Onslow Solar Salt Project

Onslow Salt Pty Ltd

Proposed Change to Environmental Conditions

Report and recommendations
of the Environmental Protection Authority

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Summary

This report is to provide the Environmental Protection Authority (EPA) advice and recommendations to the Minister for the Environment on the environmental factors relevant to the proposal by Onslow Salt Pty Ltd to modify components of the existing approved Onslow Solar Salt Project.

In the EPA's opinion the following are the environmental factors relevant to the proposal:

(a) algal mats;

(b) coral reefs; and

(c) marine water quality.

The conditions and procedures, in the EPA's opinion, to which the modified project should be subject, if implemented, are in summary:

(a) the existing Ministerial Conditions applied to the project (Ministerial Statement 401, 21 November 1995), subject to modification of Conditions 1, 2 and 22 (proponent's commitments, implementation and time limit on approval) and the addition of Condition 24 (environmental management system) as set out in (b), (c), (d) and (e) below;

(b) the proponent's additional commitment made during the assessment process to monitor the stability of spoil disposal sites and the sedimentation rate on Ward's Reef, and if significant impacts on the sedimentation rate on adjacent coral reefs is detected, the proponent will consult the EPA to develop practical strategies to alleviate such impacts, should be made enforceable through the application of Condition 1;

(c) the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the EPA initially with the proposal, and reported on in the EPA Bulletin 495 (1991) and subsequently, in EPA Bulletin 776 (1995) and in this Bulletin, as part of further consideration under Section 46 of the *Environmental Protection Act* 1986. Changes to the proposal which are not substantial may be carried out with the approval of the Minister for the Environment;

(d) the proponent must substantially commence the modified project within five years of the publication of the Ministerial statement relating to this proposal. Any application to extend the period of five years shall be made before the expiration of that period to the Minister for the Environment;

(e) in order to manage the relevant environmental factors and EPA objectives contained in this Bulletin, and subsequent environmental Conditions and Procedures authorised by the Minister for the Environment, the proponent is required to prepare, prior to implementation of the proposal, an environmental management system, including an environmental management program, in accordance with recognised environmental management principles, such as those in Australian Standards AS/NZS ISO 14000 series; and

(f) the existing Procedures outlined in the existing Ministerial Conditions applied to the project (Ministerial Statement 401, 21 November 1995).

The EPA submits the following recommendations:

Recommendation 1

That the Minister for the Environment note the relevant environmental factors and the EPA's objective set for each factor (Section 3).

Recommendation 2

That subject to the satisfactory implementation of the EPA's recommended conditions and procedures (Section 4), including the proponent's environmental management commitments, the proposal can be managed to meet the EPA's objectives.

Recommendation 3

That the Minister for the Environment imposes the conditions and procedures set out in Section 4 of this report.

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1. Introduction

This report is to provide the Environmental Protection Authority (EPA) advice and recommendations to the Minister for the Environment on the environmental factors relevant to the proposal by Onslow Salt Pty Ltd to modify components of the existing approved Onslow Solar Salt Project.

In 1990, a proposal was submitted by Gulf Holdings Pty Ltd to the EPA to develop a new saltfield near Onslow to produce and ship salt from a new port facility to be built near Beadon Point (Figure 1). The EPA set the level of assessment for the proposal at Environmental Review and Management Programme (ERMP). The EPA assessed Gulf Holdings' ERMP (Gulf Holdings Pty Ltd, 1990) and provided its report and recommendations to the Minister for the Environment in 1991 (EPA, 1991). Approval to implement the project, subject to a number of Environmental conditions and commitments, was issued in 1991 (Ministerial Statement 168, 13 August 1991).

In 1995, Onslow Salt Pty Ltd replaced Gulf Holdings Pty Ltd as the proponent of the Onslow Solar Salt Project.

Onslow Salt made a submission to have three environmental conditions withdrawn from the Minister for the Environment's 1991 statement of approval in 1995 (Onslow Salt, 1995). The Minister requested the EPA to examine the environmental implications of the proposed changes and report to him under Section 46 of the Environmental Protection Act, 1986. The EPA's report and recommendations were published in EPA Bulletin 776 (EPA, 1995). The Minister approved the changes to conditions, and a new statement (401) was published on 21 November 1995.

In late 1996, Onslow Salt proposed a second change to environmental conditions. The change results from Onslow Salt's intention to make a number of changes to the project, essentially to allow an increased start-up production from 1.5 million tonnes per annum (Mtpa) to 2.5 Mtpa (Halpern Glick Maunsell Pty Ltd, 1997a). On 21 January 1997, the Minister for the Environment requested the EPA to inquire into the proponent's changes to the existing environmental conditions, under Section 46 of the Environmental Protection Act 1986. A report outlining the proposed changes to the approved Onslow Solar Salt Project and to existing conditions and commitments, hereafter called the Section 46 report (Halpern Glick Maunsell Pty Ltd, 1997a), was released by the proponent in February 1997.

Further information on the proposal are given in Section 2 of this report. Section 3 discusses environmental factors relevant to the proposal.

Conditions and procedures to which the proposal should be subject if the Minister determines that it may be implemented are set out in Section 4. Section 5 presents the EPA's recommendations to the Minister.

Appendix 1 provides maps relating to the proposal. A list of organisations that made submissions is included in Appendix 2, and references cited in this report are listed in Appendix 3.

2. The proposal

The proposal to modify the Onslow Solar Salt Project and relevant conditions is described in the Section 46 report (Halpern Glick Maunsell Pty Ltd, 1997a).

The changes to the project are to allow the start-up production to increase from 1.5 Mtpa to 2.5 Mtpa. Modifications proposed in the Section 46 report are outlined in Figure 2, and include:

- expansion of condenser pond area from 70 km^2 to 80 km^2;
- expansion of the crystalliser pond area from 7.2 km^2 to 8.2 km^2;
- area for storage of bitterns;

- extension of the jetty structure by 300 m;
- extension of the dredged approach channel offshore, from 4 km long and -9 m (Chart Datum) deep to 9.6 km long and -10.8 m deep;
- increased volume of spoil from 600 000 m^3 to 3 000 000 m^3 and relocation of spoil dumping sites from the east to the west of the proposed shipping channel; and
- provision of alternate access/service corridors within the project area.

A detailed description of the proposed modified project is provided in Sections 2 and 3 of the Onslow Solar Salt Project Section 46 report (Halpern Glick Maunsell Pty Ltd, 1997a).

During the assessment of the modified Onslow Solar Salt Project, the proponent agreed to the following alterations to the modified proposal:

(a) the bitterns storage area is no longer proposed as part of the modified proposal; and

(b) spoil disposal sites will be relocated back to the eastern side of the proposed shipping channel, and consolidated into one concentrated area (Figure 3).

These changes have been incorporated in this assessment.

