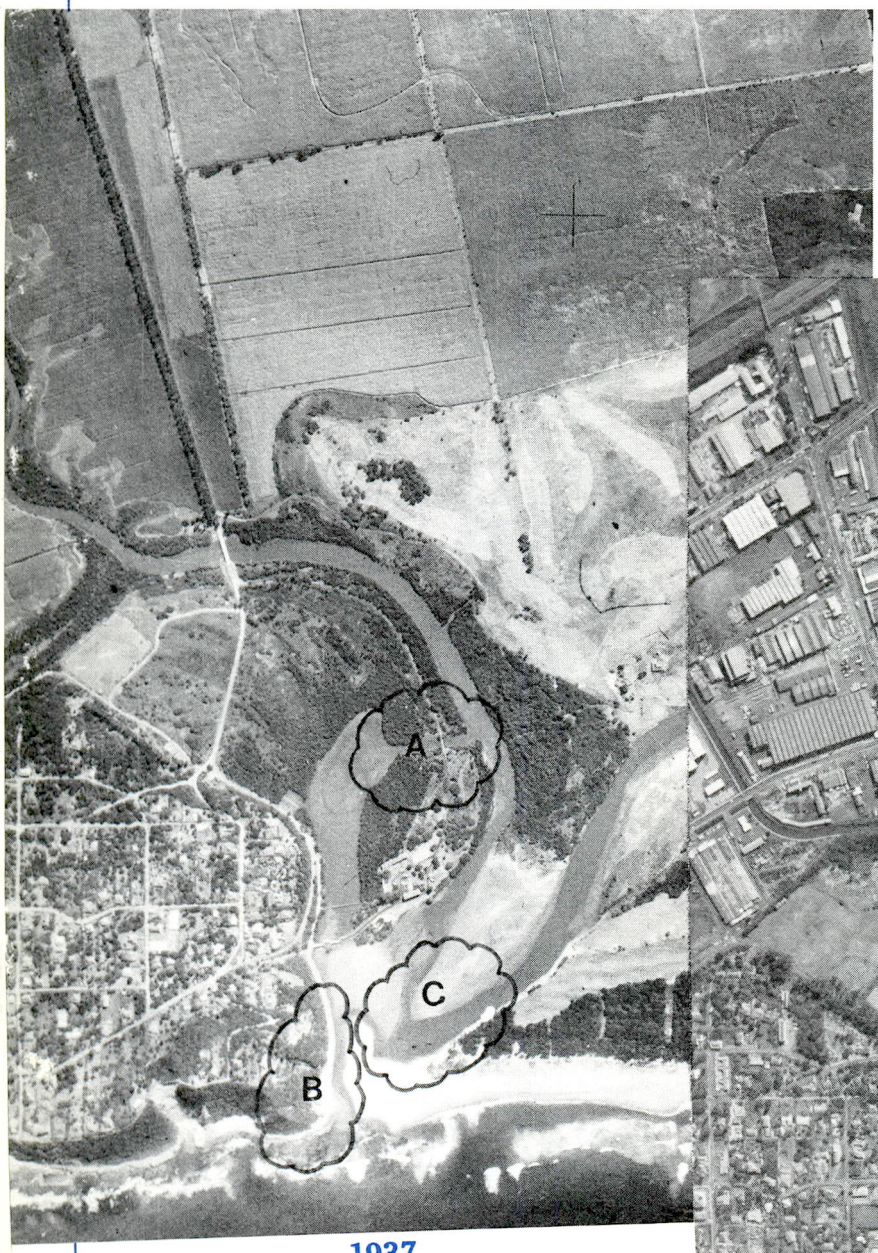
Rehabilitation of the Isipingo Estuary and Lagoon



1937

1986

Proceedings of a Seminar

REHABILITATION OF THE ISIPINGO ESTUARY AND LAGOON

Rehabilitation of the Isipingo Estuary and Lagoon

Proceedings of a Seminar

April 1986

NATAL TOWN AND REGIONAL PLANNING SUPPLEMENTARY REPORT VOLUME 25

First published in 1987 by
Natal Town and Regional Planning Commission
Private Bag 9038
Pietermaritzburg 3200
Natal, South Africa

ISBN 0 86967 159 6

Price: R7,50 incl.

Contents

First Session

Chairman: Mr D.V. Harris, Chairman, Town and Regional Planning Commission

Second Session

Chairman: Mr L. Moodley, First Chairman Isipingo Branch of the Wild Life Society

Third Session

Chairman: Mr S. Craven, President, Natal Branch, Wild Life Society

Foreword

The seed from which the Isipingo Seminar germinated was sown back in 1978 when Dr G. Begg was retained by the Natal Town and Regional Plannig Commission to carry out a research project on the Estuaries of Natal. Dr Begg's brief was to assess the condition of Natal's estuaries and to document their state of biological and environmental health and, based on this research, to formulate policy guidelines for countering worsening trends towards general degradation of these sensitive and important elements of our environment.

In respect of the Isipingo estuary Dr Begg found, inter alia, as follows:

> "... the Sipingo lagoon constitutes a public health hazard. This state of affairs is unacceptable if the Indian community intend to use the lagoon as a recreational amentiy in future."
> (The Estuaries of Natal, 1978)

and

> "(the Sipingo lagoon) is one of the most severely degraded of estuarine systems in Natal."
> (The Estuaries of Natal, 1978)

It was therefore with alacrity that the Commission agreed to collaborate with the Isipingo Town Council and the Wildlife Society in capitalising on the enthusiasm and initiative shown by the Isipingo Branch of the Society to launch a campaign to clean up the Sipingo lagoon and estuary and to endeavour, as far as possible, to restore it to its former pristine condition. Associated with this objective was the longer-term ideal of creating a nature reserve incorporating the Estuary, mangrove forest and lagoon and linking this through a marine nature reserve with the Treasure Beach and Bluff Nature Reserve under the control of Natal Parks Board.

To mark the launching of the campaign and to provide guidance and direction to the campaigners in their future endeavours, a Seminar was organised jointly with the Wildlife Society and the Council at which speakers representing a wide spectrum of expertise and experience were invited to speak. This publication is a record of the proceedings of that Seminar.

D.V. HARRIS
Chairman, Natal Town and Regional Planning Commission

1ST SESSION

Chairman: Mr D.V. Harris
Chairman, Natal Town and Regional Planning Commission

Welcome

Mr D.V. Harris
Chairman, Natal Town and Regional Planning Commission

A cordial welcome to this seminar on the rehabilitation on the Isipingo Lagoon. A very special welcome to Mr S.V. Naicker, the Deputy Minister of Environment Affairs and Tourism in the House of Delegates. Mr Naicker has kindly consented to open our Seminar this morning and on behalf of us all I would like to express our thanks and appreciation to him for consenting to do this. Mr Minister, I knew the Isipingo River way back in the early 1930's when it was a fine, clear, tree-lined river, flowing between the cane fields of Prospecton sugar estates. It flowed into a coastal lagoon where it was joined by the Umlazi; at the mouth, most of the water was contributed by the Umalazi which flowed through a wide flood plain, where the Louis Botha Airport is today.

Since then there have been very many assaults on the river system, and no doubt the speakers are going to tell you all about these assaults. I would like to let myself go in this regard but I know I must resist. One other point I would like to make is the terrific amount of littering, the industrial pollution and other pollution, all contributing to a most degrading spectacle. However, when I see gatherings like this, when I talk to people such as you conservationists here this morning, when I talk to the Wild Life Society, when I talk to His Worship the Mayor of Isipingo, and I see enthusiasm, keenness and devotion towards rehabilitating this lagoon, then I am filled with hope.

I would like to just say at this stage that this seminar is jointly sponsored by the Wild Life Society, by the Town and Regional Planning Commission, by the Municipality of Isipingo and, last but not least, by Messrs BP Southern Africa, who have contributed quite a substantial amount towards the cost of the organisation. Now, with those few words of introduction, I would like to call upon Mr Naicker, the Deputy Minister, to open these proceedings. Mr Minister.

Opening

Mr S.V. Naicker
Deputy Minister for Environment Affairs & Tourism

Mr Master of Ceremonies, various dignatories, and the various organisations that are involved in this very important exercise here, I want to thank you personally for the opportunity you have afforded me to be with you here this morning. Firstly, perhaps it is necessary for me to remind you that I have a unique background from poverty to politics in that I have gone through many mills in life, but above everything else my concern for the well-being of people has brought me to the levels of the present. However, no matter what status or position you have, it is the bounden duty of every individual to make a positive contribution, and this contribution is dependant on its direction.

Mr Chairman, Ladies and Gentlemen, we are going through a very, very sensitive period in this beautiful country of South Africa; sensitive in that in just about every other subject matter there are political overtones. The question this morning, Mr Chairman, is to what extent should this exercise have political overtones. To me this is a unique issue which should not at any stage have any political overtones. It must be understood that man as he is known is not merely an extension of the mechanical machine. Man is multi-functional and equally multi-directional, and will be able to preserve culture, religion, conservation and above everything else must be able to establish the priorities of life. And therefore in any exercise we must be able to have a very firm frame of mind to be able to find solutions to problems which we are facing.

Unfortunately, Mr Chairman, I have a very, very overburdened diary and have to be some 600 km away by 4 o'clock this afternoon, so I will not be very long with you. Nevertheless, I want at this stage to bring to you the compliments and good wishes of my Minister, Mr John Wylie and his Department. From the time I have been in that Department I realise how important that particular Department is. Though it may not be a controversial Department, it is an exceptionally unique one. Unique in the sense that my Department has the touch, and the attachment of nature, and therefore we are involved in the preservation of nature.

I should personally like to thank you again for providing the convenience of the seminar for inviting me to perform this pleasant duty of getting it underway. I am always pleased to be in this part of the world although we spend most of our time in Pretoria and Cape Town. When this opportunity is combined with an environmental issue, it gives me added interest, because in spite of the variety of responsibilities of being in the Ministry, I do my utmost to know as much as possible and to give a helping hand in whatever way we possibly can. It is such a pity, Ladies and Gentlemen, that the Isipingo lagoon, in particular, is one of the most severely degraded of the estuary systems in Natal, and all of you like myself must be concerned about it otherwise you would not be here this morning. So I feel it is greatly to the credit of the Wild Life Society, the Town and Regional Planning Commission, and the Borough of Isipingo, that they have organised this seminar to discuss the proposal by the Wild Life Society to create a nature reserve in the area. By creating a nature reserve, the trend towards deterioration will be halted and hopefully reversed. By this you will appreciate how important it is for us to make constructive decisions in order that the situation does not deteriorate any further.

Before this can happen, though, we need to know the various causes of the deterioration. This is a question for scientists and planners, and I am told that a lot of thought has already been applied to this. I understand that a primary cause is simply the lack of sufficient flow of water through the lagoon. At present there is simply not enough water to keep the system healthy. Littering is another problem. Few things can be more unsightly along the river banks than piles of empty beer containers which obstinately refuse to decompose.

Now, ladies and gentlemen, I want to remind you that quite often, when an audience is being addressed by a politician, there is some sense of suspicion. In a very large gathering one day, a lady got up and asked the Prime Minister "What happens when you die?" He said "I lie when I die", which means "I speak like you when I'm dead", but I don't think, as I mentioned earlier, that this a subject matter of any hard line politics. For instance, ladies and gentlemen, pollution of the system is a constant problem, but through the efforts of government officials, and with the help of the local authorities involved, and with the co-operation of the industrialists, this seems to be generally under control in the Prospection area. Disasters do still occur from time to time, though this can arise from genuine accidents, which are generally of as much concern to the offender as to the offended pollution controller. What is perhaps equally worrying is the "one off" event, when someone finds himself with a load of something horrible on his hands and sees no way of disposing of it without having to pay for doing so. I emphasize the without paying aspect, because it is well known that there are organisations which specialise in the disposing of such materials. However, this costs money and if the offending operator places his profits above his civic duties towards the environment, when no one is looking he dumps his waste into a channel and hopes no one will find out. My department, ladies and gentlemen, is very well aware of this practice because it happens all over the country, not just at Isipingo. It is

difficult thing to stop as it requires vigilance and detective work on the part of pollution control officers.

If the Natal Parks Board agrees to manage the area they will look to the local branch of the Wild Life Society to ease their task. Having played a major part in bringing the reserve into being, it will not be sufficient for them to sit back complacently, basking in the justifiable pride of their achievement, because their work would have only just begun. Individual members of the society will be expected to take the lead in preserving the area and I am sure they will do this. They will also need to set an example, not merely passively but actively. Here I am thinking of the family weekend picnic, under the trees away from the noises and smells of the factory. Society members will, I am sure, and without even thinking, leave the site clean. But they will also have the social duty of encouraging their less environmentally conscious friends to do the same.

Private enterprise can also help the project in a variety of ways. An obvious example is the provision of strategically placed litter bins, perhaps carrying the logo of donors. Fencing will also be required and this will hopefully be donated by the private sector. To help increase the flow of water, obstructions in the river course need to be removed and this too could be sponsored by private enterprise.

To achieve and maintain this worthwhile project, unbounded enthusiasm, pride and initiative are required. I am sure that with the backing of the parent body, the Isipingo Town Council, the Town and Regional Planning Commission, the Local Branch of the Wild Life Society will not be found wanting in the task it has set itself. The incredible resilience of the lagoon has been demonstrated by the survival of mangroves and the associated fauna, so despite its abuse by man, it should serve as an inspiration to the Society.

With this, ladies and gentlemen, I want to wish you well in this exercise. I personally realise and understand and appreciate the importance of this exercise, and I want to leave you here with an assurance that, in so far as the Department of Environment is concerned, I will endeavour to the best of my ability to assist in every way I possibly can. But there is one important factor. The initiative has to be taken, and the initiative must be demonstrated in constructive terms, and in that way you will definitely get the assistance you require. I also want to tell you here this morning that from the time I personally ventured into this particular Department, there has been a general awareness of environmental matters in the non-white communities; and I am glad to say in many parts of the country there is awareness and there is involvement. With an organisation like the Wildlife Society and the Natal Parks Board and an enthusiastic Town Council, I cannot foresee that you will have any problems.

With this thought in mind, I have pleasure in declaring this seminar open. Once again, on behalf of my Department, I wish you every success. You can depend on our assistance and co-operation. Thank you very much.

Chairman:

Thank you very much, Mr Minister, for your relevant remarks and for getting this seminar on its way. Thank you for your encouragement. Your presence here is indicative of your interest in the subject, and I very much like the picture that you paint of natural beauty and of people enjoying themselves. That is what we all hope to see here in Isipingo. Instead of allowing the system to die, it can be restored in the kind of natural functioning system which you have described, Mr Minister, from which people can derive pleasure. This is what the Wild Life Society, the Municipality of Isipingo, and the Town and Regional Planning Commission hope to achieve and this is what we are here today to discuss.

Now, our first speaker is Mr Barry Anderson. Incidently, in the very beginning, I should pay tribute to the keen organisers of this seminar, Mr Barry Anderson, the Assistant Town and Regional Planner, Mr Ken Bromley, who has done most of the hard work, and of course Mr Keith Cooper of the Wild Life Society has been very intimately involved, Mr Kallan, His Worship the Mayor of Isipingo and his councillors. We pay tribute to them.

I now would like to ask Mr Anderson to deliver the first paper of the morning which is Planning for Outdoor Passive Recreation.

Planning for Outdoor Passive Recreation

Mr J.B. Anderson
Assistant Chief Town and Regional Planner

Mr Chairman, Ladies and Gentlemen, my subject is planning for outdoor recreation and associated with that is of course the environment which is the word we hear very often today. It often conjours in peoples minds spectacles of hills and valleys, mountains and plains, stretching forever in all directions upwards, downwards, forwards, backwards and sideways. That is one particular perpsective and a common perspective of environment.

Now lets have a look at it in a different perspective. The surface of the earth is really a thin skin on the surface of the planet. You can see it in this picture which was taken in space. This skin comprises 71% water and 29% land. If one scaled down the size of the earth by drawing a circle 1 m in diameter, the troposphere, which is the air envelope, would be some 2,3 mm in width. The first thousand metres of atmosphere, that is the living environment, in ordinary speaking would be 0,16 of a millimeter. The tallest tree on earth would be no more than 0,016 of a millimetre and one metre of top soil would be 0,0016 of a millimetre.

All terrestrial life, including 5 billion human beings, has its existence on that skin stretching over the surface of the planet. It needs no emphasis on my part to stress the vulnerability of that thin skin, its vulnerability to damage, and pollution. In fact, looked at in this perspective, one is surprised there is not more concern amongst people at the way that the earth's resources are being squandered, the way that they are being sullied and smeared, and the way that waste and spillage takes place. Some critic has truthfully said "let no one underestimate man's capacity for fouling his own nest".

But having said that, and looking at it from a broad perspective, let us now focus on the closer-to-home, to the metropolitan perspective. The metropolitan area in 1980 had a population of Blacks 991 000, Coloureds 56 000, Indians 476 000, and Whites 331 000, making a total of 1 854 000 people. That is something of a mind boggling figure, but of more importance is the density side of it. In 1980 the gross density within the greater Durban Metropolitan area was 15 persons per hectare. In 1990, that figure will rise to 21 persons per hectare at the rate of growth, and by the year 2000, the gross density will be 29 persons per hectare. So by the turn of the century we are looking at a doubling of density in the Metropolitan area; to my way of thinking this increases drastically the urgency with which we must look to our existing open spaces and ensure that nothing further is lost, if not added to.

There is one more statistic to which I would like to draw to your attention. A chap called Wynn did a research project for the Town and Regional Planning Commission concerning the open space in the metropolitan area. He was able to show that if you divided the metropolitan area into two sectors, divided roughly by the outer ring road, that in the western sector you are looking at 90% of the open space with 47% of the population, in contrast to 10% open space in the eastern sector with 53% of the population. So there is a substantial imbalance in the distribution of open space in the metropolitan area. I merely mention this to emphasize the fact that Isipingo lies in that eastern sector, that deprived section of the metropolitan area.

Now homing in even further into the area, and focusing in on Isipingo and the lagoon, you can see that our particular concern is the lagoon. We are gathered here today because of the real worry at the state of that little environment. We are here also to determine whether or not it is possible to rehabilitate that area to anything like its original pristine state, and also whether it will be possible to consolidate it with a Marine Reserve running north from the mouth and including Treasure Beach, Happy Valley and the Bluff Nature Reserve.

Before going on to discuss the lagoon I just want to make a few general comments from the Town Planning point of view, and to endeavour to establish some sort of framework in which specific ideas and proposals may be examined in better perspective. First of all, let us look at the question of why we need open space. If we look around us we see an urbanisation phenomenon which is not just common to this area but common the world over. We see it on our back door step. It results in ever rising living densities, ever greater pressure on open spaces, and ever falling open space standards, and corresponds with a diminishing prospect of retaining some of the country within the urban area.

I think there is an inherent urge within man to experience nature. We all remember in our young days and our childhood days how our lives were enriched by paddling in streams, catching tadpoles, climbing trees and so on. At this stage I would like to quote an American writer, a chap called Marans. He has written that, "while there is little research to demonstrate that the survival of urban man is dependant upon the fulfillment of that need, there is considerable evidence from the research on residential environments that demonstrates the importance of the natural settings to residential satisfaction". Wilson's study of 1962 of a North Carolina commmunity reported that adults described their ideal neighbourhood as one that is country-like and close to nature, while Peterson in 1967 in attempting to identify peoples' preferences for the visual appearance of neighbourhoods, found that harmony was one of the significant mentions of choice. The proximity to nature and the surrounding country side was a principle reason given by residents in attracting them to their communities.

Going on now to discuss the functions of open space, first of all there is the conservation function which can be used for protecting areas which are sensitive, which need protecting for conservation purposes. It can be used for educative purposes, and conservation for its own sake is, I believe, sufficient motive. Then there is phsyical exercise. Taking the dog for a walk, a place for children to dissipate surplus energy. A social interchange for making social contacts, passing the time of day and so on. It can be used for isolating different land uses, it can be used for overlooking, for screening unsightly development, and reducing noise. Also there is a visual amenity function. It serves to break up suburban monotony, for softening the outline of brick and concrete and so on. Then there is the question of environmental protection which needs little comment except to say that it's obvious use is for water courses, vleis, sponges and other sensitive area.

