way of example in Table 3.

Table 3. Example: Impacts on vegetation

Impact: *Loss of areas of high or intermediate botanical conservation importance*

Project Stage	Extent	Duration	Intensity	Probability	Significance without Mitigation	Significance assuming Mitigation	Status	Confidence
Construction	Local	Long-term	Medium	High	Significant	Not significant	_	High
Operational	Local	Long-term	Medium	High	Significant	Not significant	_	High

Recommended Mitigation Measures

Mitigation measures or management actions are recommended that will minimise or eliminate negative environmental impacts, assist design, enhance project benefits and protect public and individual rights to compensation.

Impacts are rated both **with** and **without** the assumed effective implementation of mitigation measures (see Table 3). If appropriate, it is being differentiated between essential mitigation measures which must be implemented (i.e. implicit in the "assuming mitigation" rating) and optional mitigation measures, i.e. "nice-to-haves", but which do not affect the impact rating.

6.4.3. Tables rating positive and negative impacts

Positive impacts (rating with and without enhancements and mitigation)

Preservation of groundwater resources

Project Stage	Extent	Duration	Intensity	Probability	Significance without Mitigation	Significance assuming Mitigation	Status	Confidence
Operational	Regional	Long term	Medium	Definite	Medium	High	Positive	High

Provision of good quality water

Project Stage	Extent	Duration	Intensity	Probability	Significance without Mitigation	Significance assuming Mitigation	Status	Confidence
Operational	Regional	Long term	High	Definite	Medium	High	Positive	High

Reliable long term source of water

Project Stage	Extent	Duration	Intensity	Probability	Significance without Mitigation	Significance assuming Mitigation	Status	Confidence
Operational	Regional	Long term	High	Definite	Medium	High	Positive	High

Supplementing and blending poorer quality coastal aquifer water with good quality RO water will preserve precious groundwater resources in the area as well as provide a better quality product that is sustainable in the long term. The significance of the three positive impacts that were identified is considered to be high. It should be stressed that the availability of a reliable source of good quality water forms the very basis of those policies and practises that lead to the prosperity of the town and with it to the social upliftment of previously disadvantaged persons. Without water there will be no upliftment.

Negative impacts (rating with and without enhancements and mitigation)

Geological structure and stability

Project Stage	Extent	Duration	Intensity	Probability	Significance without Mitigation	Significance assuming Mitigation	Status	Confidence
Construction	Local	Temporary	Low	Definite	Medium	Low to very low	Negative	High
Operational	Local	Long term	Low	Definite	Medium	Low to very low	Negative	High

Topography

Project Stage	Extent	Duration	Intensity	Probability	Significance without Mitigation	Significance assuming Mitigation	Status	Confidence
Construction	Local	Temporary	Low	Definite	Medium	Low to very low	Negative	High
Operational	Local	Long term	Low	Definite	Medium	Low to very low	Negative	High

Although the installation of a feedwater pipe and pump house will impact on the geology and topography of the estuary, the intensity of the intervention will be low and with proper mitigation the significance of these impacts will be low to very low.

Aquatic environment

Effect of brine, heat and chemicals discharge on the environment

Project Stage	Extent	Duration	Intensity	Probability	Significance without Mitigation	Significance assuming Mitigation	Status	Confidence
Operational	Site specific	Long term	Low	Definite	Medium	Low to very low	Negative	Medium to high

Abstraction of feedwater

Project Stage	Extent	Duration	Intensity	Probability	Significance without Mitigation	Significance assuming Mitigation	Status	Confidence
Operational	Site specific	Long term	Low	Highly probable	Medium	Low to very low	Negative	Medium to high

Increasing the discharge of brine into and sourcing feedwater from the estuary will be of low intensity and, assuming mitigation, the impact will be low to very low.

Impacts on the terrestrial environment

Project Stage	Extent	Duration	Intensity	Probability	Significance without Mitigation	Significance assuming Mitigation	Status	Confidence
Construction	Site specific	Temporary	Medium	Definite	Medium	Low to very low	Negative	High
Operational	Site specific	Long term	Low	Highly probable	Low to very low	Low to very low	Negative	High

Impacts on archaeological and historical sites

No archaeological or historical sites are situated at the study site. Impacts are therefore not rated.

Electrical energy use

Project Stage	Extent	Duration	Intensity	Probability	Significance without Mitigation	Significance assuming Mitigation	Status	Confidence
Operational	Regional	Long term	Medium	Definite	Low to very low	Low to very low	Negative	High

Noise impacts

Project Stage	Extent	Duration	Intensity	Probability	Significance without Mitigation	Significance assuming Mitigation	Status	Confidence
Construction	Local	Temporary	Medium	Highly probable	Medium	Low to very low	Negative	High
Operational	Local	Long term	Low	Highly probable	Medium	Low to very low	Negative	High

Noise impacts during construction can be mitigated to very low levels by working during the week and out of season. Through the application of best technology, the noise from the high-speed pumps can be muffled effectively.

Sense of place and aesthetics

Project Stage	Extent	Duration	Intensity	Probability	Significance without Mitigation	Significance assuming Mitigation	Status	Confidence
Construction	Site specific	Temporary	Medium	Definite	Medium	Low to very low	Negative	High
Operational	Local	Long term	Low	Definite	Medium	Low to very low	Negative	High

Social issues

Project Stage	Extent	Duration	Intensity	Probability	Significance without Mitigation	Significance assuming Mitigation	Status	Confidence
Construction	Regional	Temporary	Medium	Highly probable	Medium	Medium	Positive	High
Operational	Regional	Long term	Medium	Highly probable	High	Low to very low	Negative	High

Construction may have a positive impact by providing short-term employment. If the expansion of the bulk water scheme is not accompanied by water saving and education programmes and is not incorporated in the Integrated Development Plan for the area, the uncontrolled demand for ever more water will lead to degradation of the environment.

6.5 Evaluation of the environmental impact of the unlicensed components of the water works

6.5.1. Introduction

As outlined in Section 1.6, several structures commissioned by the ACWB over the years during the expansion of their waterworks which fell within the ambit of identified activities, were not subjected to an EIA process and are thus operating without the required authorisation from DEAE&T. These structures present the main components of the desalination plant operating at present (see p.6). In response to the NEMA directive of DEAE&T issued to the ACWB, an assessment of the impacts of the existing [illegal] aspects of the water purification plant activities on the environment was made in this section.

The process of desalination of seawater in BRM/KoS is intended to reduce the deficit in potable water both at present and in the future. The desalination of seawater through reverse osmosis offers various environmental benefits (related to preservation of groundwater, maintenance of estuarine and river fresh water requirements, etc.), but adverse environmental effects also accompany the process. Desalination in the study area may be said to have impacted on eight aspects of the environment, namely

1. biodiversity of fauna and flora,
2. soil quality,
3. topography,
4. sense of place and aesthetics,
5. air quality,
6. noise,
7. water, and
8. socio-economic factors.

These impacts have been detailed in the preceding parts of this document, particularly in Chapters 3, 5 and 6, and they can now be formally evaluated and rated. Since there are no archaeological or historical sites of significance situated at the study sites, impacts of this kind are not considered.

6.5.2. Methods used in the evaluation

Impacts on the eight aspects of the environment by a.) the desalination plant on the ACWB grounds, b.) well field at the mouth of the Bushmansriver and c.) brine discharge into the estuary were scored using appropriately selected criteria outlined in Section 6.4.2.

6.5.3. Results of the evaluation

*a.) Environmental impact of the **desalination plant** situated on the ACWB grounds*

Aspect	Spatial extent	Duration	Intensity	Significance	Status	Confidence
Biodiversity	local	long term	very low	low	negative	high
Soil	site-specific	permanent	medium	low	negative	high
Topography	local	permanent	no impact	no impact	neutral	high
Aesthetics	local	long term	low	low	negative	high
Air quality	local	long term	no impact	no impact	neutral	high
Noise	site-specific	long term	low to medium	low	negative	high
Water	regional	long term	high	high	positive	high
Social	regional	long term	high	high	positive	high

Since the second shed housing RO2 and RO3 plants was placed next to the first (licensed) shed on already disturbed ground, the negative impacts are all of low significance. Conversely, the construction and subsequent operation of the desalination plant has made a significant positive contribution to the preservation of groundwater resources and the social fabric of the area. Without this plant, opportunities for community growth and development, including tourism, would have been severely curtailed in recent years. The plant has had no impact on the topography or the air quality.

*b.) Environmental impact of the **well field** at the mouth of the Bushmans River*

Aspect	Spatial extent	Duration	Intensity	Significance	Status	Confidence
Biodiversity	site-specific	long term	very low	low	negative	high
Soil	site-specific	permanent	medium	low	negative	high
Topography	local	long term	low	low	negative	high
Aesthetics	site-specific	long term	medium	medium	negative	high
Air quality	local	long term	no impact	no impact	neutral	high
Noise	local	long term	no impact	no impact	neutral	high
Water	local	long term	high	high	ambivalent	high
Social	regional	long term	high	high	positive	high

Owing to fact that parts of each borehole/well is visible above ground, the natural beauty of the sparsely vegetated dunes has been compromised to some extent. The impact on water resources has been ambivalent: while the well field has been essential in bringing water to the community, thus facilitating social development, the operation of the wells has severely compromised the underlying aquifer through overpumping and subsequent saltwater intrusion. However, to some degree this effect may also have occurred through pumping from the other boreholes that are licensed.

*c.) Environmental impact of the brine **discharge pipeline** near the estuary mouth*

Aspect	Spatial extent	Duration	Intensity	Significance	Status	Confidence
Biodiversity	local	long-term	low	low	negative	high
Soil	site-specific	long-term	low	low	negative	high
Topography	site-specific	long-term	no impact	no impact	neutral	high
Aesthetics	site-specific	long-term	low	low	negative	high

Aspect	Spatial extent	Duration	Intensity	Significance	Status	Confidence
Air quality	local	long term	no impact	no impact	neutral	high
Noise	local	long term	no impact	no impact	neutral	high
Water	regional	long-term	low/high	low/high	ambivalent	high
Social	regional	long term	very low	very low	negative	high

As has been the case with the wellfield, the impact of the discharge pipeline on the water situation has been ambivalent: while it has been an essential structure for the provision of water to the community resulting in a high positive impact on the community, the brine has also slightly burdened the hydrology of the estuary in that it has added salt to a waterbody starved by freshwater input upstream (see Section 3.3). The discharge pipeline has had no impact on the topography or the air quality.

CHAPTER 7: RECOMMENDATIONS AND CONCLUSIONS

7.1. Conclusions

No fatal flaw that would stop the proposed development emerged during the course of this investigation. None of the alternatives that were discussed and evaluated in Chapter 5 were superior to the development option proposed by the ACWB. Discharging the brine through the existing outlet and construction of a new inlet next to the gabion wall is preferred over the use of the seashore for discharge and abstraction. Desalination does carry some threats to the coastal environment, but if designed and practiced judiciously, it has the potential to provide significant quantities of potable water without any significant impact as a result of the seawater abstraction and/or brine discharge. As compared to further extraction of freshwater from river and groundwater systems, this water source appears to be the way of the future in an environmentally aware world where other sources of freshwater are scarce.

As a precautionary measure, at least a part of the brine should be discharged on an outgoing tide. Should the mouth of the Bushmans Estuary close for whatever reason, all discharge of brine into the system should be stopped until the mouth is open again.

The influence of the increased brine discharge on the Bushmans Estuary should be determined once the upgrade of the desalination plant has been completed. It can then be decided whether the proposed mitigation measures of spray nozzles and/or injection of the effluent with river water need to be implemented.

As there is limited scope for further upgrades of the RO facility, development plans in the region should be adjusted accordingly.

7.2. Recommendations

Sufficient evidence has emerged from this investigation and from the input of I&APs during the PPP to conclude that this Scoping Study should not proceed to a full EIA and additional specialist studies.

This scoping report was designed to obtain sufficient information to evaluate the proposed activity and to identify and determine the significance of the potential environmental impacts. The IECM is satisfied that this target has been achieved. Therefore, the information in this report will assist authorities in making an informed decision when considering the application of the Albany Coast Water Board.

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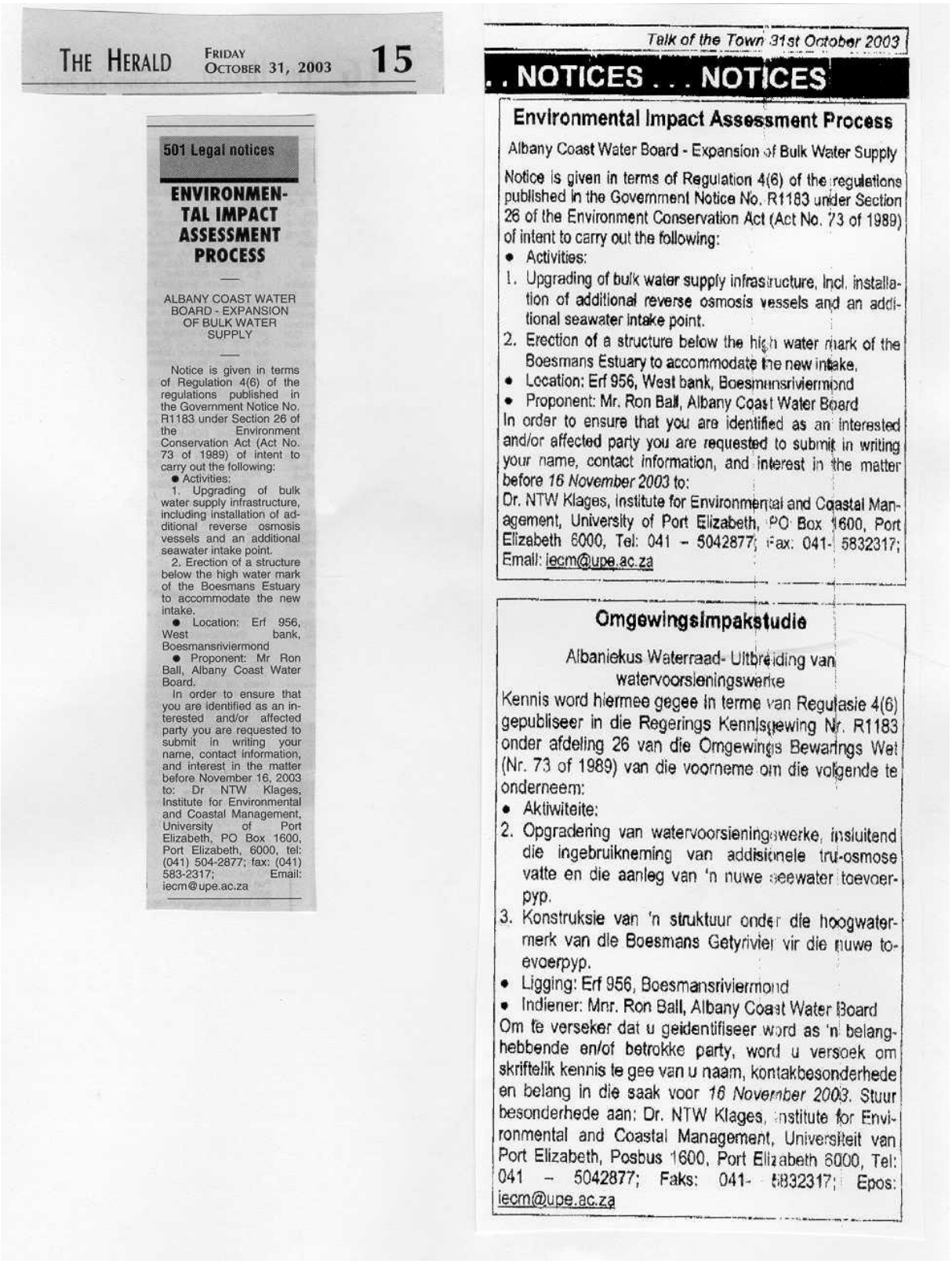
Appendix A: Newspaper Advertisements



THE HERALD FRIDAY OCTOBER 31, 2003 15

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ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

ALBANY COAST WATER BOARD - EXPANSION OF BULK WATER SUPPLY

Notice is given in terms of Regulation 4(6) of the regulations published in the Government Notice No. R1183 under Section 26 of the Environment Conservation Act (Act No. 73 of 1989) of intent to carry out the following:

- Activities:

1. Upgrading of bulk water supply infrastructure, including installation of additional reverse osmosis vessels and an additional seawater intake point.
2. Erection of a structure below the high water mark of the Boesmans Estuary to accommodate the new intake.

