



## Anchor Environmental Consultants CC

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28 August 2008

PETER SILBERNAGL  
PDNA/SRK JOINT VENTURE c/o PDNA  
P O Box 7786, Roggebaai, 8012  
2<sup>nd</sup> Floor St Georges Mall  
Cape Town

Dear Peter

**RE: REVIEW OF MARINE SPECIALIST ASSESSMENTS AND RELEVANT SECTIONS OF THE FINAL BASIC ASSESSMENT REPORT FOR A REVERSE OSMOSIS PLANT IN SALDANHA**

I was appointed to undertake a scientific review of the Marine Special Study that formed part of a Basic Environmental Impact Assessment for a Reverse Osmosis Plant in Saldanha. Documents covered by this review include the following:

Van Ballegooyen, N. Steffani and A. Pulfrich 2007. Environmental Impact Assessment: Proposed Reverse Osmosis Plant, Iron –ore Handling Facility, Port of Saldanha – Marine Impact Assessment Specialist Study, Joint CSIR/Pisces Report, CSIR/NRE/ECO/ER/2007/0149/C, 190pp + 198pp App. (Marine Specialist Study - EIA\_DesalinationPlant\_SaldanhaBay\_FinalReport\_20070515).

Van Ballegooyen, N. Steffani and A. Pulfrich 2008. Environmental Impact Assessment: Proposed Reverse Osmosis Plant, Iron-ore Handling Facility, Port of Saldanha - Addendum to the Specialist Marine Impact Assessment: Sensitivity Analysis of Model Results to Elevations in Seawater Temperature between the Intake and Discharge Locations. Joint CSIR/Pisces Report, CSIR/NRE/ECO/ER/2008/0050/C, 44pp. (Marine Specialist Study - EIA\_DesalinationPlant\_SaldanhaBay\_AddendumtoFinalReport\_20080515).

PDNA/SRK Consulting 2008. Proposed RO Plant: Port of Saldanha - Final Basic Assessment Report. (36447042G\_RO Plant\_Final BA Main Report\_May08)

SRK Consulting 2008. Proposed RO Plant: Port of Saldanha - Comments and Response Report (36447042G\_RO Plant\_Comments and Responses Table\_May08)

The primary focus of the review included the following aspects (as laid out in the Terms of Reference for the Review):

- Review the Terms of Reference provided to the specialist and whether the specialist has reasonably met these.
- Assess whether the Terms of Reference are adequate and appropriate for the proposed development.
- Review the methodology and ensuing findings.

- Assess whether the major impacts have been identified, and whether you agree with the assessments made of these impacts. (This would cover whether you agree that the impacts are considered acceptable or not.)
- Assess whether reasonable alternatives have been considered adequately.
- Assess whether the concerns from I&APs relating to the marine studies have been adequately addressed.
- Comment on the fact that the proposed changes/upgrades (dredging and reclamation as part of Phase 2) have not been taken into consideration in the modelling of marine impacts and ecological impact assessment.
- The review should be undertaken generally in terms of DEA&DP Guideline 2b on Review of Specialist studies (on FTP site under DEA&DP Guidelines).

A request to assess whether the legal context for the Marine Specialist study had been adequately addressed by the authors of the marine specialist study report was also added verbally to the TORs (P. Silbernagl, PDNA, pers. comm. 18 July 2008).

This review was undertaken in accordance with guidelines issued by the Provincial Government of the Western Cape: Keatimilwe and Ashton 2005 - Guideline for the review of specialist input in EIA processes, and is divided into a number of sub-sections to ensure adequate attention to all components listed in the TORs for this review. Responses to all questions contained in the review checklist provided by Keatimilwe and Ashton (2005) are provided in the accompanying table (Annex 1).

### **Terms of reference provided to the specialist**

I am satisfied that the terms of reference supplied to the authors of the Marine Specialist study were adequate and appropriate to the proposed development and that the specialist has addressed these in a comprehensive manner.