A summary of the proposed changes to the Onslow Solar Salt Project is outlined in Table 1 below.

Table 1. Summary of proposed changes to Onslow Solar Salt Project

	ORIGINAL PROPOSAL	MODIFIED PROPOSAL	FINAL PROPOSAL
Production (Mtpa)	1.5	2.5	2.5
Haulage, washing and stacking rate (Tpa)	880	1 500	1 500
Sea water pumping capacity (m^3/sec)	12	12	12
Washwater (l/sec)	-	250	250
Condenser ponds (km^2)	70	80	80
Settling ponds (ha)	-	5	5
Crystalliser ponds (km^2)	7.2	8.2	8.2
Stockpile volume (m^3)	1 000 000	1 000 000	1 000 000
Bitterns storage (km^2)	-	3	0
Bitterns discharge (m^3/d)	25 000	25 000	25 000
Jetty length (m)	950	1 250	1 250
Dredge channel depth (m below chart datum)	9	10.8	10.8
Dredge channel length (km)	4	9.6	9.6
Dredge channel width (m)	120	120	120
Dredge spoil (m^3)	600 000	3 000 000	3 000 000
Spoil disposal sites	east of channel one site	west of channel three sites	east of channel one site
Ship size (DWT)	28 000	45 000	45 000
Ship loading rate (tph)	1 300	2 000	2 000
Power consumption (MW)	2	3	3

3. Environmental factors

A number of environmental factors relating to the Onslow Solar Salt Project were identified and addressed in previous environmental assessments of the project (including the original Environmental Review and Management Programme and previous Section 46 assessment). Three of these environmental factors have the potential to be further affected as a result of the proposed modifications to the Onslow Solar Salt Project. These are identified and discussed below.

3.1 Relevant environmental factors

It is the EPA's opinion, based on the submissions and material listed in Appendix 3, that the following are the environmental factors relevant to the modified proposal:

(a) algal mats;

(b) coral reefs; and

(c) marine water quality.

These relevant environmental factors are discussed in Sections 3.2 to 3.4 of this report. Relevant factors, EPA's objectives, proponent's commitments and EPA opinion is summarised in Table 2.

3.2 Algal Mats

Aspects of Algal Mats

Algal mats are primary producers which incorporate carbon and other elements into organic molecules, and have also been shown to fix nitrogen from the atmosphere. Algal mats are considered to be an important part of the general mangrove ecosystem and the nearshore environment. It has been suggested that it is probable that the mangrove-algal mat association is a key element in the nutrient cycle for all organisms that inhabit the shelf zone (Paling, 1990).

Present algal mat distribution on the project site in the vicinity of the condenser pond and the crystalliser pond is illustrated in Figures 4a and 4b respectively. It is estimated that 1968 ha of algal mats occur in the 270 km^2 of tidal and supratidal flats surrounding the vicinity of the project area (Gulf Holdings, 1990).

As outlined in the Section 46 report, it is estimated that the modified proposal will result in the loss of approximately 26% of algal mat in the vicinity of the project area. The majority of this loss is associated with the construction of the additional condenser pond and the bitterns storage area, which will inundate 150 ha and 175 ha of algal mats respectively (Figure 2). The approved Onslow Solar Salt Project was estimated to result in the loss of approximately 12% (230 ha) of algal mats. Therefore, the proposed modifications to the project will increase the area of algal mat lost by approximately 14%.

The Department of Environmental Protection Karratha Regional Office expressed concern regarding the significant increase in the area of algal mat affected by the modified proposal, and considers that there is insufficient justification given in the Section 46 report for the loss of algal mat. It was suggested that alternative configuration of the crystalliser ponds to take up salt flats to the west and moving the bitterns storage area south should be considered as an alternative.

Assessment

Algal mats occur on areas of tidal and supratidal flats in the tropical arid climatic zone. A distinct tidal area (270 km^2) supporting an estimated 1968 ha of algal mats has been identified surrounding Onslow (Figure 5). It is the area of algal mat existing in this tidal area which is considered for the assessment of this relevant environmental factor.

The EPA's objective in regard to this relevant environmental factor is to "maintain the ecological function, abundance, species diversity, productivity and geographic distribution of algal mats"

It was suggested that the design of the condenser pond be modified to avoid areas of algal mat, thereby reducing the area of algal mat lost directly as a result of the proposed project. However, the proponent has the view that such modification of the condenser pond would reduce the condenser area and result in reduced production capacity. The proponent also advised that the bitterns storage area is no longer proposed as part of the modified Onslow Solar Salt Project. As outlined in the Section 46 Report, this storage area was estimated to inundate approximately 175 ha of algal mat. Without the bitterns storage area, it is estimated that a total of 380 ha (19%) of algal mats in the vicinity of the project area will be lost as a result of the modified proposal.

It is noted that the modified Onslow Solar Salt Project has been designed to avoid large areas of mangroves and algal mats. The EPA also notes that an existing Ministerial Condition requiring the proponent to "construct and manage the facility such that there are no significant indirect adverse impacts on the mangroves or algal mats beyond the boundary of the solar salt facilities" was outlined in the original and subsequent assessments of the Onslow Solar Salt Project to confine impacts on algal mats to within the project area.

Having particular regard to:

(a) the omission of the bitterns storage area as part of the modified project;

(b) the design approach in the modified project to avoid large areas of mangroves and algal mats; and

(c) the existing Ministerial Condition requiring the proponent to "construct and manage the facility such that there are no significant indirect adverse impacts on the mangroves or algal mats beyond the boundary of the solar salt facilities";

it is the EPA's opinion that its objective relating to algal mats is unlikely to be compromised by the proposed modifications to the project.

3.3 Coral reefs

Aspects of coral reefs

An isolated coral reef, known as Ward's reef, is located adjacent to the proposed shipping channel approximately four kilometres offshore of the project area (Figure 3). The Section 46 report describes Ward's Reef as having a unique assemblage of corals and associated biota which tolerate low light conditions and high turbidity levels.

Proposed modifications to the project include deepening and lengthening the proposed shipping channel, which will result in approximately 3 000 000 m^3 of spoil, compared to 600 000 m^3 of spoil created by the approved project. The modified project also proposed to relocate spoil disposal sites from the east to the west of the proposed shipping channel (Figure 3).

The modified proposal indicated that spoil dumping sites are proposed to be relocated to an area approximately 500 m away from Ward's Reef, indicated by the shaded areas of Figure 3. Although this distance is beyond the distance specified in the existing proponent's commitments, which states that no spoil will be dumped within 500 m of Ward's Reef, it is significantly closer to the reef than spoil disposal sites specified in the approved project, which were located approximately 1600 m from the reef on the eastern side of the proposed shipping channel (Figure 3). Additionally, the increased volume of spoil for disposal increases the potential for impacts on adjacent coral reefs.