Then we have motor-free access. At Richards Bay the open space system has been woven into the fabric of the whole of that neighbourhood so that, for example, the children can get from home to school, without having to cross a major road, through the open space system. Lastly, we can talk about status symbol, snob value, if you like. It has been proven that the values of property and land have been shown to increase in direct proportion to proximity to parks, for example.

So there is a strong case, I believe, for using our utmost endeavour to provide open space, but at the same time we should not blind ourselves to the fact that there are certain problems. First of all there is the cost of acquisition which is always a headache. Many local authorities assign a low priority to the acquisition programme for open spaces. Then once having acquired an open space, there is the question of continued maintenance. This is a perennial headache. People dump rubbish, one has to keep the grass cut and so on. Then there is the security aspect. Urban spaces are frequently the spaces which harbour undesirables; they also provide escape routes for thieves, criminals, —sometimes the culprits are snakes, monkeys and rats! Co-ordination and management is also a problem, and by that I mean where an open space crosses one or more local authority boundaries, there needs to be co-ordination between the different authorities affected in regard to the management.

I believe, however, these problems can be overcome, given the will to do so. I think few people would deny that we would be immeasurably poorer if there was no open space in our urban areas, and yet, sad to say, most people perhaps merely pay lip service to the value of open space.

After having said that, I must say how gratified I am at the turnout at this symposium. I am also heartened by the response we have had to the MOSS project, about which Keith Cooper will be talking shortly.

To conclude, gentlemen, I just want to turn briefly to the criteria which I mentioned earlier and to measure the Isipingo project against those criteria. The first question I ask, "Does it have a conservation value?" and I would say emphatically, "Yes, even if it was just for the preservation of the mangroves". But with the estuary cleaned up I believe we would have a magnificant conservation area in this particular part of the world. It is a venue for physical excercise. I believe if the water course could be cleaned up, water-based activities could be resumed. And do not forget that it could be the beginning of a trail which would take us from here up to the Bluff Nature Reserve.

A place for social interchange? Yes, I believe it is. It is already used for social purposes, it is a pleasant place to be in, a pleasant place in which to picnic.

Is it a visual amenity? I believe it is. It already has a visual charm in my opinion, and any rehabilitation that takes place can enhance that charm.

Will it promote environment protection? The answer to that is obviously "Yes". As a status symbol I believe it will enhance or bring lustre to the whole of the beach front scheme, and it would be, I believe, an area of which the citizens of Isipingo could be proud. I believe that the Isipingo project has a lot going for it, but there are a couple of questions which will need to be answered in an early stage, so I pose them now. These two key questions are, "Is it physically possible partially or wholly to rehabilitate the lagoon and estuary, and if so can it be done without spending money? That I think is the 64 000 dollar question, but I do believe that we will be in a better position to answer those questions at the end of this seminar. Having said that, I personally have a gut feeling that we have got a worthwhile project here. Unquestionably, there will be many obstacles and difficulties to overcome, but I suggest one sure way to find out the size of the problem and its complexity is actually to tackle it. I say "Lets go for it!"

Chairman:

Thank you very much indeed Mr Anderson and congratulations on a very well constructed and well presented paper. You put your finger on many nerves and you have done it very ably and of course you have asked some of the 64 000 dollar questions that are involved. One thing you say, and I think you have stressed it, as the Honourable Minister stressed it, is that we can do these things if we have the right will. That is the bottom line. Mr Anderson, thank you very much indeed for a very interesting paper.

The next speaker on our list is Mr Nico Geldenhuys who is the Deputy Director of the Environmental Conservation Branch of the Departmen of Environment Affairs. Mr Geldenhuys will talk to us on the management of the Coastal Zone.

Management of Coastal Zone

Mr N. Geldenhuys
Deputy Director Department of Environment Affairs

Thank you, Mr Chairman, Mr Minister, Mr Mayor, for the opportunity to participate in this seminar. The topic of my discussion will be Coastal Zone Management. I will have to speak in very general terms, but in doing so please bear in mind that estuaries are but one of the many components of the coastal zone, so please bear with me when we go through the general framework on Coastal Zone Management as it stands in South Africa.

If we look at the Coastal Zone I would like to discuss three general things. Firstly, the reason why we are interested in the coast, the importance of the area; secondly, the steps which are being taken at present to establish a framework for Coastal Zone Management in South Africa; and, thirdly, I would like to mention the involvement of my department in coastal management.

There are various reasons for the importance of the Coastal Zone. To many people it's obvious. To many other people they don't really have an idea what it's all about. I would just like to mention quickly that it's firstly a finite resource. We have got about 3 000 km of coastline of various types. The west coast is a totally inhospitable sort of area where one could not really put development, so they all go to the east coast and south coast environments.

Also, as a second point, that is where the land meets the sea and there are very special forces operating in that area. We have winds, salt spray, tidal wave action, all these have a very definite impact on how you plan and develop in the coast.

Then, at the same time, the coastal zone is also popular for many types of human activities, industrial, residential, nature conservation. Defence is also very important lately, as are transport and modern fisheries. All of these different activities, sooner or later lead to conflicting demands on the limited coastline we have.

To consider very briefly the definition of the area, we could either talk about our ecological coastal zone which would include all catchments way up inland, as well as going out to 200 miles off shore. For practical reasons, this is not manageable, and we would rather talk of an administrative coastal zone. When we talk about that we would include all the coastal land forms, or coastal features such as estuaries, beaches, coastal lakes etc., and then out to sea for about 12 km. So that is the narrow strip we talk about in defining the coastal zone.

Secondly, I would like to discuss the present status of coastal zone management in South Africa. Two aspects are relevant here. Firstly, there is the policy framework by which we look at the coasts, and secondly, the administrative or legal work. This is being developed by the Committee for the Coastal Zone, the Committee for Coastal and Marine Systems, being the new name of the Council for the Environment; Dr Alan Heydorn, who most of you know, is the present Chairman of that Committee. That Committee has produced some documents as an attempt to provide the policy of overall structure for coastal zone management. A document has been produced on objectives and principles for coastal zone management in South Africa and I would like to come back to that a little later on. Also a document on guide lines for coastal zone management has been produced and I would like to discuss that a in bit more detail later. Then other things like a policy for controlling off road vehicles on the coastal zone, a plan for the protection of special national features in the coastal zone, a plan for handling small town facilities, procedures for evaluating development, education in the coastal zone, and some other things which are not relevant to this particular seminar.

The "Principles and Objectives" document states the general aim for coastal zone management, in order to ensure that development in the coastal zone be regarded as a common heritage of the nation and be regulated in such a way as to benefit the greatest number of people possible, while at the same time taking regard of environmental features and ecological processes operative along the coast.

Next I would just like to mention specific aims. Firstly, the integration of conservation principles into the planning process. Secondly, promotion of necessary development; in other words, one would like to promote development in specific areas as long as the environmental constraints of the coastal zone are taken into account. Thirdly, to restrict ecological harmful developments, and to direct major developments as far as possible to existing growth points.

From that, it is logical to discourage developments in undeveloped areas, in order to retain the natural character of the coast as far as possible. A further point would be the protection, as far as possible, of the major ecologically sensitive coastal components. That is lagoons and estuaries or dune systems or dune forests, whatever the case may be. And then, lastly, promotion of public education so that voluntary collaboration in the implementation of these coastal zone management procedures.

A further point mentioned in the policy statement deals with coastal zone mangement. This is a form of land use planning, which recognises that there are certain sensitive areas which should always be borne in mind when planning or developing a certain area. I must briefly mention these: firstly, the sensitive areas, that is areas of high risk as a result of natural processes which are operative in those

areas, and secondly, areas in which the natural equilibrium is disturbed by human actions.

Firstly, the areas of high risk. We talk about long term flow changes. We also talk about extreme events such as happen very often along this part of the coast. The components involved here would be beach dune areas where the sediment is a major factor; the erosion accretion factor is associated with that. In the tidal regions of estuaries, flooding is a major concern in flood plain areas. On steep slopes, rock falls and erosion are associated.

Then the areas in which the natural equilibrium is disturbed. Human actions can lead to the destruction of normal processes operative in those areas, and this leads to a degradation of the economic, the social and environmental values of the area. At the same time it also endangers the specific project at stake or which caused the interference. Again the various components such as dunes, swamps and estuaries, which are the areas of concern.

To summarise about the sensitive areas. In land use planning along the coast, in the areas of high risk one would refuse development in future, and that would be sort of a general attitude. Then in the areas in which the natural equilibrium would be easily disturbed, special studies and conditions would apply. When I say this one should bear in mind that many developments have happened in the past that cannot be cancelled out, but the sort of statement made in this policy paper is aimed at future utilization, and better planning of the coastal zone.

The guidelines for coastal zone management which are being addressed by the Committee for Coastal and Marine Systems consist of two components. Firstly, in the mental guidelines for the physical planning on the coast, incorporating aspects mentioned under the policy statement like conservation principles, entertaining, directing development to major growth points, and conserving parts on the coast etc., etc. The eventual aim of all these things is to produce coastal plans for specific regions.

Then secondly, the guideline documents deal with criteria for different components of the coastal zone. Here we talk about the dune systems, estuarine systems, the beach areas and how these should be utilized. As far as estuaries are concerned, the main concern mentioned in the guideline document deals with sedimentation, siltation being the major problem. The section on tidal action, fresh water input, pollution, artificial breaching of the river mouth, are physical actions undertaken by man which affect the secondary function of the estuaries in terms of biotic criteria.

About the administrative legal framework for coastal zone management, there was an investigation by the Commission for Administration, some two years or so ago. They came to some conclusions and recommendations, aimed mainly at establishing one controlling or co-ordinating authority for coastal management, and also to streamline or rationalise legislation. Up to now nothing has materialised, and I would guess that this is all tied up to the constitutional arrangements which are being undertaken at present.

Lastly, about the Department of Environment Affairs. There is no other body at present in a central level of government to co-ordinate coastal zone management matters. The Department of Environment Affairs is undertaking this on an interim basis, and in doing so a specific group in the Department is involved in evaluating most, if not all, development applications along the coast. This encompasses roads, town planning, resorts, small town harbours, marine pipelines—the whole spectrum of development actions. The Department also attempts to co-ordinate many of the things related to coastal management by way of committees, and there is a long list of committees involved in this process. We also fund research either by direct contract with universities or outside contractors, or with universities and CSIR. We also fund the Natal Town and Regional Planning Commission for some of the work being done in Natal, on wetlands and estuaries.

Then the Department also administers the Environmental Conservation Act. Very briefly, there are three things involved here. It provides for the establishment of a Council for the Environment which advises the Minister on any matter affecting the environment; the Committee for Coastal and Marine Systems is but one of the sub-committees of the Council for the Environment. It makes provision for the appointment of Management Committees for Nature Areas. As you know, no two areas are areas of specific, or unique wild life characteristics or scenic or landscape features.

In terms of the Environmental Conservation Act, the Minister may appoint a Managing Committee to advice him on the management of those nature areas. The Act also makes provision for the promulgation of Regulations for any aspect affecting the environment.

The one I would like to mention here that is of relevance would be the proposed Regulations on controlling development within 500 m of the highwater mark all along the coast. It states that any activity undertaken within 500 metres measured from the highwater mark will require a permit from the Minister of Environment Affairs. These draft regulations were published for public comment in December; comments have been received, and these are being processed. The Minister has indicated that he would like to see these regulations in force in July this year, '86. The idea would be that many of the stipulations of the Regulations would be delegated to local authorities, who will take a large responsibility, as well as to the second level of government, in which the Natal Town and Regional Planning Commission and the Natal Parks Board have already indicated that they are very capable in dealing with these sort of matters.

In summary, much has been done over the last two or three years to establish a proper framework for coastal management in Southern Africa. We haven't achieved the sort of ideals yet but we are making good progress towards that goal. Secondly, many systems and components in the coastal zone have been degraded over years by improper planning or a lack of awareness of the various forces operative in the coastal zone, and therefore there are many areas where there is scope for repairs to be undertaken. We welcome therefore the attempts being undertaken here at the Isipingo Lagoon and specifically the involvement of the Wild Life Society, the Local Authority, as well as the Natal Town and Regional Planning Commission.

Just one other point, Conservation areas in the coastal zone. One would like to see large and viable areas if at all possible, or even better, to combine these various components, that is estuaries, dunes, and dune forests—into one group conservation system. My last conclusion then is just to say that any remedial action undertaken is to be based on scientific knowledge and understanding of the systems involved, and the use of the general guidelines which I mentioned just now. I think we have got all the expertise together here today, to advise on the best way to undertake the rehabilitation of the Isipingo Lagoon.

Chairman:

Thank you very much indeed, Mr Geldenhuys, for the very interesting report that you have given us on coastal zone management. We accord our very grateful thanks to Mr Geldenhuys for coming all the way to Isipingo to address us, and for bringing us up to date on the legislation and the activities in the department of Environmental Affairs.

Gentlemen, I am told that the Honourable Minister would like to leave now. Mr Minister we would like to thank you once again for coming here and for consenting to open our seminar.

Ladies and Gentlemen, we now come to the third paper on our morning session and this is by Mr Keith Cooper who will speak to us on the Isipingo/Treasure Beach Nature Reserve and the MOSS concept.

Isipingo/Treasure Beach Nature Reserve and the MOSS Concept

Mr K. Cooper
Director: Conservation, Wild Life Society of South Africa

For many years there has been concern about the future of the Isipingo Lagoon and its surviving

mangrove community. Originally this area was one of the finest estuaries and mangrove habitats on the entire Natal Coast. No other Natal estuary has suffered such abuse and degradation as has the Isipingo. With the development of the low lying Isipingo flats to accommodate the Louis Botha Airport, SAPREF Oil Refinery and later the Prospection industrial complex, great changes have been made to the area, and these have all had a negative impact on the ecological function of the Isipingo Estuary as a natural system.

Before the commencement of the above development both the Isipingo and Umlazi Rivers flowed into the estuary as good quality water. The estuary was open to the sea more often than it was closed, and there was a good tidal interchange. Under these conditions a great diversity of life forms existed in and around the estuary. Fortunately we have a study by C.J. Ward. This study was published in 1980 by the Botanic Research Institute as Memoir No. 45 in the Botanical Survey Series. There are probably no other coastal areas of Southern Africa so comprehensively studied from a plant ecological point of view, as has been the Isipingo by C.J. Ward. Because we have this study I am not going to make any attempt to duplicate the information that has already been published. For those of you who are interested in the Isipingo Lagoon I would commend this particular publication to you.

I would also like to pay tribute to Mr C.J. Ward. Unfortunately he is not with us here today, but he is a very well known ecologist and he, more than anybody else, has been instrumental in drawing our attention to the importance of Isipingo. We also have a relative of his here today, Mr Dave Hatton, who is with BP. Dave here, as well as Roddy, have always had a great interest in Isipingo, having been born here and lived here for many years. Now I would like to pay tribute to Roddy because it is through his help that I have become involved in this area, and in trying to do something to save it for conservation.

Instead of going into details, this presentation will concentrate on having the Lagoon — it's no longer and estuary — and its surroundings proclaimed a nature reserve, and to list the steps required to be taken to try and ameliorate the negative impacts caused by various developments in the adjoining areas.

The area proposed as a nature reserve is shown on the attached map (that is the attachment to my paper), and it is also indicated on the maps on the back.

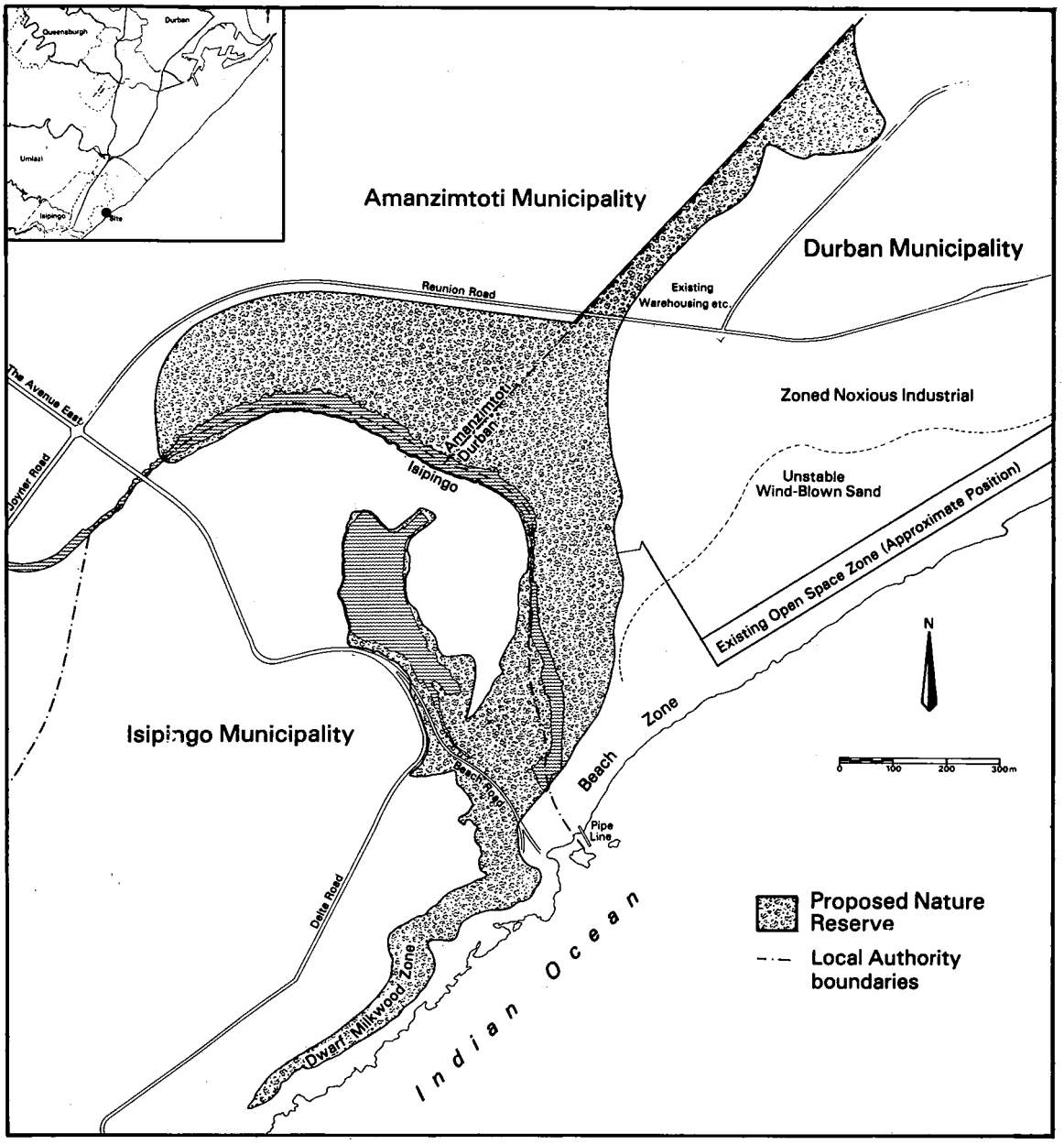
That is an aerial view of the Isipingo Lagoon and you can see the river flowing out to sea. This was taken at a high spring tide. The main mangrove community follows the river along there and down here. It is the mangrove community that is of great interest to us because, despite the terrible dedragation of the sytem, the mangroves are still in a very healthy state, and in fact some of the best red mangroves, a species called *Rhisophora mucronata,* are still found in this particular estuary — the best examples in the whole of the south east coast of Southern Africa still occur in this area. This is quite remarkable and it really gives us hope that we can try and save the situation here. I don't believe that we can ever bring it back to what is was before, but I do believe that certain steps could be taken to improve the situation and the first step of course is our suggestion to have it proclaimed a nature reserve and bring it under proper management.

Adjoining the mangroves there is a lovely forest here. There are some very fine trees and we would hope that this area would also be included. Along the sea shore there is a very disturbed area which would be part of the conservation area. Starting here, and moving round you have an example of *Minusops Caffra,* or milkwood community pruned by the salt spray. It's a unique situation along the Natal coast, and that we would also suggest be incorporated into the Nature Reserve.