### **Consideration of alternatives**

I am satisfied that the alternatives as provided to the marine specialists in the Terms of Reference have been adequately by addressed in their report. I had some initial concerns in this respect but additional input provided by the project proponents (included as Annex 2 of this report) have addressed these concerns. The concerns related to the elimination of alternative discharge pipeline locations outside of Saldanha Bay due to the significantly increased costs thereof which I felt were unfairly biased by comparison with a limited number of alternatives. In their response, the project proponents have demonstrated that alternative options for disposal near to the entrance of Saldanha Bay (e.g. Tabakbaai and Skulpiesbaai) will not necessarily be more cost effective than the options that were rejected based on increased cost even though the former discharge sites are in closer proximity to the proposed RO plant. Additional costs of effluent disposal outside of the Bay do not appear to be warranted given the significance (extent and severity) of the impacts as assessed by the marine specialists.

### **Legal and policy/planning context for the study**

I am satisfied that the authors of the marine specialist study have provided an adequate description of the legal and policy/planning context and legal requirements for the study, and have identified relevant standards against which to benchmark their findings.

### **Methodology employed by the specialist, ensuing findings, and assessment of impacts**

The specialists have adopted a primarily 'desktop' approach for the assessment of marine impacts of the RO plant utilising a mathematical dispersion model set up for the purpose. This is in line with their TORs given to the marine specialists and I believe mostly adequate for the proposed development. Note though that this comment does not extend to the accuracy of the dispersion models set-up to examine environmental impacts associated with effluents discharged to the marine environment but merely to the interpretation of the results thereof. The accuracy of the dispersion model has not been evaluated in this review and is being assessed by a companion review prepared by Prof Ron Cox of the Water Research Laboratory, University of New South Wales, Australia.

The only area where I feel that the consultants should have diverged from the desk-top approach is to undertake toxicity testing of "simulated"<sup>1</sup> effluent from the RO plant. The specialists include mandatory recommendations for toxicity testing of the effluent from the plant once it has been constructed (p XII and again on p. 176, 3rd paragraph of the Marine Specialist report), results of which they suggest should be used to guide implementation of appropriate mitigation measures. This is all fine and well, except that the only mitigation measures proposed in the report to be implemented in the event that the effluent is shown to be more toxic than predicted from information gleaned from the literature include "designing the brine basin so as to ensure greater and sufficient dilution of the DBNPA residuals in the effluent stream before discharge or to revert to the use of an oxidizing biocide (chlorine) in this role" or to carefully monitor "dosing to ensure minimal DBNPA concentrations in the discharge" (Marine specialist report p. IX and 174). I query whether these can be considered realistic and feasible mitigation measures, given the fact that the first mitigation measure should be implemented as a matter of course and the fact that oxidising biocide (chlorine) has been rejected for use in this project owing to the perceived damage that it may cause to the membranes in the RO plant (see footnote on p 39 of Marine specialist report).

Given the considerable uncertainties involved in this study (not just limited to the normal, potentially high levels of uncertainties associated with a study based on model results), including the fact that the model simulations did not take account of the shock doses of biocide to be applied (as opposed to continuous treatment) or the likely temperature differential between uptake and discharge water (Section 4.2 of the Marine specialist report, p 39), I believe that toxicity testing of the effluent is warranted before the RO plant is constructed and the chosen approach becomes "irreversible" owing to the potentially high costs involved with changing approach at a later stage (e.g. invoking alternative disposal sites outside of the Bay). Such toxicity testing should include both acute and chronic tests to be applied to a range of different organisms from different taxonomic groups (e.g. algae, invertebrate and fish) and should include sensitive life history stages of these groups. Guidance on the design of toxicity tests can be found in documents published by the International Maritime Organisation (Resolution MEPC 126(53): Procedure for approval of ballast water management systems that make use of active substances (G9)), the US Environmental Protection Agency (USEPA Ecological Effects Test Guidelines) or the Organisation for Economic Co-operation and Development (OECD Guideline for Testing of Chemicals).

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<sup>1</sup> As the plant is not yet operational, it is not possible to directly test effluent from this plant. However, it should be relatively easy to prepare a sample of seawater with similar characteristics to that projected for the plant under a worst case scenario and to use this for standardized toxicity testing using a range of different organisms.