Concerns were raised in submissions from the Fisheries Department of WA and the DEP regarding the potential for sediment to impact on adjacent coral reefs, namely Ward's Reef.

Assessment

Analysis of particle size and settling behaviour of sediment in the vicinity of the proposed dredging has indicated that 100% of sediment is estimated to settle after travelling for approximately 30 km (Figure 6). Therefore, the area considered for assessment of the relevant environmental factor, coral reefs, is the approximate area within a 30 km radius from the dredging and spoil disposal sites. It is noted, however, that the proponent has indicated that, over distances of the order of kilometres, it is expected that concentrations of suspended sediment will be indistinguishable from background levels (Halpern Glick Maunsell Pty Ltd, 1997b).

The EPA's objective in regard to this environmental factor coral reefs is to "protect the abundance, diversity, geographic distribution and productivity of coral reefs".

Sediment created during dredging for the shipping channel and potential sediment movement from spoil disposal sites has the potential cause impacts on adjacent coral reefs as a result of increased water turbidity (see section 3.4 below), and directly as a result of smothering.

The proponent indicated that the relocation of spoil disposal sites from the currently approved location on the eastern side of the proposed shipping channel, to three discrete areas on the western side of the channel, was primarily to reduce the potential for sediment movement back into the shipping channel under cyclonic conditions. It is the potential for such sediment movement, and the potential impacts such movement may have on adjacent coral reefs, that is of concern to the EPA.

As a result of these concerns, the proponent has agreed to relocate the spoil disposal sites back to the east of the proposed shipping channel. The proponent has also agreed to dump spoil into one consolidated area. The area identified for this dumping, as suggested by Environment Australia as part as their assessment of this proposal under the Environmental Protection (Sea Dumping) Act 1981, is illustrated in Figure 3.

The siting of spoil disposal sites in this area to the east of the shipping channel will place the spoil disposal sites at a distance of approximately 1600 m from Ward's Reef, compared to approximately 500 m away as proposed in the Section 46 report. Additionally, the consolidation of spoil disposal into one concentrated area will reduce the potential for disturbance to the spoil and for sediment to impact on adjacent coral reefs.

The EPA notes that a number of Ministerial Conditions and commitments were outlined in the original assessment of the Onslow Solar Salt Project to minimise the potential impacts of this project on Coral Reefs. These require the proponent to:

- monitor the effect on Ward's reef from sediment from the dredging of the shipping channel, and modify dredging procedures if monitoring shows the reef is being adversely affected;
- no dredging is to be carried out within 800 m of Ward's reef and no spoil disposal within 500 m of Ward's reef; and
- no channel blasting will be undertaken near Ward's reef.

These commitments should apply to dredging carried out during the construction of the shipping channel, and during any maintenance dredging which may be required.

In addition to the existing Ministerial Conditions and proponent's commitments, the proponent has made an additional commitment to monitor the stability of spoil disposal sites and the sedimentation rate on Ward's Reef. If significant impacts on the sedimentation rate on adjacent coral reefs is detected, the proponent will consult the EPA to develop practical strategies to alleviate such impacts.

In addition to these commitments made by the proponent, Environment Australia has advised that, through licensing provisions of the Environmental Protection (Sea Dumping) Act 1981, they will impose a number of more specific conditions regarding the monitoring and management of sediments during dredging.

Having particular regard to:

(a) the existing Ministerial Conditions and proponent's commitments to reduce the potential impacts on coral reefs resulting from dredging the shipping channel;

(b) the fact that spoil disposal sites will be relocated back to the eastern side of the proposed shipping channel, and consolidated into one concentrated area;

(c) the additional commitment requiring the proponent to monitor the stability of spoil disposal sites and the sedimentation rate on Ward's reef, and if significant impacts are detected, to consult the EPA to develop practical strategies to alleviate such impacts; and

(d) the fact that the Commonwealth will impose a number of more specific conditions regarding monitoring and management of sediments during dredging;

it is the EPA's opinion that the modifications to the proposed project are unlikely to compromise its objective to protect the abundance, diversity, geographic distribution and productivity of coral reefs.

3.4 Marine water quality

Aspects of marine water quality

The modified project has the potential to adversely affect the marine water quality in the vicinity of the project area as a result of increased sediment during dredging and, over the long term, through increased turbidity resulting from sediment movement from spoil disposal sites.

As outlined in 3.3 above, the modified project will create approximately five times the amount of spoil compared with the approved project. Disposal of this increased amount of spoil may increase the potential risk of adverse impacts on marine water quality.

It is considered that potential impacts resulting from other potential marine water contaminants, such as bitterns and potential oil spills, have been identified and addressed during previous assessments of the Onslow Solar Salt Project, and that the potential impacts from these contaminants can be adequately managed through existing Ministerial Conditions and proponent's commitments.

Assessment

As outlined in section 3.3 above, analysis of particle size and settling behaviour of sediment in the vicinity of the proposed dredging has indicated that 100% of sediment is estimated to settle after travelling for approximately 30 km (Figure 6). Therefore, the area considered for assessment of the relevant environmental factor, marine water quality, is the approximate area within a 30 km radius from the dredging and spoil disposal sites. It is noted, however, that the proponent has indicated that, over distances of the order of kilometres, it is expected that concentrations of suspended sediment will be indistinguishable from background levels (Halpern Glick Maunsell Pty Ltd, 1997b).

The EPA's objective for the factor marine water quality is to "maintain water quality to ensure ecosystem maintenance in agreed areas".

The Section 46 report indicates that, as part of the modified project, spoil is proposed to be dumped in three separate elongated areas alongside the proposed shipping channel (Figure 3). During the Commonwealth's assessment of the Sea Dumping Application made as part of this project, Environment Australia outlined that, to reduce the potential for disturbance to spoil disposal sites, and therefore to reduce the dispersal of sediment from these sites, spoil should be placed in one concentrated area. Environment Australia has advised of an acceptable site for dumping, as illustrated in Figure 3. Commonwealth conditions on the dumping permit will specifically address monitoring of turbidity from dredging.

The EPA considers that dumping spoil in one concentrated area will reduce the potential for sediment movement from spoil sites, and therefore reduce the potential for sediment to impact upon marine water quality.

Furthermore, the proponent has made an additional commitment to monitor the stability of spoil disposal sites.

The EPA notes that a number of Ministerial Conditions and commitments were outlined in the original assessment of the Onslow Solar Salt Project to minimise the potential impacts of this project on marine water quality. These require the proponent to:

- prepare an oil spill contingency plan;
- monitoring of the dilution and discharge of bitterns, and prepare and implement a revised discharge strategy if required; and
- monitor the effects of sediment from dredging on Ward's Reef.

The EPA also notes that, in addition to the existing Ministerial Conditions and proponent's commitments, the proponent has made an additional commitment to monitor the stability of spoil disposal sites and the sedimentation rate on Ward's Reef.