So the Nature Reserve would include the blind lagoon, the mangroves in front of the hotel which is right on our doorstep here, the mangroves fringing the river right up to the bridge, then the very good example of forest, and then extending right up the coast. Eventually this area links up with the Reunion Rocks and Treasure Beach Area. This is shown on the map.

Roddy Ward and I have spent a lot of time here with the committee members of the Wild Life Society, to whom I must also pay tribute. They are very enthusiastic, and terribly keen that something should

be done to rehabilitate this lagoon, and we believe that it is something very well worth while getting stuck into. As has already been mentioned we would like to see the Natal Parks Board taking over this area in conjunction with the Reunion Rocks, Treasure Beach area, because they already administer the Bluff Nature Reserve. It is a small area and, as Mr Gedenhuys mentioned just now, if you increase the size of these areas they become more viable from a conservation, ecological point of view. Also we believe that if we could secure Isipingo as part of the complex, you would have a number of different ecosystems represented in one reserve, ranging from mangroves to lagoons (with problems, but with possibilities for rehabilitation), and the beach zone, and a very beautiful rock pool life at Reunion.



Map of the proposed Isipingo Lagoon Nature Reserve

A very important and beautiful rock pool exists at Reunion, possibly one of the best examples of this type of system in the whole of Southern Africa. I have yet to see a better one. It is very strictly protected at the moment because it falls into a security zone and that has been looked after very well

by SAFREF, and we envisage that being a strict nature reserve. Of course the area from the Reunion to Isipingo would be for dense recreation. It is very heavily utilised by people. There are some very serious problems with the destruction of the dune vegetation but that is one of the points I would like to refer to in the steps to be taken. Going north of that we get to the Treasure Beach area which also has some very fine coastal rock pools; these we envisage being physically used for education and also angling. A little further north of that, opposite the Treasure Beach area, we would envisage another area for a more dense form of recreation. We don't have any objection to a tidal pool but we would not like to see major developments taking place in that area.

From there we go inland from across Treasure Beach and we have an important area of natural grass land which was drawn to our attention many years ago, firstly by the late Prof. Adolf Buyer, Professor at the Natal University. He drew our attention to this outstanding example of fire maintained grass land where you still find *Themeda triandra* which is the red grass occuring in this area. The importance of it was for the wide variety of flowering plants in that Treasure Beach area. That is an area Wild Life Society has campaigned for a long time, and we have had a tremendous amount of support particularly from the Durban City Council. I must pay tribute to the wonderful work that they have done and the supportive role they have played in trying to secure this whole complex for conservation.

Then from that Treasure Beach grassland it goes further inland, down into the Bluff Nature Reserve where you have a fresh water plain, quite an important bird habitat, where there are a number of water birds nesting. Then it goes inland just adjacent to Wentworth Hospital, where we have an example of coastal plain forest, which is different from the dune forest we have along the coast.

So within this small area we have a number of different ecosystems ideal for outdoor education. Within the whole Durban metropolitan area we have a population of approaching two million people, which is one of the fastest growing areas in Southern Africa and possibly in the world. We have an opportunity here of being able to create a reserve which can be used not only for conservation but also for education.

Situated on the grasslands of Treasure Beach is an old Radar School which was used in the Second World War. It is a Wild Life Society's object to convert this old school into an educational centre. This is going to require a large sum of money and we are hopeful that we will get this support from the private sector. So within this whole complex we have very exciting possibilities for conservation, education and recreation. Mr Anderson mentioned the ideal of a trail along the coast; these are all possibilities within this area.

But the most important thing about this whole thing and particularly with the Isipingo Lagoon is the management of the area. I would like to dwell on these points because Roddy Ward and I have spent a lot of time with the committee, and we believe that there are ten necessary steps to take to bring about some positive action.

The first step is obviously the formal proclamation of the area, shown on the attached map which I have distributed, as a Nature Reserve. A problem that we have in the area is that all three boroughs join in the proposed Nature Reserve. We have Durban, Isipingo, Amanzimtoti, all meeting in the Reserve.

So this will require council resolutions by the Town Councils of those three boroughs, and that really is the first step.

The second step is that we need to have a permanent oil trap and trash rack placed across the river or the Avenue East Road crossing. This will be needed to prevent litter and pollution from property under the control of the Borough of Amanzimtoti coming into the Isipingo Lagoon. We feel that the cost of such installation should be borne by the Borough of Amanzimtoti; failing this the state should be approached to assist.

The third step is that every effort must be made to improve the sea/lagoon connection and increase the salt interchange between the sea and the lagoon. We believe this can be done in a number of ways. The

existing twin pipe connection between the sea and the lagoon is inadequate and needs to be supplemented.

The addition of two extra pipes will assist, especially if these were placed at a very slightly lower level than the two existing pipes or, periodically, breaching is undertaken. This would have the effect of increasing the volume of sea water inflow at high tide and draining off quantities of lagoon water at low tide. Sand removal for building purposes should be concentrated in the mouth area, so that in high spring tides larger volumes of sea water will enter the lagoon and a better flushing effect will result. What has happened at the moment is that sand is being removed along the beach; we are suggesting that the sand removers should concentrate on removing sand from the mouth area, so when you do have high spring tides you are more likely to get a greater volume of spring water going right up. Let me say that at equinoctial spring tides, the sea water does come right in here, and it extends right up into this whole area. I think that is the only thing that has kept the mangroves alive.

The fourth step is that sediment removal in the lagoon mouth area should be undertaken to increase the tidal prism, that is the volume of tidal water moving in and out of the lagoon, and to connect the old lagoon with the estuary even at low tide as in the past. We suggest that sand be removed from the estuary lagoon area here. There are also some constrictions up the river, but if we can reconnect this blind lagoon to the sea, we believe that this would help, particularly at times of high spring tides. However, great care should be taken when performing this operation, so as to prevent damage to existing mangroves and other plants and alteration of drainage patterns. The dredged material should be taken away by trucks and used for land-fill away from the lagoon area. Dredging of the Isipingo River should also be undertaken. This has become constricted by silt blockages. This requires particular care since the material is very fine and can smother plant and animal life. Furthermore, it is not likely to be in great demand unless used for infill elsewhere. All the areas to be dredged should first be determined in the field by an ecologist. This was emphasied by Roddy Ward who recommends that no work should be undertaken without first consulting a botanist and perhaps a hydrologist, who have sensitivity for the requirements of the marine life and the mangroves. This should be determined in the field before any work is actually undertaken.

Step five. There should be no dumping of rubble or any other material in the mangroves or in the reed beds fronting the lagoon or the Isipingo River. There is already much evidence of this having taken place.

Point six is that all litter should be removed from the mangroves. This could be done by groups of school children. I noted that a lot of this work has already been done by Isipingo and we acknowledge the work done by this centre.

Step seven. Companies and factories adjoining the Isipingo River and Prospecton should be approached with the request to enter the river — now of course canalised through Prospecton.Every effort must be made to gain the full co-operation of the factories and the owners of the plants there.

Step eight. Both sluice gates regulating the flow of the Isipingo River into the lagoon should be kept fully open to allow maximum river flow into the system. These gates were designed to accept full discharge without flooding in Prospecton. At present only one sluice gate is open. If necessary one or both gates may be closed in exceptional circumstances. Now this is quite an important issue and for those of you who also are not aware of the system, the Umlazi River was of course completely diverted away from the estuary many years ago, and was canalised into the sea. I personally would like to ask our engineers whether there is any possibility of ever being able to try and get that water back into the system, either by some sort of weir higher up-stream and a pipe line across to the Isipingo River, or by some other means. The Umlazi River is very essential, and at present it just flows out to sea.

The other one is the question of the Isipingo River. At the moment, most of the river is diverted into the Umbogintweni River. Right now most of that water is actually flowing into the river system to the south and is being denied to the Isipingo Lagoon. There are two sluice gates which regulate that flow of the river down the channel and one sluice gate is permanently closed. We believe that this is under

the control of the City Engineer of Amanzimtoti. We hope that he is here today because we want to ask him to keep both of those sluice gates open permanently. He is going to say that even with both open it is not going to make much effect. We don't agree with that. We would like to have both of these gates kept permanently open. We don't believe that even if there is a maximum flow through those gates there will be any overflow in the channel which would effect Prospecton. This is a very definite request, and we would like to see some very swift action on that if possible.

Also, representations should be made to the City of Durban to have the land adjoining the proposed Nature Reserve on its northern boundary rezoned for light industrial. At present, this land is zoned for noxious industrial use; it is unacceptable to have noxious industrial development joining a nature reserve and sensitive lagoon environment.

The last step is representations should also be made to the representatives of the City of Durban to stabilise the serious sand blow severely threatening the Industrial land to the north of the proposed nature reserve. There used to be a continuous dune, along here, with high milkwood trees protecting the inland area. It has been destroyed and there is quite a serious movement of sand. This sand is now threatening the proposed industrial land. If Durban wants to rezone it to open space that is fine, but we believe that they have a problem to deal with here, and this needs to be stabilised. Otherwise satisfactory development in the interior area will not be possible without serious problems from sand movement.

Mr Chairman, my time has run out. I would have liked a lot more time to be able to show how this area fits into the area to the north, and also to show how this area fits into the whole metropolitan open space project. This is a very exciting project which has been developed jointly by our Society and the Town and Regional Planning Commission. Mr Anderson mentioned earlier on that the need for passive recreation areas is very great in this extemely fact growing area. Unfortunately, time does not permit to go into those details, but hopefully duringdiscussion time we can get to grips with some of the other problems.

Chairman:

Thank you very much indeed, Mr Cooper. I think that your proposals make common sense. I am hopeful that some of the proposals that you made will evoke some response from the people that are here particularly for instance regarding the permanent opening of the sluice gates. Perhaps we could hear from the Town Engineer from Amanzimtoti on that subject. We could perhaps hear from His Worship the Mayor of Durban on the possibility of rezoning the land from noxious industry to light industry. I think that it is something Mr Little ought to make a mental note of.

Gentlemen, the three papers that we have had this morning are open for discussion.

Libbie du Toit, Chairman of Environmental Committee of the Durban City Council:

I would just like to assure Mr Cooper that his proposals have come before our Committee. We are in complete agreement with all the suggestions that he has put forward, and particularly in the light of the new legislation regarding the 500 m coastal zone. I feel quite sure that we shouldn't have any problems there in supporting wholeheartedly the proposals for the development of this area.

Chairman:

Mr Stroude, can you please tell us why you can't keep those gates open permanently.

Mr Stroude. Town Engineer, Amanzimtoti:

For me to give you an answer to this perhaps promotes further discussion on the paper that we are getting from Water Affairs, so I will be very brief about it.

We have on the Isipingo River the diversion works which diverts the water into the Umbogentweni system. The reason why this was put in was because when the developers of Prospecton decided to put an industrial Township there, it was necessary to divert the water from the Isipingo into the Umbogintweni. For this purpose the diversion canal was constructed. The diversion works is

constructed to such a level that it takes flood waters only. Below the invert level of the diversion works there is a certain free-board margin, which accommodates what we might call the dry weather flow of the Isipingo River. In other words the Isipingo River flows with the dry weather flow at all times. In order to achieve the design of the storm water system in Prospecton, which is basically a very level swamp area (and was when Dick King was alive), they filled in the whole area to a level which was above what you might call flood level. In order to achieve storm water drainage of the area, it was necessary to lay the system of storm water canals. This drains the area from the point of view of run-off.

Now, as one will appreciate in an industrial area, the run-off is considerable, and 75-80 % of the total run-off of the rain that falls in the area ultimately finds its way into the Isipingo River. So naturally it is important that the water which flows in the Isipingo River is controlled. If we do not control it by some means at a time of maximum intensity of rainfall it would cause flooding conditions which would be intolerable in the industrial area. Also, the Isipingo would flood its banks and people down-stream, particularly the Island township, would possibly be subject to flooding. For this reason the consultants put in the sluice gates which Mr Cooper has referred to. There are two sluice gates, and we are fortunate today in having Mr McGarr here who was with the consulting firm who designed the storm water system in Propecton. Based on their recommendations at the time, the intention was that the smaller of the sluice gates would remain permanently open to accommodate the dry weather flow. This has been designed from the hydrology of the area and is calculated in old terms as 1,13 cusecs.

Chairman:

Mr Stroude, are you saying to us that you cannot keep these sluice gates permanently open?

Mr Stroude:

Well briefly I will sum up by just explaining the reasons behind the design. Basically, the smaller sluice gate must remain open. The larger sluice gate is opened when we want to dissipate these flood waters over a period of time, presumably over an extended period.

Chairman:

Thank you very much, Mr Stroude. Well, Mr Cooper, I am quite sure that you and perhaps other people here would argue with Mr Stroude on this one. Ladies and Gentlemen, we will now break for tea and coffee and I would like to thank the speakers and thank everybody so far.

2ND SESSION

Chairman: Mr L. Moodley
First Chairman, Isipingo Branch of the Wild Life Society

Chairman:

I would like to welcome you to the second session of this seminar with respect to the rehabilitation of the Isipingo Estuary and Lagoon. I would like to introduce to you our first speaker, Dr A. Ramm.

Isipingo Estuary and Lagoon

Dr A. Ramm
NIWR, CSIR

Most of what I want to deal with in my discussion really has to do with surveys that have been done over the past seven years, some of which were done on the Isipingo Lagoon. The original work was done in 1978/81 by George Begg who was working at the Oceanographic Research Institute. George of course was doing the Isipingo as part of a series of surveys of some 65 different lagoons and estuaries up and down the Natal Coast. I think it's important to put what George found in perspective with what we found in our survey of the Isipingo last August.

It is important to note that in a sense, we have both an estuary and a lagoon. The lagoon is frequently closed to the sea, whereas the estuary is almost always open. This is due to the fact that there is a drain or pipe which exists along the sand bar which allows the sea water to enter whenever the tide is high. So there is free exchange between the estuary and the sea, but only an occasional exchange with that lagoon area. During the surveys that George Begg conducted he found essentially no organisms in his trails—no living organisms within the estuary itself. In other words, he sampled the estuary area and within that area he found virtuallly nothing over a period of 2 years. He also found when he measured the physical conditions and the oxygen regime in that area, that in fact there was essentially no oxygen in the water. Also the turbidity of the water was very high. In other words the extent to which light could penetrate into the water was restricted to about one third of a metre.

On the other hand, he also surveyed the lagoon area, and within this area he found an assortment of about 12 to 15 different species of fish, crabs and plants. So if one has to summarise what George found in 1980/81, one could say that the estuary was virtually lifeless in the upper area, and that the lagoon nearby was reasonably rich considering that it only opens to the sea rather infrequently.

Now to compare that to what we found this previous year. We ran a series of samples by running gill nets across the area. A gill net is simply a large net that one suspends by floats across the stream with weights at the bottom, with some sort of anchor rope. The fish swim into that and become entrapped in the netting. A seine is a similar sort of net which one pulls or pushes through the water. You suspend it between two people or two boats for instance and you bring it around, and you capture the fish in that. A trawl is nothing more than a netlike contraption on runners, generally pulled by handle behind a boat. It generally moves along the bottom.

There is a little chain which we call a tickler chain in front of it which causes the animals to jump up and then we catch them in the net. During the survey which Dr Begg did he used the trawl exclusively.

We are using different types of gear for a variety of reasons. The gill nets are particularly good in a deeper area where we know fish would tend to move through, in and out from around the vegetation on the banks, and to the centre part of the body of water, or longitudinally up and down the length of such an area of water. Seines are usually used in a very shallow area. We use the trawl, as I say, in both areas, although we don't show the trawl as we did over in the areas where the gill nets are. The results of this I think are illustrative of the condition of the lagoon.

Basically we found some dozen species with our sampling on 14 August. You will see that these

unidentified juvenile type of mullet were extremely abundant. We also got some prawns and we have a crab which is quite common in these systems. These unidentified mullet were all collected in the area where the seining was done. In addition a lot of the tilapia which we collected in there were taken where gill No. 1 was. All but about three of the twelve species were collected with the trawl. The rest of them were collected with the boat seine. Three other gills had absolutely nothing in them except black sludge, and it's not surprising when you look at the physical conditions at the time we did our sampling.

Well first of all the dissolved oxygen which is very indicative of the water quality. In this area both at the surface and at the bottom this was in the neighbourhood of about 6 parts per million. This happens to be quite a reasonable number for a well saturated bit of salt water. About the most oxygen you could get in it would be about 8 to 10 parts per million and I wouldn't expect in this water which is not fresh, but not salty either, that one would ever be able to stock more than about 12 parts per million into it. So 6 per million is about 50 % of saturation which is a very good number.

In this area the salinity (which is an indication of how much salt water is getting into the area) is very low, which indicates it is cut off. Down here, however, the salinity was about one sixth of that of sea water, so it indicates the influence of the sea coming through this drain. We would suggest that the fish that we found in this area, the mullet, particularly those young juvenile mullet, were largely recruited from the sea, and they were living in this area because this is a rather protected area for them.

The oxygen in every one of these sites at the bottom was zero. Not only was the oxygen zero but in a site where the depth of the water was about 2 and a half metres you couldn't see more than about one third of a meter into the water—just as George found in 1979/81. So there was a lot of suspended stuff in the water. The lack of oxygen, the lack of living organisms in our collection in this area, and their presence here leaves one to believe that in fact this area is being heavily effected by pollution—in fact undoubtedly by the pollution coming from the very anoxic bottom deposits of this area. The bottom deposits are so anoxic in fact, so high in hydrogen sulphide which as you know is quite a toxic substance in most aquatic organisms, that when we put our anchor chain in here for our gill nets, the chains were etched by the hydrogen suphide. So it's not surprising that there are no living organisms in this area.

In fact, this is a perfect place for hydrogen sulphide to be produced because it is full of organic material which is the bacteria's food, and it is full of sulphate which washes in from the sea, which is like the bacteria's oxygen. Those two things being mixed in this area you have a perfect situation for the production of sulphide, and since sulphide is toxic to most organisms it's not surprising that there isn't anything in there. In fact, until that bottom deposit could be somehow removed from the area, or if in some way one could prevent the diffusion of that material into the overlying water, one is not going to have living organisms in that water. So that is a barrier to any aquatic fauna in this area.

This was a one day shot and I don't want to give the impression that it is a result of a large long term survey. We will be back there again in a few months as part of our survey work but I think one can pretty well demonstrate part of the problem here within the lower Isipingo. This oxygen demanding material within the lower part of this lagoon is really preventing any life from existing.

In terms of planning, and thinking relative to what purpose one wants to put this area, one should think in terms of whether or not aquatic life is desirable. If you want aquatic fauna as a part of that overall plan, then it is pretty clear that you are going to have to remove this oxygen-demanding material within there, or seal it off somehow so that it doesn't produce a toxic material which would prevent aquatic fauna from establishing itself. So although this is a one shot survey, it compares quite well with what George Begg found. I think from the organisms and the water chemistry, from the simple chemical analyses that we did, and the fact that hydrogen sulphide is present there in large quantities, from that I think the overall pattern of the situation is clearly established.

As I said, I think one has to make a decision about what purpose one wants to put this to. Thank you.

Chairman:

Dr Ramm spoke to you on the Isipingo Lagoon and the estuary and you will have learnt that the Isipingo has one of the finest lagoons and estuary systems on the coast but the system is sadly neglected and abused. It is disturbing when one learns that there is hardly any oxygen in the lagoon. Dr Ramm, on behalf of the organisers of this seminar, we would like to thank you very much for your talk and your slide presentation. During the discussion you will have an opportunity to answer questions.

The next speaker is going to talk to you on "River pollution with special reference to Prospecton Industrial Estate". This talk will be given to you by Mr Gravelet-Blondin who is an Assistant Director in charge of the water pollution in Natal.