Given the forgoing, my endorsement of the findings of the specialists in respect of the severity and significance of identified impacts must remain conditional on the results of toxicity tests performed on “simulated” effluent from the RO plant being no more severe than gleaned from available literature by the specialists (i.e. No Observable Effect Concentration (NOEC) is not lower than 0.07 mg. DBNPA.l<sup>-1</sup>, even when present in combination with other constituents or characteristics of the effluent from the proposed RO plant). Note that I am comfortable to endorse the finding from the marine study in all other respects.

A second concern I have with the approach adopted for the study that does not affect my judgment on the findings of the specialists but nonetheless needs to be addressed, is the fact that while a number of mandatory recommendations have been included in the Marine specialist report and in the main BA report for monitoring studies and are designed to validate model predictions (2nd bullet, p. 41 of the Marine specialist study report) and for monitoring of impacts to subtidal benthos and the like (Marine specialist study report p XII), no thresholds or action levels have been stipulated where action would automatically be triggered nor have any specifications been included for what action would need to be taken in the event that such a level were exceeded. Presumably the recommended monitoring will be conducted by an independent agency and that results would be submitted to a competent authority for consideration not just to the developer.

#### **Concerns raised by I&APs and extent to which these have been addressed**

There is clearly very strong opposition to the imposition of further anthropogenic impacts to the Saldanha Bay system, particularly to the discharge of additional effluent into the Bay. I believe this is borne from the recognition of the ecological importance of the system, being one of the few sheltered bays on this section of coast, and its increasing importance as a tourist destination. It is generally agreed that water quality requirements for receiving environments should be defined by the users and these comments must thus be given due consideration. Data from the sorts of toxicity tests proposed above (and recommended by the marine specialists) would probably go a long way towards allaying some of the concerns expressed. Notwithstanding this, I believe that all comments raised by I&APs have been adequately addressed.

#### **Commentary on the fact that the proposed changes/upgrades (dredging and reclamation as part of Phase 2) have not been taken into consideration in the modelling of marine impacts and ecological impact assessment**

I am not an expert on hydrodynamic modelling and thus defer to the companion review undertaken by Prof Ron Cox and Mr Brett Miller of the Water Research Laboratory, University of New South Wales, Australia, that focuses on this aspect of the study. These reviewers did not dispute the assessment by the marine specialists that the dense effluent from the RO plant is unlikely to accumulate to any significant extent in the existing dredged areas or future proposed dredge sites. I am satisfied that these assumptions are correct and am confident that the proposed water quality and biotic monitoring will resolve any uncertainties in this respect in any event. (Note that if the effluent from the RO plant does accumulate to a significant extent in the deeper dredged areas this will be evident from low oxygen levels in these areas and altered benthic communities.)

I trust that this review has been helpful and would like to assure you that I am open to further discussion on any of the issues raised in this report.

Yours faithfully,

A handwritten signature in black ink, appearing to be 'Dr Barry Clark', written in a cursive style.

Dr Barry Clark

**ANNEX 1: REVIEW CHECKLIST FOR SPECIALIST INPUT (FROM KEATIMILWE AND ASHTON (2005))**

REVIEW AREA	REVIEWER'S COMMENT	ADEQUATE	INADEQUATE
<b>Review Field 1 : Overall Quality Assurance</b>			
<b>A. Ethics</b>			
A.1 Does the specialist/s have the necessary qualifications, expertise and experience, to provide input to the EIA process?	Yes definitely	X	
A.2 Is there any evidence of unethical behaviour? e.g. bias or inappropriate emphasis, unwarranted assumptions, emotive, irrational or unsubstantiated statements, vested or conflict of interest?	No evidence of unethical behaviour	X	
A.3 Has the specialist confirmed the validity of the information included in the integrated report?	Specialists have made good use of available published and unpublished literature, and opinions of other experts but have not validated information on effluent toxicity through toxicity tests		X
A.4 Are the specialist's Terms of Reference adequate and appropriate to the proposed development?	Yes	X	
<b>B. Adequacy of Information</b>			
B.1 Is information sufficient for decision-making purposes in terms of the level of detail and reliability of findings?	Information provided is sufficient in most respects aside from validation of effluent toxicity through direct toxicity tests.		X
B.2 Have impacts been assessed and communicated in terms of the extent to which they support or conflict with the desired future state/vision of the area and sustainable development objectives (as described in relevant policies, plans and legislation)?	Yes	X	
B.3 Has the specialist met all the requirements of the Terms of Reference for the specialist input?	Yes	X	
B.4 Where appropriate, has traditional or indigenous knowledge been included as information in the input?	N/A	X	
B.5 Are there any uncertainties, or low levels of confidence in the assessment or evaluation? Are these	Yes – particularly in respect of toxicity of biocides discharged		X