- Location: Erf 956, West bank, Boesmansriviermond
- Proponent: Mr Ron Ball, Albany Coast Water Board.

In order to ensure that you are identified as an interested and/or affected party you are requested to submit in writing your name, contact information, and interest in the matter before November 16, 2003 to: Dr NTW Klages, Institute for Environmental and Coastal Management, University of Port Elizabeth, PO Box 1600, Port Elizabeth, 6000, tel: (041) 504-2877; fax: (041) 583-2317; Email: iecm@upe.ac.za

Talk of the Town 31st October 2003

. . NOTICES . . . NOTICES

Environmental Impact Assessment Process

Albany Coast Water Board - Expansion of Bulk Water Supply

Notice is given in terms of Regulation 4(6) of the regulations published in the Government Notice No. R1183 under Section 26 of the Environment Conservation Act (Act No. 73 of 1989) of intent to carry out the following:

- Activities:

1. Upgrading of bulk water supply infrastructure, Incl. installation of additional reverse osmosis vessels and an additional seawater intake point.
2. Erection of a structure below the high water mark of the Boesmans Estuary to accommodate the new intake.

- Location: Erf 956, West bank, Boesmansriviermond
- Proponent: Mr. Ron Ball, Albany Coast Water Board

In order to ensure that you are identified as an interested and/or affected party you are requested to submit in writing your name, contact information, and interest in the matter before *16 November 2003* to:
Dr. NTW Klages, Institute for Environmental and Coastal Management, University of Port Elizabeth, PO Box 1600, Port Elizabeth 6000, Tel: 041 – 5042877; Fax: 041- 5832317; Email: iecm@upe.ac.za

Omgewingsimpakstudie

Albaniekus Waterraad- Uitbreiding van watervoorsieningswerke

Kennis word hiermee gegee in terme van Regulasie 4(6) gepubliseer in die Regerings Kennisgewing Nr. R1183 onder afdeling 26 van die Omgewings Bewarings Wet (Nr. 73 of 1989) van die voorneme om die volgende te onderneem:

- Aktiwiteite:

2. Opgradering van watervoorsieningswerke, insluitend die ingebruikneming van addisionele tru-osmose vatte en die aanleg van 'n nuwe seewater toevoerpyp.
3. Konstruksie van 'n struktuur onder die hoogwatermerk van die Boesmans Getyrivier vir die nuwe toevoerpyp.

- Ligging: Erf 956, Boesmansriviermond
- Indiener: Mnr. Ron Ball, Albany Coast Water Board

Om te verseker dat u geidentifiseer word as 'n belanghebbende en/of betrokke party, word u versoek om skriftelik kennis te gee van u naam, kontakbesonderhede en belang in die saak voor *16 November 2003*. Stuur besonderhede aan: Dr. NTW Klages, Institute for Environmental and Coastal Management, Universiteit van Port Elizabeth, Posbus 1600, Port Elizabeth 6000, Tel: 041 – 5042877; Faks: 041- 5832317; Epos: iecm@upe.ac.za

Appendix B: On-Site Posters

Environmental Impact Assessment Process

Albany Coast Water Board - Expansion of Bulk Water Supply

Notice is given in terms of Regulation 4(6) of the regulations published in the Government Notice No. R1183 under Section 26 of the Environment Conservation Act (Act No. 73 of 1989) of intent to carry out the following:

- Activities:
  1. Upgrading of bulk water supply infrastructure, incl. installation of additional reverse osmosis vessels and an additional seawater intake point.
  2. Erection of a structure below the high water mark of the Boesmans Estuary to accommodate the new intake.
- Location: Erf 956, West bank, Boesmansriviermond
- Proponent: Mr. Ron Ball, Albany Coast Water Board

In order to ensure that you are identified as an interested and/or affected party you are requested to submit in writing your name, contact information, and interest in the matter before *16 November 2003* to:
Dr. NTW Klages, Institute for Environmental and Coastal Management, University of Port Elizabeth, PO Box 1600, Port Elizabeth 6000, Tel: 041 – 5042877; Fax: 041- 5832317; Email: iecm@upe.ac.za

Omgewingsimpakstudie

Albaniekus Waterraad- Uitbreiding van watervoorsieningswerke

Kennis word hiermee gegee in terme van Regulasie 4(6) gepubliseer in die Regerings Kennisgewing Nr. R1183 onder afdeling 26 van die Omgewings Bewarings Wet (Nr. 73 of 1989) van die voorneme om die volgende te onderneem:

- Aktiwiteite:
  1. Opgradering van watervoorsieningswerke, insluitend die ingebruikneming van addisionele tru-osmose vatte en die aanleg van ‘n nuwe seewater toevoerpyp.
  2. Konstruksie van ‘n struktuur onder die hoogwatermerk van die Boesmans Getyrivier vir die nuwe toevoerpyp.
- Ligging: Erf 956, Boesmansriviermond
- Indiener: Mnr. Ron Ball, Albany Coast Water Board

Om te verseker dat u geidentifiseer word as ‘n belanghebbende en/of betrokke party, word u versoek om skriftelik kennis te gee van u naam, kontakbesonderhede en belang in die saak voor *16 November 2003*. Stuur besonderhede aan: Dr. NTW Klages, Institute for Environmental and Coastal Management, Universiteit van Port Elizabeth, Posbus 1600, Port Elizabeth 6000, Tel: 041 – 5042877; Faks: 041- 5832317; Epos: iecm@upe.ac.za

Appendix C: List of Interested and Affected Parties

Name and Designation	Address
Mr Nick Fox, Chairman	Estuary Care, P O Box 31, KoS 6190, nickfox@intekom.co.za
Mr Ian Duthie	Estuary Care, Box 77, BRM 6190
Mr RB Holcroft, Chairman	Bushmans River Ratepayers Assoc., PO Box 90, BRM 6190
Mr Fanie Fouche	Ndlambe Municipality, Box 13, Port Alfred 6170, ffouche@ndlambe.co.za
Mr Dennis Laubscher	Laubscher & Associates, Box 95, BRM 6190, dennis.laubscher@border.co.za
Mr John Lillis	Boesmans/Kariega Trust, Estuary Care, Box 48, BRM 6190
Mr Mluleki Matiwane	Directorate Housing, Ndlambe Municipality, Box 13, Port Alfred 6170
Mr Chester Wilmot	Joan Muirhead Nature Reserve, Box 69, KoS 6191
Mr Joseph Abraham	River Control Officer, Ndlambe Municipality, Box 13, Port Alfred
Mr Grant Davis	Boesmans/Kariega Trust, Estuary Care, Box 323, KoS
Ms L Coetzee, Chairman:	KoS Ratepayers Association, Box 472, KoS 6191, ccoetzee@intekom.co.za
Ms Jos Guest	Bathurst West Farmers Assoc., c/o Estuary Care, Box 31, KoS 6190
Mr Anton Gouws, Director	Community Protection Services, Ndlambe Municipality, Box 13, Port Alfred 6170, agouws@ndlambe.co.za
Councillor Eric Khoathani	Ward 3, Ndlambe Municipality, P O Box 2, Port Alfred 6170
Councillor Jones Phillipson	Ward 7, Ndlambe Municipality, P O Box 2, Port Alfred 6170
Councillor Zola Zweni	Ward 4, Ndlambe Municipality, Box 2, Port Alfred 6170
Mr W Balura, Mayor	Ndlambe Municipality, P O Box 13, Port Alfred 6170
Mr George Ngesi, Town Engineer	Ndlambe Municipality, Box 13, Port Alfred 6170
Mr Bill Patterson	Director: Infrastructure, Ndlambe Municipality, Box 13, Port Alfred
Mr Gert Jordaan	Developmental Planning, Ndlambe Municipality, Box 13, Port Alfred 6170, gjordaan@ndlambe.co.za
Mr Nicholas Scarr	DEAE&T, P.Bag X5001, PE 6000
Mr PG Retief	DWAF, P.Bag X6041, PE 6000, retief@dwaf.gov.za
Dr Alan Whitfield Director:	SA Institute f. Aquatic Biodiversity, Bag X1015, Grahamstown 6140
Mr Andrew Lucas	DWAF, Box 7019, East London 5200
Mr Francois Kruger, Chairman:	Alexandria Angling Club, Box 260, KoS 6191
Dr Steve Mitchell	Water Research Commission, Private Bag X03, Gesina 0031
Ms Margaret McKenzie	Inst f. Natural Resources, Bag X01, Scottsville 3201
Prof Guy Bate, Chair	Consortium f. Estuarine Research & Monitoring, 18 Oakley Dr, Howick 3290, btagcb@mweb.co.za
Mr Zako : Assistant Director	Marine Coastal Management, P O Box 161, Port Alfred 6170
Mr Warrick Stewart	WESSA, 2b Lawrence Str, Central, PE 6001
Mr Willie & Mrs Delia Enright	7 Oceanview Drive, Boesmansriviermond / PO Box 863, Bellville, 7535.
Mr Uli Haydam, Principle Engineer	WSM-Leshika Pty Ltd, PO Box 2752, Port Alfred 6170, wsmec@telkomsa.net
Dr Eckart Schumann	Geology Department, University of Port Elizabeth, PO Box 1600, PE 6000

Appendix D: Background Information Document

Reverse Osmosis Upgrade of Kenton-on-Sea/Bushmansrivermouth Bulk Supply

The Institute for Environmental & Coastal Management (IECM) is an independent environmental consultancy based at the University of Port Elizabeth. The Albany Coast Water Board (ACWB) has appointed the IECM to assess the environmental impacts of its proposed upgrading of the bulk water supply infrastructure and the erection of a fixed structure (water intake) below the high water mark of the Bushmans Estuary. The plant is situated on the premises of the ACWB on the west bank of the Bushmans River near the mouth (Figure 1).

A scheme for the abstraction and utilisation of ground or surface water for bulk supply purposes is a 'listed activity' in terms of the Environmental Conservation Act of 1989. Erection of a structure below the high water mark is a listed activity in terms of the National Water Act (36 of 1998). The National Water Act also requires that an Environmental Impact Assessment (EIA) be conducted for the expansion of waterworks before a permit can be issued.

The environmental assessment process includes a public participation component. **You are hereby invited to submit, in writing, any environmental issues/concerns that you may have in relation to the upgrading of the reverse osmosis plant. Your submission can be made by mail, fax or email. The contact details of the IECM are given below.**

To assist you in making an informed decision whether or not you may want to become involved in this process and to be registered as an Interested and Affected Party (I&AP), a description of the issues at hand are provided.

The Albany Coast Water Board is a non-profit National Government Business Enterprise responsible for supplying water of an adequate and sustainable quality to all members of the community within its area. In terms of the Constitution, access to reliable sources of potable water is a basic human right. The area of jurisdiction of the Board extends along the coast from just east of the Kariega River mouth to just west of Boknes and 10 km inland from the coast. The ACWB has been supplying bulk water to greater Kenton-on-Sea/Bushmansrivermouth since 1982.

The towns of Bushmansrivermouth and Kenton-on-Sea in the Ndlambe Municipality have grown substantially in recent years and, together, they have a resident population of approximately 9500 people. Typically, this number swells by another 15 000 holidaymakers during the summer holiday period. The popularity of Kenton-on-Sea and Bushmansrivermouth as a tourism destination, as well as its growing resident population, has caused an unprecedented demand for potable water. To meet this demand, the ACWB had to double its bulk supply from 1995 to 2001. Nevertheless, a shortfall of 21 000 cubic meters was experienced in summer 2001/02 that led to a 7-day water shortage and affected over 23 000 people from all communities.