River Pollution with special reference to Prospecton Industrial Estate

Mr L. Gravelot-Blondin
Department of Water Affairs

Thank you, Mr Chairman I will just make a few introductory remarks, and then hand you over to my colleague Mr Dennis Griffiths who has a far more detailed insight into the area than I have

What I actually want to tell you is about the provisions of the Water Act, and the control of pollution, and I would like the industrailists here to take special note of that, and the local authority. Basically Section 21 states that all water used for industrail purposes must be discharged back into the river or water bodies from which that water came, including the sea, at a quality which is determined in conjunction with the S.A.B.S., which we call a general standard. So anything not complying with those two requirements is an offence in terms of the Water Act. Secondly, the local authorities, with the amended Water Act (and I am referring here specifically to Isipingo, Durban and Amanzimtoti) are responsible for the control of water pollution in their area, and it has been stated by our director in Pretoria that should we go ahead and charge an industrialist and it has been found that the Local Authority has been slack on their side, we will charge the Local Authority. So please take note of that.

The next point I want to bring to your notice, and this is now specifically for the industrialist, is the new Section 22 which states that contaminated rain water is regarded as an effluent. Basically what this boils down to is good housekeeping. Storm water drains must, and I repeat must, be kept clean, and storm water drains are not there to discharge effluent. Effluent for the information of the industrialists includes wash waters. Storm water drains should only flow when it rains, but we invariably find that they are flowing when it is not raining. That we regard as an industrial effluent discharge. So industrialists please take note.

A particular problem is the run-off of contaminated rain water into the storm water drains, then into the canals. This is a slow but insidious accumulation of pollution into this whole system. Thirdly, perhaps the teeth of its Section 23 where it is an offence to willfully pollute water. Now we as a Department, do not like to act as policemen in the sense of going around laying charges. We far prefer to work in co-operation with the factories, industrialists and everybody concerned and negotiate with them. But I must say, and warn the industrialists, that if we do not get their co-operation we will have no other alternative but to lay a charge and take them to court. The fines now are pretty heavy compared to what they used to be.

Under Section 24, the Minister now has a wide range of powers and authority. Basically he can direct that when doing an investigation we can go on to any property that we like. He can also direct that any body or person, including an industrialist, must take steps to prevent pollution. If those steps are

not taken, he can direct that the steps be taken, and be paid for out of monies appropriated by Parliament. Then the monies are recovered from the industrialist or body concerned. And that is it. You have no choice. You will pay.

Also, in Section 26 the Minister has wide ranging powers to make all sorts of regulations which are now being promulgated re pollution control. So he has now much more power than he has had before. Also, under the Water Act, if a body or person or industrialist does not toe the line, the Minister now has the rights to have the water supply to that industry either reduced or curtailed. Now industrialists use a lot of water, and if you have no water that is the end of your industry. However, we don't want to go that far. I assure you I have no intention of closing down industries. I don't think that is a good thing to do at all—but we do have this power. So industries take note of the powers that are now in the amended Water Act which, if you do not toe the line, we will have to enforce.

Mr Chairman, I would like to now hand you over to Mr Dennis Griffiths, my colleague in the Department who will give you a far more detailed talk on the area.

Mr D. Griffiths
Department of Water Affairs

Ladies and Gentlemen, Mr Blondin has already indicated to you the powers of this Department over controlling pollution, so I will confine myself to the two areas that we have to deal with in connection with this Isipingo Lagoon. These two areas are the Isipingo River itself, specifically that portion above the sluice gates, and the Isipingo canal system which is part of the Prospecton area where industrial run-off is likely to take place. However, I think that we msut stretch this a little bit further than Prospecton itself, because we have got the Isipingo industrial area which drains through the bamboo drain and this can also effect the lagoon.

I think many people are concerned with pollution of the river as it comes out of the township of Umlazi. I have been asked this question many times, "How much of the sewerage effluent is discharged into the Isipingo River?" To make matters clear I must tell you that there are three sewerage handling ponds on the Umlazi River — the Umlazi S ponds, the Umlazi J ponds and the main Umlazi sewerage treatment pond. The S pond effluent pond itself is pumped to Durban Corporation for treatment. The J ponds discharge their treated effluent into the Umlazi River, and only the treated effluent from the main Umlazi sewerage works discharges into the Isipingo River. This treated effluent is sampled by our Department on regular occasions. Over a period from June 1984 up until January 1986, there were only 5 times where the general standards had been exceeded. A problem in 1984 was a result of some poison which got into the works. Once that had been eliminated, generally the situation is good.

That is looking at the actual effluent leaving the Umlazi sewerage works, but we come to the bitter bit now. That is the fact that there is a very disturbing feature in connection with this treatment plant, because many of the sewer mains leading to the works cross the Isipingo River on high support. In past years I have myself on several occasions found broken and leaking mains, allowing raw sewerage to go into the Isipingo River. Although these breaks have been reported by the Superintendent of the Works—who has no responsibility incidently for the reticulation—nothing was done until this department intervened.

I have not toured through the Umlazi since the trouble started there last year, but in December this year I noticed that the average daily quantity being treated by the plant was about 35 % of the plant capacity. The superintendent stated that he had reported this to the KwaZulu Department of Works but had not noticed any action. Earlier this month I found the flow to the works was down to 26 % capacity compared to 67 % in January 1985. The design capacity of this works is 9,18 megalitres a day, so the difference between the 67 % and the 26 % amounts to 3,76 megalitres of raw sewerage being discharged into the Isipingo River, if this reduction is due to open sewer mains. On the other hand, if the works should be a full load, then there could be as much as 6,7 megalitres a day of raw

sewerage running into that river. As this situation has been going on for some years, it seems to be only corrected when pressure is brought on the KwaZulu Department of Works from outside.

When I contacted Dr Paischek the other day he said that he had noticed the same problem and had notified the correct authorities, but has not yet seen any improvement.

For a moment I would like to go outside my brief on actual pollution and elaborate a little bit on what Mr Stroude was telling you about the control of the river flow through the sluice gates. The pipes and the culvert leaving the sluice gates leading to the channel can only take a total of 2,26 cubic metres per second. This is the way they were designed, whereas the small sluice gate supplies just half that. The remainder of the flow was to catch the water between the sluice gates and the railway line during a one-in-twenty-five year rainfall, making the 2,26 cubic metres per second entering the beginning of the canal. The first part of the canal can only carry 9,7 cubic metres per second, that is 7,44 cubic metres per second run-off in that area which is alongside the railway line, and where the canal runs from north to south. The remainder of the canal is designed to carry 68 cubic metres per second of storm water arising from a one-in-twenty-five year rainfall on the Prospecton area itself. I think one must compare this with—and this is quoting from George Begg's book—the one in ten year flood from the Isipingo itself, which is 120 cubic metres per second. This indicates to you why it is necessary to have these floodgates, to divert the water into the Umbogintweni River. If one allowed 120 cubic metres a second of Isipingo water into the canal system, which is only designed to carry 68 cubic metres a second, then you realise that there would be a lot of flooding of industries and a considerable amount of complaint about it. This is a design by the consultants at the time, and is something which we are stuck with. The main canal is about 3 km long and from it branch subsidiary canals for the combined length of about 4 km. These subsidiary canals are in effect open storm water drains and rubbish bins. During dry weather they are normally covered along the bottom with stagnant water.

We come now to pollution from industrial run-off in the Isipingo industrial area. Because of the number of roads and the area of roofs and the size of the hard standings in the Prospecton area, very little open ground is available for absorbing storm water, so there is a considerable amount of direct run-off in the canals. This run-off carries with it all the air-borne pollutants which have settled on the roofs and roads, together with all the oil dripping from motor vehicles, rubber worn from tyres, spillages of all sorts from vehicles using the roads, and industrial hard-standings. Each pollution, so minor it is unnoticeable, but occuring in their hundreds of thousands, must become significant.

In addition, the storm water carries into the canals all the filth deposited in the area by the thousands of people working in, or shopping in Prospecton. All this is lumped in under the heading of urban run-off, a massive source of pollution from which no solution has yet been found.

The second half of my speech shows you the tests we do on the Isipingo canals, looking for pollution when we have no knowledge of a specific spill by an industrialist. These range from figures taken in 1984 up until the present. You will see that we seldom do the COD's but there was a time near the end of 1984 when we were carrying out COD's because there had been an industrial spill, which went up to 365 mg per litre. But in later times when that effluent had been washed away, no COD's were done. Compare the OA's in recent times running between 7,2 and 11,4 mg per litre, to the OA's that occured in that canal during this time when industrial spills size 53 occurred. If we see OA's rising above the 10 then we know that we have got a certain amount of pollution. Many of these are from rain water, run-off from the area, and not from the actual spill from the industry.

It is my opinion that the development of the Umlaas River, the canalisation and the restriction of the Isipingo River to prevent the flooding of Prosepecton, plus the establishment of the Prospecton industrial area itself, are irreversible contributors to the pollution which has taken place in the estuary of the Isipingo River. I do feel that all that can be done is to try and make the best of a bad job. I think that the original designers had more concern for protecting the industries in Prospecton that they had for the ecology of the river. While I don't think that it can ever be restored to its pristine condition, no doubt quite a lot of work can be done to improve what is there now.

Chairman:

Thank you very much, Mr Blondin and Mr Griffiths, for your talk. Ladies and Gentlemen, I have pleasure in introducing our First Citizen to you, His Worship the Mayor of Isipingo, Councillor Ronnie Kallan.

Local Authority Problems

Mr R. Kallan
Mayor of Isipingo

Mr Chairman, Ladies and Gentlemen and distinguished guests. I wish to welcome you all to our Borough. I hope you will enjoy your little stay here, and will not only look at the bad side of Isipingo, because there is also some good in Isipingo. I would also like to record my special thanks to the Deputy Minister of Environmental Affairs and Tourism, the Honourable Mr S.V. Naicker for opening this session today. One behalf of my Councillors and residents of this Borough I wish to thank you for showing your interest in our Borough and the involvement in our Town.

Mr Chairman, as you know Isipingo has been an autonomous local authority (minus Prospecton) since 1972. Since then, the Borough has been on the receiving end of the major part of the pollution that is emitted or discharged mainly by industries. Unfortunately, my council has no control over the major contributors of pollution in this borough, as the majority of the culprits are from outside Isipingo. That is Umlazi, City of Durban and Amanzimtoti.

Air pollution comes from two sources, that is from Prospecton which is under the jurisdiction of Amanzimtoti, and from the oil refineries which are under control of the City of Durban. Of these two sources of pollution, that which is more hazardous to health and the safety of residents comes from the Amanzimtoti area, from the iron foundry. It is understood that these two industries enjoy protection of the Government under special legislation, and therefore the respective local authorities have little or no say in effectively combating or abating this nuisance.

The other form of pollution, which is of great concern to my council, is the industrial effluent discharge into the Isipingo River, which has been the cause of the loss of many marine lives. No doubt as most of us know, adequate legislation has been passed to control the senseless destruction of marine life through pollution, but the law enforcers, and those who have to implement the legislation to enforce the regulations do not have the desired bite in their teeth. The pollution of the Isipingo River has received sufficient publicity of recent years to warrant the attention from concerned politicians but we have not yet heard any rumblings in the political circles, such as we heard when the one Umkomaas industrialist discharged effluent into the sea.

There is also some destruction of the mangroves by the public.

Other detailed problems related to Isipingo have been covered by the previous speakers in their papers, so I am not going to duplicate that. I believe all the efforts made by the administrators and the Wild Life Society of South Africa to protect and preserve the Isipingo estuary and the remains of the marine life, would be in vain if the pollution of the river continued unabated. In conclusion, the only solution to the problem it seems, is to take more stringent steps in the way of law enforcement, passing further legislation if necessary, and side by side continue with anti-pollution, conservation, public awareness, and to restrict the public in the conservation areas.

Chairman:

Thank you, Mr Mayor, for bringing this august gathering here some of our local problems with respect to conservation, pollution and all those allied subjects.

I would now like to introduce to you Professor Pat Berjak, who was one of the prime movers in the

Wild Life Society's successful battle to save and rehabilitate the Beachwood Mangroves. Her talk is about Mangroves in general rather than the Isipingo Mangroves. However, the principles are exactly the same. I have pleasure now in introducing to you Professor Pat Berjak.

Isipingo Mangrove Forests

Prof. P. Berjak

Mr Chairman, Mr Mayor, Ladies and Gentlemen. It's a tremendous pleasure for me to be here on this occasion and I hope that what I have got to say to you will influence the thinking of people about the biology, the ecology, and the importance of mangrove areas. This is a record taken from the Parks Board's book at Beachwood recording that in the first three and a half years that they kept these records, about 10 000 people, mainly school children, came to the area to study ecology. We feel this is very significant.

A mangrove area is phenomenally good for teaching ecological principles. Not only do the tree species create a beautiful and tranquil area but an area which is very easy to understand. There are three tree species locally, and where the trees in fact cannot grow we then have this low vervacious or soft vegetation also tolerant of salt.

The whole area is defined by water level, the high water level and the low water levels, so this makes it an easy area to conceive of, even to the non ecologist. The trees themselves are extremely intriguing biological specimens, and illustrate some very important principles about plant adaptation. This is another reason that we feel that these areas are tremendously important.

Let me introduce you to the species. This is the so called white mangrove *Avicennia marina* and it is the pioneer. It's the tree that comes first and makes the area hospitable for the other species of plants and for animals.

The second species, *Brugiera gymnorrhiza,* the so called black mangrove with its very characteristic breathing roots; I will tell you a bit about breathing root in a moment.

Finally the species for which Isipingo can become justly famous, and that is the red mangrove, *Rhisophera Mucronata* with the stilt or prop roots.

Now making the acquaintance of *Avicennia marina* first, the pioneer tree is a beautiful tree when it grows up in unrestricted areas and it has these extraordinary root extensions that come out of the ground. Now if you consider a mangrove area, the thing about the soil is that it is waterlogged. In your garden there is air between the soil particles. In a mangrove area there is water. So in order to survive, the trees have to have an adaptation allowing them to breath. They don't have lungs. Every part of the tree has got to be in contact with air. So they have a root system that partially comes above the ground. It's a tree with very inconspicuous but extemely beautiful flowers, and produces these fruits which should be obvious right now. They fall from the tree and they actually establish themselves incredibly quickly. The quick establishment is important because they stand a very good chance of being washed away the next time the water washes over the area, because it is an area subject to, or should be subject to, tidal fluctuations. In a very, very short while—a matter of a few months—we have quite a respectable young sapling established.

Now sea water is salty and salt water is not a usual medium for plants. In fact were you to water your garden with even moderatly saline water, I think you would have an ecological disaster on your hands. So again, another principle about mangroves is their adaptation to overcoming the salt problem. The *Avicennia marina* overcomes the salt problem by taking up about a quarter of the salt in the sea water and actively excreting it from the back of the leaf surface.

Brugiera gymnorrhiza is the secondary coloniser. It comes in predominantly when the area has been

ameliorated by *Avicennia.* It grows with typical breathing roots, which are in the form of knees, knobbly knees which come out of the soil — also to facilitate oxygen coming to the root system. It has got curious brown flowers which after pollination give rise to an even more curious sort of seed. The seed actually develops and grows right off the fruit, until it finally becomes an elongated cigar shaped structure attaining some 12 to 15 centimetres, after which it will fall off; many of them will impale in the mud round the base of the parent tree. It solves its salt problem in a different way from the *Avicennia.* The leaves take up a little salt each day and when the salt flow becomes too great the leaves are shed. These provide the basic food for this rather handsome red mangrove crab. No mangrove trees, no red mangrove crabs.

This is *Rhisophera* the red mangrove. Some nice specimens here, with the very characteristic prop roots and these very long seeds. These fall off and some of them will impale the same way as *Brugiera* will. Here they are at their full length. They really are exceedingly long and probably 20 cm or longer, and because a lot of them impale round the parent tree, the well grown mature and unpolluted mangrove area will become very dense.

Even where it is very salty *Avicennia* can survive, although this is a very ancient *Avicennia* kept stunted by the high salinity of the particular soil here. But where it is too salty for mangroves — and that is usually high up where the tide washes over once a month or once every two months and then in a dry spell the water will evaporate and the salt will accumulate and the sytems will become very, very salty — we have this low soft body vervacious vegetation which takes over. This is robust, it is extremely tough and actually I find it quite beautiful.

The mangrove fauna is there by virtue and courtesy of the mangrove plant. They make the area suitable for the animals, and you heard from Dr Ramm that we are in fact not too well off on the mangrove fauna here at the moment.

The roots of the mangrove trees provide a haven for a remarkable spectrum of animals but, again for the sake of teaching ecology, there is not a great diversity of species. This puts it in the grasp of anybody to actually appreciate the animals because they don't have to learn dozens and dozens of names. Here for example there are some snails, some molluscs, and there is this extremely intriguing double turreted U shaped burrow of a fish. Now where else would you find a fish that actually walks on land other than in a mangrove swamp? The mud skipper prefers to be out of the water rather than in the water. He has a very intriguing device to breath out of water, but he is truly a fish. He has nothing of an amphibian in him.

When the tide comes in, mangrove animals don't stay in the water because water brings in predators, cilla crabs, eels and what have you, looking for food. The mangrove animals seem to have a very well-developed instinct not to be food, so fish which are amphibious in their habit, and crabs, will climb out of the water and sit passively on the nearest tree trunk or log returning only to water at very infrequent intervals to replenish the water in their gills. They will sit out the high tide period in this way. Crabs such as the ones I showed you tend to climb trees if there is one; if there isn't, a suitable low branch will suffice and they will actually climb up pretty high. The red mangrove crab will first leave his burrow to get onto slightly higher ground, finally taking to the trees, if in fact the tide comes up high enough. These trees are festooned with crabs once the ground is under water and they will just cling there. They don't even take advantage of the fact that there is all this delicious food supply around. They just hang on until the tide goes out.

Among the mangrove animals there are these jewel bright tiny fiddler crabs, and they are the real characters of the swamp. Let me show you. This is one of them, which tends to live where the soil is dryish and sandy, and provides a lot of amusement and education to people in the courtship dances that they perform at certain times of the year. Another one of these fiddler crabs. The colours are quite phenomenal and going with this bright coloration seems to be the fact that nothing eats them. In the real hard world of nature if you are brightly coloured you are conspicuous; if you are conspicious, something will eat you. Therefore you must taste bad or be poisonous. I don't know if they taste bad or if they are poisonous but nothing eats them.

The females usually are more drab, but in this particular species are very brightly coloured. This one, which I think is the most beautiful one of all with the royal blue carapace and this gold coloured claw, lives where it is very muddy and very wet.

Finally this, which occurs only where it is wet and it is sandy. We don't have many wet sandy habitats in the Natal estuaries so this species is rather scarce.

The red mangrove crab tends to make these enormous burrows. I hope we will see some of these for those of you who are brave enough to come out with me, but I don't think we will see the fiddler crabs. They are the ones that rely absolutely on the leaves which are shed from the mangrove tree. There are several species of this kind of crab and yet another one. All are responsible for removing the leaf litter from the ground, carrying it to their burrows, ripping it up into little bits and returning valuable nutrients to the whole estuary—nutrients which are important for all the fish that live in the water or should live in the water and ultimately for man as I have explained. This is yet another kind of crab in the area. Where else than in a mangrove estuary would you find snails that spend most of their time climbing up the trees, not only snails that climb trees, but snails which home back to the same tree once they have been down in the mud to feed?

The whole mangrove ecosystem is tremendously important for a variety of reasons. The trees drop leaves, the leaves are torn to bits by the crabs that feed on them primarily (they don't eat a fraction of what they tear to bits). Many bits are returned as detritus to the system. This sustains shrimps, and prawns and other crabs and small fish, and man predates on those animals. Also of course, in some parts of the world, on the wood. The small fish, and crustacea and so forth, sustain larger fish which in turn will sustain large carnivores. Man is dependent partly on these fish and on large carnivores.

In 1983 a very eminent ecologist in the States, calculated the annual value of this kind of wetland to the economy in dollars per acre. I translated it to rands per hectare, and I came to an absolutely staggering figure. It is made up of three components. One is the ability of the bacteria that live in estuarine and mangrove muds to detoxify some pollutants. The second is the soil-trapping value of the estuary, because the soil that washes down the rivers because of poor farming practices is actually caught by the mangrove roots; the third, and what is most important to us here, is the value of the mangrove estuary as a nursery ground for juvenile fish. Many of the fish that breed at sea, the important commercial and angling species, come into the estuaries as tiny fry and they live there and they grow up there. There is a lot of food, there is a lot of shelter, and for some reason or other there is a lack of particular predators that will get them in the sea. I personally think, though I have no evidence, but I feel intuitively, that a lot of the decline of our fish stocks off the coast goes hand in hand with the decline of the various estuaries along the Natal coast. So the choice is ours. Do we let our estuaries continue to be degraded in this dreadful manner? Or do we allow them to grow up like this, also along the Natal coast?