Having particular regard to:

(a) the existing Ministerial Conditions and proponent's commitments to reduce the potential for impacts of marine water quality resulting from the modified proposal;

(b) the fact that spoil disposal sites will be relocated back to the eastern side of the proposed shipping channel, and consolidated into one concentrated area; and

(c) the additional commitment requiring the proponent to monitor the stability of spoil disposal sites and the sedimentation rate on Ward's reef;

it is the EPA's opinion that the modifications to the proposed project are unlikely to compromise its objective to "maintain water quality to ensure ecosystem maintenance in agreed areas".

4. Conditions and procedures

4.1 Conditions

In the EPA's opinion, the modified project should be subject to the following conditions if implemented:

(a) the existing Ministerial Conditions applied to the project (Ministerial Statement 401, 21 November 1995), subject to modification of Conditions 1, 2 and 22 (proponent's commitments, implementation and time limit on approval) and the addition of Condition 24 (environmental management system) as set out in (b), (c), (d) and (e) below;

(b) the proponent's additional commitment made during the assessment process to monitor the stability of spoil disposal sites and the sedimentation rate on Ward's Reef, and if significant impacts on the sedimentation rate on adjacent coral reefs is detected, the proponent will consult the EPA to develop practical strategies to alleviate such impacts, should be made enforceable through the application of Condition 1;

(c) the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent to the EPA initially with the proposal, and reported on in the EPA Bulletin 495 (1991) and subsequently, in EPA Bulletin 776 (1995) and in this Bulletin, as part of further consideration under Section 46 of the *Environmental Protection Act* 1986. Changes to the proposal which are not substantial may be carried out with the approval of the Minister for the Environment;

(d) the proponent must substantially commence the modified project within five years of the publication of the Ministerial statement relating to this proposal. Any application to extend the period of five years shall be made before the expiration of that period to the Minister for the Environment; and

(e) in order to manage the relevant environmental factors and EPA objectives contained in this Bulletin, and subsequent environmental Conditions and Procedures authorised by the Minister for the Environment, the proponent is required to prepare, prior to implementation of the proposal, an environmental management system, including an environmental management program, in accordance with recognised environmental management principles, such as those in Australian Standards AS/NZS ISO 14000 series.

4.2 Procedures

In the EPA's opinion, the modified project should be subject to the existing Procedures outlined in the existing Ministerial Conditions applied to the project (Ministerial Statement 401, 21 November 1995).

5. Recommendations

The EPA submits the following recommendations:

Recommendation 1

That the Minister for the Environment note the relevant environmental factors and the EPA's objective set for each factor (Section 3).

Recommendation 2

That subject to the satisfactory implementation of the EPA's recommended conditions and procedures (Section 4), including the proponent's environmental management commitments, the proposal can be managed to meet the EPA's objectives.

Recommendation 3

That the Minister for the Environment imposes the conditions and procedures set out in Section 4 of this report.

Table 2. Summary of relevant environmental factors, environmental objectives, proponent's commitments and EPA's opinion

RELEVANT ENVIRONMENTAL FACTOR	ENVIRONMENTAL OBJECTIVE	PROPONENT'S COMMITMENT	EPA OPINION
Algal mats	Maintain the ecological function, abundance, species diversity, productivity and geographic distribution of algal mats	Existing condition 9 requires the proponent to construct and manage the saltfield such that there are no significant indirect adverse impacts on algal mats beyond the boundaries of the solar salt facilities.	Bitterns storage area is no longer proposed as part of the modified proposal. The modified proposal will therefore result in approx 19% loss of algal mats in the Onslow area, compared with 12% lost by approved project. Potential impacts on algal mats arising from the modifications to the project can be adequately managed by the existing Ministerial Conditions and the proponent's commitments. The EPA's objective to 'maintain the ecological function, abundance, species diversity, productivity and geographic distribution of algal mats' is unlikely to be compromised.
Coral Reefs	Protect the abundance, diversity, geographic distribution and productivity of coral reefs	Existing condition 16 to monitor effects of sediment from dredging on Ward's Reef, and modify dredging procedures if monitoring shows the reef is being adversely affected. Existing commitment 14 that no dredging will be carried out within 800 m of Wards Reef and no spoil dumped within 500 m of Wards Reef. Existing commitment 17 provides for spoil to be kept within the designated areas and heights specified during assessment. Additional commitment requiring proponent to monitor the stability of spoil disposal sites and to monitor sedimentation on Wards Reef.	Spoil disposal sites consolidated into one area and relocated to eastern side of proposed shipping channel. Additional commitment requiring proponent to monitor the stability of spoil disposal sites and to monitor sedimentation on Wards Reef. Potential impacts on coral reefs arising from modified project can be adequately managed by the existing Ministerial Conditions and proponent's commitments, by the additional proponent's commitment, and by conditions enforced by Environment Australia under the Environment Protection (Sea Dumping) Act 1981. The EPA's objective to 'protect the abundance, diversity, geographic distribution and productivity of coral reefs' is unlikely to be compromised.
Marine water quality	Maintain water quality to ensure ecosystem maintenance in agreed areas	Existing condition 18 and commitment 19 requires proponent to prepare an oilspill contingency plan. Existing condition 16 requires proponent to monitor effects of sediment from dredging on Wards Reef, and modify dredging procedures if monitoring shows the reef is being adversely affected. Existing condition 10 and commitment 10 requires proponent to monitor the dilution and discharge of bitterns, and prepare and implement a revised discharge strategy if required.	Spoil disposal sites consolidated into one area reducing potential for sediment dispersal. Additional commitment requiring proponent to monitor the stability of spoil disposal sites. Potential impacts on marine water quality arising from the modifications to the project can be adequately managed by the existing Ministerial Conditions and proponent's commitments, and by the additional commitment made by proponent. The EPA's objective to 'maintain water quality to ensure ecosystem maintenance in agreed areas' is unlikely to be compromised.