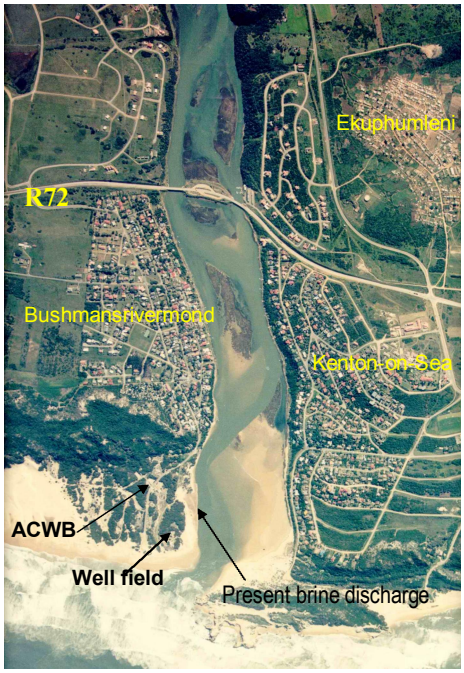
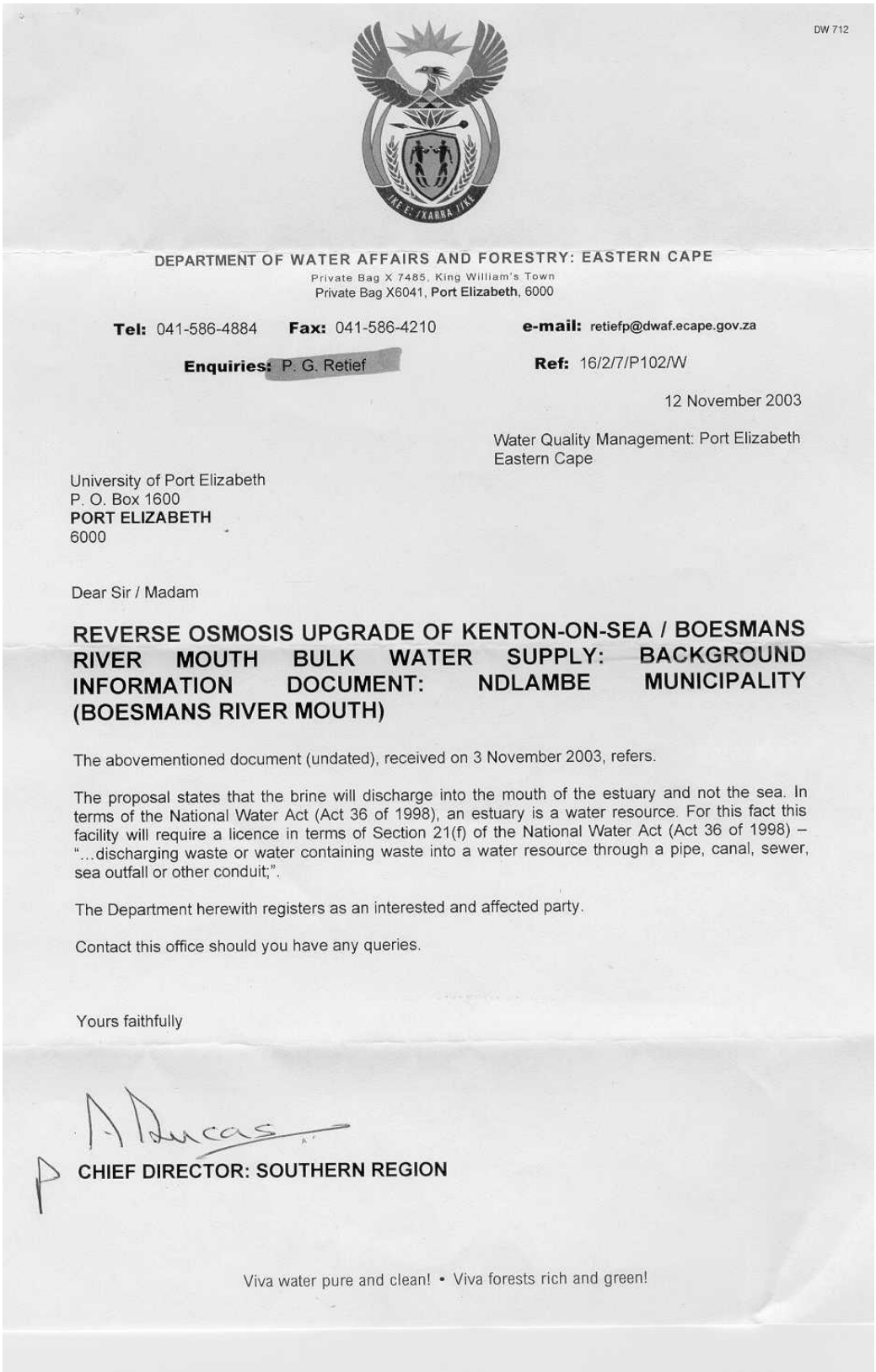


Figure 1. Aerial view of the study site

Salinisation of the Bushmansrivermouth aquifer and unfavourable water quality of the Diaz Cross coastal aquifer, resulted in the commissioning of Reverse Osmosis (RO) plants. The Board blends water from a freshwater aquifer (Diaz Cross) and from its own RO desalination plant for supply to its customers. The desalination process separates water from dissolved salts to produce freshwater. At present, seawater for the plant is drawn from wells near the mouth of the Bushmansriver and close to 500 cubic meters of hypersaline effluent (brine) is returned daily into the mouth of the Bushmansriver. No additional water can be taken from the Diaz Cross coastal aquifer to meet the increased demand, as the area is hydro-geologically unfavourable and the ACWB is currently exploiting its full quota from this source.

The increased demand for potable water can therefore only be met by upgrading of the bulk water supply infrastructure, including installation of additional reverse osmosis vessels. However, owing to the severe drawdown in the current supply wells, there is a shortage of seawater. The upgrading of the infrastructure will require that an alternate seawater intake be constructed below the high water mark of the Bushmans Estuary. The volume of brine produced will also increase and need to be disposed of in an environmentally acceptable way.

Appendix E: Comments from Interested and Affected Parties



DW 712

DEPARTMENT OF WATER AFFAIRS AND FORESTRY: EASTERN CAPE
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Tel: 041-586-4884 **Fax:** 041-586-4210 **e-mail:** retiefp@dwaf.ecape.gov.za

Enquiries: P. G. Retief **Ref:** 16/2/7/P102/W

12 November 2003

Water Quality Management: Port Elizabeth
Eastern Cape

University of Port Elizabeth
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Dear Sir / Madam

REVERSE OSMOSIS UPGRADE OF KENTON-ON-SEA / BOESMANS RIVER MOUTH BULK WATER SUPPLY: BACKGROUND INFORMATION DOCUMENT: NDLAMBE MUNICIPALITY (BOESMANS RIVER MOUTH)

The abovementioned document (undated), received on 3 November 2003, refers.

The proposal states that the brine will discharge into the mouth of the estuary and not the sea. In terms of the National Water Act (Act 36 of 1998), an estuary is a water resource. For this fact this facility will require a licence in terms of Section 21(f) of the National Water Act (Act 36 of 1998) – "...discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit;".

The Department herewith registers as an interested and affected party.

Contact this office should you have any queries.

Yours faithfully

CHIEF DIRECTOR: SOUTHERN REGION

Viva water pure and clean! • Viva forests rich and green!

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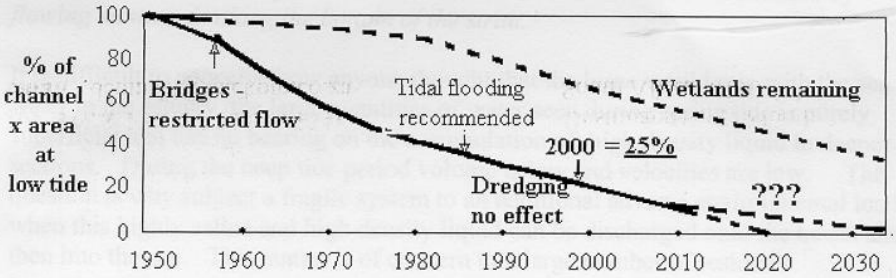
ALBANY WATER BOARD REVERSE OSMOSIS DESALINATION PLANT – HIGH SALINITY (BRINE) DISCHARGE INTO THE BUSHMANS ESTUARY

GENERAL INFORMATION ON THE BUSHMANS ESTUARY

The marine sedimentation of the Bushmans estuary is increasing at an exponential rate as can be seen from the following diagram which shows the cross sectional area of the channels at low tide in the lower four kilometres.. This means that the estuary is no longer as vibrant as it was years ago owing to the lack of fresh water floods and the narrowing of the mouth and channels. There has been repeated concern expressed about the increasing salinity in the Bushmans river owing to lack of fresh water inflow (A Paterson).



There has been a noticeable decrease in the fish reporting in the estuary compared with other estuaries in the Eastern Cape e.g. Fish River. Does this mean that the fish are responding to the high salinity in the Bushmans river?

DISCHARGE OF BRINE INTO THE BUSHMANS ESTUARY.

Concern has been expressed to the Albany Water Board about the discharge of brine into the Bushmans estuary. The information that has been made available to the public is that of the sea water intake into the plant 50% becomes fresh water and enters the domestic system and 50% is discharged into the Bushmans estuary. Owing to the water shortage the capacity of the plant is being increased and therefore the quantity of the discharge will also increase. Currently 500 cu.m. is discharged daily with the increase in plant capacity that could double, which equates to 365000 cu.m. a year - a large quantity of pollutant.

As we all know, the Bushmans estuary is a very fragile system with high salinity in the upper reaches and a large net gain in marine sediment. This situation is deteriorating owing to the lack of fresh water floods and man's interference in the system. It is important to appreciate that the flood tide enters the estuary at 50% higher velocity than the ebb tide, this results in marine sediment being moved up stream by suspension, but mainly by bed load.

The discharge from the desalination plant has a high salinity and also a much higher density than the sea water that it is being discharged into. This liquid will settle to the river bed and will be carried upstream by the flood tide. It will occupy the deeper sections and move upstream by bed load. As the ebb tide is not as vigorous as the flood tide there will be a net gain in this 'pollutant'. Once the liquid has crossed the 'delta' at Riversbend it is impossible for it to be removed except by natural floods with pronounced agitation. It is estimated that 40% of the brine will be retained in the estuary above Riversbend. **In a 10 year period this will amount to 1.5 million cu.m.!!!**

It is an established fact that liquids with different salinities do not mix readily as recently seen in the Bushmans with flood fresh water flowing over seawater in estuaries and the layering in the Black Sea. The following extract from National Geographic is of interest *" Question – Which way does water flow in the Strait of Gibraltar.* ***Answer*** *– It flows east and west. The surface flow carries the water into the Mediterranean Sea where it is subjected to strong evaporation. The water's salinity increases, making it denser. It then sinks and returns to the Atlantic by flowing westwards along the bottom of the strait.'*

It is difficult to conceive how anyone thought that the brine would mix with the sea water in the estuary, the large quantities of water seen during spring tide is purely superficial and has no bearing on the accumulation of high density liquid in deeper sections. During the neep tide period volume is low and velocities are low. The question is why subject a fragile system to an additional adverse environmental load when this highly saline and high density liquid can be discharged onto the beach and then into the sea. This matter is of concern to a large number of residents.

DISCHARGE SITE

Evidently Albany Water Board originally recommended that the brine be discharged into the sea, however some environmental official said it would affect the few mollusc on an otherwise rather sterile shoreline and insisted that the brine be discharged into a fragile estuary !!!!!

The current discharge site is into the 'Deacons Wall' some 300m from the mouth. The wall has an irregular surface leading to turbulent flow depending on the velocity of tide flow. Up stream of the wall there is an eddy zone between the wall and the groin. At peak velocities with spring flood tides it might be argued that mixing does occur. However, peak velocities only occur over short periods and other tidal phases must be considered.

SAMPLING

There has been talk on sampling the river to establish whether there is an increase in the salinity. Any sampling exercise has to be systematic and comprehensive. This means that samples must be taken at regular intervals over the lower four kilometres, at deep water sections, over all the tidal phases - neep to spring – and the tidal cycles flood to ebb.

CONCLUSIONS

What is puzzling is the effort that is being made to justify discharging a pollutant into a fragile estuary when it can be discharged into the sea out of harms way.

D H Laubscher

04/11/2003

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10 November 2003

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Attention: Dr TG Bornman

Sir,

REVERSE OSMOSIS UPGRADE OF KENTON-ON SEA / BUSHMANSRIVERMOUTH BULK SUPPLY

Thank you for sending me a copy of the "Background information document" of the proposed upgrading of the bulk water supply infrastructure of the Albany Coast Water Board.

I am the owner of the property situated at 7 Ocean View Drive, Boesmansriviermond in the Ndlambe Municipality in the Eastern Cape.

It is with alarm and utmost astonishment that we learnt – just by co-incidence – that the Albany Coast Water Board (ACWB) are planning yet again an upgrading of the bulk water supply infrastructure and the erection of a fixed structure (water intake) below the high water mark of the Bushman's Estuary. Please note that the latter is not on the property of the Albany Coast Water Board.

As property owners we have a long standing dispute with the Albany Coast Water Board for their poorly designed illegal developments. An undertaking that they will keep us and the ratepayers involved in future planning is again violated.

I will comment on some aspects listed in your "background information document", but will have to have a lot more information on this project in order to be able to exercise my right for information, my right to be consulted and my right to demand that the environment be taken care of.

A. *A scheme for the abstraction and utilisation of ground or surface water for bulk supply purposes is a 'listed activity' in terms of the Environmental Conservation Act of 1989. Erection of a structure below the high water mark is a listed activity in terms of the National Water Act (36 of 1998). The National Water Act also requires that an Environmental Impact Assessment (EIA) be conducted for the expansion of waterworks before a permit can be issued.*

I think there is some confusion between the applicability of these two Acts. What is however very clear is that no such approvals were obtained for the bulk water infrastructure including the industrial shed in which the two previous pumps and Reverse Osmosis plants are situated, and the so called well-point concrete structure on the river bank. No public participation was done in these cases. Records of decision were only obtained from the Department of Economic Affairs, Environment and Tourism for the pipeline from the boreholes on the river (not from the concrete well-point!) and for the pipeline to the reservoir at Kenton-on-Sea. These pipelines were laid without adhering to the conditions of the Record of Decision and without even permission of the then Town Clerk of Bushman's River Mouth, although it was laid through the town and damaging roads etc.!

The industrial shed accommodating the pumps and desalination plant is illegal and never approved by the Municipality or Department of Economic Affairs, Environment and Tourism. The Ndlambe Municipality gave me a copy of the plan of the building as submitted to the Municipality by the Water Board. The plans indicated that the buildings would be used as stores. This is seen as a deliberate act of deceit to provide false information. The plans were not drawn or designed by consulting Engineers as claimed by Mr. Ball, but are in fact sub-standard drawings. No formal approval could be found although two signatures appeared on the plans. One signature was that of Mr. Wells, a councillor and also a Water Board member!

B. *The Albany Coast Water Board is a non-profit National Government Business Enterprise responsible for supplying water of an adequate and sustainable quality to all members of the community within its area.*

This is a very short sighted and biased description of the functions of the Water Board. The Albany Coast Water Board is functioning under the Water Services Act, 1997. The Albany Coast Water Board did not perform its functions as stated in the Water Services Act, Act 108 of 1997.