I think the choice for Isipingo is easy. I don't think it is going to be as difficult to achieve as one might think because if we could move or curtail the major despoilers and pollutants of the environment we can improve the water flow. This sytem looks after itself, it rehabilitates itself.

Chairman:

Thank you, Professor Berjak, for introducing us to the various types of mangroves and their importance to the marine life, and to ourselves. And now, ladies and gentlemen, I want to introduce to you Dr D.H. Swart.

Engineering Remedies

Dr H. Swart
Sediment Dynamics Division, NRIO, CSIR, Stellenbosch

Mr Chairman, what I would like to do today is to discuss engineering remedies to the multitude of problems we have heard of. In doing that I would like to firstly give you a problem statement. I would like then to discuss the history of the Isipingo in a bit more detail than has been done to date, and show you some graphs and figures which will make my point. Then I would very briefly like to discuss the physical processes at an inlet, use all of the proceedings to make a synthesis of the problem, come up with some conclusions, and some recommendations.

The title of my talk is "Engineering Remedies". Now to what are we seeking engineering remedies? The Isipingo/Umlazi system previously had a rather higher flow than at present. The mouth which was previously more open than closed is now closed 99 % of the time according to George Begg. The water exchange in the system is poor as has been shown. There are fish kills, and there are also various obstructions to flow in the upper estuary. On top of that, as we have heard a bit earlier in the debate, there is quite a lot of controversy of the use of the sluice gates up in the Isipingo.

If one looks at the history of Isipingo I would like to consider three periods.

Firstly the period before 1952. In that period the Isipingo and the Umlazi were still entering the Indian Ocean via one mouth. The mean annual run-off of this joint system was about 102 million cubic metres per year. One can add to that the Umbogintweni, slightly more to the south, which is of the order of a million cubic metres per year. In the period then between 1952 and 1969 the flow was reduced to 6 million cubic metres per year mean annual run-off. The reason for this was that in the design and construction of the Louis Botha Airport the Umlazi was going slap through the middle of it, and in order to prevent any flooding problems the river was canalised. Then in 1969 the Prospecton industrial area was developed, and after numerous in depth studies, it was decided that the only way in which the Prospecton area could be developed was to reduce the peak flow in the Isipingo. In order to do that, a diversion canal was created to the Umbogintweni, taking half the remaining six million cubic metres of the Isipingo. So effectively in 1952 the MAR of the Isipingo mouth was reduced to 6 % of the original, and in 1969 to 3 % of the original. As a result of this reduction in flow in the 1950's, already it became apparent that the Isipingo mouth was now more permanently closed, and in order to get some contact with the sea, firstly in 1955 a steel pipe about a metre in diameter was put through the sand bar, and when this failed in 1961 two concrete pipes of 1 metre diameter each were put through the sand bar.

Now one point I would like to make is in reading up all the literature on the Isipingo, I frequently see references to the fact that the NRIO advised about the putting in of these pipes at the sandbar. I would just like to point out that the pipes were put in about twenty years before that Institute even got into being.

I have tried to summarise, just for clarity, how the run-off was distributed, and is distributed now. You can see there was the Isipingo and the Umlazi with a pre-1952 flow of 102 million cubic metres; then the diversion which was made into the Umlazi with 96 million cubic metres that left a remaining 6 million cubic metres in Isipingo; then in 1969 there was a diversion of a further 3 million which was mainly the peak flood event, into the Umbogintweni. This meant that the Umbogintweni flow of 36 million cubic metres then became 39 million and what was left in the Isipingo was 3 million.

I would also like to point out that the figures shown by Mr Griffiths indicate that there could be up to 1 to 2 million cubic metres of raw sewerage entering the Isipingo, which would be about 30—40 % of the fresh water flow down the system.

In trying to decide on a remedy and how to repair something, one wants to know how it looked previously. I have therefore taken the 1937 photograph of this area and coloured the water in blue. You will have to believe me but I didn't colour in the area that wasn't water, but I wanted to show that the dead southern arm was, at that time, connected properly by a good healthy canal to the main river. So there was a link there. There was already some sand in this area here. The other important thing is that the Umlazi, major system carrying 96 % of the water, entered right at the mouth that was more predominantly open.

The question put to us today was "Can you bring the system back to what it was then?" I think that without any further ado one can say "No". What one must do then, is to see how close you can come in your rehabilitation, to the situation which is the ultimate, although we know we cannot achieve it.

We have been speaking quite a lot about the reduced flow. What I would like to do is to just show you a simulated run-off figure for the period 1921 through 1949 up to 1975. It says simulated run-off because run-off was not measured in that period but rainfall was, therefore one could, by using the rainfall records, simulate the run-off in this system. This I call virgin run-off for Isipingo. It doesn't include the Umlazi—I could show you that as well but I just wanted to show you the nature of the run-off in the Isipingo previously. You can see a number of bars—in fact for every month of the year there is a vertical bar. The length of it indicates the amount of run-off in that month. Then there is a solid line which is repeated every year. It is just the mean run-off for every single month. For example, if you identified February, the value for February in that little curve is the mean of all the Februaries in the 60 year period.

You can see that the run-off is very erratic; there are very definite peak events dispersed throughout the record. Secondly, you can see that there are long periods where the flow is very much below average. That indicates that the average is rather meaningless in a way because it is never achieved. It is only very rarely that flows higher than that occur. It does though give some sort of an angle by which you can see the very nature of this sort of flow.

Representing that information in a slightly different way, if one takes all the values for one year and adds them together, and then works out the mean annual run-off for the whole period you can mark as a block, every year. The green blocks are those periods when the run-off was higher than the mean, and the red ones are those showing the extent to which they are lower than the mean. The whole area is typified by dry phases, with the odd wet period between. They are generally about ten years apart.

The third and last way in which to represent this is to use the cumulative annual rain-fall. There are short periods which are wet, interspersed by long periods which are dry, but in general this curve tends to go up at the same rate so in general the rainfall pattern has not changed.

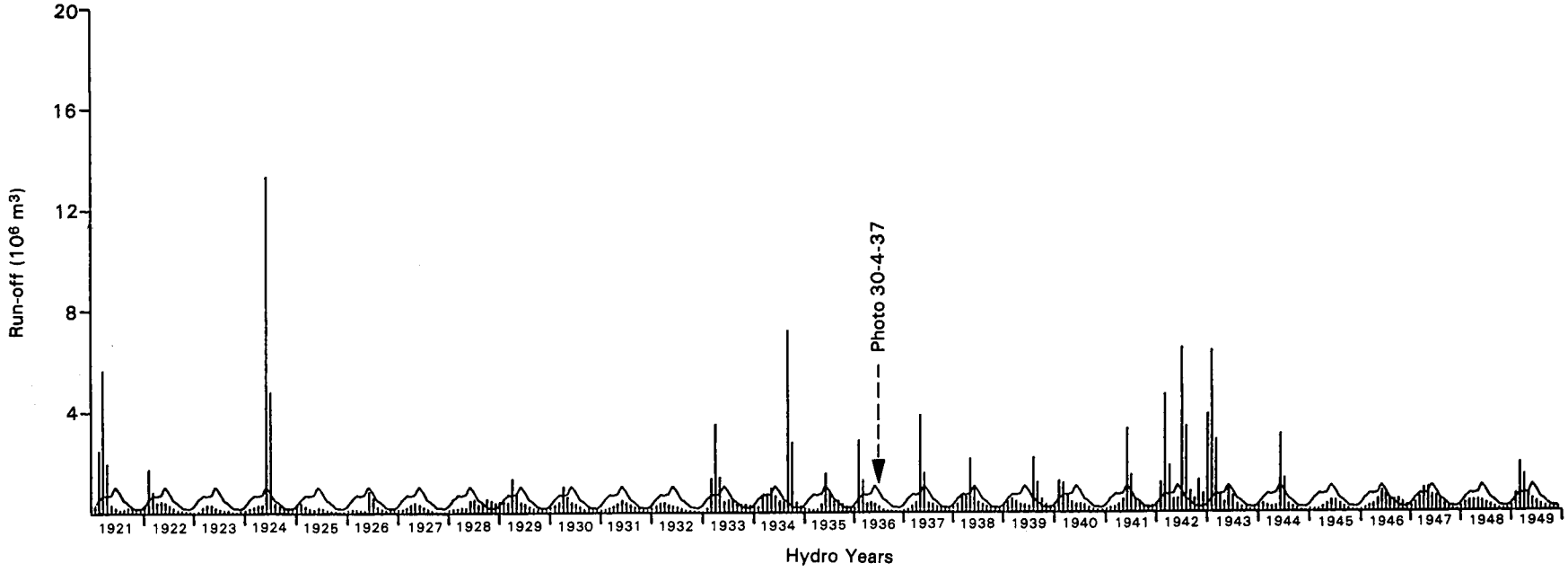
Adjusted Isipingo/Umlazi run-off pattern.

I have taken the Isipingo and I have taken the Umlazi flows from the rainfall data in the two catchments, and joined them together. There is now a totally different scale on the axis. It now goes to 200 million whereas previously it went to 20 million, and you will see some massive flood periods here in 1924; 200 million cubic metres in one month, whereas the mean annual run-off is only about 100 million. Same pattern as before. Now look from 1952 to 1969 the winter red ring period. You can see that the bars are still there—perhaps you can see them better than I can—but it's very much lower than what was initially the mean annual run-off. Then from 1969 to the present I assure you there are bars but they are only 3 % of what they were before. You virtually can't see them. This typifies to you on a month to month basis how the run-off has changed.

I want to do the same on an annual basis. I have marked it in red for clarity. The top is pre-interference. This is a period when the Umlazi was separate but there was no division into the Umbogintweni; this was after the diversion to the Umbogintweni. You can see it was a totally different system. The question one has to ask, if one wants to rehabilitate only partly, is "Where will the water come from?" That I think is the crucial question.

Scale 1:10 000

Figure 1: Isipingo Estuary on 30 April 1937 at 12h44



Note: The highly erractic nature of the run-off

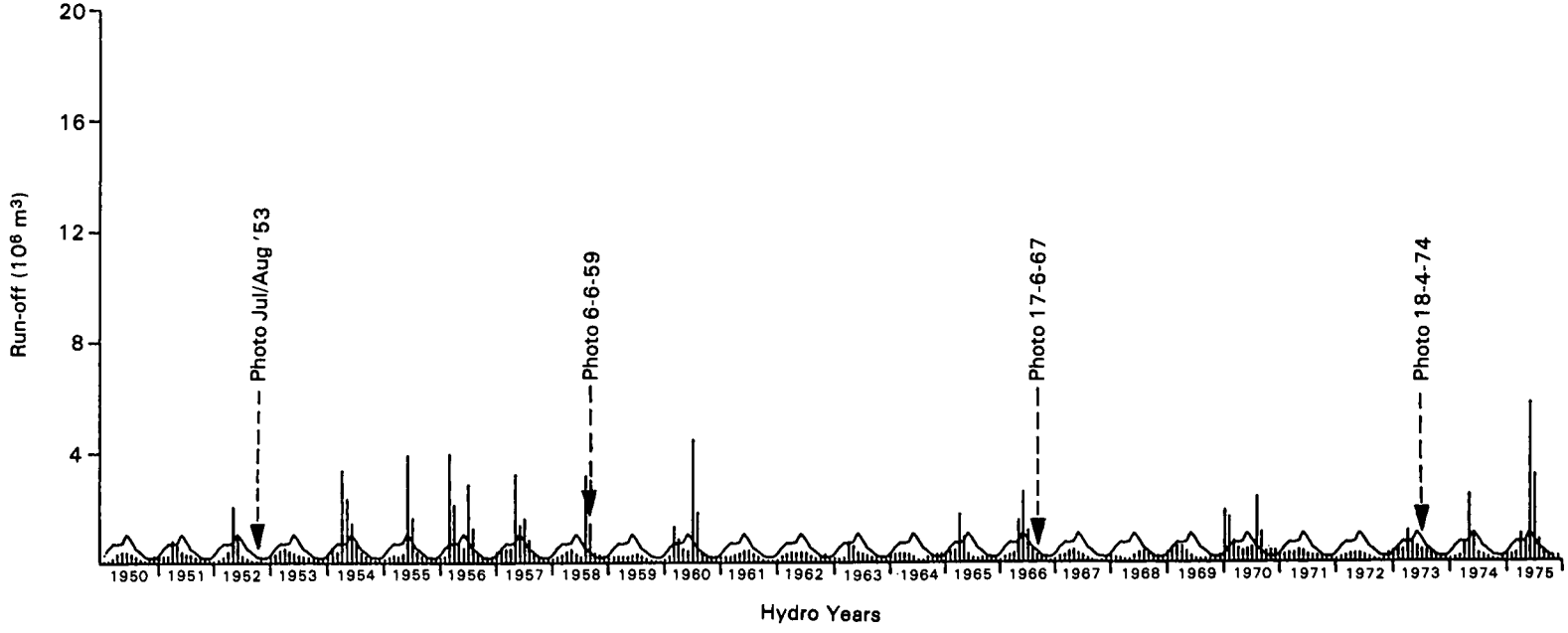
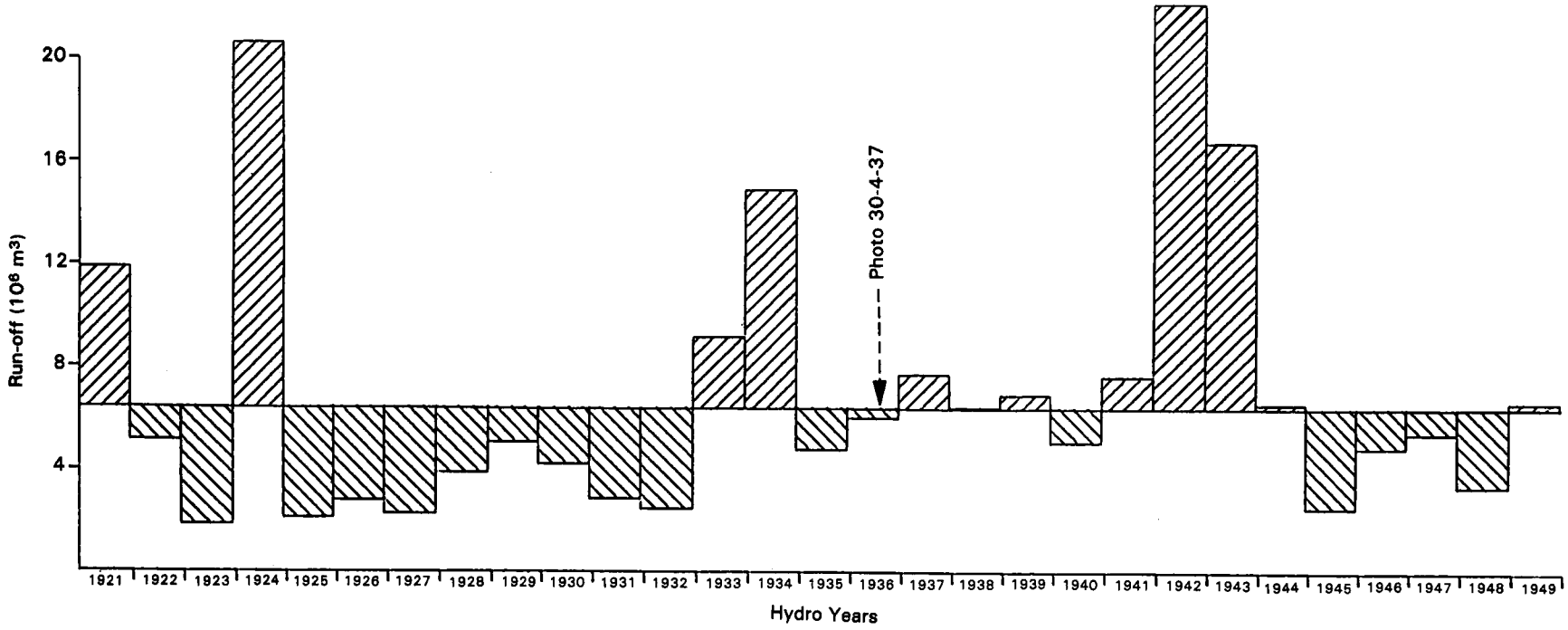


Figure 2: Virgin Simulated Monthly Run-off for Isipingo River Alone for the Period 1921 to 1975.



Note: The wet and dry periods when the run-off is above and below the mean annual run-off respectively

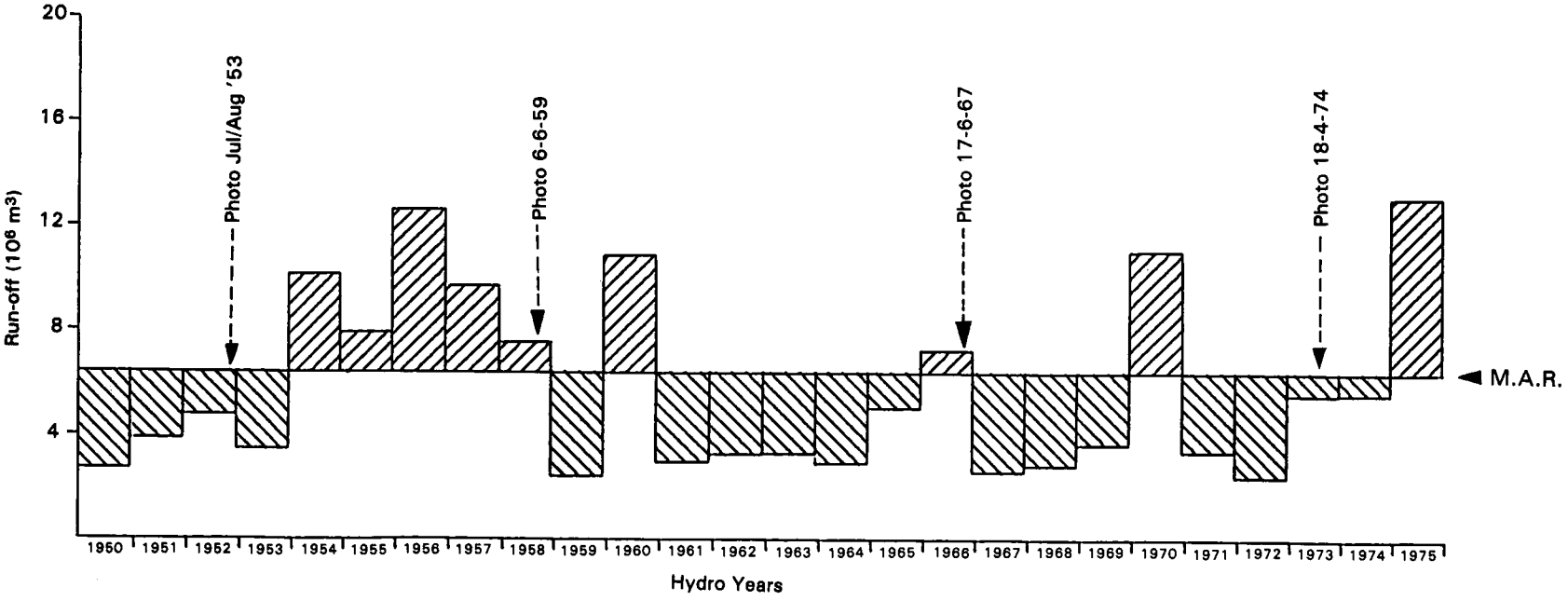


Figure 3: Virgin Simulated Annual Run-off for the Isipingo River Alone for the Period 1921 to 1975.