Appendix 1

Figures

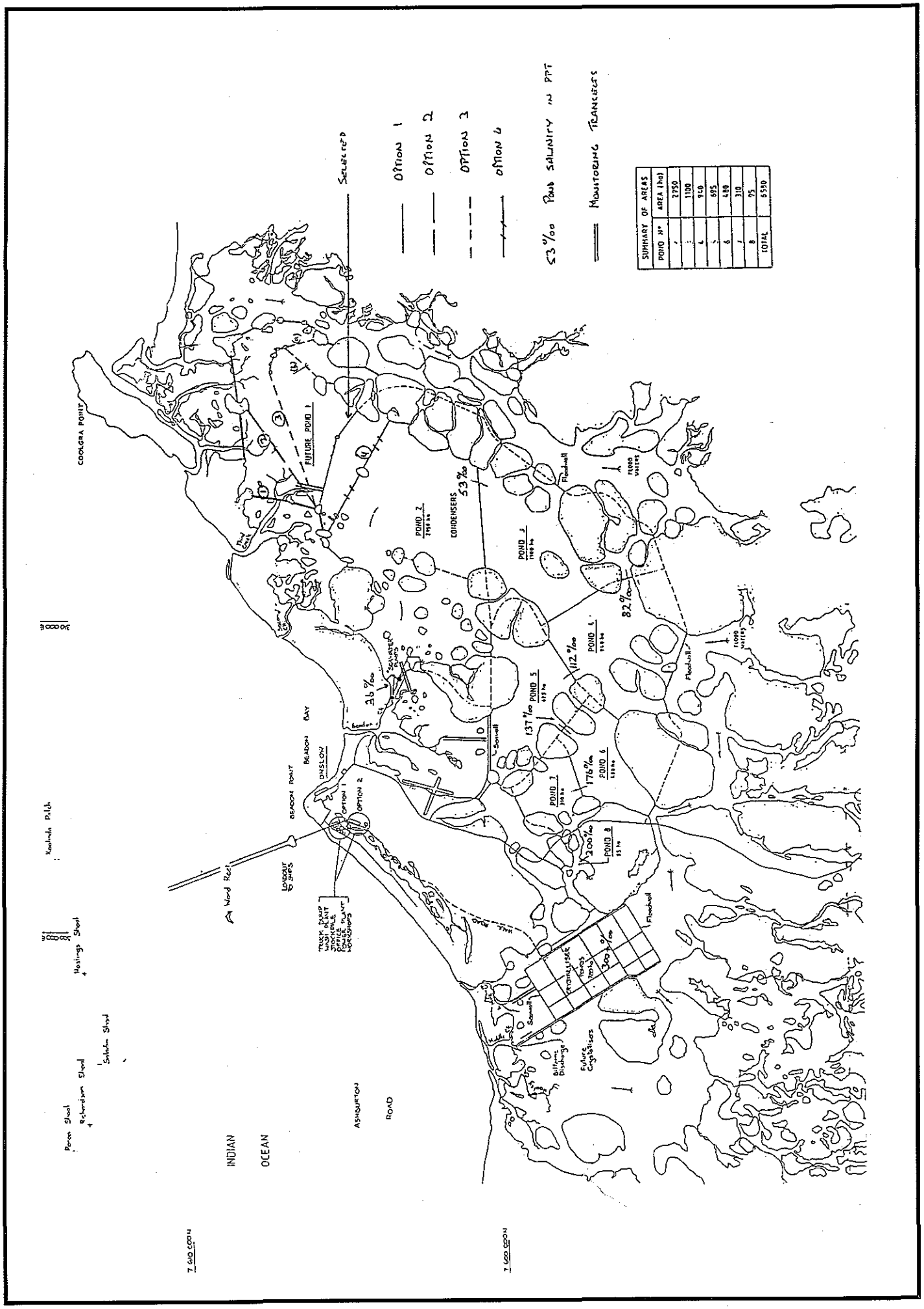

Figure 1. Original Onslow Solar Salt Project (Source: Gulf Holdings Pty Ltd).

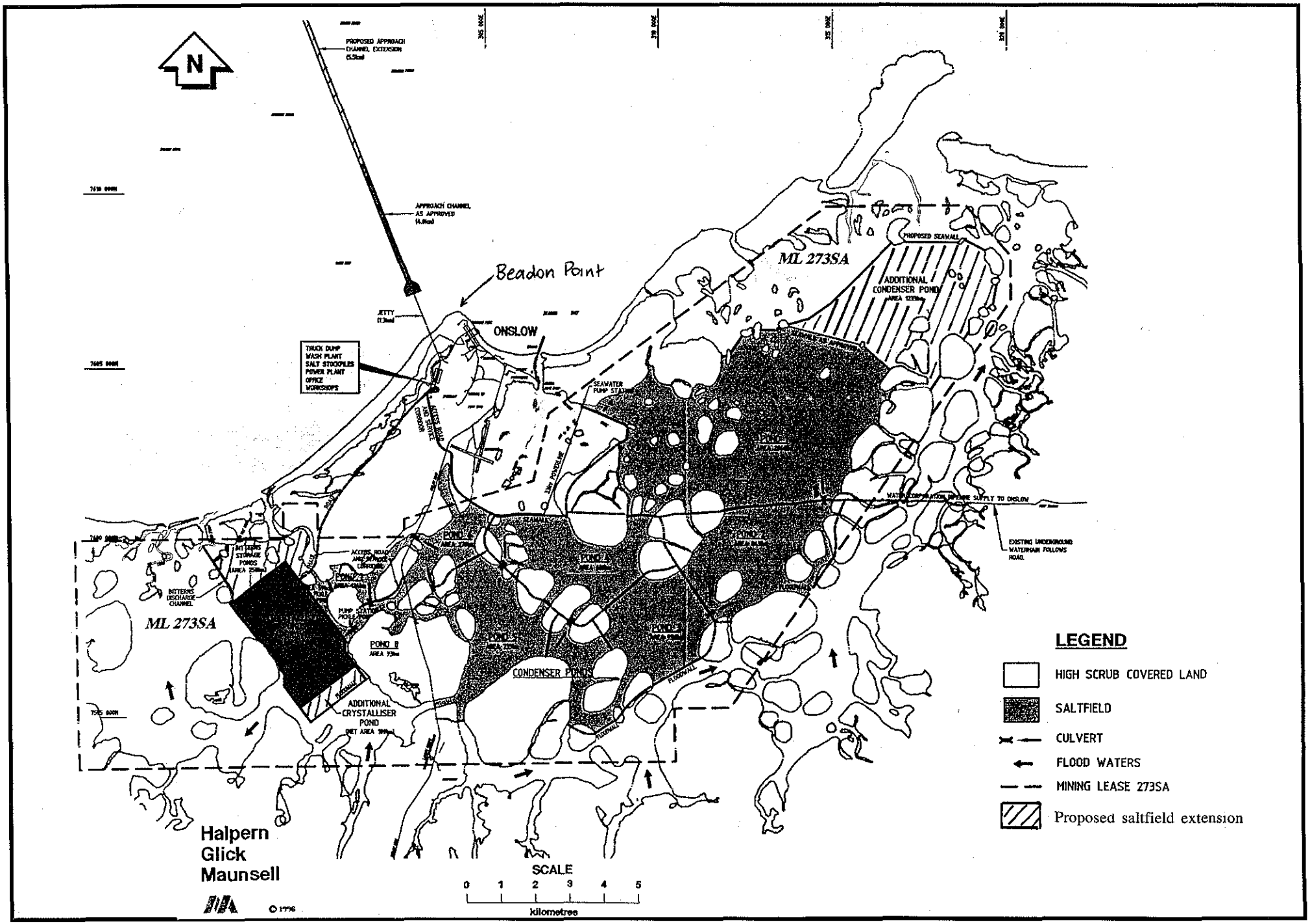

Figure 2. Onslow Solar Saltfield - proposed amendments to layout.