According to the Water Services Act of 1997:

34. (1) In performing its activities, exercising its powers and carrying out its duties a water board must achieve a balance between—

- **(a) striving to provide efficient, reliable and sustainable water services;**
- (b) optimally using available resources;
- (c) striving to be financially viable;
- (d) promoting the efficiency of water services authorities;
- **(e) taking cognisance of the needs of water services institutions, consumers and users;**
- **(f) taking into account national and provincial policies, objects and developments;**
- (g) acting in an equitable, transparent and fair manner;
- (h) complying with health and environmental policies; and
- **(i) taking reasonable measures to promote water conservation and water demand management, including promoting public awareness of these matters.**

C. *In terms of the Constitution, access to reliable sources of potable water is a basic human right.*

This is not quite correct. What the Constitution states is access to "sufficient" water, not water in abundance. This is in fact the policy of the Department of water Affairs to ensure that all people have access to 25 kiloliter per capita per day. The "Free basic Water" policy for 6 kl per household also has its foundation from the Constitution. This however does not give everybody access to any quantity of water to the detriment of the environment. In the case of Albany Coast Water there are no restrictions in the area of supply. A standard rate for water is applicable and no increaséd rate in tariffs for higher consumption is applicable. This practice is in fact encouraging water wastage and definitely not water conservation.

The Constitution of South Africa guarantees:-

- The right to an environment that is not harmful to health or well-being (Section 24 (a));
- The right to have the environment protected (Sections 24(b).
  Government must comply with the constitutional right to have the environment protected by taking protective measures to ensure a balance between economic, social and environmental considerations with new developments.

According to the National Environmental Management Act of 1998:

- All stakeholders have the right to be consulted on impact assessments (section 2 and chapter 5)
- Everyone has the right to information (section 31)
- Everyone has the right to demand that the environment be taken care of (section 28). A responsible environmental officer may order any person who harms the environment to take remedial measures.

These requirements have not been adhered to.

D. *The popularity of Kenton-on-Sea and Bushmansrivermouth as a tourism destination, as well as its growing resident population, has caused an unprecedented demand for potable water.*

It is ironic that the very environment that attracts the visitors and tourists are what is being spoiled and harmed by the Albany Coast Water Board.

E. *A shortfall of 21 000 cubic meters was experienced in summer 2001/02 that led to a 7-day water shortage and affected over 23 000 people from all communities.*

The shortages that occurred during the summer of 2001/02 were not due to increased consumption but by different problems experienced at the plant. The pumps were often not running and then commenced again at night. This was ascribed to operational problems.

F. *At present, seawater for the plant is drawn from wells near the mouth of the Bushmansriver and close to 500 cubic meters of hypersaline effluent (brine) is returned daily into the mouth of the Bushmansriver.*

Most of the wells or boreholes are some distance away and out of normal sight from the river. A large concrete structure around a testing "well" is however situated right on the river beach. This is unsightly and a dangerous obstruction. There appears also evidence that the abstraction of water from the river sand cause unstable conditions and

sand/concrete bags along the river are collapsing more than before. The discharge is not returned at the river mouth but some distance upstream into the river estuary – in line with the Water Board's works. Although the original idea was to only discharge brine during outgoing tide, the Water Board did not adhere to this. There is evidence that this blob of concentrated brine moves upstream due to the fact that the incoming tide is stronger than the outgoing tide and thus gradually move this concentrated brine upstream, affecting the ecological system and habitat in an environmentally unacceptable way.

G. *The increased demand for potable water can therefore only be met by upgrading of the bulk water supply infrastructure, including installation of additional reverse osmosis vessels.*

Again, this is a very simplistic and biased way to describe the infrastructure without mentioning the fact that heavy pumps with excessive noise and vibration and large industrial sheds are part of this bulk infrastructure. This is what is unacceptable. The excessive vibrations by the pumps are causing our houses to vibrate and us not being able to sleep at night.

H. *The upgrading of the infrastructure will require that an alternate seawater intake be constructed below the high water mark of the Bushmans Estuary.*

No permission was granted by Department of Economic Affairs, Environment and Tourism or the Department of Water Affairs and Forestry for the existing concrete well point on the river beach. It is unacceptable that this environmentally sensitive river estuary be further degraded by concrete structures and pumping plants.

I. *The volume of brine produced will also increase and need to be disposed of in an environmentally acceptable way.*

The possible environmentally more acceptable option is to lead this brine directly to sea to be spread by the surf action. If this is the case then the option of also relocating the desalinisation plant to a better acceptable location should be investigated – away from the river as a high ecologically sensitive estuary and the most important tourist attraction, and away from houses.

Further comments

Although seawater desalination is an option held up as the future source for many coastal municipalities, the example set by the Albany Coast Water Board is already making it an environmentally disastrous option due to bad planning and operation. This in fact become a text book case of ill planning, environmental unsound practices, bad public participation and a mockery of co-operative governance between organs of state where the Albany Coast is already contravening the following Acts:

Constitution of RSA, 1996
Environment Conservation Act, 1989
National Environmental Management Act, 1998
Water Services Act, 1997
National Water Act, 1999
Promotion on Access on Information Act, 2000
National Occupational Health and Safety Act, 1993

This necessitated me to lay a criminal charge at the Police for disturbance and contravention of legislation. The Police recognised the problem at three earlier occasions when complaints were lodged.

In addition I have also consulted an attorney on this matter and he is quite positive that these malicious activities can be stopped. We are presently in discussions for further legal action.

Although the Department of Economic Affairs, Environment and Tourism promised that a draft Record of Decision on the second pump in the illegal building would be sent to me for comment, nothing has been received. The new pumping plant as well as the others are therefore still in contravention of the Environment Conservation Act. The approval of the second plant will not be accepted unless installed in a professional manner in a properly designed building further away from the house to ensure that the distance will lessen the vibration and sound effects. This third proposed plant cannot be installed in an illegal industrial shed and be operated in combination with other illegal pump installations.

The following aspects need urgent attention before any new developments can take place:

- The inconsiderate development which have an effect on the tranquility of the environment and residential area.
- The installation of a pumping plant in an inadequate industrial building next to the residential area without taking into account the effect of noise and vibration levels on the residents, estuary and Nature Reserve.
- Remedial measures to be taken to restore the tranquility and eliminate the noise disturbance.
- Enforcement of regulations for the building of pumps to be moved further away from the residential area.
- Compliance to the Environment Conservation Act and regulations with a full-scale environmental impact assessment for any further developments in this area. No public participation or proper requests for comments have previously been done.
- Access to information on all developments. The Promotion of Access of Information Act is being violated by refusing to give me the documentation requested on several occasions. The executive officer and non-voting member of the Board Mr. Ron Ball instructed that no documentation must be given to us.
- The efficiency of the board members and staff for this important function of water supply as an organ of state.

Please note that these are just some notes at this stage and that we require full information on the proposed project and the interaction with current illegal infrastructure before further input can be given.

Yours sincerely

Mrs. Delia Enright

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19 February 2004

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Attention: Dr TG Bornman

Sir,

REVERSE OSMOSIS UPGRADE OF KENTON-ON SEA / BUSHMANSRIVERMOUTH BULK SUPPLY

Thank you for sending me a copy of draft "Environmental Impact Report" (EIR) of the proposed upgrading of the bulk water supply infrastructure of the Albany Coast Water Board. The quality of some of the content and correctness of detail described in the report is however incorrect, vague and based on assumptions.

I want to put on record that although comment was submitted to you on the information described in the "Background Information Document" (BID), no opportunity was given to comment on the detail of the proposed scheme. I requested that more detailed information should be send to me, but no response was received on this. I highlight the request in my previous letter to you:

> "I will comment on some aspects listed in your "background information document", but will require much more information on this project in order to be able to exercise my right for information, my right to be consulted and my right to demand that the environment be taken care of."

Limited detail is only available now through the EIR, and some of this detail is very alarming. I wish to put on record that the extent of the public participation process and the detail in which the environmental impact was ascertained, is not considered to be of best practice and is unacceptable for a project of this nature. These shortcomings necessitates me to take further legal action to stop the proposed uncontrolled extensions to the already illegal industrial developments in a sensitive area.

Due to time constraints a few comments on the EIR, according to numbering in the report, are highlighted herewith.

1.1 Background
Detail is vague and misleading. The fact is that the growing demand is partly due to no restrictive measures such as a sliding or block rate tariff structure for water. Residents and holiday makers can use water relatively unrestricted with no financial incentive to conserve water. Mention is made that EIA is required for bulk water supply schemes but no mention is made that previous parts of the scheme are illegal and not approved in terms of the Environmental Conservation Act, 1989.

1.3Approach to the study
1.4 Limitations

The local office of DWAF in Ndlambe is not known to me. In fact I am not sure that this statement is correct at all.

Advertisements were placed in the newspapers mentioned. It is considered as standard practice for coastal towns to distribute information to absent owners through means such as Municipal newsletters, accounts, etc. A public meeting was not held.

It is stated that I&AP were identified. This is absolutely not true in respect of the most affected residents next to the pumping and desalination plant. We are the only residents listed in the list of I&AP in the EIR. We only registered in the nick of time after being notified by other people of the notice to register. Mr Ball confirmed that he did not give any names to the consultant which is a flagrant omission. The consultants should also know that these are the obvious I&APs and should be included automatically.

The larger group of homeowners and thus I&AP are not resident in the area and cannot be blatantly ignored as happened in this case. It is stated as a limitation in the report but there was in fact an ideal opportunity. The study culminated over the holiday season and the most logical participation method would be to address the ratepayers associations' meetings during December in the area. No official mentioning of the proposed extensions to the bulk water infrastructure was made at these meetings even though the Secretary of the Water Board, Mr Ball attended the meetings! All comments of I&APs were also not adequately worked into the EIR. Only some of my limited comments were addressed in a partial way.

2.2Regional and local setting

Information on the location of the large pump station and intake works at the gabion wall further upstream only become clear in this report. This is unknown to people along Hoepoe Street that will certainly object, being severely affected. This is also part of the major recreational area that will become unsafe and a highly noise polluted area. This cannot be acceptable. This area was stabilised with the gabions due to instability, and will be disturbed again by the project. The influence thereof has not been addressed at all. It can be regarded that this information is intentionally kept away from the public to avoid a major uproar and proceed with the project as quickly as possible.

2.3Existing infrastructure and present operations

According to the Water Services Act of 1997 the functions of the Water Board also includes:
34. (1) In performing its activities, exercising its powers and carrying out its duties a water board must achieve a balance between—
- **(a) striving to provide efficient, reliable and sustainable water services;**
- (b) optimally using available resources;
- (c) striving to be financially viable;
- (d) promoting the efficiency of water services authorities;

(e) taking cognisance of the needs of water services institutions, consumers and users;
(f) taking into account national and provincial policies, objects and developments;
(g) acting in an equitable, transparent and fair manner;
(h) complying with health and environmental policies; and
(i) taking reasonable measures to promote water conservation and water demand management, including promoting public awareness of these matters.

Reference is made to the first RO plant, RO1, that was shut down for major refurbishment in 2002 is misleading. According to a letter by the ACWB dated 19 April 2002, this plant was in fact decommissioned and replaced by RO3, and as understood by DEAE&T. In the mean time the plant (R01) was completely refurbished and put back in operation with RO3. We could not determine whether the refurbishing of plant R01 increased the pump capacity which can be regarded as a measure to upgrade the facility. This is considered to be illegal, without an EIA approval

2.4 Motivation for the development

The description of reverse osmosis is fairly well described. What is not mentioned is that it require high pressure pumps resulting in excessive vibrations if not installed in a proper way and installed in a completely inadequate large steel shed with fibre cement cladding. To reduce noise and vibration, the building and installation must be done according to best practices. Figure 7 depicts the ACWB setup which should never be referred to as a "typical" setup. There are better examples such as Bitterfontein in South Namaqualand, built by DWAF. The setup of ACWB is referred to in University lectures as the type of construction that should never be done.

2.5 Details of the Development

The magnitude of the intake works is alarming. A pumping rate of 200 m^3/hour is considered as excessive and will have a major effect in the vicinity of the intake. I again do not have detail of the intake works but consider this as highly dangerous to recreational water users and the environment and the tranquillity of the area. This area is the major recreational area for swimmers, children and animals and will endanger lives. Pumps for this capacity will be very noisy. In addition electricity lines will need to come down to the pumping plant and pipe work will criss-cross the area. The size of the pumps was not even referred to in the BID.

It is not clear where the filtration plant will be stationed and what will happen to the inorganic and organic particles. This will lead to further pollution of the environment and a cluttering of plants over the whole area. Apart from the fact that the existing building that house RO2 and RO3 is illegal without proper approval from the municipality, DEAE&T confirmed in a letter dated 10 December 2002 that "the upgrading of the ACWB's desalination plant occurred during 1999-2000 is in contravention of the Environment Conservation Act" and consider the building as illegal.

The RO expansion by rebuilding RO1 (which is already done prior to approval) and expanding RO3 will require upgrading of the existing pump system. This will cause severe increase in vibration and noise annoyance. The RO1 has already been refurbished, again without adequate provision for noise and vibration disturbance. The canopies put over the motors are kept open due to heat build-up! There is still no provisioning to reduce vibrations. The pumps that will pump the water to the reservoirs were not addressed in the report. The extractor fans with these pumps will increase the noise and vibrations

It is not indicated what increased volume of brine will be pumped to the estuary. The alternative of over engineering of the river intake to produce spare capacity is again increasing the size of pumps which are the worst disturbance factor. The second alternative to discharge brine at the high tide zone some 800 m from the plant is not clear. Does this mean "during" high tide? The better option is perhaps during out

flowing tide. This was in fact the idea with the original RO1, but never materialised! Water is pump due to demand and is also affected by breakdowns. It came to our attention in July 2002 that the pumps can discharge waste water in the sand dunes.

4.Public Participation Process
4.1Purpose of public scoping

The EIR rightly mentions that the purpose of public scoping is to ensure that interested and affected parties (I&AP) are afforded the opportunity to comment on development projects applications submitted in terms of the Environment Conservation Act, 1989. The option to comment on developments was however not afforded to I&APs due to a total absence of information and only limited information in BID. I personally requested more information from the ACWB and consultants but without any success. Apart from violating the objectives of the public scoping as part of the EIA, it also violates my constitutional right to access of vital information. This aspect is being taken up and supported by the South African Public Protector.

4.2 Identification and notification of I&APs

The identification and notification of I&APs was done in a total inadequate and unacceptable way and is seen as a violation of individual rights. This process will have to be rectified and repeated.