REVIEW AREA	REVIEWER'S COMMENT	ADEQUATE	INADEQUATE
uncertainties and confidence levels clearly stated?	with brine effluent. These are not adequately acknowledged in the report (confidence listed as Medium/High).		
B.6 Are the assumptions in the approach and method, assessment, evaluation and management options sound? Do any undermine the credibility of findings?	Uncertainties highlighted in B.5 above have bearing on the significance of impacts as assessed and thus could undermine credibility of findings		X
<b>C. Clarity of Report</b>			
C.1 Is there a clear, non-technical summary?	Yes	X	
C.2 Are the sources of information clear and explicit?	Yes	X	
C.3 Are opinions or statements justified and adequately motivated?	Yes	X	
C.4 Are conclusions derived from findings of study logically consistent?	Yes	X	
C.5 Is a summary impact assessment table included, using the defined impact assessment and significance rating criteria to evaluate different alternatives both with and without management actions?	Yes	X	
C.6 Are consequences of the predicted impacts made explicit?	Yes	X	
C.7 Is a statement of impact significance provided for each issue, specifying whether thresholds of significance have been exceeded or not, and whether or not the impact presents a potential fatal flaw?	Yes	X	
C.8 Is there a clear indication of whether impacts are irreversible or result in an irreplaceable loss to the ecosystem and/or society?	Yes	X	
C.9 Are key risks and uncertainties that may influence the impact assessment findings clearly specified?	Yes	X	
C.10 Is the degree of confidence in the impact assessment prediction clearly specified?	Yes	X	
C.11 Is a summary of key management actions that fundamentally affect impact significance provided?	Yes	X	
<b>D. Consideration of alternatives</b>			
bD.1 Has adequate consideration been given to the identification of reasonable alternatives?	Yes	X	

REVIEW AREA	REVIEWER'S COMMENT	ADEQUATE	INADEQUATE
<ul style="list-style-type: none"> <li>For projects proposed on public land and/or for the public good, have fundamental development alternatives been considered which would meet the stated need and purpose for the project; e.g. the nature and location of the proposed project?</li> <li>For all projects, both public and private, are incremental alternatives considered; e.g. the siting, process, design, scale, timing, funding and production system alternatives, as and where appropriate?</li> </ul>			
D.2 Have alternatives been addressed at a scale and level of detail that enables adequate comparison with the proposed project?	Yes	X	
D.3 Has the specialist identified the alternative that is the best practicable environmental option (BPEO) from the perspective of their specialist domain?	Yes – within the scope of alternatives offered to them	X	
<b>E. Description of the project and the affected environment</b>			
E.1 Has the purpose and need for the proposed project been clearly stated?	Yes	X	
E.2 Is there adequate description of the proposed project and alternatives to identify and assess possible direct, indirect and cumulative impacts (e.g. location, siting, routing, scheduling, activities, inputs and outputs, labour, buildings and structures, infrastructure and operating scenarios)?	Yes	X	
E.3 Is there adequate description of the key characteristics of the affected socio-economic and biophysical environment (as relevant to the specialist domain) including baseline conditions, sensitive receptors or resources, uses/users, anticipated trends and pressures, and future scenarios?	Yes	X	
E.4 Are off-site as well as on-site characteristics adequately described to provide the broader context within which the development is proposed, where it is clear that impacts of the proposed project would extend beyond the immediate site?	Yes	X	
E.5 Are clear and accurate maps, plans and possibly photographs, of the project and affected environment provided?	Yes	X	