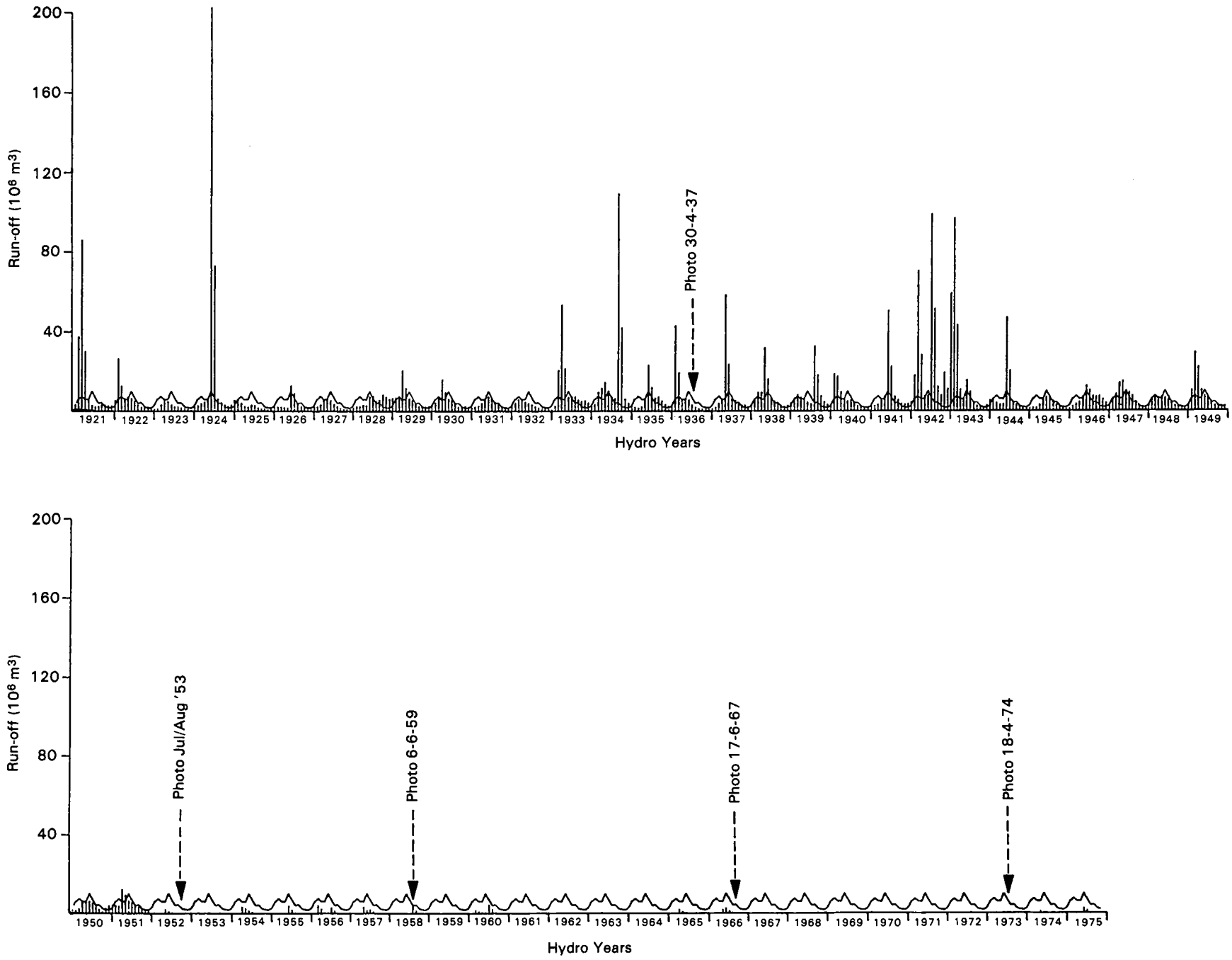


Figure 4: Adjusted Simulated Monthly Run-off for Isipingo and Mlazi rivers for the Period 1921 to 1975.

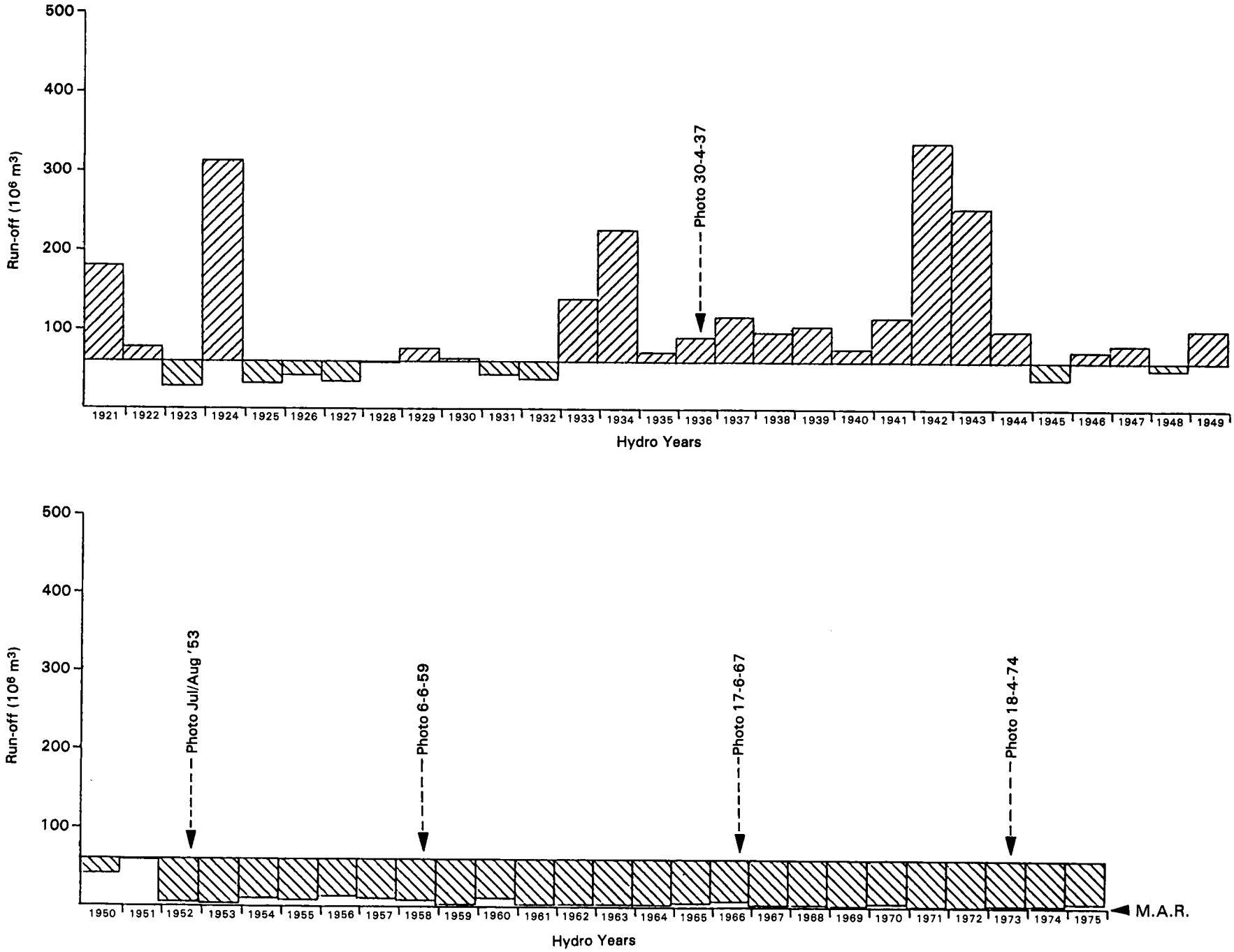


Figure 5: Adjusted Simulated Annual Run-off for Isipingo and Mlazi Rivers for the Period 1921 to 1975.

Now Mr Cooper said, "Can't we get some of the water back out of the Umlazi?" I personally think that if one looks at these figures that is most probably the only logical source of water; whether its practical, one will have to look at the problem in a lot more detail.

Just to show you the accumulative curve.

I have again drawn the line which should actually have gone on and on but if you look here at what actually exists through the mouth of the Isipingo, it went up until about 1980, then it basically just stopped.

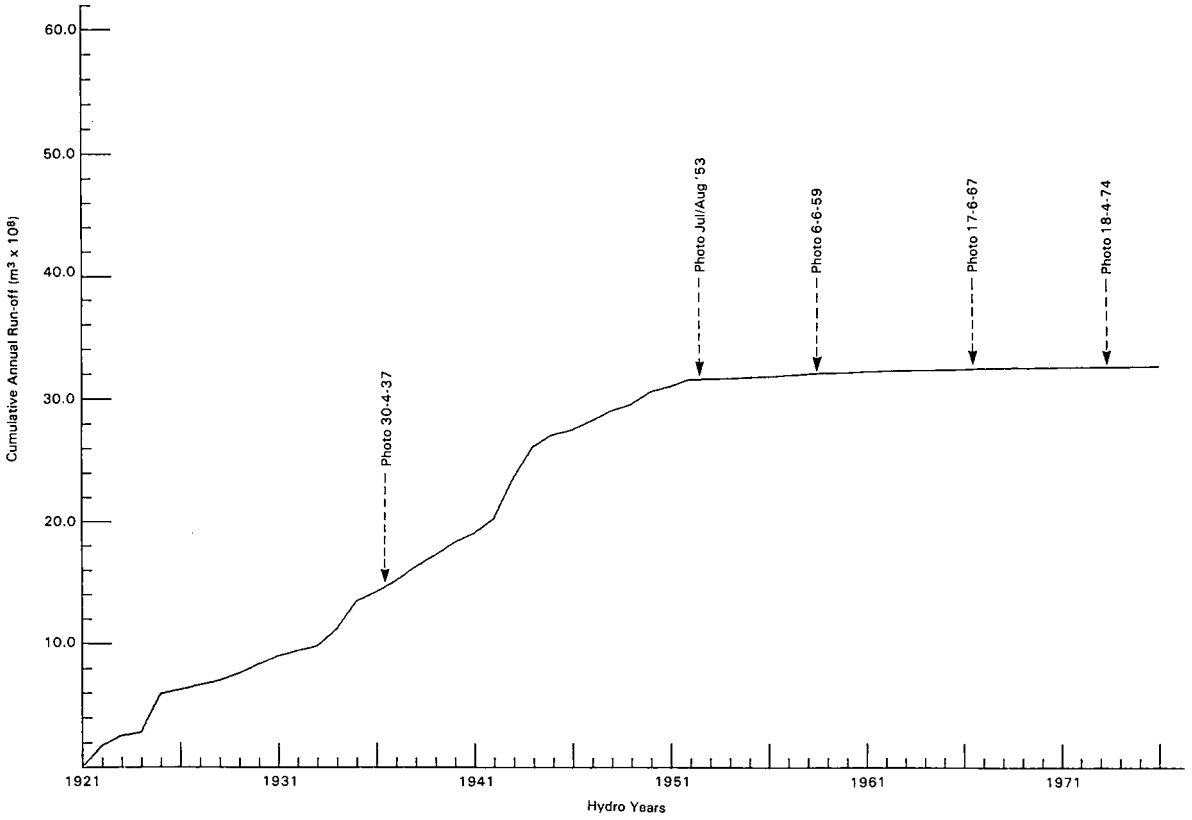


Figure 6: Cumulative Adjusted Annual Run-off for the Isipingo River for the Period 1921 to 1975.

Now with that as a background I would just like to give you a few facts on the physical processes at the inlet. There is a lot one can say about this. I will only concentrate on one aspect.

The waves in the sea when they arrive at the coast dissipate as they create currents; these currents carry sand either in the on or off shore direction, perpendicular to the shore, or in the long shore direction. In the Durban area we have got very well proved facts that the general long shore drift of sand is 650 thousand cubic metres per year from south to north. This is based on dredging figures at Cave Rock just slightly to the north, where since 1903 that volume of sediment on average has been taken out every year. That would be the same as 130 thousand ten ton trucks full of sand passing that area every year not to return. Part of that sediment actually wants to block the estuary mouth, tries to clog it up. It is the blocking agent.

On top of that there is water running down the system, in this case the Isipingo, previously the Isipingo/Umlazi, trying to exit to the sea. Also, because of the fact that the mouth is open, there are tidal currents through the mouth which fill the estuary with sea water at the rising tide and scour out again at the falling tide. Now this fresh water run-off plus the tidal flow through the mouth together constitute the scouring agent, and every estuary mouth in the work actually is controlled by these two factors. The ratio between them will determine to what extent the mouth has a possibility of remaining open or to what extent it will close.

There are techniques available which allow one to predict on the basis of numerous measurements done all over the world, many of them in India, a lot in Denmark, and in the States, and also in Southern Africa. Where all these have been put together, one can show that if one takes the ratio between the scouring agent which I call just for clarity's sake the sum of the "Q's", and the sediment movement, one can determine if it is a wide open healthy mouth or if it is a very constricted mouth. We have done studies of this nature for a number of systems in the country and I can safely say that the Isipingo as it is today, with the type of ratio one can get for it, would be called an overflow canal which occasionally gets a shot in the arm due to a flood. Except for one thing. There are no floods here, so in fact it doesn't get the shot in the arm.

In the design of dams or impoundments near the coast, we have been working with the Department of Water Affairs for about seven years, looking at the release policy from these dams. We use this ratio of sigma in order to determine what the situation at the mouth is before the dam is built, with the idea of trying to get after the building of the dam, something which is similar to what it was before. I will on the next page just dwell on that slightly.

I would like to make one other observation, that is that George Begg in his monumental thesis has shown that in studying about 60 estuaries in Natal, one can, by using detrended correspondence analysis, get some sort of a grouping of the estuaries. Starting from Durban Bay this grouping starts from the river mouth on the one side, to various groups of estuaries or lagoons. There are three types of lagoons which one can broadly group, and if one looks carefully at the way in which these things group, you can see that the mouth condition is actualy paramount in determining where they form. So the conditions at the mouth are actually vital. Here we haven't got a mouth — we have got two pipes.

To dwell on this dam release policy for one minute, we have found in doing studies in the Palmiet and at the Umgeni and at the Tugela and at the Hartenbos and on the Orange River that one can actually design a release policy which is such that you will get after the construction of the dam, a situation where for short periods of time during the year the system returns to what it was beforehand. What we found in those studies is that somewhere between 6 and 11 % of the mean annual run-off is required for that to be done, and it must be concentrated in one or two, or at the most three flash floods which take place for one or two or three day periods at a time, trying to simulate what happened previously. If one takes the Umlazi and the Isipingo, their joint mean annual run-off prior to 1952 was about 100 million cubic metres. That means one would need between 5 and 10 million cubic metres of water per annum to manage the downstream part of this system. The present mean annual run-off of the Isipingo is 3 million. That means that one needs between 2 and 3 times the present mean annual run-off of the Isipingo if you want to even try and approach something which for a short period of time will look as it used to look before. In theory this sounds fine, but I don't think that without putting a lot of money into it one can even hope to achieve that.

Coming to the sluice gates for a moment. If one can use them, and I think that it has been shown quite clearly that one cannot use them, but if one could use them, it means that only about 15 %, of what is required to stimulate a flash flood, could ever be supplied by these sluice gates; although that is the case one must remember that every little bit will help. However, one cannot do it if it will result in flooding of the lowlying areas.

My last point is that we found in the previous studies that there is a very definite relationship between the area of the mouth and the fresh water run-off. In fact for the smaller system in South Africa it is not so much the area of the mouth as compared to the tidal prism which is important, but rather the fresh water flow. We have got nearly 5 years of data at the Palmiet which show this, and we got full scale tests at the Hartenbos, which has been declared by the DWA as a full scale test site, to prove this point.

Now getting to a synthesis, it means that when the run-off of the Umlazi was diverted, the run-off was reduced from 100 to 6 million cubic metres. Flood peaks were truncated because of the diversion to the Umbogintweni from 6 to 3 million. As a result the mouth was restricted—it was clogged, it was piped—and now the mean annual run-off is too low to maintain the mouth at all.

If one wants to do anything one must try to improve the fresh sea water exchange or the contact between the estuary and the sea. If one looks at the tidal prism of the present system, the estuarine area is about 6,6 hectares. If one calculates according to the tidal variation inside the estuary, it works out to about 20 to 40 thousand cubic metres per tide at present. On the other hand these pipes could give you the same order of magnitude of water into the system. This means that even if one said "I am going to try and improve the tidal prism. How can I do that?" for example, as Mr Cooper so rightly said, by dredging the lower Isipingo, you can perhaps gain 30 % of the tidal prism. It is only a very little but it may help. Even if one does that, these two prism pipes could most probably cope with that, but then again one has to add that the bigger the area, the bigger the flow or vice-versa, so it is most probably going to be very advantagous to add more pipes. I think these comments in this regard are very relevant.

Now in planning a dredging operation such as this, one has to be very sure that you don't interrupt the vegetation, and that you don't interrupt the faunal communities in the area. Therefore I think it is quite imperative that before anything is done it be jointly evaluated by a physical/biological science team. In NRIO at Stellenbosch we have developed a system where Engineers and Ecologists always go jointly to evaluate such requests. We call it the "Econeering" approach, something of a cross between a Ecologist and an Engineer.

One last thing about contact with the sea, I think there is a lot to be said for lowering the level of the sand bar to try to improve the overspills. Also if it is at all possible to have flash floods down the system, then I think it will also be advantagous to lower slightly more certain parts of the bar, to show the river where it has to break out to sea.

So my conclusions are that there are now strongly reduced fresh water flows, without flood peaks, and the mouth is clogged. I think the system is irreversibly damaged. One cannot go back to where you were before. One can perhaps only marginally improve the situation within the present or existing constraints. I think the cheapest way of going about it would be to try and improve the sea water exchange by increasing the tidal prism and secondly, try to improve the fresh water flows, although I think that will cost a lot more money. Additional improvement measure at an estuary mouth such as building break-waters and dredging just will not work. If you want to have a permanently open mouth without pipes, I think that is going to cost a lot of money and I think one can talk of an excess of a million rand a year just for maintenance costs.

So my final recommendation would be to improve the sea water exchange, dredge to increase the tidal prism, reduce the crest level of the bar for more frequent over-spilling, and perhaps look at flash floods —although I am not very hopeful about that.

To come to Mr Anderson's few questions "Will it be possible to partially or wholly rehabilitate the Isipingo?" My answer is "Yes, but only very partially" and "Will it cost money?" Most definitely "Yes". But I also say "Lets go for it".

Chairman:

Thank you, Dr Swart, that was a most interesting talk on engineering remedies. I am sure all of us "will go for it" as you say, although it will be most difficult if not impossible to bring back the flow of water to the Isipingo estuary and lagoon to what is was originally. I am sure that if we work with a positive attitude, and if we work with the will that something can be done, I am sure it will be done, and we who are interested in conservation and preservation will do everything in our power to see that something is done. We shall "go for it". Thank you very much, Dr Swart.

Now, Ladies and Gentlemen, we will now go on a tour of the area, led by Prof. Berjak.

3RD SESSION

Chairman: Mr S. Craven
President, Natal Branch, Wild Life Society

Discussion and Resolutions

Summing Up

Mr A.M. Little
Chief Town and Regional Planner

We come now to the final session of this seminar. There is a radio advertising blurb which goes talk talk talk talk talk and so on, and the message is that talk alone is insufficient. You have got to do more than that, and we hope to conclude this seminar with some resolutions which are going to get us somewhere. We have listened to some erudite speakers throughout the morning, and I don't think anyone can claim that they have not been informed as a result of this seminar. I think all of us have learnt a great deal about what is required to be done as far as Isipingo lagoon is concerned. We hope that later on we shall get some resolutions put forward to implement the decisions of this seminar. But before we get to that stage, there are a lot of loose ends to tie up. A number of speakers have put forward sometimes controversial issues which require some explanation or elucidation, and so I would suggest that first of all we throw the meeting open for questions on any of the subjects which have been discussed this morning.

Ted Beasley of SAAICOR, Umkomaas:

For the benefit of further thinking during the session, can somebody tell me what the black sludge on the bottom of the estuarine arm is? Is it sewerage sludge or is it industrial sludge? I would be grateful to hear that one.

Chaiman:

Thank you. Who is prepared to answer that question?

Dr Ramm

Thank you. We haven't done any analysis of the sludge so it is a little difficult to answer directly. It is clear that it is not simply detritus. From looking at it, it doesn't have the consistency that you would find in a mangrove swamp. It is clearly some sort of sludge, but we didn't do any chemical analysis of it so I don't know whether it is industrial or domestic waster, or what it is.