4.3 Key issues and concerns

Not all key issues and concerns have been addressed. As mentioned, comments were limited to information in BID with request for more information to be able to comment better. This lack of information and request for more information were key issues and are not tabled. The following key issues were also not captured:

- Access to information on all developments.
- Inability of ACWB to perform its functions as stated in the Water Services Act, Act 108 of 1997.
- The industrial shed accommodating the pumps and desalination plant is illegal and never approved by the Municipality or DEAE&T.
- A standard rate for water is in fact encouraging water wastage and definitely not water conservation.
- The Constitution of South Africa guarantees the right to an environment that is not harmful to health or well-being (Section 24 (a)); whilst this right is violated by ACWB
- According to the National Environmental Management Act of 1998 all stakeholders have the right to be consulted on impact assessments (section 2 and chapter 5).
- Everyone has the right to information (section 31) – this was not granted.
- The inability of ACWB to operate pumps. The pumps were often not running and then commenced again at night. This was ascribed to operational problems.
- No permission was granted by DEAE&T or DWAF for the existing concrete well point on the river beach. It is unacceptable that this environmentally sensitive river estuary be further degraded by concrete structures and pumping plants.
- This ill planning, environmental unsound practices, bad public participation of ACWB makes a mockery of co-operative governance between organs of state where the Albany Coast is already contravening several Acts.
- This proposed plant cannot be installed in an illegal industrial shed and be operated in combination with other illegal pump installations.
- Remedial measures to be taken to restore the tranquility and eliminate the noise and vibration disturbance.

Responses in table of key issues are also not correct or adequate.

The comment that the RO plant that was initially installed was allowed by DEAE&T as there was an acute water shortage on condition that an EIA will be conducted later on, is a flagrant untruth and against National Acts. Refer to DEAE&T letter dated 10 December 2002 that "the upgrading of the ACWB's desalination plant occurred during 1999-2000 is in contravention of the Environment Conservation Act." According to legislation a post facto approval cannot be given as stated in letters by DEAE&T and plant will remain illegal.

To indicated that ACWB will only install equipment complying to SA health and safety regulations and municipal bylaws show a complete ignorance of the current situation. Even with previous approvals of EIA applications, conditions of Records of Decision were not adhered to as indicated in DEAE&T letter dated 18 January 2001. Also, the building plans were not approved for a pump station. Pumps of this nature are regarded as a industrial plant and must be installed in buildings which meet the requirements of industrial buildings.

A remark to the effect that "it is disputed that the present operation is unduly noisy" shows a complete lack of understanding the problem. Nobody from the consultancy verified this, visited the house, felt or measured the vibration, verify the cracks in the house attributed to vibration, or experienced the noise and vibration late at night when it is quiet.

Distances to nearest residences are wrong e.g there is not two houses 170 m from the plant. The nearest unbuilt property, is even closer. There are 5 houses directly affected in Ocean View Drive. More houses in Hoepoe Street will also be affected with the intake pumping plant.

The suggestion that ACWB intends to comply fully with the permitting requirements is a bit far fetched taken into account their track record. Refer again to letter dated 18 January 2001 from DEAE&T on transgressions of conditions of Records of Decisions and deliberate transgressions of at least 7 Acts. The letter dated 20 April 2001 by the Municipality instructed ACWB to "restore the tranquillity of the area and that the interests of residents should be looked at when restoring the conditions of the area and that rate payers should make suggestions in this regard" has also been ignored.

5. Descriptions of alternatives

Some of the future alternatives are hair-raising and comment is withheld at present. Better research needs to be done for some of these options.

6.2.2 Topography

The assumption that erosion around a structure is not so pronounced in the estuary as the lower reaches are characterised by flood and ebb tides causing both deposition and erosion either way, is not correct. People understanding flow regimes, will realise that flows of incoming tide have a higher velocity than outgoing tide, affecting the erosion potential. Current structures are evidence to the fact that sand deposition or erosion is rarely the same on both sides of structures.

6.2.3 Impacts on aquatic environment

This section does not provide sufficient peace of mind concerning the effect on the aquatic environment. This aspect has not been researched adequately. The Reserve, according to the National Water Act, 1998, for aquatic requirements must be determined by competent professionals and approved by the Director-General of DWAF before approval can be obtained.

6.2.6 Electrical energy use

The "technological" option to reduce electricity costs at night when tariffs are lower again indicate a complete lack of appreciation of the problem of sleepless nights due to vibration and noise of pumps. The problem is especially at night and this option to only pump after 6 at night will even require more and larger pumps. It is unacceptable that family members must move beds around in the house to find the best location to sleep at night. The pumps are switch on and off during operation due to operational requirements in the reverse osmoses process. The moment the pumps are switch on or off, it can be felt and leads to sleep disturbances. The fire hazard and precaution measures have not been addressed at all.

6.2.7 Noise impacts

There is again no appreciation that there is a difference between noise and vibration. Specialists should be consulted such as members of the Vibration Institute of South Africa.

7.2 Recommendations

It is clear from the above that far better investigations need to be done and the recommendation that the Scoping Study should not proceed to a full EIA and additional specialist studies can definitely not be accepted. The existing problems must be addressed first before the EIA proceed.

A full EIA and additional specialist studies is unquestionably needed before any approval. It is note with disappointment and disillusionment that the IECM can even suggest that they are satisfied that enough information has been obtained to evaluate the proposed activity and to identify the significance of the potential environmental impacts.

This letter does not reflect all our concerns due to time constraints and pressure to reply within a very short period.

Approval of this scoping report without an EIA and additional specialist studies and proper involvement of stakeholders will be legally opposed and challenged. More information on detail of proposed plant and steps to mitigate effect of existing illegal plants are needed to objectively evaluate the impact of developments. These are considered as my constitutional rights for access to information and the right to give adequate input.

Yours sincerely

Delia Enright

Dennis H Laubscher & Associates
MINING CONSULTANTS
Principal

D H Laubscher B.Sc.(Eng)Ph.D.,C.Eng, FIMM

P O Box 95
100 River Street
Bushmans River Mouth
South Africa 6190

Tel & Fax, Local-046 648 1341
email - dennishl@intekom.co.za
International - 27 46 648 1341

Dear Dr Bornman,

Upgrade of Kenton–on-Sea/Bushmansrivermouth Bulk Water Supply

I have read the report with interest, but am concerned about several generalities which are not correct:-

TIDAL PRISM - The tidal prism will vary from say 0.4 million m³ at neep tide with an easterly wind to 1.5 million m³ at high spring tide with a strong westerly wind.

TIDAL DIFFERENCES – The report states that the tidal difference between neep and spring tide is only 200mm, if this statement refers to high tide then it is in the order of 600mm.

SALINITY – The salinity of the brine is 43.5 ppt on page 6 and 51 ppt on page 9??
Albany Water Board have said that of the two units entering the plant, one is discharged as brine and the other as fresh water. If this is the case then based on the above figures then the fresh water must have a salinity of 19 – 27 ppt, is this correct?

MIXING – Fresh water and sea water do not mix readily so I am surprised that the brine mixed so readily!

CONCLUSIONS - Based on experience elsewhere where pollutants were not considered a threat at the time and now for example, everyone is concerned about global warming, I consider that one does not discharge a pollutant into a fragile estuary. Discharge on to the beach next to the car park will not be

costly and is accepted by all that I have spoken to. However, if the brine has to be discharged into the estuary then this should only be done on the ebb tide - 7 hours, by using a holding tank during the flood tide period - 5 hours.

Yours sincerely

Dr Dennis Laubscher

15/02/04

Appendix F: Declaration of interest of consultant

I/We ***Institute for Environmental and Coastal Management*** as Environmental Consultant to ***Albany Coast Water Board*** on Project ***Environmental Impact Report for the upgrade of bulk water supply*** do hereby declare the following interests.

1. This consultancy ***is not*** a subsidiary, legally or financially, of the proponent.

2. Remuneration for services by the proponent in relation to this proposal ***is not*** linked to approval by decision-making authorities responsible for the permitting proposal.

3. The Environmental Consultancy currently has the following interest in secondary or downstream developments as a result of the authorisation of this project.
   None

4. Percentage of work received from the above proponent in the previous twelve months.
   None

I hereby declare that I am fully aware of my responsibilities in terms of Government Notice No. R. 1182 of 5 September 1997 and that failure to comply with it fully may constitute an offence in terms of the Environment Conservation Act (Act No. 73 of 1989).

Signed: Date:
Dr Norbert Klages
In capacity as Director of Institute for Environmental and Coastal Management

Witness: Witness:
Name Date: ***Name*** Date:

Appendix G: Application for authorisation

Private Bag X5001, Greenacres,
Port Elizabeth 6057

		For official use	
Nat.		Application No.:	
Prov.		Date received:	
Local		Responsible. officer:	

APPLICATION FOR AUTHORISATION
in terms of Section 22 of the Environment Conservation Act, 1989 (Act No. 73 of 1989)
in respect of an activity identified in terms of Section 21 of the said Act.

NOTE: Please complete in print with a black pen. No other form may be used to register an application.

PARTICULARS OF APPLICANT

Name of applicant:	Mr. Ron Ball		
Postal Address:	Albany Coast Water Board PO Box 51 Boesmansriviermond		
		Postal code:	6190
Day telephone number:	(046) 6481233	**Fax number:**	(046) 6481552
Cellular phone number	0832704874	**e-mail address:**	albwater@border.co.za

DESCRIPTION OF ACTIVITY

- Upgrading of bulk water supply infrastructure, incl. installation of additional reverse osmosis vessels and an additional seawater intake point.
- Erection of a structure below the high water mark of the Boesmans Estuary to accommodate the new intake.

LOCATION OF PROPOSED ACTIVITY

Province(s):	Eastern Cape
Magisterial district(s):	Ndlambe
Farm / plot name(s) & number(s):	Erf 956
closest city or town:	Boesmansriviermond

CONSULTANT

I propose to make use of the following consultant for the purposes of sub-regulation 3(1)(a) of Government Notice No. R1183 of 5 September 1997.

Name:	Telephone & Fax numbers:	Postal Address:
Institute for Environmental and Coastal Management	(041) 504-2877 (tel) / 583-2317 (fax) Email: Tom.Bornman@upe.ac.za	University of Port Elizabeth, P O Box 1600, Port Elizabeth, 6000

DECLARATION

I, hereby, declare that I am fully aware of my responsibilities in terms of Government Notice No. R1183 of 5 September 1997 and that failure to comply with it fully may constitute an offence in terms of the Environment Conservation Act, 1989 (Act No. 73 of 1989).

SIGNATURES

	Applicant	Witness	Witness
Signatures:			
Date:			
Place:			

You will be contacted after receipt of this application in order to inform you whether and how to advertise the application, as well as to inform you whether you have to submit a plan of study for scoping in terms of Sub-regulation 5(1)(a) of Government Notice No. R1183 of 5 September 1997, or whether you may proceed to submit a scoping report in terms of Sub-regulation 5(1)(b) in terms of the same government notice. Your application must be sent to, or be handed in at the address given above. Any additional information you might like to provide to assist your application may accompany this application form.

PLEASE DO NOT BIND OR STAPLE THIS FORM TO ANY OTHER DOCUMENT.

APPENDIX H: PLAN OF STUDY FOR SCOPING

Reverse Osmosis Upgrade of Kenton-on-Sea / Bushmansrivermouth Bulk Supply

INTRODUCTION

This document describes issues pertinent to the undertaking of an Environmental Impact Assessment (EIA) in respect of an application by the Albany Coast Water Board to upgrade their Reverse Osmosis facility and tasks that the environmental consultant proposes to follow in this respect.

Applicant

Mr. Ron Ball (CEO)
Albany Coast Water Board
PO Box 51
Bushmansrivermouth
6190
Ph: 046-6481233, fax: 046-6481552, e-mail: albwater@border.co.za

Environmental Consultant

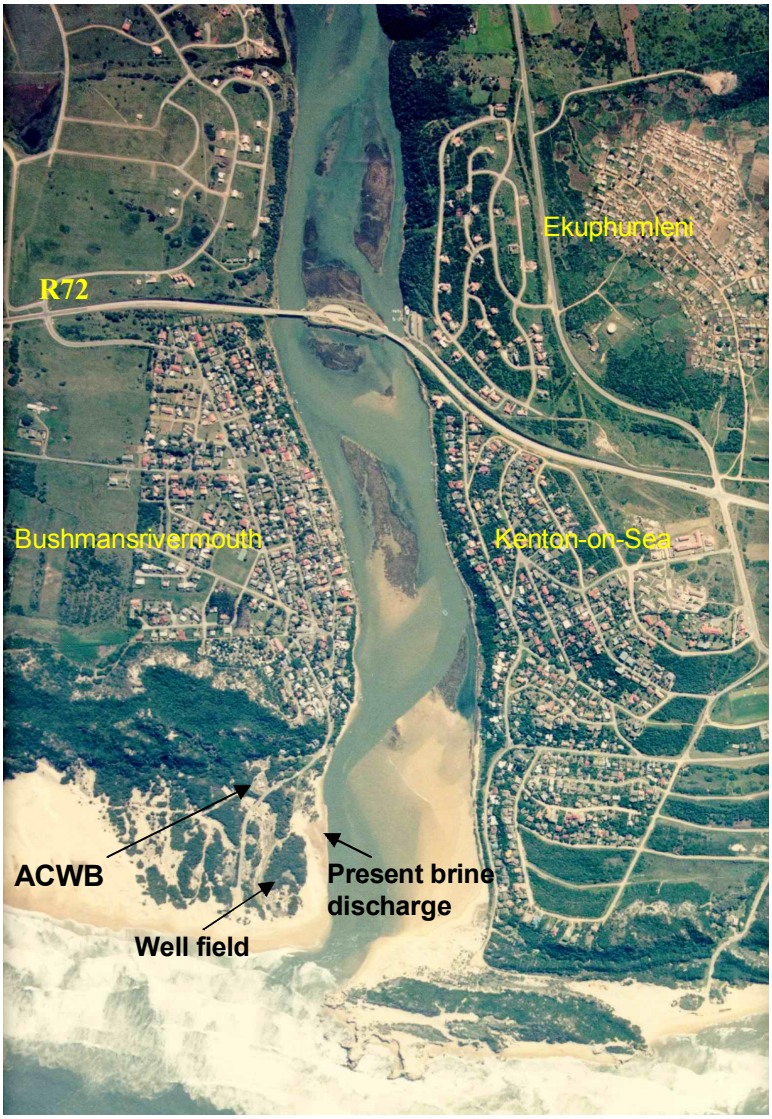
Dr Thomas G Bornman & Dr Norbert TW Klages
Institute for Environmental and Coastal Management
University of Port Elizabeth
P. O. Box 1600
Port Elizabeth
6000
Ph: 041-504 2877 / 2747, fax: 041-5832317, e-mail: Tom.Bornman@upe.ac.za / coastal@upe.ac.za

DESCRIPTION OF THE ISSUE IN HAND

Description of the proposed activity

The Albany Coast Water Board (ACWB) is a non-profit National Government Business Enterprise responsible for supplying potable water of an adequate and sustainable quality to all members of the local community. The Board blends water from a freshwater aquifer (Diaz Cross) and from its own reverse osmosis (RO) desalination plant for supply to its customers. The desalination process separates water from dissolved impurities to produce freshwater. Seawater for the plant is drawn from wells near the mouth of the Bushmans River and close to 500 m^3 of hypersaline "effluent" (brine) is returned daily into the mouth of the Bushmans River.