REVIEW AREA	REVIEWER'S COMMENT	ADEQUATE	INADEQUATE
<b>F. Description of legislation, policies and plans</b>			
F.1 Is the legal context described and are legal requirements, including those arising from international agreements, clearly considered?	Yes	X	
F.2 Is the policy and planning context of the proposal described, and clearly considered (taking into consideration international, national, provincial and local policies and plans)?	Yes	X	
F.3 Have accepted standards been identified and clearly taken into consideration (e.g. WHO standards, DWAF water quality standards, etc.)?	Yes	X	
F.4 Have opportunities for the proposed project to support or contribute to the implementation of policy, plans or programmes been identified?	Yes	X	
F.5 Have inconsistencies, potential areas of conflict and or likely non-compliance between the proposed project and the legal, policy and planning context been clearly identified and the implications described?	Yes	X	
<b>G. Identification of key issues</b>			
G.1 Has the identification of potential issues through scoping been adequate? If not, has the specialist identified additional key issues?	Yes	X	
G.2 Within the specialist's area of expertise, have key I&APs had input to scoping where the proposed project could have a direct and/or potentially significant effect on their particular or mandated area of responsibility or interest?	Yes	X	
G.3 Where scoping has missed key stakeholders, and/or where additional stakeholder involvement is clearly needed to refine, or better define issues or impacts, has the specialist made adequate provision for such involvement?	N/A	X	
<b>H. Prediction and assessment of impacts</b>			
H.1 Are the time and space boundaries of the study appropriate and adequately motivated?	Yes	X	
H.2 Have plausible environmental and operating scenarios been considered in the assessment?	Yes	X	
H.3 Has a recognised approach and methodology been used by the specialist and has this been clearly	Yes	X	

REVIEW AREA	REVIEWER'S COMMENT	ADEQUATE	INADEQUATE
motivated?			
H.4 Have linkages to other specialist inputs been identified and taken into account where relevant?	Yes	X	
H.5 Are clear, sufficient and explicit criteria used to assess impacts of different alternatives?	N/A	X	
H.6 Have the issues raised and alternatives suggested by I&APs during scoping, and in comment on draft documents, been addressed satisfactorily?	Yes	X	
H.7 Is there adequate attention to indirect or cumulative effects on significant or sensitive resources? Where potentially significant cumulative effects are possible, but cannot be addressed at the EIA level, has the need for higher order studies been clearly stated?	Some uncertainty remains in respect of the cumulative impacts of the dredging proposed for the expansion of the iron ore terminal and the likelihood of effluent accumulating in these areas		
H.8 Have explicit and sufficient criteria been used to evaluate significance of impacts of alternatives, taking into account the planned mitigation and management?	Yes	X	
H.9 Are there systematic, explicit and rational links from identification of key issues, through assessment to evaluation of significance?	Yes	X	
H.10 Are the beneficiaries, and those who stand to lose from the proposed development, clearly identified?	Yes	X	
H.11 For trans-boundary projects, have the approach and methodology been agreed to by all countries?	N/A	X	
<b>I. Recommendations for management and monitoring</b>			
I.1 Has the management of the potential positive and negative impacts been systematically and adequately addressed (i.e. has the specialist considered measures for the avoidance, mitigation, restoration, rehabilitation or compensation of negative impacts in a hierarchical fashion; and have measures for enhancing positive impacts been considered)?	No. No thresholds or action levels designed to trigger management action have been included with recommendations for monitoring		X
I.2 Has the precautionary principle been applied to the recommendations for management and monitoring measures where there is uncertainty or high risk associated with impacts?	In most respects precautionary approach has been applied except in respect of toxicity testing of		X