Chairman:

Would no one like to take up the cudgels with Mr Stroude who put forward suggestions in direct contradiction to Mr Cooper's?

Mr Raiman: Isipingo Wildlife Centre:

On the issue of the sluice gates. The Isipingo Centre believes that irrespective of whether a single sluice gate or both sluice gates are open there will be no flooding in the Prospecton area. This is simply because the diameter of these gates will only allow a certain minimal amount of water to enter into the Prospecton area. Now I don't have the same figures that were quoted by other speakers but the figures that I do have, and they come from the Town and Regional Planning Commission, show that the maximum capacity of these gates is 1,7 cubic metres per second whereas the canal system is designed to hold the maximum of 325 cubic metres per second.

Chairman:

Could we have some comment on that as well?

Mr McGarr, Bosch and Associates, Consulting Engineers, Durban:

I wrote to the Borough Engineer a month or so back setting out the design criteria for the discharge through the outlet works, and certain other information regarding the flow in the main canals in

Prospecton. After listening to Mr Griffiths this morning in fact I think our recommendation would probably be a little bit different, particularly with regard to the amount of raw sewerage which is flowing down the Isipingo — I think that we would have recommended that the gates be closed at all times!

I can give you a lot of figures, but I don't know whether it will mean much to people without having the information in front of them.

The drainage canals in Prospecton were designed for a total flow of 68 cubic metres per second which was the estimated 25 years flow. That in fact is the discharge at the lower end of the canal system. The canal into which the diversion works discharge is the canal at the top end of Joiner Road. The estimated flow of discharge at that point is 9,7 cubic metres per second which includes 2,27 cubic metres per second for the diversion outlet works. Discharge throught the outlet works is controlled by two pentstocks as mentioned before. The smaller pentstock can discharge up to 1,13 metres cubed per second in times of flood, that is with a head on. The culvert between the outlet works and the Prospecton canal was designed to convey this flow, plus a further 1,13 cubic metres per second of run-off from between the diversion embankment and the rail embankment.

Our recommendation on the operation on the gauge was this. That the small pentstock be left open at all times. This allows the low flow, and all flows up to a maximum of 1,13 cubic metres per second into Prospecton in times of flood. At times of flood the diversion canal will come into operation—that is in times of flooding of the Isipingo and Umbogintweni rivers. The diversion canal then comes into operation, and the flood will eventually subside to a level of 3,96 metres above msl which is the invert level of the diversion canal. This then forms a pond behind the outlet works, up to a level of about 3,96. The water retained at this level in the Isipingo River can then be drained into the Prospecton system by opening the larger pentstock, after first ensuring that the canal system in Prospecton can accept the increased flows. We estimated that the water retained in this pond could be drained if you so wish by means of a larger pentstock into the canal system of Prospecton within a matter of 36 hours. That was the criteria behind the design of the outlet ridge.

Mr Cooper:

First of all, yes we do want that water to be released into the lagoon periodically. That is very essential. What is happening at the moment is that there is only water coming through the canal via the small sluice gate. The majority of Isipingo River water is going down into the Umbogentweni River. This is the position now. What we want to know is that if you opened the second pentstock, with both fully opened you are not going to have any flooding. Is that correct? You are not going to have any flooding in Prospecton with both fully opened and a head on that water?

Mr McGarr:

Well that depends on the actual flood you have got in Prospecton itself. Now presuming that there is no flood, assuming there is no precipitation over Prospecton, certainly you wouldn't get any flooding in Prospecton.

Mr Cooper:

No. That is what we want. Right now as we are talking, the position is that this dam is holding a lot of water. It is overflowing into the Umbogintweni River and we are denying the Isipingo Lagoon of that water. So we want that second gate opened and we want to be able to monitor the effects of opening it, even at times when you have a build up of water in that dam. What we don't want to see happening is most of the Isipingo River water flowing into the Umbogintweni River. We would like to actually monitor that and see what effect that has.

As far as we are aware, that second pentstock has been closed for a long, long time. It has been rusted up and I don't think it has been opened for many, many years. We would request first that that be done. Is that impossible, or it that possible?

Mr McGarr:

Well I can't speak on behalf of the authority controlling the gates, Mr Chairman, but as far as I know, what I have said to you here is the recommendation that we made at the time that the diversion canal was built. I certainly agree that with no precipitation over Prospecton area there would be no problem in opening the larger valve to let the ponded area water through. Then the responsibility is that of the Borough Engineer of Amanzimtoti to ensure that if that larger pentstock is open, that somebody does close it before a major storm occurs over the Prospecton area.

Mr Cooper:

Mr Chairman, could I continue on this same question? With regard to the qualtiy of the water in that holding dam. Before the Isipingo reaches that holding dam it actually travels through quite a large area of reed swamp and aquatic vegetation, and we know that that water is very highly nutritious.

The holding dam is virtually covered with *Eichhornia crassipes,* that is the water hyacynth, but I believe that a lot of the sewerage that was mentioned earlier on is actually trapped and dispersed higher up, so the quality of the Isipingo River water coming down into that holding dam isn't too bad in my opinion. I have had a look at it many times and there is quite a lot of bird life in that area and so on. It is very rich in nutrients, but I don't think the black mud which was mentioned earlier on is actually emanating from the sewerage higher up. I believe that the black sludge is emanating from a number of sources in Prospecton. I am prepared to give an indication as to where they come from if you would like to talk to me privately afterwards. I don't believe that the black sludge, the sulphuretted hydrogen muck in the bottom, is actually coming down to that area. However, there is another problem. Just below the sluice gates between there and the railway line is another pipeline coming in from the north.

Mr J. Walton, Deputy Environmental Engineer of Amanzimtoti:

Just one brief comment. The sluice gate is not rusted up. It has been opened comparatively recently.

Dr Swart:

I would like to ask Dr Ramm a question. When he showed these figures of the various types of fauna caught in the system he mentioned 12 types. I read last night the newspaper reports of the fish fills in 1984, and there are a number of species mentioned there. For example, the paper spoke about very large eels. What I want to ask you is if one finds such a lot of other species in the system which are not caught by the trawls, isn't the system perhaps much richer than we think it is?

Dr Ramm:

You wouldn't catch an eel with a gill net first of all, so it is clear that if that was the only method we were using we wouldn't find one. We didn't use traps. If we had used traps we may have caught eels. Relative to richness, all I can say is, what you have to do is to compare what we caught using that methodology with what we have caught using a similar methodology elsewhere. That gives you the idea of relative richness. I would say off-hand that with a "once-out" attempt with the methods we are using we generally catch, I would guess, somewhere between 60—70 % of what is out there. Certain things are going to come in seasonally (you wouldn't find them at other times of the year). Some will come in only after the system is open, and you won't find them for a period of time after that, but I think it gives you a general pattern. For example, there is a big difference between a dozen things and thirty different types of things. So the things we found in addition were things which we could put into certain categories. For example the *Tillapia* is a fresh water organism, and we found down below the area there are other organisms. So it is coming from further up, but once it gets past that other area it seems to be present in fairly large numbers. This makes me believe that the reason for not catching them in the area above it is because of the quality of water there.

Again if we were to get up underneath the mangroves and put other types of gear in there I know we could catch other types of fish. But that number we caught indicates a typical Natal lagoonal system that doesn't open very often. That is pretty much what we are seeing there. The system though is a

fairly large system and if it did open more often, certainly there would be more things there.

The only thing I would say though, in terms of planning for the use of such an area, I am not sure that having grunter runs up the Isipingo is necessary. I am not sure whether your plan would be to develop an area where people could come to fish, as much as an area which is a fairly unique mangrove swamp area along the Natal coast. So I am not sure that trying to establish a diverse fish fauna is necessarily the way one would want to go anyway.

Chairman:

I think from what has been said this morning that one of the first priorities is to increase the flow of fresh water into the system, and to increase the seawater interchange. It would seem that the sluice gates are to some measure in any rate a factor, and it would seem advisable that these gates be opened more frequently than they are at present. I gather that the problems are, the dangers are, flooding, and from what has been said the danger of flooding is not present unless there is an excess of water in the Prospecton area. So can we take it that an acceptable solution would be more regular opening of the sluice gates which are more or less permanently closed, as I understand it at the moment? Would it not be possible? Perhaps Mr Stroude could say whether it is possible, and would he agree to opening them systematically over appropriate periods? Is this not a step in the right direction?

Mr Stroude:

The choice of opening the sluice gates on a permanent basis. Let us say we open both sluice gates on a permanent basis. We must look a little bit ahead and see what would occur. The difficulty from the point of view of Amanzimtoti is that the capacity of the canal system is based on the hydraulics which have been outlined to you by Mr McGarr, our previous speaker, and it would seem to me that if we opened the sluice gates on a permanent basis, both are opened, what you are going to achieve (from the Isipingo estuary point of view) is that you are going to get more water. This is true, but, at the same time you are also going to put several industrial businesses into jeopardy.

We have on occasions experienced problems with at least two government orientated firms who have large warehouses in the Jeppels road area, who have complained very seriously about flood water entering their premises. This has motivated us in our restriciton of the flow in the Isipingo canal system. The other aspect of course is the cleaning of the canals due to the velocities which are involved in these canals (particularly the Jeppels Road one). Due to the hydraulics, the velocity is so slow that you get deposition of silt, and the canals require constant cleaning out. I am quite happy to try for a limited period this situation of opening the sluice gates, but as Mr McGarr previously explained, the total flow even if we open it fully after a flood will be a matter of 36 hours and then you won't have any more water. So what we are doing in fact by restricting the flow, is that we are spreading the amount of water over a longer period. It is a question here of getting the water at a much quicker rate, with the consequent flooding of the premises, or alternatively restricting the flow, when you achieve the flow at a lower rate over a longer period. But I am quite prepared to take the matter of opening these gates a step further, and we will try to put a little bit more water into the canal. I don't think quite honestly that it will make any difference and I think you will find that you will dry up what you might term the perennial flow which we normally allow you. So that is the positiol. It is all very quickly and nothing afterwards, or a small amount all the time.

Mr Raiman:

Back to Mr Stroude. Firstly, we are not talking about flood conditions. As Dr Swart has pointed out there are more dry periods than flood periods, and we suggest that both these sluice gates be open preferably during the normal flow. The canal system is well designed to undertake or cope with the normal flow. We don't want to see serious flooding and we agree with the principle that the gates be closed during severe storms. Furthermore we believe that there will be plenty of time to get to the sluice gates if high precipitation does occur within the Prospecton area.

As far as the Borough Engineer from Amanzimtoti is concerned, those sluice gates were definitely rusted up prior to September last year. That was on a personal inspection. I think we Centre members

have been to that sluice gate more often than the Borough of Amanzimtoti.

In addition, as far as the monitoring of the sluice gate and the canal system is concerned, this was contained in a letter to the Borough last October. We haven't received a reply to that yet.

Mrs L. Du Toit:

I think we actually need to establish right at the outset that the very purpose of this seminar was to bring together interested persons in a spirit of co-operation. I feel this business of the sluice gates is leading towards a huge bone of contention.

What I would suggest is that it would appear obvious that the river needs the water. Why don't the Borough of Amanzimtoti set up some kind of a water management programme with the Industrialists involved so that together you work out a reasonably feasible situation? Otherwise I think we are really going to be talking around in circles. I don't believe you would ever willingly allow these premises to be flooded and I do believe there is a way we can actually overcome this. We are not talking about flood conditions, we are just talking about normal every day conditions as it were. I am quite sure that there are times when the sluice gates can be opened without detriment to the industries and certainly to the benefit of the lagoon and the estuary. I think the big thing to keep in mind is that we are here to solve a problem and in resolving that problem we are going to have to meet each other half way.

(Applause)

Chairman:

I hope that Mr Stroude is not taking this in any personal capacity. We are, as Mrs du Toit said, seeking a solution to a problem. We do appreciate the responsibilities and the hazards to resolve the problem.

Dr Swart:

I think what one must perhaps do, is firstly to ask "What do we want to retain in this system, or what do we want to regain in it?" There are a number of things I can think of. They have all been mentioned this morning.

For each of these different qualities that you want to retain or regain, there are different remedial actions. Some of them are possible and some of them are impossible. So what I think we should do is to make a list of what are the possible things we want to gain. One can ask "Do we want viable mangroves swamps?" If so, then a remedial measure as far as I can see is to improve sea water exchange. Diverse biotic communities? I totally agree with Dr Ramm in asking if we want that. If you do there are cetain things you have to do. You have to re-establish the estuary. You have to have a good sea water exchange. You have to have improved fresh water flood regimes. You have to remove the anaerobic sludge.

Already this list of things is a fairly tall order. If you want aquatic recreation you must dredge judiciously to increase the open water area. If you want to improve water quality you must control the input to the system and you have to remove anaerobic sludge.

So my idea, if you talk around it like this, is that perhaps there are other black points to add, but then we say to ourselves "We can achieve one, three and four but two is difficult". This being the case, you can see that in fact the fresh water is not so important anymore. It is important of course, but it is less important than other things. So we can stop this arguing around in circles.

On the fresh water question I would like to make one point to Mr Stroude, and that is that the estuary has been used to receiving water in sudden bursts before man started putting up sluice gates, so I don't think we actually need to argue over what is best. I think it is necessary to have those sudden bursts, because that is a natural process.

Chairman:

Thank you very much. Shall we take these suggestions. Taking No. 1 first would anybody like to comment on that.

Prof. P. Berjak, University of Natal:

I don't want to say what should be done about it but I do want to say that I don't think it matters what sort of water the estuary gets. I think, knowing mangroves, knowing the biology and their ecology, if we can improve the sea water flow which seems to be the most feasible possibility at present times, I think the estuary will actually go from strength to strength.

Chairman:

To get down to brass tacks about improving the sea water flow, perhaps the engineers could suggest or perhaps repeat what has already been suggested. What we require to do to improve the sea water flow, the question of dredging, the question of increasing the pipe capacity, and so on.

Dr H. Swart:

Dredging could, as far as I can make out from looking at the area very carefully, improve the tidal exchange by about 30 %. As Mr Cooper said this morning, if one adds more pipes that will be two more. You can also obviously improve the capacity of the pipe system, but one must remember that there is only so much water that can enter into the system. You cannot pile it higher than out in the sea. So that will help marginally but it won't help all that much.

But I do agree that one firstly does the dredging. I think that is the first step. See what that does and then as the second step go for more pipes. If you do go for more pipes, one will have to be very careful about siting them lower than the present pipes because they will be more prone to silting up from the sea side then. But I think the sequence is, dredging first and then pipes. I think the dredging as has been said by a number of people can be fairly cheaply done because if one tells a contractor, he can have the sand for free, perhaps even let him pay for it — that is the way to do it.

Mr K. Cooper:

I agree with what Dr Swart has said and I am sorry that we laboured the point about fresh water. The most important thing unquestionably is the bringing of sea water into the system and that of course is mentioned in my paper. It is so far the most important priority. We have seen that at equinoctial high spring tides, when the mouth was fairly well open, the sea water extended higher up, quite far up almost to the road bridge, and that had a very beneficial effect on the mangrove community. There is no doubt about it.

On the strength of that observation we would like to suggest that an additional two pipes be put in and that the actual removal of sand be undertaken at the mouth area. There are two contractors working there at the moment, so that if you can actually reduce the sand bar as Dr Swart said, you will have that inflow at times of equinoctial spring tides and even ordinary high spring tides. This is very important. So I would go along with that and I think that would do a lot to improve system.

We don't like to use the word dredging, but we feel that some means of removing the silt from the system is important. Just how it's done would have to be very carefully considered because if you bring in large dredgers it could actually cause a problem.

I think that what we would actually like to see happen is that these suggestions are followed up by a working committee that is established by this meeting. I would go along with Councillor Libbie du Toit who says that we mustn't fiddle while Rome burns. We have got to get down to thinking.

Mr J.B. Anderson:

Thank you. Mr Chairman, I would just like to refer to a question I proposed during the course of my paper. The suggestion that there should be additional pipes put in is going to cost money. It would probably be something in the order of the 64 000 dollar question. My question is "Where will this money come from?" I would like to ask whether one could expect Government support or financial assistance, particularly in order to provide these pipes.

Mr N. Geldenhuys, Environmental Affairs:

I don't think we should deal with the cost aspects at this stage. I think we should rather complete that

picture and come up with a total package in phases, or priorities. By that we can discuss attempts to raise the funds to do what needs to be done.

Mr Lawton, Coates Brothers:

I would like to ask Dr Swart what the possibilities are of valving the inner end of the exisiting pipe lines, or any new pipes that might be put in, so that on the rising tides the water could be pumped in by the sea and held by the closed valves until the lagoon is pumped up by a period of highs. Obviously the water flow in will be comparatively slow compared to the actual rise of the sea level because it is such a small bore in which it has got to come through, but if over a number of rising tides the lagoon can be pumped up, and then when a major falling tide occurs such as the spring low, the valves can be held in an open position literally a flat valve against the mouth of those pipes to allow the water to move out *en masse*, would that be an engineering problem?

Dr H. Swart:

What would be the purpose of doing that?

Mr Lawton:

To cause movement in, and a fairly strong movement out of sea water.

Dr H. Swart:

I am sure one can do that. You see you have got the wave power actually pumping with the sets of waves as they pump energy into the system, so it is not as if you are using pure gravity to do it. So I am sure it could be done but I am not quite convinced that it would have a lot of positive effects. You will not be pulling off very close to the pipes, you will be increasing the velocity dramatically, but further away I don't think it will do all that much. I think one will then have to look at the effect of this larger variation in the water level on, for example, the mangroves. I am not sure what Professor Berjak wants to say on that; it could be done but I don't think that I could really see such great benefits in it. Apparently a number of the references say that these gates were actually designed in the way that you explained, but now some say they are now only open pipes.

Chairman:

Dr Swart has summarised his suggestion. Is there any comment. Do we accept the situation as he has put it? Does everybody agree that this is the way to go? On the question of priorities, has anybody any comment or suggestion regarding priorities on the proposals?

Dr H. Swart:

May I ask a direct question? Item two, is there anybody who wishes that to be a high priority?

Prof. A. Bowmaker, ORI:

I would like to carry on with what Harry started if I may, and also with what Libbie said. We are here not to point fingers but to get something viable. I have been incredibly encouraged by the co-operative atmosphere, by a real want to try and improve a situation which isn't too bad really, if you look at it. The mangroves are living, they are not dead yet, and when Keith says its the worst system I don't agree with him. It's bad but it is not that bad.

I think we should go for the first quality alternative. We want to look initially at a viable mangroves swamp which means partially an improved sea water exchange. But it bothers me a little bit, because it's a balance between sea water and the fresh water input which gives the required saltiness to any system. If we go overboard on the sea water input we could push the salinities up to a level whereby we don't create a viable system for the mangroves any longer, even though they can live in very high salinities. The fresh water dilution factor has decreased enormously over time, as shown very clearly by Dr Swart, and therefore one is looking also at the fresh water input and what we can do cheaply on the fresh water side. With a little bit of effort, and foresight, and planning, I think one can look at the system with the open gates as it were pushing more water towards Isipingo even under quasi

cataclismic regimes. Again, as has been pointed out, the engineers would like to control nature, whereas the biologist feels that nature should just let itself go occasionally. I think a heavy input of fresh water on occasions can only do the system good.

I think the management of these gates is critical and if you look at all the alternatives Harry has spelt out, dredging occurs in two of them and dredging is sand removal. Sand can be used, and I think it is an alternative which should be looked at very carefully. So really, what one is looking at is the management of the sluice gates or pentstocks and the improved seawater exchange by increasing the tidal prism and perhaps by increasing the number of pipes going through the system. A very important factor which I think "Gravels" should look at, is control of input, particularly that one pipe line coming in all by itself.

Chairman:

Thank you very much. I think that virtually summarises the input we have had through the day.

During the tour of the area I wondered about the discipline of the public here. I saw mangroves trees being cut down, and there was a lot of debris lying around. I didn't see any refuse bins or any effort to clean up the area. I would like to ask the Borough, "Are there any problems in cleaning it up?"