No additional water can be taken from the Dias Coastal aquifer to meet the increased demand, as the area is hydrologically unfavourable and the ACWB is currently exploiting its full quota from this source. Increased demand for potable water can therefore only be met by upgrading of the bulk water supply infrastructure, including installation of additional reverse osmosis vessels. However, owing to the severe drawdown in the current supply wells, there is a shortage of seawater. The upgrading of the infrastructure will require that an alternate seawater intake be constructed below the high water mark of the Bushmans River estuary. The upgrading of the RO facility will also increase the volume of brine produced that will need to be disposed of in an environmentally acceptable way. The ACWB is therefore proposing to double its output of drinking water and has approached the IECM to assist in the required environmental investigations.



Aerial view of the study site

The need for an EIA

A scheme for the abstraction and utilisation of ground or surface water for bulk supply purposes is a 'listed activity' in terms of the Environmental Conservation Act of 1989. Erection of a structure below the high water mark is a listed activity in terms of the National Water Act 36 of 1998. The National Water Act also requires that an EIA be conducted for the expansion of waterworks before a permit can be issued.

The National Water Act regulates the protection, use, development, conservation, management and control of all water resources, including estuaries. An important concept in this context is the freshwater reserve of a river and its estuary. The expansion of the RO facility may affect the reserve of the Bushmans River through the abstraction of water and the discharge of brine in the estuary. The Reserve is defined by the Act as the quantity and quality of water required to meet basic human needs and to protect aquatic ecosystems.

Law therefore requires an assessment of the environmental impacts.

Description of the locality

The Albany Coast Water Board premises are located close to the mouth on the western bank of the Bushmans River (Figure 1). The wells supplying seawater for the RO facility are located behind the foredune ridge at the mouth. The brine effluent presently produced is released at a point close to the mouth of the estuary.

DESCRIPTION OF KEY TASKS TO BE PERFORMED DURING STUDY

Report Preparation and Format

A Scoping Report will be prepared according to EIA guideline documentation issued by the Department of Environmental Affairs and Tourism (DEAT 1998).

Identification of Issues

Issues pertinent to the proposed activity will be identified through three mechanisms, namely:

1. Consultation with relevant authorities,
2. Public Scoping,
3. Desktop and field study of the environmental sensitivity of the estuary to increased seawater abstraction and brine disposal. This will also entail measurements of the present dispersal patterns of brine in the lower estuary. Alternate abstraction and disposal sites near but outside the estuary will be investigated.

Authority Consultation

Pre-application consultation and submission of the Plan of Study for Scoping (this submission),
On submission and after review of draft Scoping Report,
After amendments (if required) to draft Scoping Report,
On submission of I&AP Response Report after draft Scoping Report availability for public review,
On submission of final Scoping Report,
During consideration of Application and on notification of record of decision.

Public Scoping Process

Identification and Notification of Interested and Affected Parties (I&APs)
I&APs will be identified and provided the opportunity to raise issues and concerns pertinent to the proposed activity in the following manner:
Onsite advertising: Onsite advertising will be undertaken in accordance with EIA regulations, the advert format identical to that used for press advertising purposes but with minimum size specifications (60 cm height x 42 cm width) in accordance with EIA regulations.
Newspaper advertising: I&APs will be identified by means of advertisements in the "Eastern Province Herald" and the local "Talk of Town" newspapers. In accordance with legislation, I&APs will be provided 14 days after the advertisement date to submit issues and concerns to the environmental consultant.
I&APs will be mailed a background information document with an invitation to comment on the EIA process.
Public Meeting: Should the volume of interest in the proposed activity warrant it, a Public Meeting would be held at a local venue.

Evaluation of Concerns Raised by I&APs and Feedback Mechanisms

Issues and concerns raised by I&APs will be individually evaluated and will be addressed within the Scoping Report in the form of a Comment and Response Report. Feedback to I&APs will be facilitated through two mechanisms, as required. Firstly, the Comments and Response Report will be available for review to the public after relevant authorities have reviewed the Scoping Report. This will enable I&APs to determine whether their issues or concerns were indeed noted, and whether these were addressed to their satisfaction. Secondly, if necessary a Public Meeting will be held to inform I&APs of the proposed activity. Should the response to the proposed activity be such that a Public Meeting is not warranted, I&APs may be met individually to discuss the proposed activity.

Identification and Assessment of Potential Environmental Impacts

Identification of potential environmental impacts associated with the proposed activities will be undertaken in accordance with 'environmental checklists' in DEAT documentation pertaining to the undertaking of EIAs. Each identified potential impact will be briefly described and then assessed according to whether it will be negative or positive, its spatial extent, its duration relative to the life of the proposed activity, its intensity, and its probability of occurrence. Negative impacts will be further assessed according to their predicted significance, as low, medium or high, both before and after implementation of appropriate mitigatory action. Suggested actions for the prevention or amelioration of each potential negative impact will be described.

Proposed Timetable of Tasks

A proposed timetable of tasks to be performed is as follows:

Activity	*Date*
1. Pre-application meeting with DEAE&T and DWAF & submission of Plan of Study	7 October 2003
2. Field work & advertisement of EIA Process (Press/Onsite/Postal/Community)	15 – 17 October 2003
3. Cut-off Date for Comments from I&APs	31 October 2003
4. Public Meetings (If required)	3 November 2003
5. Submission of Draft Reports to Relevant Authorities for Comment	7 November 2003
6. Amendments to Draft Reports Completed	14 November 2003
7. Notification of Availability of Draft Reports for Public Review	17 November 2003
8. Cut-off date for Comment on Draft Reports	24 November 2003
9. Amendments to Draft Reports	27 November 2003
10. Submission of Final Report to Relevant Authorities	28 November 2003

This timetable assumes that:

- No unforeseen problems arise during the EIA process.
- Relevant authorities review and comment upon the Draft Scoping Report within 21 days of submission.
- Amendments to the Draft Scoping Report are limited.

APPENDIX I: Marine Intake & Pumping Main - Conceptional Design

(Provided by consulting engineers WSM Leshika)

1. DESCRIPTION OF WORKS

The existing boreholes in the dune field in front of the Albany Coast Water Board (ACWB) property can at present only feed 1500 m^3 per day of seawater to the Reverse Osmosis (RO) plant. However, for the RO plant to run at full capacity, feed water of 2250 m^3 per day is required.

The purpose of this project is to take seawater directly from the Bushmans River, in this way releasing the bottleneck the boreholes are imposing onto the supply of seawater to the RO plant.

The project is divided into

- marine intake,
- seawater pipeline to the RO plant
- filtration unit to clear water to an acceptable standard before it enters the RO plant.

The following describes the design philosophy with specific attention to the impact on the environment.

2. PIPELINE

2.1. Route of Pipeline

2.1.1. The layout of the pipeline is shown on Sketch 1.

2.1.2. The pipe starts at the marine intake structure and runs up the dune embankment onto the upper outlook area. From here it crosses the road, turns towards the ACWB property, running 5 meters away but parallel to the road.

2.1.3. The dune embankment is overgrown with meter high shrubs and succulent vegetation. There is however a path at present, being used by the public, which leads down to the river. Because this path has disturbed the vegetation the pipeline will follow this path. After backfilling and area finishing has been completed, timber steps will be placed to allow for public access down to the marine intake.

2.1.4. The outlook and the parking areas are grassed and after pipe laying is complete, the grass will be reinstated. Likewise, the log fence, which will have to be removed during construction, will be reinstated.

2.1.5. From the parking area to the ACWB property, the route runs through natural vegetation approximately 2m high. The route will be cleared 10 m wide to allow for construction activities.

2.2. Trenching & Pipe laying

2.2.1. The excavation depth of the trench will be 1m deep and 0.9 m wide as indicated on Sketch 2.

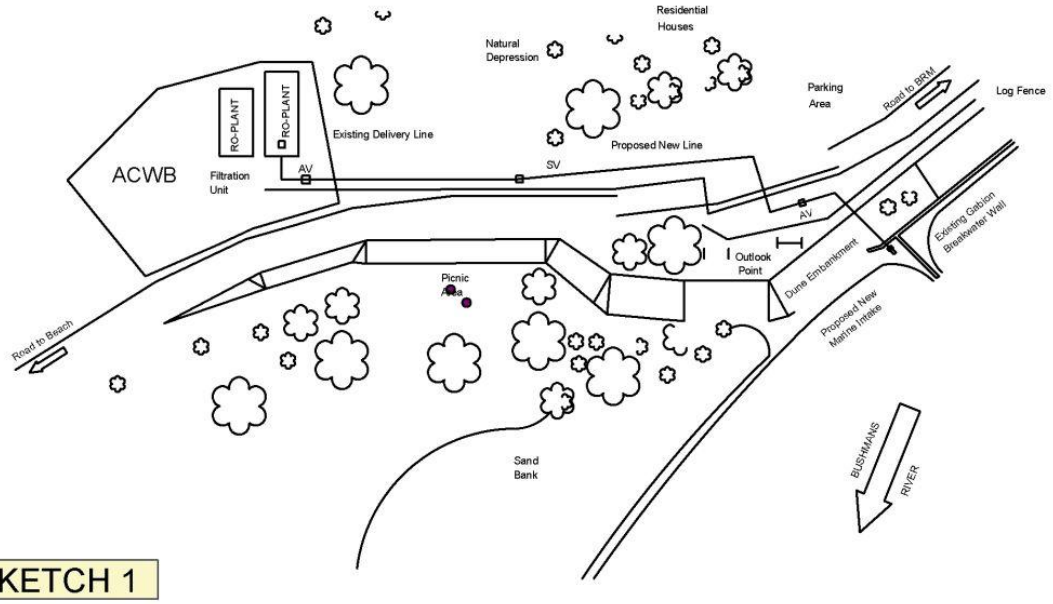
2.2.2. Bedding and blanket material will be selected from trench excavation, and if need be, supplemented by importing sand from commercial sources.

2.2.3. The pipe is a 250 mm diameter HDPE pipe and heat butt-welded.

2.2.4. The air valve chamber will be 1.0 m square brickwall structure build on a concrete slab and covered with a 200 mm thick concrete roof. The top of the chamber will not be higher than 500 mm above ground level.

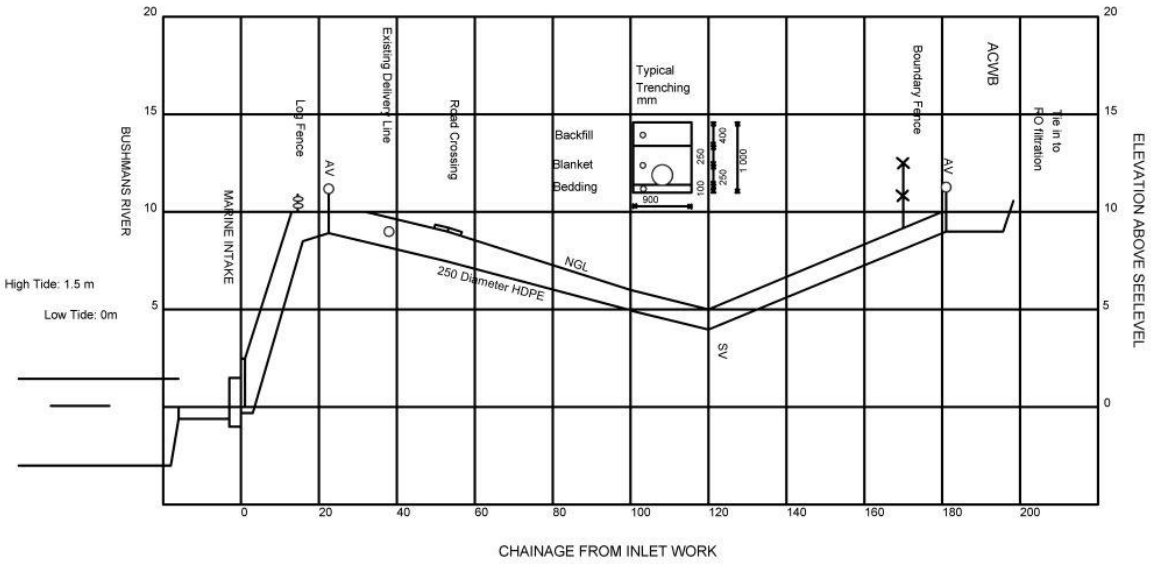
2.2.5. The scour chamber will be 1.5 m square constructed from concrete. Scour water will be discharged into the lower laying depression. The top of the chamber will not be higher than 500 mm above ground level.

CONCEPTIONAL DESIGN
PACWB- MARINE INTAKE : PUMPING MAIN
PSchemactic Layout



SKETCH 1

CONCEPTIONAL DESIGN
PACWB- MARINE INTAKE : PUMPING MAIN
PLongitudinal Section



SKETCH 2

3.

4. MARINE INTAKE

4.1. The layout of the marine intake is shown on Sketch 4. The pump well and valve chamber cradles the groin of the existing gabion breakwater wall, and the inlet culvert protrudes into the Bushmans River.