REVIEW AREA	REVIEWER'S COMMENT	ADEQUATE	INADEQUATE
	"simulated" effluent and in modeling cumulative impacts of effluent discharge and future proposed dredging.		
I.3 Are recommended management actions practical, viable and in line with best practice? Are these clearly described and motivated?	Yes	X	
I.4 Have potential knock-on impacts of management actions been considered by the other specialist/s and the EIA practitioner?	Yes	X	
I.5 Does the recommended monitoring program(es) include: the specific questions to be asked by monitoring; the frequency, season and timing for monitoring; responsibility for monitoring, analysis and implementation of responsive management actions; targets and indicators for monitoring; significance thresholds; and auditing and reporting requirements?	No – specific threshold levels have not been identified that will trigger management action or introduction of additional mitigation measures		X
I.6 Is the proposed monitoring program(es) practical, viable and in line with best practice? Has it been clearly described and motivated?	Yes	X	

## **ANNEX 2: HMG JV RESPONSE TO 'CONSIDERATION OF ALTERNATIVES' COMMENTS (RECEIVED BY EMAIL ON 11 AUGUST 2008)**

**From:** JV - HMG - Campbell, Ellen [mailto:Ellen.Campbell@hmgjv.co.za]

**Sent:** 11 August 2008 11:59 AM

**To:** Peter Silbernagl; Jones, Sharon

**Cc:** JV - HMG - Stark, Conrad; JV - HMG - Minnaar, Christo; JV - HMG - Goosen, Rodney; JV - HMG - Clark, Max

**Subject:** RE: Saldanha: RO Plant: Review of Marine Studies: ecological review HMG JV comments

Hi Peter/Sharon,

Please find below our response to Dr Barry Clark's 'Consideration of Alternatives' comments in the peer review of the marine study undertaken for the proposed RO plant.

Dr Clark's comments on page 2 are extracted as follow:-

"....I believe that adequate consideration has not been given to assessment of sites in closer proximity to the iron ore terminal e.g. cost of laying a pipeline across the land to North Bay (on the west side of the Marcus Island causeway) or to Tabakbaai, which are both much closer to the proposed location for the RO plant and I believe would not weigh as heavily in financial terms in favour of options involving effluent disposal into Saldanha Bay".

HMG JV's response is as follows:-

The presented pipe routes were chosen for the following reasons:-

Velddrift (38 km) – as the Cerebos and Velddrift Salt works are situated there it was the intention to deliver the brine to the salt works for beneficial use.

Jacobs Baai (18 km) – as it is considered the closest point outside Saldanha Bay where the pipe will not have to be routed through the town of Saldanha.

Other routes possible: (please refer to the attached map for illustration) [included below]

Tabakbaai (16km) – This would mean that the pipe will have to be routed through the town of Saldanha with associated construction disruptions and expenses. An 11% saving in pipe length would be offset by interference with existing services and traffic disruptions within the town of Saldanha.

Skulpiesbaai (14 km) - This would mean that the pipe will have to be routed through the town of Saldanha with associated construction difficulties and expenses. A 22% saving in pipe length would be offset by interference with existing services and traffic disruptions within the town of Saldanha. It would be simpler to go across the bay than to use this route.

The price estimates for the pipe drilling and dredging were obtained from suppliers in the relevant field and are considered order of magnitude prices accurate to 30%.

The price estimates for the pipelines are from our existing project estimating database and are considered accurate for order of magnitude costing.

It must be noted that the costs of all these options (including Tabakbaai and Skulpiesbaai) could well be increased substantially due to project delays (specifically those associated with the acquisition of servitudes outside of Transnet National Ports Authority land), additional engineering and geotechnical surveys costs. The potential timeframes for development of these overland options is not conducive with the immediate need for additional water supplies for use in dust suppression measures for current operations.

These additional project related risks would increase the cost per unit volume of water produced through the RO process and would make the RO plant financially unviable.

It is important that the additional costs and significant additional project related risks associated with the discharging of brine outside of Saldanha Bay be considered and balanced in conjunction with the outcomes of the marine and other specialist studies which assign impact ratings to the potential environmental impacts associated with discharging brine within Saldanha Bay.

From the perspective of proposing a financially viable and low risk project, the considerations given in the Engineering Considerations Report demonstrate that progressing further with these options is neither reasonable nor justified.

Please forward our response to Dr Clark for his information and finalisation of his peer review report.

Regards,

Ellen

**Ellen Campbell**  
**Environmental Manager**



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