Mrs Bramer:

I belong to the school liaison committee of the Wild Life Society. Last year after the initiation of the society, we decided to take a group of school children and get the area cleaned up. This was fairly successful but later we found that we did have some problems regarding the boundary of the area around the lagoon. And of course you will find that there is more debris lying around now, after the Easter holiday. We are thinking of future excursions as we want to involve the school children but we cannot do much until the boundary has been defined.

Mr Blondin:

I agree with what Dr Ramm has said about management of the sluice gates. I think what we are trying to get to here is to use the Isipingo water that is now going to the Umbogintwini, so that it is possible to use it to keep the canals open without the danger of flooding. I think that is what we should definitely look into in view of what Alan said.

I must say as far as the quality of the water is concerned, whether you have got a litre or a hundred litres of water, the quality of the water does count a lot. And over the last year or so, and thanks very much to the co-operation of the Borough of Isipingo and the Borough of Amanzimtoti, we have had far fewer incidents of pollution from the industrialists in the Prospecton area. There may have been a few that we don't know about, but the number of incidents that have come to our knowledge has definitely decreased.

So that is a good thing to continue with as far as we are concerned—continue to put pressure on the industrialists to keep the storm water drains clean. But you will always have run-off in times of heavy rainfall from hard-stand area or parking areas and from roads. This cannot really be helped. It is always there with the tarred surface, with the phenyls etc., the oil that is on the road. Durban corporation did put in an oil trap across the canal which ends in the harbour, and this has trapped a lot of floating debris and a lot of oil which is regularly taken off. Earlier an idea was mentioned of putting a trash rack at the bottom end of the canal. We have brought this up before to both the Borough of Amanzimtoti and the Borough of Isipingo and I would like some comment on that side of things. To treat the causes as best we can, but some things you just cannot treat, such as run-off from the roads. Can we not think of putting in a trash rack as well as an oil trap at the bottom end of the canals to keep what we can out of the Isipingo Estuary.

Mr Walton:

We have been speaking about pollution. We have been talking about fresh water going into the estuary area, but can we look at the long term policy here? We talk about the *E. Coli* content of the Isipingo

River, the sewerage coming from the upper ends of KwaZulu. What is going to be done about that? The other point is that we realisethat there has been pollution from the Prospecton area which is now totally controlled. We also know that there is pollution from the Isipingo area. This is a very big problem to them, but I would like to question the dumping of household rubbish on the Isipingo banks by the Isipingo municipality. What is going to happen in the future? Is there going to be a leachate from this? Is this going to be controlled?

The other thing is oil and Juba boxes that come floating down the canal system. We suggested that booms be put across at various points in the canal system to trap this. Who will pay for this and who will clear it is another question.

Mr Blondin:

We are on an ongoing negotiation with the KwaZulu authorities as far as pollution is concerned. We hope to get to a point whereby we will be appointed at least as agents for the KwaZulu Government to conduct pollution control in the area. At the present time we do not have official authority in KwaZulu. We are hoping to get to that and we are moving very fast towards that, and we should hopefully be able to sort that problem out.

There are always the practical problems of pipe breakages and then finding the necessary people at the right time to repair that. As far as the illegal dumping of rubbish is concerned, when the solid waste regulations are promulgated, and we are very near that now, it will be illegal to run a waste disposal site without a licence in terms of the Act. As far as the oil and grease trap or trash rack is concerned, if the oil or trash is emanating from the Prospecton area it will be the cost and the responsibility of Amanzimtoti in terms of Section 21 of the Water Act. If it comes from Isipingo it will be the cost and responsibility of Isipingo in terms of Section 21 of the Water Act.

Dr Swart:

As regards this point about the mangroves needing a balance of sea water and fresh water, I take that point.

I still cannot understand this business about the sluice gate. If I heard the facts correctly this morning, there were two sluice gates, one having the capacity of around 2,3 cubic metres a second and the other about 1,1 cubic metres a second. So the two have a joint capacity of about 3-4 cubic metres a second. That is what I saw in the literature. So if that is the case, and if the problem in the canal is about something big which has a capacity of 9,7 cubic metres a second, I cannot understand why the two sluice gates cannot always be open. It must mean surely that the controlling factor is not the canal but is the sluice gate. If that is the case it means that even if there are 60 cubic metres a second, which is about a one in two year flood, if this flow comes down to the sluice gates only 3 or 4 cubic metres can pass through and the rest go to Umbogintweni. That is my understanding of the situation. (Applause). If that is the case, then I would suggest we just look into it to make sure that these facts are correct, and if they are correct, then I would suggest that apart from improving the sea water exchange one also opens both sluice gates, for a trial period, and then if that works then go further from there.

Chairman:

I think, Mr Stroude, you have already agreed to that, have you not?

Mr Stroude:

Correct

Prof. J. Berjak:

May I just make a comment about the apparent confusion about the sea water and fresh water for mangroves. There is no harm to mangroves if they are irrigated only by sea water, as long as the sea water does not dry up so that there is an excessive evaporation from that ground that has been saturated. So as long as this river does not dry up, or the sluice gates are there so that the water from the dam can be let in, those mangroves will be fine, and I would encourage in every way the sea water

influx. If you look at Durban Bay, Richards Bay, and first bay of Kosi Bay, and the bays in Mozambique, they depend on mainly sea water. So as long as you don't get excessive drying you will be okay.

Chairman:

It seems as far as the management of the sluice gates is concerned we have obtained co-operation of the municipality, and that the sluice gates are going to be opened on a trial basis to see what happens.

The increase in the tidal input of sea water is a question of who does it, at what cost, and who pays.

Mr Cooper:

On the question of who does it and who pays, could we not ask the Provincial Administration of Natal whether this would be one of their responsibilities? They do have a dredger at Zinkwazi or they did have one there. They have got them up at St Lucia. We are not necessarily suggesting those, but we are suggesting that the principle of them being involved in the removal of the sediment from estuaries and lagoons has been part of thier responsibility, and I wonder whether we could not ask the Province of Natal to pick up this one.

Chairman:

Perhaps we should throw the ball into the court of the Isipingo municipality this time because it has been suggested that by putting the dredging out to tender, this could possibly produce some revenue which I am sure Isipingo could do with. The Isipingo municipality is certainly showing a very keen interest in this area, and perhaps they could make all the necessary approaches to put something in motion to that end.

Dr Swart:

As an example, in the Cape, in the Keantsi estuary, exactly the same problem occurred. We advised the municipality to see whether they cannot get a contractor to go in and take it out. A contractor went in, and he got the sand for free, they didn't charge him for it and he sold it at R14 per cubic metre.

Perhaps all this material isn't suitable, but I think it could be a very profitable proposition for a private enterprise.

Chairman:

The final summary point is the control of the input, and I think we have already got an answer there from Mr Blondin. This is being negotiated with the KwaZulu authorities and something is being done about it so perhaps if there is no further discussion we could call for comments on resolutions now. The whole purpose of the seminar, as I said at the outset, is useless unless we implement something from the seminar. It is important that some resolutions be taken as to where to go from here and what would be done and so on.

Mr A.M. Little, Chief Town and Regional Planner:

I believe that one resolution would be that a follow up committee be established. We can come to membership later if you wish to, but I think most of the parties here today and I would like to say that I believe if Town and Regional Planning were approached to convene at least the first meeting of that follow up committee (if it is agreed by the people here today), they would be prepared to take up that particular part of the challenge. So I would like to recommend that we do set up a committee, and that Town and Regional and Planning is approached to convene at least the first meeting of that Committee. During that meeting we would be able to take many of the suggestions and suggested priorities, sift through them, and take it a step further.

Chairman:

Are we all agreed that this be taken up by the Town and Regional Planning Commission, and for them

to set up a committee to implement the proposals which have been voiced today? Are we all agreed? Anybody against it?

Dr G. Hughes, Natal Parks Board:

There have been a number of recommendations that the Parks Board become the management authority for this, so it is desirable to get an indication from the people here today whether the authorities would be prepared to make the land available for a viable nature reserve, either by deed or by lease or by sale. If there is support for this, and the Parks Board becomes the co-ordinating management authority, then with respect to Mr Little's suggestion, it would probably be better for the Parks Board to act as the co-ordinator. If they (NPB) are going to manage it, it would be managed in the same way that they manage any other reserve, certainly some of our coastal reserves. Here we have had a great deal of involvement by people like Pat Berjak and others. This then becomes a management committee for the reserve. The objectives that Dr Swart suggested must be addressed at the management level because we can make wonderful resolutions here, but if there is no co-ordinating authority, and there is no long term management, then they are just going to fall flat. So it is really up to management level. We would expect people like Dr Swart to come along as he has done recently to Beachwood Mangroves, to advise the management group and to make suggestions as to ways and means.

If the Isipingo authority wants to continue to control the sand winning operations, and to derive revenues for them, then this is going to make it very difficult for a management authority like the Natal Parks Board. So it would be of interest to know whether there is support for Keith's suggestion that there be a central managing authority, that there be a reserve, and whether it goes to the Parks Board or not. I might add on behalf of the Parks Board (although I cannot speak on behalf of my board) that we are greatly interested in managing this end of a coastal reserve running from Bluff down, and we are entirely supportive of this endeavour.

I would also like to take the opportunity of thanking the organisers for this day.

(Applause)

Chairman:

I think the whole feeling of the meeting is indeed that Parks Board should undertake responsibility for the management of the area, ultimately; but would it not be premature at this stage, because of the involvement of so many other parties? Would it not be better at this stage to be initiated by the Town and Regional Planning Commission with the ultimate objective of handing it over to the Parks Board for management? That would seem to me (I speak personally) the logical thing to do, but I throw it open for discussion.

Can I ask if everybody is in favour of handing it over to the Town and Regional Planning Commission to take the initiative in forming a committee to implement the suggestions made today? Is everybody agreed to that? Anybody against that?

Thank you very much.

Is there any further discussion that anybody or any comment that anybody would like to make, before we go onto the next item?

Mrs du Toit:

I think that what Dr Hughes was getting at was that we actually agree in principle to the setting up of such a nature reserve which would include the boundary of such a reserve.

Agreeing to it in principle does not necessarily say that it is going to come about. That we are in agreement that such a nature reserve be formed is resolution No. 1. Then flowing from that, that a mangement committee be set up under the auspices of either the Town and Regional Planning Commission or the Natal Parks Board. I personally would favour such a committee being set up under the auspices of the Parks Board. That is my personal opinion.

Mr Little:

When I put forward my suggestion I said merely that the Town and Regional Planning Commission would be prepared to convene the first meeting. I think if we could leave it at that, I would be very happy if my sister organisation captained by Dr Hughes takes over from there, but I think that could be settled at the first meeting.

Chairman:

Can I come back to Mrs du Toit's first question. Are we agreed that it is advisable and desirable that this area be established, that a nature reserve be established in this area, and that the implementation be initiated by a committee to be set up by the Town and Regional Planning Commission?

Voice:

Agreed

Chairman:

Thank you very much.

Well now I would like to call on Mr Little to come forward to sum up the proceedings of the day.

Mr Little:

I believe the summing up is something you have done already so I don't believe that I have to spend very much time on this. It does seem to me that in reviewing some of the thoughts that we have had today, that perhaps the first thing and the most important thing that we have decided is to establish a follow up committee, with the support of everyone in this hall, bearing in mind the very wide representation which is here today. As I said previously, I think the mangement would definitely be in the Parks Board's court. At its first meeting we hope to see Dr Hughes there, and we will be able to pass the ball straight to the Parks Board so that they can see what it looks like.

The second point that seems to arise is illustrated by Dr Swart's slide here. He has pointed out the necessity for us to determine what the goals are and what the priorities are of this area. I must say that when I hear Prof Berjak speak about mangroves, and since I also love mangrove communities I get quite excited about it. But it seems to me that one of the things we have to do in setting goals, is to go back to our local people whether or not they would like to have a mangrove community here or whether they have any other ideas such as Dr Swart has indicated. So just putting that point, I believe that goals are important in the next step, and that will have to be done, but with the support of the local community.

I think also we will have to look at the question of the education of local people. I think it has been touched on. Certainly we need to examine how we can educate people to have a better behaviour pattern if I can put it that way. It was pointed out that one looks around and gets a certain impression, and we need to tidy that up. Not only are people littering things, but certain industries are perhaps not behaving according to the pattern that would seem to be desirable. This needs to be part of an educational programme which should be established in this area and focused on this particular estuary. I leave that thought which I think has come out but perhaps not been articulated as such.

There are also the large number of organisational points which have arisen today which I believe that the committee would have to look at. In addition to the points already made, we must obviously include the necessity to gain the active co-operation between the local authorities concerned. One of the speakers mentioned that it is a question of being a neighbour to other local authorities which is perhaps creating a problem to be looked at. Under co-operation between the local authorities I believe that one could then address the appropriateness of the town planning zoning schemes. The proclamation of the area, and handing over for control by the Parks Board. One needs to look at co-operation of other departments. Obviously the Department of Water Affairs, the Pollution Control Division is amenable, as are the local authorities, to taking action. But is was mentioned this morning that they could do with a couple of local policemen. I believe that is one of the things which could be provided.

We need to approach KwaZulu perhaps, in addition to the approaches which are being made by Water Affairs.

We need to see whoever is responsible for the design and the building of those pipes which connect the sea and the estuary area. I thought SATS were the people involved. I may be wrong. We need to discover those people and bring them into the equation as well.

Then also to have a look at the land ownership situation and sort that out.

I just noted down from today a couple of quite tricky organisational problems that need to be examined. I think we have had a very good expression of the ecological types of problems. I won't mention those at all. The only point I would like to make here is to say that we must be very certain that we know what we are doing before we do things.

The question of dredging has been mentioned. My limit of experience on this is that it is all right pulling muck out somewhere and hoping you can sell it. From what I heard today you might not be able to sell some of the things or some of the spoil that you will be getting out there, and you will need to know where to put it. Just as an illustration that we need to be quite certain about what our strategy is going to be in order to achieve our goals before we carry them out.

That brings me to the question of costs, because I believe to ascertain or to be certain about such strategy will cost a certain amount of effort—it will cost a certain amount of money. We have heard, I think, enough from Department of Environment Affairs to know that if we came up with a package we can approach them. I am not certain what the answer will be but certainly we have to look in that direction. Also, with the sort of tenor that I have detected today, we could approach the local authorities for financial assistance in some of these things. We can approach the Province, and we can approach some of the industrialists — the kind of people who are also concerned about their environment. I believe that one of the jobs of the committee will be to formulate a goal and a package and ideas here, to put a cost estimate on it, and then to see how we can marshal those funds. That committee must be sufficiently responsible to administer those funds and report back.

The last point that occurs to me has been the necessity for us to establish a first class maintenance of what it is that we wish to create here, and I think that this is a vital point which that particular committee should examine very carefully. We have seen from the past history of the area that we have to keep at it the whole time. With that last little thought I believe that I have done what was the duty I had to do. I thank you for the opportunity of joining with you today at this symposium, and I would say to you that I believe the conclusion you have arrived at, and the feeling of togetherness and co-operation has really been worthwhile. I believe Mr Harris, who is the Chairman of our Commission, would feel exactly the same thing. Not only have we decided to go for it as Mr Anderson said but it has been worthwhile doing so.

Chairman:

Thank you, Mr Little, for so adequately summing up and drawing to a conclusion the proceedings. I am sure that your comments alone are evident of the very capable hands in which we place our future course of action in calling the first meeting and organising the first committee. You have been very careful to point out the difficulties which would be faced and the dangers of going at the objective half cocked without taking cognisance of the consequences. I am sure we have every confidence that the committee to be appointed will not fall into that particular trap.

I would now like to take this opportunity of thanking those responsible for organising this seminar. We have drawn a very distinguished gathering, of not only of speakers but participants as well, thank you all for your attendance.

On behalf of the Wild Life Society I would particularly like to thank the small committee which organised the programme. I have been to a number of seminars over a number of years but I really think that this has been a cohesive seminar, well programmed from beginnning to end. I would like to congratulate them on the preliminary work they put into the organisation, and particularly to the Town and Regional Planning Commission for assisting the Wild Life Society and the Borough of

Isipingo in mounting the seminar. Thank you all for your attendance.

Closure

Mr Moodley

Mr Chairman, Officials of the Wild Life Society, our special guests from the concerned and relevant Government Departments, delegates and representatives from various bodes, ladies and gentlemen, it gives me great pleasure as chairman of the Isipingo Centre of the Wild Life Society to bring to a close the day's proceedings. I would be failing my duty as chairman of the Centre if I did not very quickly and very briefly reflect on the views of our Centre and more important on the view of our local community. Many of you are familiar with the area; that is the area in contention. Others have learnt from today's deliberations this area was once a beautiful natural and picturesque one, bountiful in its rare mangrove community, and a variety of other characteristic plant and animal life. As you have heard in the course of this mornings proceedings, the recent major developments in the neighbouring areas, that is firstly the siting of the Louis Botha Airport and the SAPREP oil refinery and later the Prospecton industrial complex, resulted in the diversion and canalisation of the two most important rivers, the Umlazi and the Isipingo. These were largely responsible for the picturesque area changing to a very derelict one. Unfortunately the local inhabitants, those that were going to be directly affected by the backlash of such changes, were not consulted. One must remember that people also live here. We as conservationists realise the modern development and technology must go on, but not to the detriment of, or at the expense of, our natural resources. Obviously, environmental impact studies had been made, but an implementation of the recommendations set out to minimise the ill-effects of such changes, either showed no real or positive results, or were managed according to recommendations in the report.

Ladies and Gentlemen, it is this gloomy picture that spurred and pricked not only conservationists both local and outside. But the local community can now stand up and voice their disapproval. The earnestness and concern lead to the resuscitation of the Isipingo Centre of the Wild Life Society. Our Centre is proud to mention that we liase with local school children to create awareness amongst them. We stress education through awareness, and education through action.

Our immediate concern is the resuscitation of the Isipingo lagoon and estuary, and all efforts by the Director of Conservation of the Wild Life Society of South Africa, Mr Keith Cooper here, have culminated in today's seminar materialising. We are no longer willling to sit back and allow the degradation to continue in this Isipingo river mouth. The mouth may be closed, but the estuary is not dead yet. Let us use our mouths not for lip service but to actively apply mouth to mouth resuscitation. Here I am referring to the resuscitation of the lagoon mouth.

We are confident that the days proceedings and deliberations will set the ball rolling, in creating and stimulating awareness and enlightment especially in the individuals and authorities who need to reflect on their priorities. We have to act before it is too late. Like an extinct plant or animal no miracle can bring it back.

The success of the seminar cannot be gauged immediately. Success can only be attained if all interested parties, delegates and respresentatives from the various bodies from the different Government Departments and Municipalities show an ongoing concern, a commitment and involvement, through interaction and co-operation from the multifarious team. This was tabled as one of the resolutions this afternoon.

For this seminar my centre would like to thank the following.

Firstly, the Deputy Minister of Environmental Affairs. We are indeed very grateful to him for gracefully opening the seminar. His presence and participation underline the importance of this

seminar. We know that we can depend upon him for support, both moral and otherwise, in our endeavours to revitalise the area. To our other special guests, eminent personalities, specialists, and authorities in their field, we are indebted to you for the enlightenment and expertise that you brought out in your lectures. We know that your specialised knowledge will be of tremendous benefit as guidelines to resuscitate the lagoon area. To the chairman of the three sessions and also to all others present, thank you for your participation and discussion. Your views and thoughts have proved invaluable in our efforts. We are also indebted to Mr C.J. Ward, an eminent ecologist and senior lecturer in the department of botany in UDW, for his active interest and work in the Isipingo area, and for his research report seminar No. 45 of the Botanical Research Institute which I think is the basis for our seminar. We would also like to place on record the interest and support of Mr Vincent Collery and Mr Dave Hatton of BP Southern Africa, firstly for sponsoring the cheese and wine party to resuscitate the Isipingo Centre, and presently for BP's major sponsorship of this seminar to the value of R1 500,00. I would also like to thank the Wild Life Society, especially the Director of Conservation Mr Keith Cooper, for initiating this seminar. To Town and Regional Planning, especially to Mr Bromley, the man behind the scenes, for the organisation and arrangement. To the Mayor and Deputy Mayor of Isipingo, thank you for the cocktail party. Thank you ladies and gentlemen.