4.2. Inlet Culvert and Fish Screens

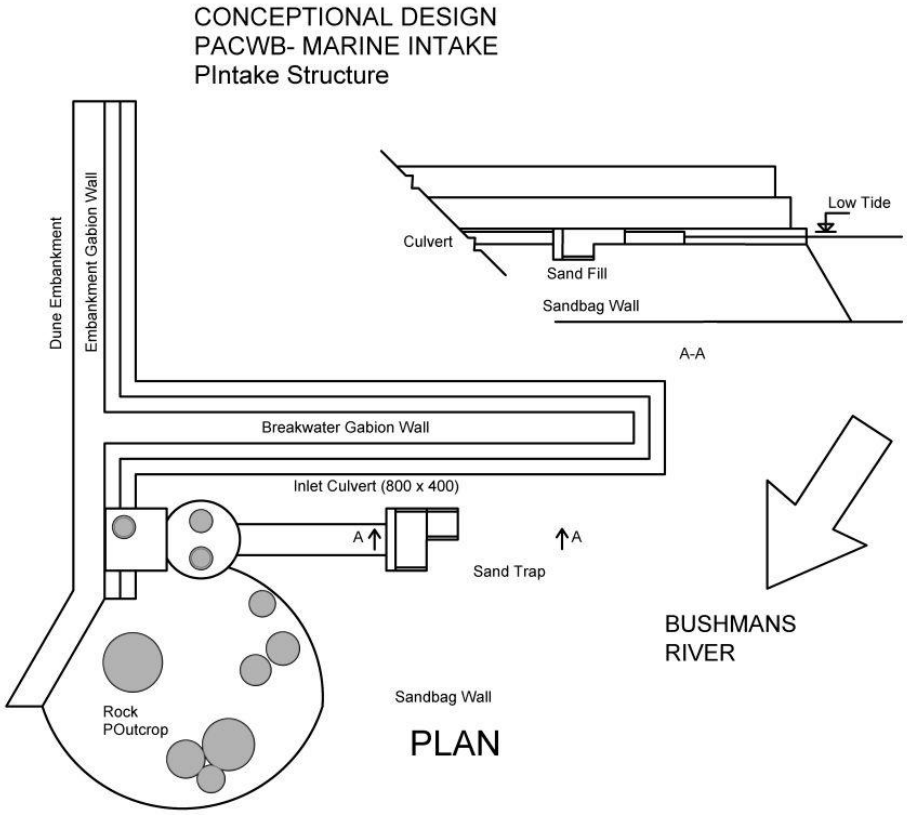
4.2.1. The inlet is an 800 x 400 mm precast culvert with the top sticking 100 mm above the low tide level.

4.2.2. A sand trap is provided at the end of the inlet. It is constructed from inverted concrete culvert. Accumulating sand will be shoveled back into the Bushmans River, whenever the trap has silted up.

4.2.3. A fish screen will be installed at the end of the inlet. The stainless steel wire grid will have an aperture of 25 mm and will be removable for cleaning. Access will be gained on low tide, using the top of the inlet culvert as a walkway.

4.2.4. The inlet speed of the water into the inlet is designed at 0.15 m/s. This will prevent any impingement of fish against the fish screens. The low inlet speed will also prevent people being sucked into the pipe.

4.2.5. It is accepted that mussels will grow inside the inlet culvert. Access will be provided to enable the mechanical removal of mussels if growth inside the culvert and pump well has become too dense.



SKETCH 4

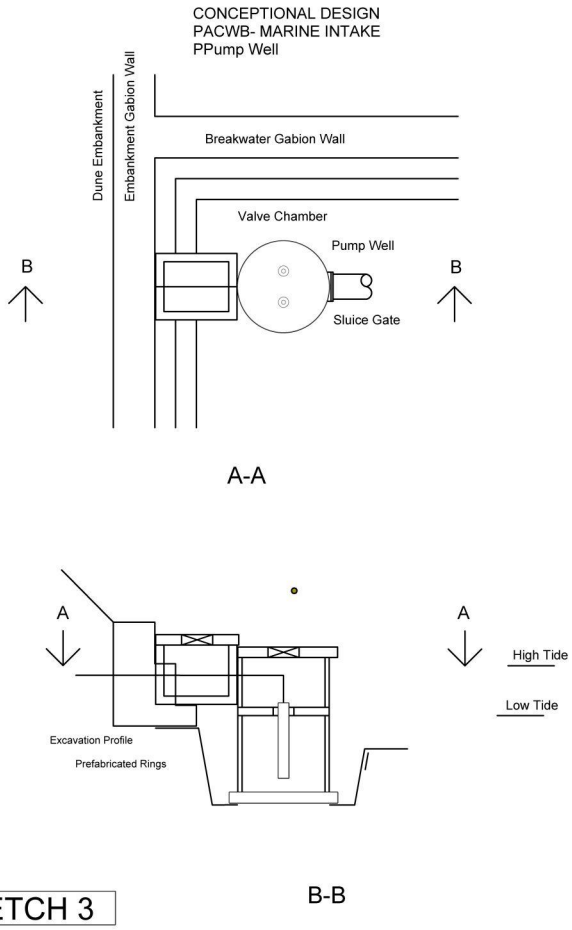
4.3. Pump Well and Valve chamber

4.3.1. A typical section through the Pump well and valve chamber is shown on Sketch 3.

4.3.2. The pump well is constructed from 2m diameter precast concrete pipe section. The invert of the sump is designed to be 2 m below the low tide level. The top of the well will protrude 150 mm above the high tide mark. A sump will be provided to allow for maintenance drainage of the well.

4.3.3. The inlet culvert can be isolated from the pump well by a sluice gate.

4.3.4. The valve chamber will house pipe reducer, isolating- and check valve. It will be constructed from concrete and will nestle into the embankment gabion wall and butting against the pump well.



SKETCH 3

4.4. Construction method

4.4.1. Particular attention has to be given to the construction method as the 2m excavations and the tidal action of the river will reduce access considerable.

4.4.2. It is proposed that the sand trap and inlet culvert be constructed first. This would be possible between tides as the excavation is fairly shallow and the underlying foundation would be in sand fill.

4.4.3. After constructing the inlet, a berm wall might be constructed to keep the high tide overflowing the well area.

4.4.4. Excavation would be by rock excavator and rock breakers, these vacating the excavation area as the tide comes in. On reaching the excavation depth, the well floor is formed and

the precast rings erected in place. Mass concrete is cast around the sump to make-good the rock over break.

4.4.5. Access for heavy equipment will be through the picnic area to the south of the intake structure and then along the river embankment. Cranes with the necessary reach might be utilised from the top of the outlook point.

4.4.6. The excavation up the embankment will be shored to prevent the sides from collapsing.

5. FILTRATION

5.1. The filtration will be a package plant. The vessel and pipe work are housed inside the RO#3 building.

5.2. A backwash of $12m^3$ per day is expected. The backwash will be through the existing brine disposal line.

6. UPGRADING OF POWER SUPPLY

6.1. A new transformer will be housed on the existing power poles inside the ACWB property.

APPENDIX J: In reply to Sue Brownlie 8.2, p. 5:

An impact of medium intensity or magnitude in the long term at a scale greater than site-specific or local **can** be accommodated by our rating system. A fictious example is shown below.

Project Stage	Extent	Duration	Intensity	Probability	Significance without Mitigation	Significance assuming Mitigation	Status	Confidence
Operational	Regional	Long-term	Medium	High	Significant	Not significant	_	High

Appendix K

PROVINCE OF THE EASTERN CAPE

DEPARTMENT OF ECONOMIC AFFAIRS, ENVIRONMENT AND TOURISM

CHIEF DIRECTORATE: ENVIRONMENTAL AFFAIRS

CACADU REGIONAL OFFICE

Private Bag X 5001, Greenacres 6057

Tel. 041 508 5800; fax 041 585 1958

Reference: ACWB.NEMA.0704

Enquiries: N. Scarr

Telephone: 041-508 5807

Fax: 041-5851958

Email: scarrn@eetrepc.ecape.gov.za

Albany Coast Water Board

P.O. Box 51

Boesmansriviermond

6190

Attention: Mr R Ball

NOTICE IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, ACT 107 OF 1998: BULK WATER SUPPLY INFRASTRUCTURE

It has come to our attention that your organisation has caused the following bulk water supply infrastructure to have been installed in violation of the Environment Conservation Act, Act 73 of 1998:

1. Four water abstraction wells in the vicinity of the Bushmans River mouth;

2. a further water abstraction well upstream of the above units, and located in the Bushmans Estuary inter-tidal zone, and

3. a reverse osmosis desalination unit (including pumping equipment), known as RO3.

4. Further to the above, it is common cause that in 2000 your organization caused an industrial building to be erected, as well as caused a reverse osmosis desalination unit (including pumping equipment), known as RO2, and other bulk water supply infrastructure, to be installed in the building.
5. These activities were likewise carried out in contravention of the Environment Conservation Act, 1989.

In order that the repercussions of all the stated activities may at this stage be conclusively dealt with, you are hereby directed, in terms of Section 28(4) of the National Environmental Act, Act 107 of 1998, to investigate, evaluate and assess the impact of these activities on the environment.

You are further directed to report the outcomes of such investigations, evaluations and assessments to this Department immediately upon completion thereof.

Upon receipt of the said outcomes, the Department will consider what additional measures, as provided for under the Act, should be taken by your organization in relation to these matters.

Any queries may be directed to the writer.

Yours faithfully

N G Scarr
Assistant Director: Environmental Affairs

*Date:*_____

Appendix L: Review of draft scoping report by Brownlie

deVilliers Brownlie Associates
Professional Services in
Environmental Planning and Management

21 Menin Avenue • Claremont 7708 • South Africa
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PROPOSED UPGRADE OF KENTON-ON-SEA / BUSHMANS RIVER MOUTH BULK WATER SUPPLY BY ALBANY COAST WATER BOARD:

REVIEW OF ENVIRONMENTAL IMPACT REPORT

Prepared by : Susie Brownlie
19 March 2004

For : André van Greunen, VGV Attornies, Notaries and Conveyancers

A : Introduction

deVilliers Brownlie Associates were asked by André van Greunen of VGV Attorneys, Notaries and Conveyancers, to review the process followed in the preparation of the Environmental Impact Report (EIR) for the proposed upgrade of the Kenton-on-Sea / Bushmans River mouth bulk water supply by the Albany Coast Water Board (ACWB). The EIR was prepared by the Institute for Environmental and Coastal Management, University of Port Elizabeth, and dated February 2004.

B : Approach to the Review

The review takes cognisance of the requirements of the environmental impact assessment (EIA) Regulations (R1182 and R1183 of 5 September 1997) promulgated in terms of the Environment Conservation Act 73 of 1989, the National Environmental Management Act 107 of 1998 (in particular S2 and S24(7)), as well as 'best practice' in environmental assessment in general, and Integrated Environmental Management in particular. These elements are incorporated in the Draft Review Guidelines for Environmental Impact Assessment in the Cape Metropolitan Area[15], adopted for use by the Western Cape Department of Environmental Affairs and Development Planning.

The main review areas used in this review, taken from the Guidelines, are as follows:

1. Adequacy of Terms of Reference, holistic interpretation of "environment", ethical conduct.
2. Adequacy of information provided for decision-making purposes.
3. Clarity of the draft report.
4. Adequacy of identifying reasonable alternatives and evaluating them at a scale and level of detail that enables reliable comparison.
5. Adequacy of description of the project and the affected environment, including the need and motivation for the project.
6. Adequacy of 'contextualising' the proposal in terms of legal, policy and planning considerations.
7. Adequacy of provision for participation by interested and affected parties in scoping, and due consideration of issues and concerns raised.
8. Adequacy of assessing and evaluating the potential significance of issues and impacts using clear and explicit criteria, and taking into account indirect or cumulative impacts as well as planned mitigation and management.
9. Adequacy of addressing measures to mitigate negative impacts and enhance benefits, as well as considering assurance for their implementation.

It should be noted that this review was carried out as a desk-top exercise only in view of time constraints; no site visit was undertaken.

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[15]. Prepared by deVilliers Brownlie Associates in association with Arcus Gibb (Pty) Ltd, the Environmental Evaluation Unit (University of Cape Town), and Sue Lane & Associates for the then Cape Metropolitan Council. November 2000.

It should also be noted that, although the report by the Institute for Environmental and Coastal Management of the University of Port Elizabeth is entitled an "Environmental Impact Report", for the purposes of this review (based on the Terms of Reference for the study) it is viewed as a Scoping Report (refer to Part C, Section 1 of this review).

C : Main Findings of Review

The main findings of this review are summarized in the text box below, and detailed thereafter for each of the review areas given in Section B.

In our opinion, the main shortcomings of the EIR and associated process are:

- Inadequacy of the participation process as part of scoping *(refer to Section 7 of this review)*;
- Insufficient consideration of alternatives *(refer to Section 4 of this review)*;
- Inadequate consideration of a number of social factors in the assessment of impacts, as well as deficiencies in the evaluation of the potential significance of impacts *(refer to Section 8 of this review)*;
- The lack of explicit mitigation measures and mitigation assurance *(refer to Section 9 of this review)*.

Based on this review, it is questionable whether the information supplied by the consultants is sufficient on which to base a sound decision.

1. Adequacy of Terms of Reference, Interpretation of "Environment", and Ethics

The Terms of Reference for the study are provided: to conduct a scoping study, including public participation; and to identify significant issues, alternatives and decision points for an EIA.

Since the purpose of the study was scoping, and the study was carried out after submission of a Plan of Study for Scoping, the title of the report prepared after scoping, namely "Environmental Impact Report", is misleading.

In terms of R1183 of 5 September 1997, promulgated in terms of the Environment Conservation Act 73 of 1989, the requirements of a Scoping Report are different from those of an

Environmental Impact Report. For the purposes of this review, and based on the Terms of Reference for the study as well as the stage in the formal authorisation process in terms of the EIA Regulations, the EIR is viewed as a Scoping Report.

A broad interpretation of the term "environment" is adopted, and conduct in carrying out the study appears to have been ethical.

2. *Adequacy of Information*

With reference to Sections 4, 7, 8 and 9 of this review, there appear to be potentially significant deficiencies related to information on a number of issues.

3. *Clarity of the Environmental Impact Report*

The EIR is generally well structured and clear to read, with some minor exceptions (eg the quality of Figures 1 and 2 is poor).

4. *Adequacy of Considering Reasonable Alternatives*

The stated purpose of, and need for, the proposed upgrade is to provide an adequate source of water during times of peak demand. At present it is stated that there is an inadequate supply of seawater to the Reverse Osmosis (RO) plant during peak times due to severe drawdown in the supply wells.

4.1 The overall water supply strategy to the Kenton-on-sea town is not addressed. This omission is seen to be significant, particularly since the Albany Coast Water Board is acting on behalf of the national government. As noted in Section 6.2.9 of the EIR, the impacts of water provision through desalination are cumulative. In theory, a number of options should be considered and evaluated at strategic level in addition to the proposed upgrade, to address the stated need for additional water during peak times. Possible alternatives to desalination include increasing the storage capacity for water currently extracted and treated, providing incentives for local residents to use rainwater tanks, and greater recycling of grey water.