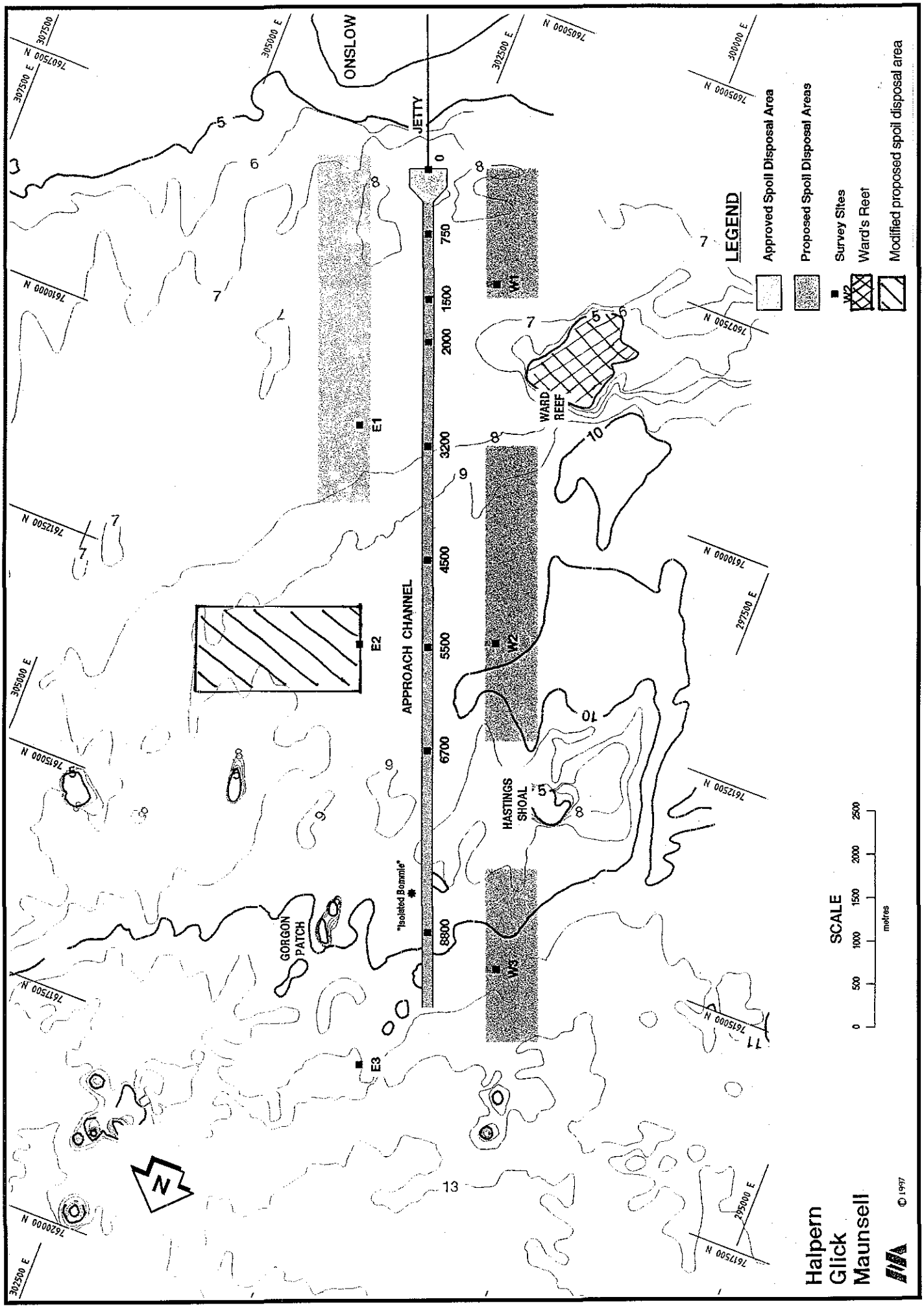

Figure 3. Onslow Solar Saltfield - marine survey sites.

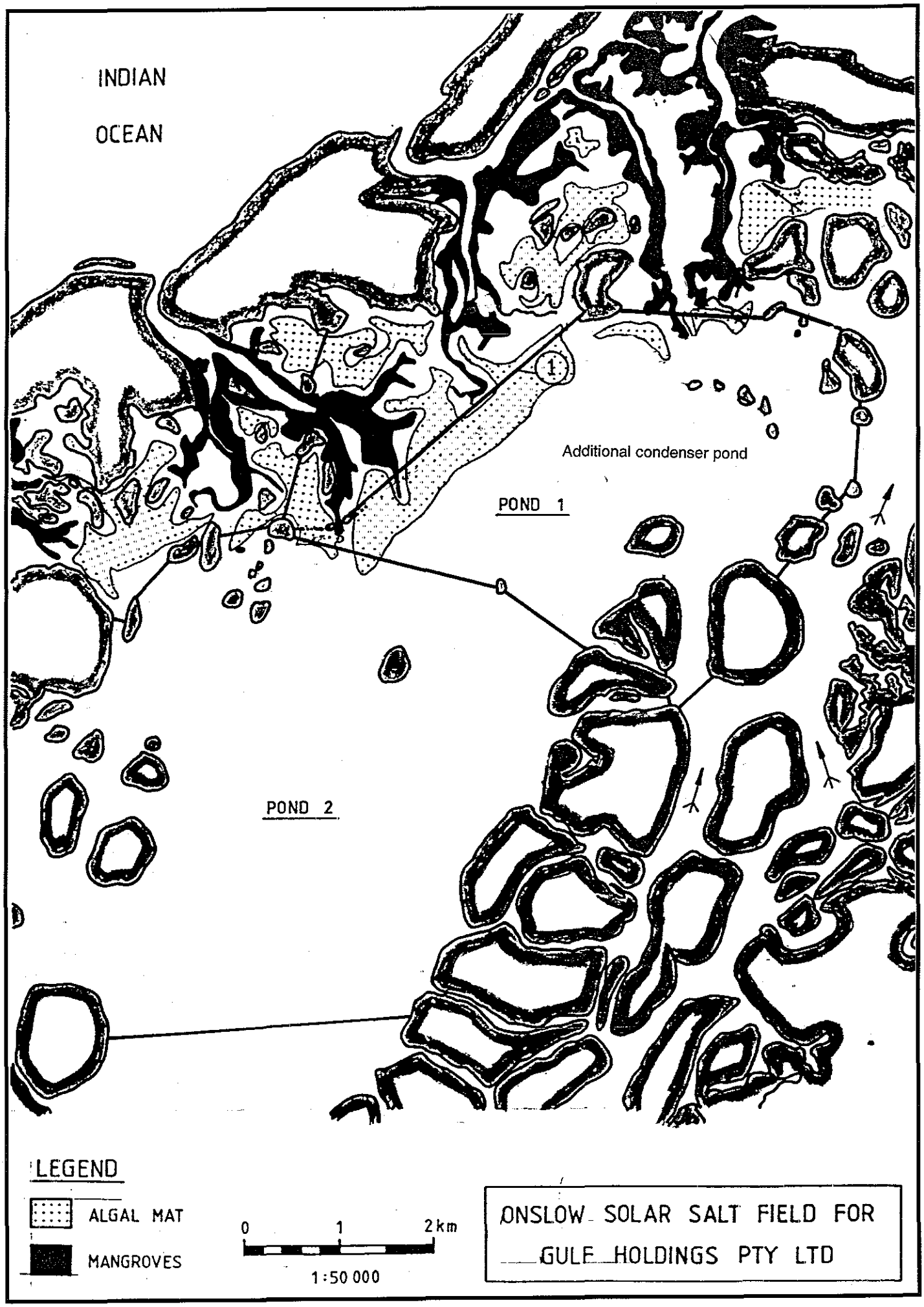

Figure 4a. Algal mat distribution in the vicinity of the condenser pond.

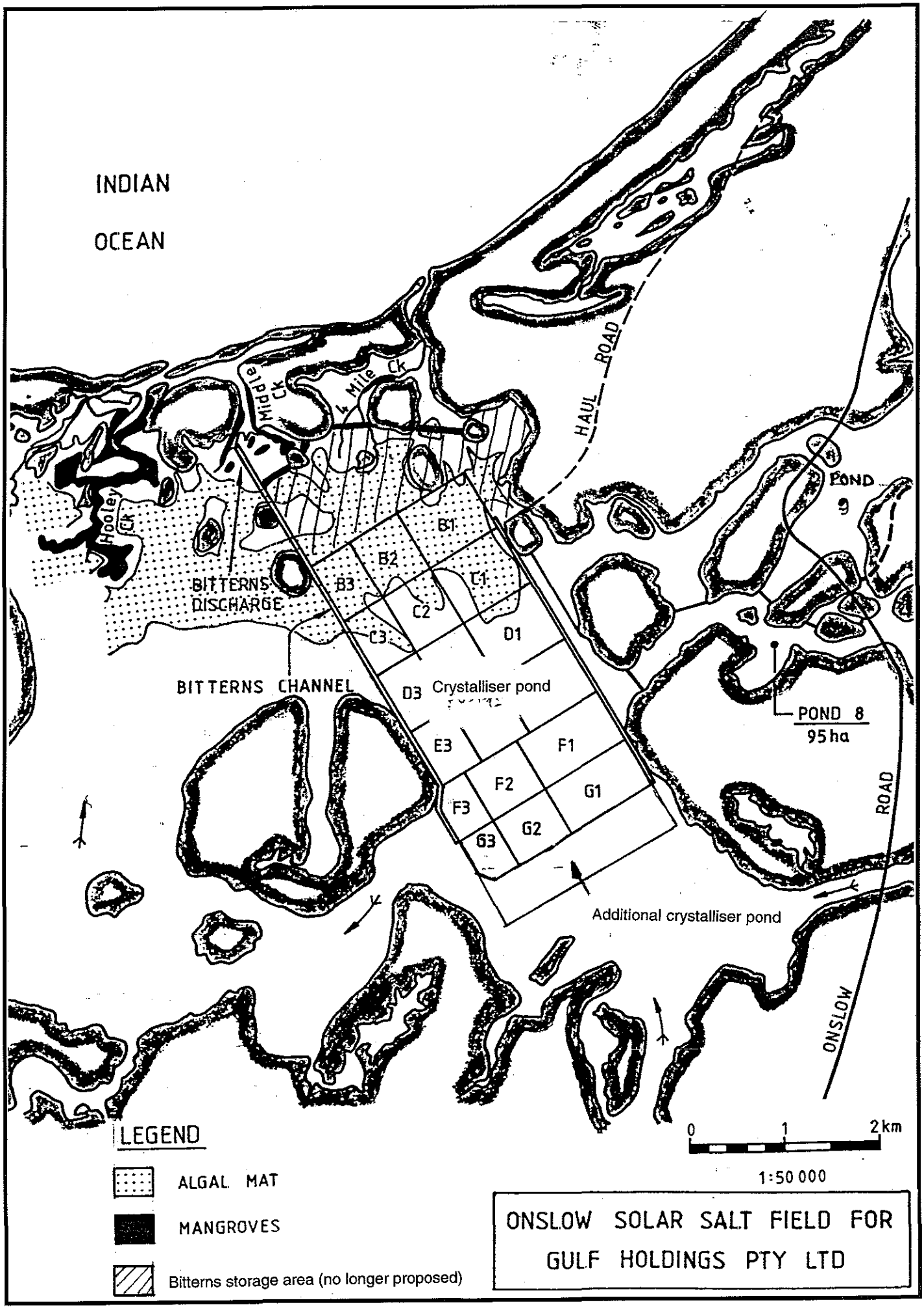

Figure 4b. Algal mat distribution in the vicinity of the crystalliser pond.