4.2 With particular reference to the proposed upgrade, alternative ways of discharging brine are addressed, as well as alternative feedwater sources and their location.

Whilst it is understood that there is an existing RO facility, and the proposed upgrade involves increasing the number of plants/racks of pressure vessels at the existing facility, it is believed pertinent that one of the three interested and affected parties (I&APs) raised the concern that the current RO facility was set up without due procedure, and that the consultant confirms (Section 4.3 of the EIR) that this facility was installed without any

environmental studies having been conducted (or, presumably, alternative locations for the facility being considered).

No alternative siting of other elements of infrastructure associated with the proposed upgrade, including pump houses (at inlet, and associated with the upgrading of the existing pump system), sand filtration plants, or additional power supplies, is discussed.

Given that the proposed upgrade will double the number of plants/racks of pressure vessels, and that the proposed upgrade is effectively a state (as opposed to a private) project, it is usual to expect alternative locations for the different components of such project to be duly considered and evaluated.

4.3 The comparison of alternative feedwater sources and locations (Section 5.2 of the EIR) refers. The conclusion in Section 6.3 of the EIR that an underground pipeline with a new inlet next to the gabion wall is "economical and least damaging to the environment, and technologically undemanding" could be challenged. No explicit or systematic assessment of possible alternatives, based on specific criteria, was carried out to allow transparent comparison.

From the relative advantages and disadvantages of use of saline groundwater and direct abstraction from the sea, it would appear that the former had relative advantages over the latter, provided that the aesthetic impacts of above-ground structures (particularly along the estuary) and negative impacts on groundwater could be minimized. It would also seem that the disadvantages associated with using groundwater could largely be overcome by spacing wells further apart along the coast, albeit costly. According to Section 5.2.2, direct use of seawater could result in considerable aesthetic impacts, possible impacts on sediment movement were a pipeline be placed above the surface, and would be "very costly" were the pipe to be buried.

5. *Adequacy of Descriptions of the Proposed Development and the Affected Environment*

The description of the proposed development is generally adequate, although there is no clarity on the siting of some elements of infrastructure associated with the proposed upgrade, namely pump houses, sand filtration plants, or additional power supplies.

The description of the affected environment is adequate with regard to biophysical factors. However, in respect of socioeconomic considerations, the EIR is not adequate: Section 3.6 of the EIR covers demographic information, but fails to describe the main use and value or importance of the Bushmans River estuary to local communities and visitors. This aspect is relevant, since the siting and operation of infrastructure has a potential impact on such use and values.

6. *Consistency with Legal, Policy and Planning Context*

No information on spatial planning frameworks for the affected area is provided in the EIR; the proposed upgrade should be consistent with spatial land use planning.

Legal requirements associated with the proposed upgrade, other than those linked to the EIA Regulations and the National Environmental Management Act 107 of 1998 (NEMA), are not addressed. Any such requirements (eg in terms of the National Water Act), and consistency with relevant hard or soft legislation (eg White Paper on Coastal Zone Management) should be covered in the EIR.

7. Adequacy of Participation by Interested and Affected Parties in Scoping

In our opinion, stakeholder participation was flawed due to shortcomings in the communication between the consultants and potential interested and affected parties. The fact that only three I&APs responded to either letters or advertisements (one authority and two individuals), is of concern[16]. The low level of response undermines the credibility of scoping and its effectiveness in identifying potential issues and alternatives. The statement in Section 1.4 of the EIR that the authors are satisfied that the comments raised are representative of the views and concerns of the greater Kenton-on-sea/Bushmans River mouth community, is challenged.

The list of I&APs provided in Appendix C appears to include most of the relevant authorities and key interest groups. However, few local residents appear on the list. The placing of advertisements in local newspapers, as well as on-site advertising, is unlikely to have been effective in terms of communicating to absent homeowners.

As noted in the EIR, a "great portion" of homeowners are not permanent residents and are present only during holiday times. For this reason, it would be expected of the independent consultant to take appropriate steps to maximise opportunities for local community involvement, either by advertising locally during holiday times, by advertising in local, regional and in national newspapers (to reach a wider audience), and/or to obtain a mailing list of residents and sending letters inviting participation. None of these measures was taken, and hence provision for the public to participate is deemed not to have been reasonable or sufficient.

For reasons related to the inadequacy of the participation process given above, it is believed to be inappropriate to confine review of the EIR to the three parties who participated in the

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[16] *Decisions must take into account the interests, needs and values of all I&APs, recognising all forms of knowledge (Section 2 of NEMA).*

EIA process, and Estuary Care, as proposed in Section 4.2. In our opinion, the draft EIR should be advertised for comment, and I&APs invited to give input, in a way that effectively communicates with both present and absent members of the local community.

8. ***Adequacy of Assessment and Evaluation of Impacts***

The approach to the assessment and evaluation of the potential significance of impacts is generally adequate, with the following exceptions:

8.1 With reference to Sections 4- 7 of this review, it is questionable whether the full range of potential alternatives, issues and associated impacts have been identified through the scoping process, and thus whether the assessment and evaluation of impacts is sufficiently comprehensive.

8.2 The impact assessment methodology given in Section 4.2 of the EIR seems to be flawed. Impacts of medium intensity or magnitude in the long term at a scale greater than site-specific or local do not seem to be accommodated.

8.3 The impact assessment methodology given in Section 4.2 of the EIR is seldom applied in subsequent sections, leading to doubts about the reliability of significance ratings.

For example (Table 2 and Section 6.4.3 refer), a temporary, localised impact of low intensity should be rated as "low to very low". These impacts are often rated as being of "medium" significance. Similarly, an impact of regional, long-term effect of high intensity should be rated as being of "high" significance, not "medium". An impact of regional, long term effect and medium intensity should be rated as "medium" at least, not "low to very low".

8.4 The area is known to be a popular holiday spot, with associated recreational activities. Potential impacts on current use of the affected estuary and coastline, including possible adverse health and safety impacts of both the suction intake and brine discharge, have not been adequately addressed. It is believed important that these impacts are covered.

8.5 It is not only the visual impact of pipelines which have the potential to affect sense of place, as implied in Section 6.2.8 of the EIR, but rather the overall change to valued attributes of the environment caused by the proposed development.

8.6 Potential impacts of, or associated with, upgrading the electricity supply, additional pumping systems (not at the RO plant), and filtration plant have not been addressed.

8.7 Given the non-specific nature of many of the proposed mitigation measures in Section 6 of the EIR, it is questionable whether the residual significance of impacts is reliable. For example, possible mitigation measures with regard to interference with sediment

dynamics, beach erosion, and changes in topography are generalised and it is not certain that they could indeed be effected.

8.8 The potential risk of the turbidity of seawater being greater than that required by the RO technology used by the ACWB, given either rough sea conditions at the point of intake and/or river flooding, has not been explicitly addressed. This risk is noted as a disadvantage in Section 5.2.2. Should seawater be more turbid than acceptable, the implications in terms of ability of the proposed upgrade to meet the stated need for the project, as well as the need for contingency planning, should be addressed.

8.9 Some of the proposed measures to mitigate negative impacts could themselves have, or aggravate, potentially significant negative impacts. For example the need to extract additional water from the estuary to dilute brine (Section 9.2 of this review) could magnify adverse impacts of "medium significance" associated with extraction of feedwater for the proposed upgrade. The cumulative significance of this mitigation measure has not been evaluated.

8.10 Statements in Section 5.2.2 of the EIR to the effect that "the impact of waves on the rocks also creates more turbulence than is found on the adjacent beach or in the estuary" belong in Section 5.1.1; such turbulence would – it is felt – be a potential disadvantage to an intake pipe.

9. *Mitigation, Monitoring and Management*

In our opinion, the EIR fails to address mitigation adequately and to give assurance that mitigation would be implemented effectively should the proposed upgrade be authorised.

9.1 In many instances, the EIR gives generalised rather than specific mitigation measures, and it is not clear whether these measures could or would be implemented. Given that most of the negative impacts during the construction and operational phases identified in the study would be of "medium" significance, assurance that specific and effective mitigation would be implemented is believed to be important in the light of the NEMA principles[3].

(An environmental management plan, comprising explicit measures to mitigate negative impacts of "medium" and/or "high" significance without mitigation, should be drawn up with clear management targets and indicators, and clear responsibilities for implementing management actions.)

9.2 Mitigation measures for adverse impacts associated with the discharge of brine, heat and chemicals (Section 6.2.3) are given as diluting the brine with marine water, discharging brine into the surf zone, increasing the velocity of brine discharge, and avoiding discharge of chemicals where possible.

In Section 7.1 it is stated that "the influence of the increased brine discharge on the Bushmans Estuary should be determined once the upgrade of the desalination plant has been completed. It can then be decided whether the proposed mitigation measures….need be implemented". Given that the volume of brine to be discharged would be doubled with the proposed upgrade, and the significance of negative impacts associated with brine discharge are given as "medium" without mitigation in the long term (Section 6.4), it would seem appropriate, with reference to the national environmental management principles[17] (Section 2 of the National Environmental Management Act 107 of 1998) to minimise or remedy these impacts through mitigation measures.

No criteria, indicators or limits of acceptable change are provided in the EIR which would "trigger" the need for implementing mitigation measures; such criteria are essential to ensure sound environmental management of the estuary.

9.3 Most, if not all, of the mitigation measures for adverse impacts associated with the abstraction of seawater seem to relate to impacts on the biophysical environment. With regard to health and safety risks associated with the intake pipe, it is stated that the pipe must be designed and sited to prevent injury to recreational users. No explicit measures are given.

9.4 It is noted that the RO plant is "a noisy plant" and that means for decreasing the noise level include the building of canopies over the pumps and "appropriate" sound proofing. It is believed important to take into consideration the ambient noise levels without the RO plant's contribution, the particular sense of place, value and importance of the affected area to the local community when considering appropriate mitigation of noise and vibration impacts raised by one of the three I&APs who submitted comment during scoping (Section 5 of this review refers).

No mention is made of other pump sites associated with, for example, the intake pipe, their potential impact and mitigation thereof.

9.5 Measures related to mitigating and managing upset operating conditions or emergencies, and to providing contingency plans, are not included in the EIR. It is believed that these measures should be provided.

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[17] *These principles include the requirement of avoiding, or where it's not possible to avoid, of minimising or remedying (amongst others) disturbance of ecosystems, and pollution and degradation of the environment. Also, the principles state that sensitive, vulnerable, dynamic or stressed ecosystems such as coastal shores, estuaries (amongst others) require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure. The use of ecosystems should not exceed the level beyond which their integrity is jeopardised.*

APPENDIX M

ATTORNEYS NOTARIES & CONVEYANCERS

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Chief Directorate: Environmental Affairs
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Dear Sir,

Att.The relevant authority in terms of Section 22 of the Environment Conservation Act 73 of 1989

Dear Sir,

Application by the Albany Coast Water Board ("the Applicant") for approval in terms of Section 22 of Act 73 of 1989 for an upgrade of the bulk water supply to Kenton-on-Sea / Boesmansriviermond ("the development")

We refer to the above matter and previous correspondence. Our client, Mrs Deliah Enright, have received a copy of the Final Environmental Scoping Report from the Institute of Environmental and Coastal Management from the University of Port Elizabeth, the consultants appointed by the Albany Coast Water Board to assess the environmental impacts of its proposed upgrading of the bulk water supply infrastructure.

Our client and other I & A P's have received a copy of the Final Report and have been invited to comment on the substance of the report and to make further submissions, if any, to the IECM. No new submissions are to be made by our client but our client is of the opinion that the report still fails to address all the concerns and issues raised against the draft report.

1. The whole process of public participation remains totally insufficient. On this basis alone, our client still believes that it would be wrong to accept the scoping report as being adequate before a more comprehensive public participation process has been followed and all possible other issues and alternatives raised during this process, has been canvassed and assessed fully.

   The concerns raised in the comments of our client and by the review consultant has not been addressed att all and we fail to understand how such an extremely important aspect of a scoping report can be ignored to such an extent. To state that because only three I & A P's expressed interest no public meeting was deemed necessary, reflects a clear disregard for the importance of the concept of public participation. It is our opinion that the limited response received is indicative of the lapsadaisical approach adopted by the consultants in obtaining the public's input.

   Furthermore, it is absurd to make the statement that because our client participated as an absentee property owner in the process, it is evidence that the public participation process has been effective for non-residents. Our client accidentally heard about the proposed development from other sources and not from any effort by the independant consultants.

   We respectfully submit that this issue can be satisfactorily addressed by holding public meetings during the December 2004 holiday season.

2. The issues raised by the review consultant appointed by our client has not been adequately addressed;

   For example the sound levels in respect of the noise impact assessment has been taken with only two pumps running, while it is common knowledge that a third pump is

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currently undergoing repairs, which, when up and running might contribute significantly to the noise impact.

3. The report fails to pay particular attention to explicit mitigation measures and especially mitigation assurance. In support of this allegation it can be pointed out that although the report recommends that the brine should only be discharged during the outgoing tide, it is also clear that this will not be adhered to as there is not sufficient storage capacity for the brine until it can be discharged and the plant will have to run continuously during the holiday season.

   Reference is also made to the importance of a water management plan and strategy but the existence of such a plan or not, is not addressed,

   The detail on the proposed desalination plant is still not very complete. Paragraph 6.1.3 mentions that if the plant is properly operated, there is low environmental impact. What assurance does the residents have that the plant will be properly operated? The applicant does not have a good reputation for proper operation and housekeeping. For a time, the brine was discharged directly into the sand dunes behind the plant where it dissipated into the sand and was in all probability absorbed into the underground water sources! The general housekeeping inside the sheds and on site leaves much to be desired.

   Concerns raised regarding the impact of the positioning of the feed pipes and brine discharge pipes has not been addressed convincingly. The subject of safety and well being of swimmers and users of the river has also not been satisfactorily addressed.

4. Besides the inadequacy of the public participation process, our client believes that the information contained in the scoping report is not sufficient for the consideration of the application without further investigation and submits that it should, (at least), be supplemented by an environmental impact assessment

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Please inform us of your decision as soon as it is made. In this regard we wish to state that our client reserves her right to appeal against any adverse decision by your department.. Kindly acknowledge receipt of this letter.

Yours faithfully

VAN NIEKERK GROENEWOUD & VAN ZYL

Per:A J VAN GREUNEN

Copies to: T G Bornman and N T W Klages c/o Institute for Environmental & Coastal Management, University of Port Elisabeth