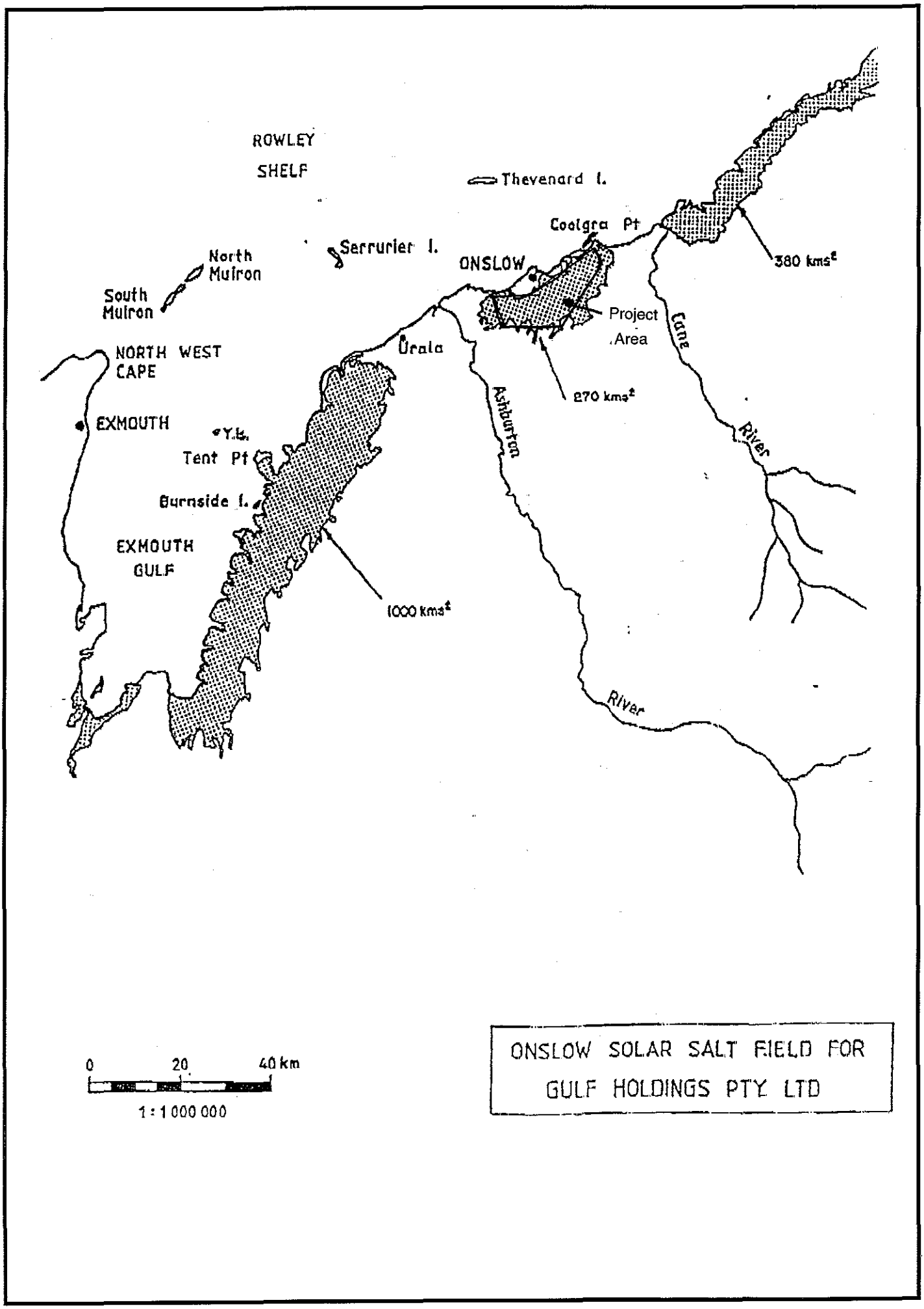

Figure 5. Tidal and supratidal flats surrounding Onslow (Source: Gulf Holdings Pty Ltd).

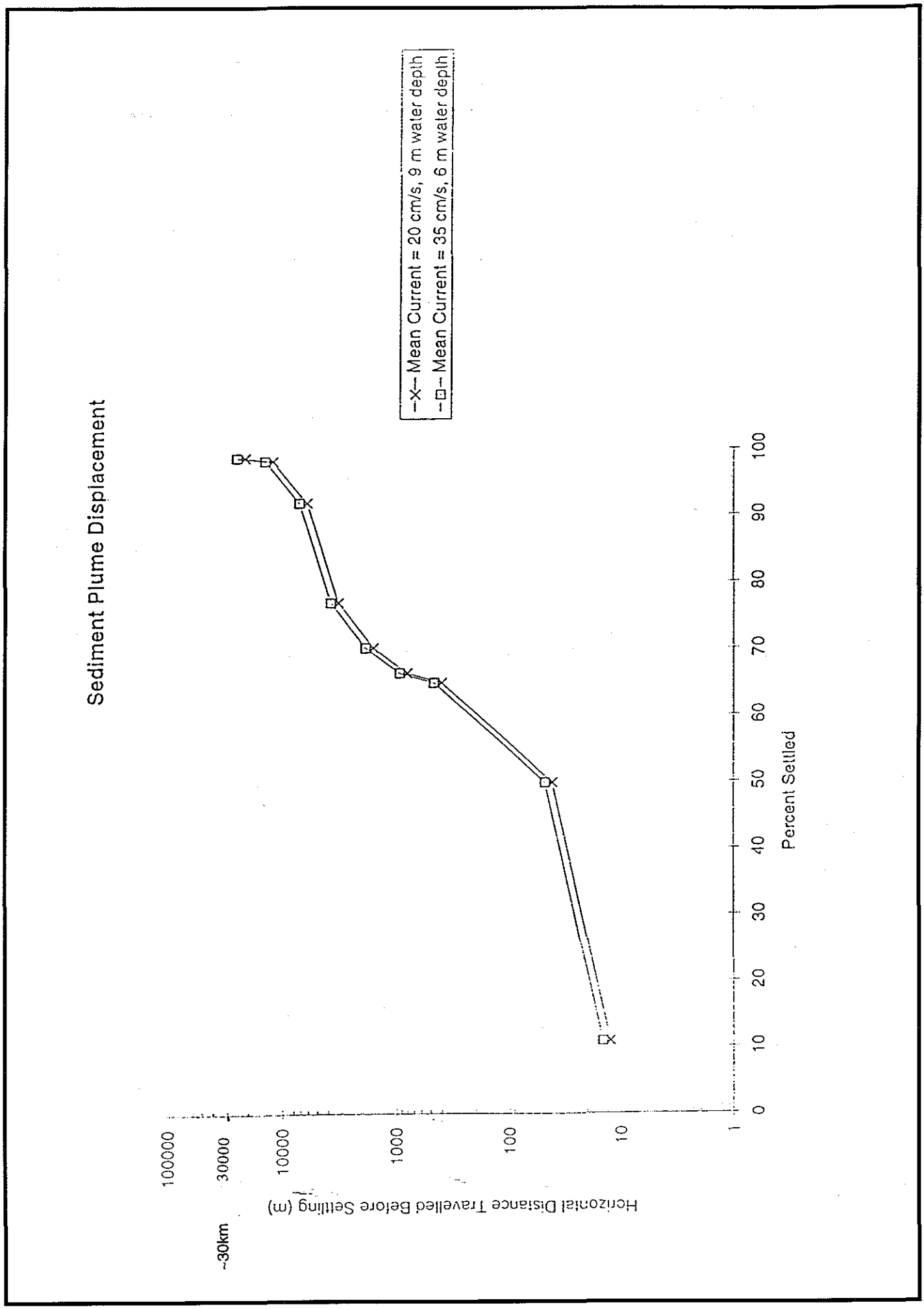

Figure 6. Sediment plume displacement (Source: Halpern Glick Maunsell Pty Ltd).

Appendix 2

List of people and organisations that made submissions

State government agencies

- Department of Transport
- Fisheries Department of Western Australia
- Department of Minerals and Energy Western Australia
- Main Roads Western Australia

Appendix 3

References

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